US Army Corps of Engineers

ERDC
Engineer Research and Development Center

BROAD AGENCY ANNOUNCEMENT (BAA)

FOR

Engineer Research and Development Center

VICKSBURG CONSOLIDATED CONTRACTING OFFICE
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PREFACE

The U.S. Army Engineer Research and Development Center (ERDC) includes the Coastal and Hydraulics Laboratory (CHL), the Geotechnical and Structures Laboratory (GSL), the Environmental Laboratory (EL) and the Information Technology Laboratory (ITL) in Vicksburg, Mississippi, the Cold Regions Research and Engineering Laboratory (CRREL) in Hanover, New Hampshire, the Construction Engineering Research Laboratory (CERL) in Champaign, Illinois, and the Topographic Engineering Center (TEC) in Alexandria, Virginia. The ERDC is responsible for conducting research in the broad fields of hydraulics, dredging, coastal engineering, instrumentation, oceanography, remote sensing, geotechnical engineering, earthquake engineering, soil effects, vehicle mobility, self-contained munitions, military engineering, geophysics, pavements, protective structures, aquatic plants, water quality, dredged material, treatment of hazardous waste, wetlands, physical/mechanical/ chemical properties of snow and other frozen precipitation, infrastructure and environmental issues for installations, computer science, telecommunications management, energy, facilities maintenance, materials and structures, engineering processes, environmental processes, land and heritage conservation, and ecological processes. This research is conducted by Government personnel and by contract with educational institutions, non-profit organizations and private industries.

The provisions of the Competition in Contracting Act of 1984 (P.L. 98-369) as implemented in the Federal Acquisition Regulation provide for the issuance of a Broad Agency Announcement (BAA) as a means of soliciting proposals for basic and applied research and that part of development not related to the development of a specific system or hardware procurement. BAAs may be used by agencies to fulfill their requirements for scientific study and experimentation directed toward advancing the state-of-the-art or increasing knowledge or understanding rather than focusing on a specific system or hardware solution. The BAA shall only be used when meaningful proposals with varying technical/scientific approaches can be reasonably anticipated. “Basic Research” is defined as research directed toward increasing knowledge in science with the primary aim being a fuller knowledge or understanding of the subject under study, rather than any practical application of that knowledge. “Applied Research” is the effort that normally follows basic research, but may not be severable from the related basic research; attempts to determine and exploit the potential of scientific discoveries or improvements in technology, materials, processes, methods, devices, or techniques; and attempts to advance the state-of-the-art. This announcement must be general in nature, identify the areas of research interest, include criteria for selecting proposals, and solicit the participation of all offerors capable of satisfying the Government's needs. The proposals submitted under this BAA will be subject to peer or scientific review. Proposals that are selected for award are considered to be the result of full and open competition and in full compliance with the provisions of PL 98-369, the Competition in Contracting Act of 1984.

This guide constitutes the BAA of this Command and conforms with regulatory requirements of the Federal Acquisition Regulation. This guide provides prospective offerors information on the preparation of proposals for basic or applied research. Directions as to form and procedures are included.

Proposals from U. S. Government facilities and organizations will not be considered under this program announcement.

PERSONS SUBMITTING PROPOSALS ARE CAUTIONED THAT ONLY A CONTRACTING OFFICER MAY OBLIGATE THE GOVERNMENT TO ANY AGREEMENT INVOLVING EXPENDITURE OF GOVERNMENT FUNDS.

This BAA supersedes all previous editions and shall remain in effect until superseded.

Proposals are encouraged from Historically Black Colleges and Universities or Minority Institutions (HBCUs/MIs) for students to provide research support to any of the research and development areas listed in this BAA. This area of student research need is 100% set-side for HBCU/MIs, as defined by the clause at 252.226.7000 of the Defense Federal Acquisition Regulation Supplement (DFARS). HBCU/MIs interested in submitting a proposal must address the specific areas of research under which they are submitting. They must also clearly state within their proposal their capability to perform the contract and include a positive statement of their eligibility as an HBCU or MI.

ERDC also encourages small business concerns, women owned small businesses, small disadvantaged business concerns, small businesses located in HUBZones, businesses participating in the Small Business Administration 8(a) program, and service disabled veteran-owned small businesses to research proposals for consideration.

The Offeror, by submission of an offer or execution of a contract in response to this solicitation, certifies that the Offeror is not debarred, suspended, declared ineligible for award of public contracts, or proposed for debarment pursuant to FAR 9.406-2. If the Offeror cannot so certify, or if the status of the Offeror changes prior to award, the Offeror must provide detailed information as to its current status.

Please contact Sally East of the Vicksburg Consolidated Contracting Office at 601-631-7259 or via email at Sally.E.East@mvk02.usace.army.mil if you have questions concerning submittal or contractual requirements. For questions concerning proposals to CERL, you may also contact Rita S. Brooks at 217-373-7280. Contact the technical personnel listed at the end of each topic area for questions concerning the topic areas themselves.

NOTE: PREPARATION INSTRUCTIONS AND ADDRESSES SHOWN ON PART III

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PART I

BACKGROUND AND RESEARCH INTERESTS OF THE RESEARCH LABORATORIES

The COASTAL AND HYDRAULICS LABORATORY (CHL) has nationally - and internationally - recognized engineering and scientific expertise related to inland waterways and the estuarine and coastal zones. CHL has foremost capabilities in prototype data collection, experimental research and numerical modeling and simulation of processes involving water levels, current, winds, waves and tides, and their interaction with sediments and structures. Specific and unique expertise exists in the engineering, hydrodynamics, sediment transport, dredging and dredged material disposal, physical processes associated with environmental analyses, groundwater modeling, military hydrology, harbor engineering, and riverbank and shore protection. CHL has the Tri-Service Reliance mission for Logistics-Over-the Shore (LOTS) for Sustainment Engineering. The Shore Protection Manual, which is internationally recognized as the most authoritative source of engineering design and guidance for the coastal engineering profession, was originally developed by the Coastal Engineering Research Center (CERC), and is being replaced by the CHL with an updated and greatly expanded Coastal Engineering Manual.

The GEOTECHNICAL and STRUCTURES LABORATORY (GSL) performs research, development and testing in many areas such as: soil mechanics, foundation design, slope stability, seepage analysis, pavements (both expedient and permanent), rock mechanics, engineering geology and geophysics, earthquake engineering, vehicle mobility and trafficability, structural dynamics, explosion and weapon effects, survivability, earth dynamics, construction materials, impact of high-velocity projectiles, development of methods for installation of fixed installation camouflage, concealment and deception, and design and analysis of structures to resist static and dynamic loading. The Geotechnical and Structures Laboratory is equipped to perform any type of laboratory testing, including centrifuge applications, needed to assist in the types of research described herein.

The ENVIRONMENTAL LABORATORY (EL) conducts Military and Civil Works R&D for the Corps of Engineers, other Department of Defense elements, and other Government agencies in the general areas of Restoration (Clean-up) and Conservation. Restoration involves the development of technologies to improve site characterization, reduce the cost and time to remediate contaminated sites, and accurately assess and monitor the hazard associated with contamination. Areas of research include: (a) environmental sensing development, (b) hazardous waste site characterization and treatment, (c) sediment geochemistry and biological effects, (d) water quality modeling, and unexploded ordinance (UXO). Conservation deals with sustaining the natural and cultural resources entrusted to DoD for continued use through improving and developing tools and technologies, which conserve, protect, and enhance natural and cultural resources and foster stewardship. Areas of research include: (a) environmental database development; (b) environmental impact prediction, assessment, and management; (c) environmental criteria for stream channel alteration; (d) natural resource management; (e) nonindigenous aquatic nuisance species management; (f) threatened and endangered species protection and management (g) water quality and ecological systems; (h) outdoor recreation; (i) cultural resources; and (j)

ecosystem simulation.

The INFORMATION TECHNOLOGY LABORATORY (ITL) performs research in computer-aided engineering, interdisciplinary engineering areas, computer science, high performance computing, instrumentation systems, and all aspects of information technology. Projects include computer-aided structural engineering, application of computer-aided design and drafting (CADD) and geographic information system (GIS) technology, three-dimensional (3-D) structural stability, finite element method analysis of structures, engineering reliability, instrumentation systems design and development, relational database management, management information systems, information engineering, software engineering, collaborative technology systems, telecommunications, scientific visualization (including virtual reality), office automation, graphic arts and publishing, library systems, and records management. The Information Technology Laboratory administers and operates on behalf of DoD the ERDC High Performance Computing (HPC) Major Shared Resource Center with a variety of advanced HPC systems that are configured to provide leading-edge computational performance, data storage capacity, network capabilities, and scientific visualization capabilities. A variety of languages and commercial software packages are available on these systems. The computational capabilities of the Center's systems may, at the option of the Government, be made available to contractors.

The U.S. Army CONSTRUCTION ENGINEERING RESEARCH LABORATORY (CERL) offers research and development (R&D) support, as well as technical assistance, to a variety of customers throughout the Department of the Army (DA) and other Government agencies. CERL is the lead Army facility for conducting R&D on infrastructure and environmental issues for installations. CERL’s research is directed toward increasing the Army’s ability to more efficiently construct, operate, and maintain its installations and ensure environmental quality and safety at a reduced life-cycle cost. To accomplish the mission, CERL has two Divisions: Facilities and Installations. Researchers in these Divisions are matrixed across the ERDC organization in multi-disciplinary teams that bring the best expertise to bear on solving problems for the Department of Defense.

The COLD REGIONS RESEARCH AND ENGINEERING LABORATORY's (CRREL) mission is to research, develop, transfer, and leverage innovative technologies to:

- Solve national cold regions science and engineering challenges
- Provide technologies to the Warfighter for exploiting better understanding of sensor performance and terrain-state dynamics in complex battlespace environments
- Develop solutions to cold impacts on construction, operations and maintenance of Army and Civil Works facilities and activities
- Provide the Corps of Engineers’ commands with timely remote sensing and geospatial technology solutions and products for emergency management, environmental quality, water resources and geospatial visualization, and
- Provide solutions for mitigating the impact of human activity on the environment in cold regions.

The TOPOGRAPHIC ENGINEERING CENTER's (TEC) mission is to provide the Warfighter with a superior knowledge of the battlefield, and to support the Nation's civil and environmental initiatives. This mission is accomplished through research, development, operations and systems support, and the application of expertise in the geospatial, topographic and related sciences. Throughout its history, TEC has developed and exploited geospatial-related technologies critical to meeting the Nation's military and civil needs. Recently, TEC has applied its expertise to the needs of homeland defense and the global war on terrorism. These technologies and their related research, operations and systems development activities, essential to the Army in accomplishing its global mission, include the following:

- Timely acquisition, fusing, analysis, display, and dissemination of remotely sensed, multi-sourced information depicting imagery, features, elevation, and other information essential to accurately describe the land warrior battlespace
- The development of geographic information software that enables reliable, efficient, and secure information management, interoperability and accessibility for myriads of different users, each with different needs, in global operations.
- The development of globally fielded applications and systems for acquiring, accessing, fusing, and delivering terrain and feature information to the soldier.
- The development of accurate on-the-fly global positioning systems for use with inertial guidance as essential positioning engines for acquiring near real time, dynamic, high-accuracy, remotely sensed 3-d terrain and feature information.
- The development of increasingly compact, more efficient, and more comprehensive applications and systems aimed at providing ever-smaller combat units with information approaching real-time, enabling rapid response to developing situations in any battlespace.
- The development of new and innovative techniques to understand and visualize terrain and battlespace information in all dimensions, and to accommodate reasoning within analytical results.
- The development of accurate and efficient survey and mapping systems for use by both military and civil communities
- Capabilities in acquisition, testing and fielding of topographic systems; advanced and engineering development of imagery systems; and research and development in the areas of imagery and intelligence data exploitation.
- Operational capabilities in geospatial information and imagery requirements development; terrain, hydrologic, and environmental analysis; and information services.

CONFERENCE AND SYMPOSIA GRANTS

I. Introduction

The ERDC supports conferences and symposia in special areas of science that bring experts together to discuss recent research or educational findings or to expose other researchers or advanced graduate students to new research and educational techniques. The ERDC encourages the convening, in the United States, of major international conferences, symposia, and assemblies of international alliances.

II. Eligibility

Notwithstanding the above, the Department of Defense (DOD) has imposed certain restrictions on the ERDC's co-sponsorship of scientific and technical conferences and symposia. Specifically, DOD instruction 5410.20 prohibits co-sponsorship of conferences and symposia with commercial concerns, i.e., ERDC cannot co-sponsor conferences or symposia with a for-profit company. Scientific, technical, or professional organizations which qualify for tax exemption under the provision of 26 U.S.C. Sec. 501 (c)(3) may receive conference and symposia grants.

III. Conference Support

Conference support proposals should be submitted a minimum of six (6) months prior to the date of the conference.

IV. Technical Proposal Preparation

The technical portion of a proposal for support of a conference or symposium should include:

a. A one page or less summary indicating the objectives of the project.

b. The topics to be covered.

c. The location and probable date(s) and why the conference is considered appropriate at the time specified.

d. An explanation of how the conference will relate to the research interests of the ERDC and how it will contribute to the enhancement and improvement of scientific, engineering, and/or educational activities as outlined in the BAA.

e. The name of chairperson(s)/principal investigator(s) and his/her biographical information.

f. A list of proposed participants and the methods of announcement or invitation.

g. A summary of how the results of the meeting will be disseminated.

Cost Proposal Preparation

The cost portion of the proposal should show:

a. Total project conference costs by major cost elements.

b. Anticipated sources of conference income amount from each.

c. Anticipated use of funds requested.

V. Participant Support

Funds provided cannot be used for payment to any federal government employee for support, subsistence, or services in connection with the proposed conference or symposium.

COASTAL AND HYDRAULICS LABORATORY

I. Introduction

Research is performed in the areas of hydraulic structures such as locks, dams, outlet works, control gates, stilling basins, spillways, channels, fish handling systems, and pumping stations, flood control channels; navigation channels; riverine and estuarine hydrodynamics and transport processes; groundwater; hydrology; dredging-related equipment; and on coastal problems related to shoreline protection; beach erosion; navigation; sedimentation; inlet stabilization; and construction, operation and maintenance of coastal structures (break-water, jetties, groins, seawalls, etc.). Major areas of interest include coastal hydrodynamics (wind waves, tides, currents, wind related water levels); coastal sedimentation (longshore transport, inlet sedimentation); coastal geology and geomorphology; design and stability of coastal structures; and interaction of structures and coastal processes. Other activities include descriptions of coastal processes; theoretical studies; Watershed and regional sediment and water systems studies; numerical and physical model techniques; data collection and analysis techniques; development of laboratory and prototype instrumentation and equipment. The following sections contain information on these research areas and specific research thrusts.

II. Research Areas

A. Physical Processes in Estuaries (CHL-1)

1. The research program in estuarine physical processes deals with the hydrodynamic and transport characteristics of water bodies located between the sea and the upland limit of tidal effects. Research is directed toward knowledge that will improve field measurements and predictions of these processes.

2. Specific areas of required research include the following physical processes in estuaries and other tidal waters.

(a) The propagation of tides.

(b) Transport of salinity, mixing processes, stratified flows.

(c) Transport, erosion, and deposition of sediments, including settling velocity, aggregation of sediment, consolidation of sediment.

(d) Behavior and characteristics of sediment beds, including movement, consolidation, armoring, bonding, physical chemical characteristics, density, erodability.

(e) Flow between aquifers and surface waters.

3. Specific areas of required research include the following activities with respect to the physical processes listed.

(a) The effect of human activities, including dredging construction, vessel traffic, flow diversion, training, structures, and protective structures.

(b) Measurements of parameters that are indicative or descriptive of the processes listed in paragraph 2 by in-situ and remote methods in the lab and field.

(c) Prediction of processes listed in paragraph 2 by analytical methods, physical models, numerical models, and other techniques.

(d) Conceptual and mathematical descriptions of the processes listed in paragraph 2.

(e) Development of materials, equipment, and methods that potentially lead to applied research that would make human activities listed safer, more economical, or more effective.

(f) Development of methods, techniques, and procedures that enable the treatment of an estuary as a system. (Contact: Dr. Rob McAdory, 601-634-3057)

B. Inland Hydraulic Structures (CHL-2)

1. The research program in hydraulic structures is related to the hydraulic performance of locks, dams, outlet works, control gates, stilling basins, spillways, channels, bank protection, riprap stability, pumping plants and other hydraulic structures, and with physical and/or numerical model studies to predict and analyze the physical water quality aspects of water resources projects.

2. Specific areas of required research include the following:

(a) Physical and numerical hydraulic model investigations of a wide variety of hydraulic structures to verify proposed designs and develop more effective and economical designs.

(b) Analysis of model and prototype data and inspection of field installations to develop design criteria for hydraulic structures.

(c) Develop methods of correlating theoretical and experimental information with design methods used by the Corps of Engineers to improve existing procedures and provide material for inclusion in appropriate manuals.

(d) Develop physical and/or numerical models to predict and analyze the water quality aspects of water resources projects and design appropriate hydraulic structures to control water as well as water quantity while satisfying the desired objectives.

(e) Conduct research and/or develop numerical codes to develop techniques for analyzing physical aspects of water quality in lakes and rivers through a better

understanding of the hydrodynamics in density-stratified environments and for improving water quality within and downstream of density-stratified reservoirs and to investigate the ability of existing and proposed water resources projects to satisfy established water quality standards.

(f) Basic studies related to development of hydraulic design and operation guidance for hydraulic structures used in inland waterways for navigation and flood control purposes.

(g) Performance tests, both model and prototype, of hydraulic appurtenances to flood control and navigation dams such as spillways, outlet works, energy dissipaters, and approach and exit channels, are conducted and/or analyzed to develop design guidance that will provide structures of maximum efficiency and reliability with minimum maintenance.

(h) Develop innovative methods to prepare and revise engineering manuals for hydraulic design of various hydraulic structures.

(i) Develop innovative methods to conduct training courses on design of various hydraulic structures.

(j) Develop innovative methods to prepare technical reports of all work conducted. (Contact: Mr. Chuck Tate, 601-634-2120)

C. Open Channel Flow and Sedimentation (CHL-3)

1. The Stable Flood Control Channel research project consists of basic studies related to development of hydraulic design guidance for designing modifications to natural stream channels to provide for local flood protection. Emphasis is placed on channel stability as well as channel flow capacity.

2. Specific areas of required research include the following:

(a) Studies related to the development of effective methods to analyze a natural stream's response to modifications made for flood control purposes.

(b) Studies applicable to development of streambank and streambed protection methods where channel instability exists.

(c) Studies applicable to development of sediment transport, local scour, and stream form relationships for a broad range of stream types, bed and bank materials, and meteorological and hydrological conditions.

(d) Collection and analysis of data which aid in evaluating existing methods and/or developing new methods to analyze channel stability for the variety of channel flow conditions and stream types existing in natural stream systems. (Contact: Dr. David

Biedenharn, 601-634-4653)

D. Dredging Research (CHL-4)

Protection and enhancement of the environment associated with operation and maintenance of navigable U.S. waterway infrastructure through dredging activities is a national priority. Dredging operations and environmental requirements of navigation projects are inseparable. Research is required to predict the time-dependent movement of non-contaminated sand and sand/silt mixtures of dredged materials placed in the nearshore zone, and all materials placed in the offshore region. The cost of dredging operations attributable to compliance with environmental windows that are determined to be over-restrictive, inconsistent, or technically unjustified can be reduced. More effective contaminated sediment characterization and management will reduce costs and enhance the reliability of methods associated with the assessment, dredging, placement, and control of sediments from navigation projects. Better instrumentation for dredge and site monitoring is required to implement automated dredge inspection and payment methods, and accurately monitor placement of contaminated materials. Emerging technologies regarding innovative equipment and processes should be expeditiously introduced into the dredging arena. Enhanced ecological risk management for dredging and disposal projects through technically sound approaches for characterizing, managing, and conducting risk-based evaluations are required for expanding options regarding both contaminated and non-contaminated dredged materials. (Contact: Dr. Lyndell Hales, 601-634-3207)

E. Navigation Channel Design (CHL-5)

1. The research program in navigation channel design involves basic research to develop design guidance for the design of new channels and modifications of existing waterways. It involves identifying maneuvering requirements in restricted waterways that affect the channel dimensions, alignment, and location of appurtenances in the navigation channel under various environmental and vessel traffic conditions. It also involves identifying the stability of the channel, maintenance requirements and designing structures that reduce or eliminate the maintenance requirements. Finally, it involves quantifying the flow and pressure fields generated by a tow or ship passing through a waterway and the related impacts on the sediment resuspension in the channel, channel border, and side channel/backwater areas. Studies involve deep and shallow draft navigation channels and physical and mathematical models. Human factors are included in research and project studies using a ship and tow simulator.

2. Specific areas of required research include the following:

(a) Physical model investigations of a wide variety of navigation channel configurations in many environments with different type vessels to verify proposed designs and to develop more efficient and safe designs and to lower environmental impacts.

(b) Development and enhancement of mathematical models of vessels, both ships and push-tows, for use on the simulator to add vessel types not available or to

increase the accuracy with which the model reproduces the vessels response.

(c) Development of methods and modeling techniques to predict the currents and sediment transport characteristics of various channel designs and integrate this with the navigation model studies, including those generated by the vessel movement.

(d) Development of methods and modeling techniques to predict the currents and sediment transport characteristics of various channel designs and integrate this with the navigation model studies.

(e) Development of methods and techniques to prepare and display visual information for the pilot on the simulator projection system.

(f) Development of methods and measurement equipment, techniques for measuring scale model performance in physical model navigation studies.

(g) Development of methods and techniques to improve ship simulator and increase reliability of design estimates, including data and tools for ship motions, draw down, squat, ship-generated waves, and ship maneuvering.

(h) Development of methods and techniques for the analysis and evaluation of model results to optimize the channel design and to determine the level of safety, or conversely, risk involved with the various designs and ship transits. (Contact: Mr. Dennis Webb, 601-634-2455, and Dr. Zeki Demirbilek, 601-634-2834)

F. Computer-Aided Hydraulic Engineering (CHL-6)

The objective of this research program is to develop computer-aided design tools that can be used by hydraulic engineers in planning, design, construction, operation, and maintenance of navigation and flood control projects. The scope includes open channel and closed conduit flows, equipment, and structures. (Contact: Dr. Steve Scott, 601-634-2371)

G. Groundwater (CHL-7)

The groundwater modeling research program is structured to enhance understanding and predict capabilities, including the development of numerical codes, groundwater flows and contaminant transport in both the saturated and unsaturated zones for both porous and fractured media. The goal of the program is the development of modeling techniques, including remedial alternative simulation, for optimal design and operation of the site cleanups. (Contact: Mr. Earl Edris, 601-634-3378)

H. Hydrology (CHL-8)

1. Research in this area primarily addresses military applications related to mobility, counter mobility and water supply.

2. Specific research involves the following areas:

(a) Remote sensing and quantification of precipitation.

(b) Development of spatially varying precipitation hydrology models.

(c) Visualization of results for hydrology and dam break models.

(d) Rapid procedures for flood forecasting.

(e) GIS interfacing with existing and new hydrology models.

(f) Groundwater surface water interaction processes.

(g) Interfacing watershed models with water quality and other environmental models. (Contact: Mr. Earl Edris, 601-634-3378)

I. H&H GIS/DATABASE DEVELOPMENT (CHL-9)

Research involves the following areas:

(a) Electronic Navigation Charting.

(b) Integration of GIS/Database and H&H models.

(c) Watershed management for erosion control.

(d) Larger River System management for flood control navigation.

(e) Visualization Techniques. (Contact: Mr. Ronald Heath, 601-634-3952)

J. Coastal Hydrodynamics (CHL-10)

Research in shallow water wave estimation; forecasting and hindcasting of wind generated waves for oceanic to local regions; wave theory; statistical distribution of wave parameters; simulation of spectral conditions in wave basins; nearshore currents; wave breaking; wave/current and wave structure interactions; long and short waves in ports and harbors; tsunami modeling; wind generated currents; storm surge; tidal circulation; two- and three dimensional numerical simulation models (including finite difference, finite element, and curvilinear coordinate techniques); coastal meteorology; explosion generated waves; ship response to winds, currents and waves; moored ship response; mooring design and analysis, ribbon bridge hydrodynamics and turbulence. (Contact: Mr. Dennis Markle, 601-634-3680, and/or Mr. Bruce Ebersole, 601-634-3209)

K. Coastal Processes, Coastal Inlets, and Navigation Channels (CHL-11)

Shoaling in inlets; stability and performance of inlet channels; scour at structures; sediment transport modeling; numerical modeling of coastal and inlet hydrodynamics and sediment-transport processes; shoreline evolution modeling; storm erosion of beaches; wind and wave generated sediment transport; sediment budget analysis; coastal and inlet geomorphology; wave forces/loads on gates (tainter, miter, etc.); and PC-, workstation-, and mainframe-based automated coastal engineering software (including relational and GIS data bases). (Contact: Dr. Nicholas Kraus, 601-634-2016, and/or Mr. Dennis Markle, 601-634-3680)

L. Coastal Structure and Facility Design (CHL-12)

Development of functional and stability design criteria for coastal structures and facilities (breakwaters, seawalls, jetties, groins, harbors, marinas, etc.); wave runup, over-topping, refraction, diffraction, transmission, reflection, etc.; design of floating breakwaters; breakwater stability; application of spectral wave conditions to coastal engineering; stability of riprap to irregular wave attack; stability and functional design of overtopped rubble mound breakwaters; scale modeling of armor unit strength; analysis of structural data for floating breakwaters; investigation of numerical structural models for floating breakwaters; development of wave runup gage for rough and porous slopes; investigation of attenuation/mooring force models of floating breakwaters; development of materials and techniques to produce high quality break-water model armor units; analysis of wave runup overtopping, refraction, diffraction, transmission and/or reflection data on coastal structures and beaches and design of structures for Logistics-Over-The-Shore (LOTS) operations. (Contact: Mr. Dennis G. Markle, 601-634-3680)

M. Field and Laboratory Measurements, Data Collection, and Analysis (CHL-13)

Wave current, water level and wind measurement systems for laboratory and field cases; advanced data analysis (spectral and nonspectral) techniques; remote sensing techniques; bedload and suspended sediment transport; monitoring and evaluating technical and structural stability of coastal projects; field measurement of coastal processes; structural response instrumentation; bathymetric survey systems. (Contact: Dr. Yen-His Chu, 601-634-2067)

N. Experimental Coastal Model Equipment, Operation and Analysis (CHL-14)

Development of equipment and techniques for specialized model construction, experimental wave generation equipment, specialized data acquisition and analysis systems, advanced model operations techniques, and laboratory and scale effects in movable bed model studies. (Contact: Mr. Dennis Markle, 601-634-3680)

O. General Coastal Engineering, Coastal Geology, and Dredging Investigations (CHL-15)

Sand bypassing systems and equipment; beachfill design; coastal geology and geomorphology; functional design and evaluation of coastal works and coastal structures; littoral transport; coastal and offshore dredging studies; agitation dredging systems and equipment; physical monitoring of dredged material; physical processes in coastal wetlands; application of Geographic Information Systems; design of nearshore and offshore dredged material placement; evaluation of dredged material disposal sites; analysis of dredging operations management. (Contact: Dr. Yen-His Chu, 601-634-2067)

P. Regional and Watershed Sediment Management (CHL-16)

Regional Sediment Management (RSM) research is intended to provide knowledge and tools that the Corps and the Nation need for effective water resource projects. RSM implies the holistic management of sediment within systems or regions to produce environmentally and economically sustainable projects. Goals include improved project design, operation, and maintenance methods, minimized disruption of natural sediment pathways and processes, and mediation of natural processes that have adverse environmental or economic impact. The approach of the Corps research is to produce targeted R&D serving multiple Corps business areas; to employ ongoing projects' experience (including Demonstration Projects) to provide data and lessons learned; to use enabling technologies of local-scale products and tools, including those generated by other R&D programs within and outside the Corps; to generate technologies that integrate the best available knowledge on sediment behavior and regional morphology into management decision support tools for a) regional and basin scale analyses and b) evaluation of the impacts of projects and management decisions on and by long-term, large-scale sedimentation processes. A key element in ERDC research is full coordination with other organizations with sediment management or monitoring expertise. (Contact: Dr. Jack Davis, 601-634-3006).

GEOTECHNICAL AND STRUCTURES LABORATORY

I. Introduction

Research performed by the Geotechnical and Structural Laboratory's nine branches consists of investigations in the areas of soil mechanics, engineering geology, geophysics and seismology, earthquake engineering, pavements (both expedient and permanent), mobility and trafficability of military vehicles, structural design and performance of structures under both static and dynamic loadings, earth dynamics and the uses and performance of concrete, cement and other construction materials. Research areas also include measurement and analysis of seismic and acoustic signals to locate airborne and ground military targets and buried objects (including unexploded ordinance) and to characterize earth media. Research on concrete and cement is predominately related to current recognized needs, both civil and military. Military expediency focuses additional attention on ease and speed of concrete placement, development of very high strength materials, and use of non-traditional, indigenous and other special materials in concrete construction. Civil works research focuses primarily on the need to improve the performance of both new and old concrete structures. Structures research involves development, testing, and evaluation of a broad class of structures to resist the effects of static and dynamic loads induced by earthquakes, and other sources. The Geotechnical and Structures Laboratory also conducts research involving all aspects for improving the survivability of fixed installations. Research in numerical modeling and computer simulation of many of these topics is also undertaken. The following paragraphs provide a synopsis of the GSL's research responsibilities and more specifically describe those areas in which pre-proposals will be considered.

II. Research Areas

A. Earthquake Engineering (GSL-1)

Research areas of interest include the dynamic behavior of soil and rock; liquefaction of soils, including coarse-grained and fine-grained soils; in-situ testing to evaluate properties related to dynamic behavior; in-situ testing to evaluate susceptibility to liquefaction; methods of analysis of dynamic behavior of earth materials; methods of analysis of dynamic soil-structure interaction; risk-based and probability-based methods of analysis; seismic wave propagation in earth materials; seismically-induced settlements in soils; and remedial treatment of soils potentially susceptible to earthquake-induced instability or strength loss, computer visualization, and dynamic simulation; site response analysis; and strong motion instrumentation. (Contact: Dr. Joseph E. Koester, 601-634-2202)

B. Geophysics (GSL-2)

ERDC supports research in the development of land, air or waterborne geophysical methods to be used for characterization of hazardous waste sites, cavity/tunnel detection, detection and monitoring of seepage, non-destructive investigation of archeological sites, location of groundwater, detection of buried objects, analytical and data processing techniques, borehole surveys, crosshole seismic imaging, electromagnetic detection of

anomalies, seismic surveys, subbottom profiling, acoustic impedance surveys, characterization of physical and mechanical properties of earth materials, and uses of microgravity. (Contact: Dr. Lillian D. Wakeley, 601-634-3215)

C. Mobility of Vehicles (GSL-3)

The Mobility Systems Branch addresses engineering research on the performance of vehicles operating cross-country, on-road, and in negotiating dry and wet obstacles in worldwide terrains. This is a highly specialized technical area involving engineering mechanics, vehicle dynamics, mathematics, statistics, computer specialties, geology, and soil mechanics. Research in this area includes developing fundamental relations between soil and vehicle running gear; improving criteria concerning the effects of vehicle vibration on human response; developing algorithms describing weather effects on terrain, multi-vehicle movements along road nets, stochastic processes describing influence of uncertainties of data elements, and developing modeling and simulation capabilities for near real time assessments of mobility and countermobility for battlefield operations and operations other than war. (Contact: Dr. William E. Willoughby, 601-634-2447)

D. Pavement Technology (GSL-4)

Research is conducted in support of the Corps mission requiring the design and construction of roads and airfields worldwide and other engineering functions as they relate to pavements and expedient surfacing. This involves the formulation of engineering criteria for the design, construction, evaluation, maintenance, and rehabilitation of permanent and expedient airfields, pavements, railroads, and ports. Research areas of interest include improved design procedures, material characterization and evaluation, nondestructive testing, rapid repair of structures, expedient surfacing, aircraft and vehicular ground flotation, access/egress systems, gravel surfaced and non-surfaced areas, the use of geotextiles and geomembranes, grid confining systems, stabilization, dust control materials and techniques, and advanced binder systems. (Contact: Mr. Don R. Alexander, 601-634-2731)

E. Soil and Rock Mechanics (GSL-5)

Research is needed to: (a) improve methods for prediction and control of erosion of unlined spillway channels during uncontrolled releases; (b) develop innovative methods for flood protection and flood-fighting, including field evaluations of promising technologies; (c) develop guidance for applications of trenchless technology on Corps Structures, including measures to ensure safety and stability of Corps Structures when trenchless technology is used to install pipelines, cables, or conducts through or beneath levees and other structures; (d) develop improved methods, including risk-based methods for analyzing earth and rockfill dams and other water control structures for both static and earthquake-induced stresses; (e) improve the state of knowledge of physical and engineering properties of soil, rock, clay shales; earth-rock mixtures, granular filters, cohesive and noncohesive fine-grained soils susceptible to liquefaction, and soils susceptible to drastic volume changes (collapse, consolidation, swell); (f) develop rational analytical procedures and more reliable prediction of behavior of partially saturated soils; (g) determine the response of soils in situ to static and

dynamic loading and unloading; (h) determine the susceptibility of earth dams to cracking, hydraulic fracturing, and internal erosion; (i) evaluate improved defensive design measures in use of materials, particularly in filter and transition zones and impervious barriers; (j) improve procedures for monitoring and analysis of the performance of new and existing structures, particularly the use and interpretation of observations and from specialized instrumentation, and expedient systems for rapid inspection and evaluation of the integrity of dams; (k) improve the understanding of the aging processes in dams and in the influence of aging (particularly deterioration of safety-related features) on long-term maintenance and/or rehabilitation requirements for dams; (l) develop a better understanding of failure mechanisms to improve design of defensive measures, to provide information for remedial repairs, to assess potential damages resulting from failure, and to provide a basis for emergency actions; (m) develop expedient remedial measures when hazardous conditions are identified and thus reduce the damages and catastrophic potential of dam failures; (n) develop methodology to evaluate forces exerted on structural elements by adjacent soil masses that result from long-term variation in soil properties; (o) develop improved methodology for design and construction procedures for shallow and deep foundations, including mats, footings, piers, and piles for buildings, hydraulic structures and waterfront structures; (p) large scale physical and numerical modeling of deep underground structures (tunnels, shafts, chambers, intersections); (q) predictions of rock mass dredgeability; (r) acoustic emission (micro-seismic) applications in geotechnical engineering; (s) geotechnical aspects of hazardous and low level radioactive waste disposal; (t) evaluation of rock for use as rip-rap; (u) grouting of soil and rock masses; (v) sliding stability of gravity structures, and (w) centrifuge modeling of structures founded on or in rock. (Contact: Dr. Joseph P. Koester, 601-634-2202)

F. Engineering Geology (GSL-6)

The GSL conducts a broad range of research in the field of engineering geology in support of federal or other government technical missions. Specific areas of interest within this field include: application of remote sensing to geologic and geomorphic assessments; geo-archeological investigations; applied and numerical geomorphic analysis; computer applications in geotechnical engineering; 3-D visualization systems; uses of geographic information systems; geohydrology in military and civil applications; geologic mapping; geologic applications of mathematical techniques and geostatistics; groundwater monitoring, including well installation and design; geologic application of groundwater models; integration of geological and geophysical subsurface exploration techniques; land-loss studies; remedial measures at groundwater contamination sites; seismic hazard characterization and evaluation; subsurface exploration methods (drilling and sampling techniques); test site selection; conceptual and geologic and hydrogeologic models. (Contact: Dr. Lillian Wakeley, 601-634-3215)

G. Excavation, Structural Demolition, and Obstacle Creation (GSL-7)

Current criteria for improved demolitions call for significantly reduced manning levels and preparation times to accomplish assigned missions. Cost effectiveness, versatility, and safety are also of great importance. Current efforts involve technologies for the standoff creation and reduction of all types of battlefield obstacles, and the excavation of fighting

positions. A prime consideration is the development of more efficient means for the application of various types of energetic materials to targets of interest. In addition, modern materials and design principles used in typical target structures must be incorporated into future plans and guidelines for demolitions. Typical missions of interest are road cratering, antitank ditching, bridge and tunnel demolition, and the breaching of walls, bunkers, levees, and dams. (Contact: Mr. H. S. McDevitt, 601-634-2705, Mr. Steve Shore, 601-634-2246, and/or Ms. Pam Kinnebrew, 601-634-3366)

H. Ammunition Storage Safety (GSL-8)

The military services must store large amounts of munitions, both for war reserves and for training purposes. New conceptual designs for components or systems for storage are needed to reduce the likelihood of an accidental detonation of stored munitions, limit the propagation of airblast and fragments, or mitigate the safety hazards produced by an accidental detonation. In addition, test data and simulation techniques are needed to aid in the definition of the safety hazards from such detonations, and the mechanics of blast propagation among munition stores. Obsolete munitions are often disposed of by deliberate, controlled detonation. Research is needed on new methods for safe, efficient, and environmentally acceptable methods for deactivation of a wide variety of munition types.
(Contact: Mr. Henry S. McDevitt, 601-634-2705 and/or Mr. Will McMahon, 601-634-2183)

I. Physical Simulation of Munition Phenomenology (GSL-9)

The mechanical effects induced munition detonations are physically simulated using a variety of energy sources. Simulations are performed at full- and small- (1/2 to 1/10) scale. The mechanical effects from conventional energetic materials are normally performed at small-scale. These studies could benefit from improved (better fidelity, less expensive) simulators and simulation techniques. They could also enhance the development of test methodology for micro-scale (1/100 to 1/10) testing. Micro-scale test methodology includes the miniature high-fidelity energy sources, miniature sensors, advanced optical techniques, high-fidelity construction techniques for miniature structures, and theoretical developments in the scaling of material behavior. (Contact: Mr. Henry S. McDevitt, 601-634-2705 and/or Mr. Steve Shore, 601-634-2246)

J. Advanced Seismic and Acoustic Sensors, Measurements, Processing, Analysis, and Modeling (GSL-10)

Research addresses seismic and acoustic sensing, processing, analysis, and modeling of ground and air targets using advanced ground-based sensor systems. This effort focuses on passive technology. Processing methods include array processing and other methods of calculating source direction, noise suppression, advanced adaptive processing, and signal classification and identification. Phenomena of interest include direct propagation within the same medium and propagation across boundaries, such as geologic layers and the air/soil interface. Modeling involves phenomenology models of signal propagation. The objectives include sensing, detecting, and locating airborne and ground military targets and buried objects. Also included are medium characterization and classifying and identifying

sources based on their acoustic and seismic signatures. (Contact: Dr. Lillian D. Wakeley, 601-634-3215)

K. Laboratory Tests and Constitutive Model Development for Geologic Materials (GSL-11)

This research requires the formulation of mathematical constitutive models to simulate the mechanical behavior of geological and structural materials and incorporation of models into application-oriented prediction/analysis techniques. Also of interest is the development of dynamic test equipment and techniques and experimental evaluation of geological and structural material response to high-pressure transient loadings. (Contact: Mr. Henry S. McDevitt, 601-634-2705)

L. Projectile Penetration (GSL-12)

Theoretical and experimental studies of projectile stresses and trajectories due to impact and penetration into geologic and manmade targets and development of design criteria for shield systems. Includes development of equipment and diagnostic techniques to examine the response of targets to low and high velocity impact of penetrators, rods, etc. (Contact: Mr. Henry S. McDevitt, 601-634-2705)

M. Computational Structural Mechanics for DoD Applications (GSL-13)

The efficient use of scalable computers will require fundamentally new concepts in computational mechanics algorithms. Research includes mathematical formulations and development of scalable computational mechanics algorithms in the areas of structural response, penetration, contact-impact, structure-medium interaction, and interdisciplinary flow-thermal-structural interactions. Research area also includes development of computational models for new materials and composite construction (consisting of concrete, composite, and/or geologic materials) as well as the behavior and control of structures composed of such composite construction for military applications. (Contact: Dr. James T. Baylot, 601-634-2137)

N. Concrete Materials (GSL-14)

Aggregates comprise as much as 80 percent of the volume of concrete. Characteristics and behavior of various types of aggregates, and chemical and physical interaction between aggregates and other concrete components, are critical to overall concrete performance. Research areas include: nature of and potential for reactions between aggregates and alkalies; significance of and techniques for regulating aggregate moisture content; importance of aggregate shape and size distributions; and contribution to concrete durability. Optimizing the use of marginal natural aggregates, such as those with high clay contents of low structural integrity, also could be investigated, as could use of man-made aggregates such as recycled concrete and lightweight aggregates. Use in concrete of by-products of other industrial processes, such as fly ash, silica fume, and ground granulated blast-furnace slag, is increasing with knowledge of the potential benefits to concrete

properties. These uses contribute to solutions of industrial waste disposal problems while enhancing potential for development of new types of concrete with properties tailored to special uses. Knowledge of the mechanisms by which these materials interact with cement, aggregates, and other concrete ingredients is essential. Effects of these materials on concrete strength and durability is another area of particular research interest as is the use of cementitious materials other than portland cement, including some fly ashes and slags.

Additional research leading to establishment of optimum quantities of pozzolans and cement in concretes for general and special uses is needed. Specialized uses of concrete and increased demands on concrete performance have increased the importance of chemical admixtures such as water-reducers, set retarders, set accelerators, air-entraining admixtures, and foaming and defoaming agents. The mechanisms by which many of these admixtures function are virtually unknown. Reinforcing in concrete is critical to concrete design and construction. Research areas include materials and methods of reinforcing, prevention of corrosion of reinforcing materials, and performance of reinforced concrete in severe environments (freezing and thawing, chloride penetration, and elevated-temperatures). Polymer concretes are being used both for restoration and new construction. Interaction among components of these composite materials, and the ranges of characteristics that could be achieved with different combinations of materials, are little known. Research areas include polymer-impregnated concrete, polymer or resin concrete, or polymer-portland-cement concrete. Research is needed on means of formulating concretes to achieve specified performance, such as concretes with very high tensile or compressive strength, low shrinkage, rapid hardening, very low permeability, resistance to abrasion and erosion, shock-attenuating properties, ultra-low density, ability to float indefinitely, or thermal insulation properties. (Contact: Dr. William P. Grogan, 601-634-2226)

O. Concrete Properties and Analyses (GSL-15)

New technologies continually are being developed for non-destructive testing of various materials. Development of new methods could lead to applications in analysis of properties and performance of concrete. Links must be developed between the sophisticated testing methods and the needs of concrete technology. New dielectric, piezoelectric, or ceramic composites, for example, may appropriately be used in new concrete test methods, if these links are made.

Many of the research areas outlined in the previous paragraphs are related to methods of testing and analysis of concrete. Consideration of aggregate quality and moisture content and the use of admixtures apply to analytical considerations. In addition, investigations are needed for new methods and for modifications to existing methods and apparatus for testing concrete materials and structures. This need derives partially from uses of new materials. Special-use concretes and technologies, such as placement of roller-compacted concrete, also demand new testing technologies.

Thermal properties of concrete and the heat generated during curing of mass concrete also are related to many of the above considerations. Understanding heat generation and thermal and mechanical stresses will require computer-assisted modeling of concrete

performance.

Other research requirements in testing and analysis include:

1. Determine critical materials and procedures for minimizing cracking in concrete and develop guidelines for predicting concrete performance. This includes developing criteria for predicting durability and longevity of concrete and grout.

2. Classification of chemical admixtures by chemical composition and mechanism of performance.

3. Development of methods of artificially accelerated curing of concrete and new means of simulating real-world conditions and long times.

4. Development of innovative systems to construct concrete structures more economically.

5. Development of theoretical, computational, and experimental methods for effectively characterizing stress, strain, progressive damage, and fracture of engineering materials subjected to static and dynamic loads. (Contact: Dr. William P. Grogan, 601-634-2226)

P. Maintenance, Repair, and Rehabilitation of Concrete (GSL-16)

Assessment of remaining life, maintenance, and minor remedial measures, repair and rehabilitation, and surveillance and monitoring are topics of interest. Structures of interest include concrete locks and dams and appurtenant concrete and steel structures (outlet works, retaining walls, gates, piles, bulkheads, tunnels, intakes, etc). (Contact: Dr. William P. Grogan, 601-634-2226)

Q. Other Areas of Concrete Research (GSL-17)

Materials that are not actually components of concrete are important in some concrete applications. Basic research is needed on the properties and performance of such materials as: curing compounds, coatings, and overlays; epoxy resins or other agents for improving bond between old and new concrete; waterstop materials for use in hydraulic structures, and methods of characterizing and testing such materials; grouts for injection underground in very fine fracture systems or porous media, and organic and inorganic composites that are used in construction. Grouts and concretes are being used at present for disposal of waste. This use is likely to increase, and research is needed on optimum proportions for cement-based materials for waste-disposal technology. In addition, grouts and concretes will be important in disposal of both commercial and defense-related low-level and high-level radioactive wastes. Additional basic research is required on the behavior of cement-based materials in the probable geologic conditions of this disposal, and radioactive conditions (Contact: Dr. William P. Grogan, 601-634-2226)

R. Structures Research (Civil Works) (GSL-18)

1. Research is needed to develop design and analysis methods for eliminating or reducing structural vibration of steel gates subject to flow conditions that have the potential to induce structural vibrations.

2. Part of the Earthquake Engineering Research Program supports the Corps' concrete dams in high seismic zones. Research is needed to develop validated nonlinear design and analysis tools for gravity and arch dams. The concrete may be placed with conventional techniques or with roller-compacting procedures. Also, research is needed in the area of ductility of lightly reinforced concrete members to evaluate existing intake towers during a maximum credible earthquake.

3. Research efforts are needed in the general area of structural reliability and risk analysis for assessing sensitivity of structural design and analysis procedures, vulnerability of structures, and assessment of critical design parameters to develop appropriate load resistance factors.

4. Nonlinear and linear system identification research is needed for improving current vibration testing, data acquisition, data processing, and analysis techniques for determining linear and nonlinear dynamic and static response properties of structures and structural systems subjected to earthquakes, blast effects from mining (or other) operations, other transient random, harmonic dynamic loads, and static or pseudostatic loads.

5. Research is needed to develop simplified and advanced computerized methods for soil-structure interaction (SSI) analysis. Potential investigations include Winkler and Pasternak methods, non-linear finite element method and boundary elements. The SSI techniques are to be applied to shallow and deep foundations, wall, and U-frame structures.

6. Research is needed for development of computer programs for design of hydraulic structures and related structures to support the Corps Civil Works mission. Such structures include miter gates, tainter gates, floodwalls, retaining walls, pile group, sheet piles, cellular cofferdams, culverts, and conduits. (Contact: Dr. Stanley Woodson, 601-634-2479)

S. Structures Research (Military) (GSL-19)

1. Research is needed on the response of aboveground and shallow-buried structures subjected to military dynamic loads; specifically, the prediction of the load and response to failure of above-ground and shallow-buried structures. This effort will involve the following research:

a. Development of techniques to simulate military dynamic loads on aboveground and mounded structures.

b. Development of design procedures for components in semi-hardened and protected facilities.

c. Analysis of structural loading and damage resulting from internal detonations. (Contact: Dr. Stanley Woodson, 601-634-2479)

2. Research on deeply based structures and hardened existing systems involving the following:

a. Development of comprehensive structural design for deeply buried and surface-buried structures subjected to airblast-induced and direct-induced ground shock from surface and shallow earth-penetrating high-energy sources.

b. Formulation of computer models for soil-structure interaction and pre- and post-test analysis of structural response to include correlation and comparison with experimental data. (Contact: Dr. James Baylot, 601-634-2137)

3. Research on surveillance and intrusion detection sensors involves the constraints of the environment on sensor systems used to detect intruders and placed along the perimeter of high-value military installations. Improved methods for rapid and accurate measurement of predetermined influential environmental parameters must be developed. Analytical techniques relating to specific, sensing phenomenologies and target/nontarget-generated signatures and signature wave interactions to variations in environmental characteristics are required. Of particular interest is the integration of multiple sensor systems (both detection-type and environmental/background monitoring transducers) that use various sensing phenomena for enhanced target detection and classification and increase nuisance and background signature rejection. Research studies are required in the determination of automated techniques for monitoring sensor system response and sensitivity to provide optimum and consistent performance as a function of time varying changes of influential environmental characteristics. (Contact: Ms. Pam Kinnebrew, 601-634-3366)

4. The Corps of Engineers is involved with research on the design of military facilities for protection from high-energy sources. These efforts include the following research:

a. Prediction of the response of structural elements common to conventional or expedient construction to military loads.

b. Methods of retrofitting conventional buildings to harden them against nearby military high-energy sources.

c. Development of innovative design of structural components, such as windows and doors, subject to high- energy sources.

d. Development of analytical methods for predicting the effects of forced entry devices on structural components.

e. Development of innovative designs using low-density materials for expedient protection of troops and equipment from the effects of military high-energy sources.

f. Development of micro-processor-based software/hardware and supporting documentation to aid in the assessment of structural survivability to the effects of conventional and advanced weapon systems. The software will address the integration of databases, weapons effects calculations, and operational factors associated with engineer survivability missions.

g. Development of a procedure to ensure robust codes, user-friendly interfaces, and supporting documentation for use in the testing and development of micro-processor-based survivability and structural assessment software/hardware. (Contact: Dr. Robert Hall, 601-634-2567)

T. Multispectral Camouflage Research (GSL-20)

This research area involves all aspects of fixed-facility camouflage, concealment, and deception (CCD). Fixed facilities include stationary and relocatable high-value targets. The general goal is to directly and indirectly increase the survivability of U.S. and Allied facilities and improve the U.S. and allies counter-CCD capability against adversaries. Multispectral refers to those areas of the electromagnetic spectrum used by the U.S. and potential adversaries in reconnaissance and surveillance and in attack platform target acquisition and detection. Major objectives include: quantifying or otherwise evaluating CCD technology effectiveness; investigating materials and techniques for signature modification; developing decoy concepts, procedures, and applications; developing computer-based analytical procedures for simulating scenes; developing instrumentation for and the conduct of target/background signature measurements; assessing U.S. and threat operations and sensor capabilities with both currently-fielded and new design reconnaissance and surveillance and attack platform sensors and systems; developing applications for intelligence information for military missions; providing guidance to field commanders and information for RDTE community; and studies of the interaction of camouflage technology with other operational factors, particularly in determining operational supportability, costs and manpower, interoperability, and joint interoperability requirements. Possible research includes the following:

a. Quantify or otherwise evaluate CCD technology multispectral effectiveness. Quantification of the effectiveness of CCD for increasing survivability of selected facilities and assets against attacks. Emphasis is on manned tactical systems on fixed and rotary-winged platforms, involving the range of current and near-term planned weapons that are available for use by potential adversaries, including precision-guided weapons.

b. Investigate materials and techniques for signature modification. Signature measurements may be both ground-based and aerial and may include scale-model measurements for some radar bands. Calibrated measurements are preferred for typical fixed-facility target types and also backgrounds. Target types include thin-walled metal buildings, concrete structures, earth-covered facilities, and hardened and paved horizontal surfaces. Backgrounds include desert, forest, grass, bare soil, croplands, snow, etc.

Signature manipulation materials and techniques include coatings, nets and screens, structural modifications, and the use of energy-absorbing, reflecting or frequency and emissivity-shifting materials.

c. Develop decoy concepts, procedures, and applications. Generation of concepts, materials, and techniques leading to the development of rapid deployment, low-to-high resolution decoys designed to emulate a target. The decoy design should consider the signature replication in the visual, thermal, and radar portions of the electromagnetic spectrum.

d. Develop computer-based analytical procedures for simulating scenes, particularly micro-processor-oriented models and systems that will become a part of an analytical camouflage design and evaluation. The goal is to support the implementation of a multispectral CCD Design Research Work Station with the capability to:

1). Generate target and background scenes using signature prediction models coupled with database look-up techniques.

2). Insert new CCD plans into the scene.

3). Predict target identification.

4). Evaluate sensors performance.

e. Develop instrumentation for and conduct target/background signature measurements. Procedures for target/scene characterization are required for all mission "target" configurations. This includes the design and application of sensors, data gathering, and data analysis procedures applied to the target-in-scene situation. Such data and information are essential in the interpretation of the sensor and operations data and in other areas such as the calibration of models. (Contact: Ms. Pam Kinnebrew, 601-634-3366)

U. TeleEngineering Operations (GSL-21)

TeleEngineering operations is an engineering analysis reach back (i.e., telepresence) capability to support personnel in the execution of their mission across the full operational spectrum. Research in this area includes the development and/or integration of models (empirical,analytical, numerical, etc.) and hardware to improve subject matter expert (SME) response time, provide highly accurate engineer analysis to deployed personnel, and improve the capability of personnel in the field to collect engineering data.
(Contact: Ms. Rhonda D. Taylor, 601-634-2795)

V. Countermine Phenomenology (GSL-22)

The research address methods and procedures to develop and demonstrate advanced technologies that support the Army's requirements for improved detection of mines and minefields. Additional research work is needed in the areas of geo-environmental modeling,

exploiting phenomenological processes to reduce false alarm rates and predicting sensor performance based on sensing, data analysis, display, and platform navigation/positioning. Special areas of interest include novel sensing concepts for the detection of buried objects (metallic and nonmetallic) using a combination of magnetic, electromagnetic induction, ground penetrating radar, seismic/acoustic, chemical, and/or nuclear methods. Fundamental measurements and models that define/predict the performance of these sensing methods in various soils/mine target conditions are also of interest. (Contact: Dr. Larry N. Lynch, 601-634-2230).

ENVIRONMENTAL LABORATORY

Environmental Sensing

I. Introduction

Current research is in the acquisition of information by remote sensor systems, the impact of the environment on imaging and other sensor systems, and advanced signal processing. Sensors using electromagnetic, seismic, and acoustic energy forms are of interest. In addition, work is conducted to determine terrain and other environmental effects on high-technology sensor systems. Sensor systems include optical and infrared millimeter wave (active and passive). Briefly described below are specific research areas.

II. Research Area

Sensing (EL-1)

The EL has an ongoing program to develop and demonstrate advanced technologies that support the Army's requirements for improved detection and discrimination of unexploded ordnance (UXO). Additional research work is needed in the Areas of UXO sensing, data analysis, display, and platform navigation/positioning. Special areas of interest include novel sensing concepts for the detection of buried objects (metallic and nonmetallic) using a combination of magnetic, electromagnetic induction, ground penetrating radar, seismic/acoustic, chemical, and/or nuclear methods. Fundamental measurements and models that define/predict the performance of these sensing methods in various soils/UXO target conditions are also of interest. Research is also needed to develop advanced data analysis techniques that can significantly reduce the number of false alarms arising from natural and man-made sources. (Contact: Dr. John Cullinane, 601-634-3723)

Hazardous Waste Site Characterization and Treatment

I. Introduction

An extensive research and development program is being conducted by the Department of Defense to assist in the cleanup of contamination at military installations. The EL is developing technologies for characterizing, monitoring, and applying physical, chemical and biological treatment of toxic and hazardous waste in contaminated surface and ground waters and soils. The EL is also developing, evaluating, and verifying numerical models and guidance for solid waste disposal systems.

II. Research Areas

A. Innovative Technologies for Rapid Characterization and Monitoring of Hazardous Waste Sites (EL-2)

The EL, in coordination with the U.S. Army Environmental Center and other Tri-

Service agencies, has developed the Site Characterization and Analysis Penetrometer System (SCAPS). The SCAPS is specially designed to conduct rapid site characterization/screening of installations for possible contamination. The SCAPS R&D Program is currently developing sensors for use with the cone penetrometer to detect contaminants such as petroleum, oil and lubricant products (i.e., aviation fuels, diesel, gasoline), explosives compounds, volatile organic carbons (VOCs), heavy metals, and radio nuclides. Additional areas of R&D include: advanced computational techniques for 3-D visualization of subsurface contamination; rapid data acquisition, analysis and interpretation; technologies to quantify levels of contamination; enhanced sampler technology development; contaminant monitor development for biological and chemical treatment assessment; and automated techniques for monitoring/assessing operational performance of remedial site cleanup operations. (Contact: Mr. John H. Ballard, 601-634-2446)

B. Innovative Technologies for Treating Hazardous Waste and Contaminated Surface and Ground Waters (EL-3)

Presently, EL is continuing to conduct research, develop technologies and apply strategies to treat complex organic- and metal-contaminated hazardous liquids, off-gases, soils sludges, sediments, and residuals from past disposal practices. Research is divided into two major categories: technologies for treating contaminated soils and sediments, and innovative technologies for treating contaminated surface and ground waters. Areas of R&D include: (1) physical and chemical technologies to minimize or reduce the quantity and toxicity of hazardous waste, (2) biological processes and methods to detoxify/destroy hazardous waste constituents, (3) techniques for in situ treatment of groundwater aquifers, (4) laboratory design criteria for and field implementation of piloting equipment for promising technologies, (5) computer-based techniques to assess operational performance of various treatment processes/systems and (6) improved analytical chemistry techniques and methodology to assess treatment technologies. (Contacts Dr. Steve Larson, 601-634-3431 (metals), 601-634-3700; Mr. Chris McGrath or Dr. Jeff Davis (physical-chemical organics), 601-634-3798 or 601-634-4846, respectively; Dr. Jeff Davis (bioremediation), 601-634-4846; and Dr. Doug Taggart, (analytical chemistry methods), (402-444-4300.)

C. Design, Evaluation, Verification and Modeling of Solid and Hazardous Wastes and Contaminated Sediments (EL-4)

Presently, efforts are continuing to develop water balance and leachate models for solid waste disposal systems and dredged material disposal facilities. Additional work is needed to model innovative designs, nonsoil surface materials, cobbled surfaces, preferential flow through heterogeneous waste materials and other layers, and effects of complex mixtures of vegetation including trees. Similarly, additional work is needed to verify the existing models. (Contact: Dr. Paul R. Schroeder, 601-634-3709)

Sediment Geochemistry and Biological Effects

I. Introduction

Potential adverse environmental impacts of disposal of contaminated sediments must be assessed prior to permitting operations. This includes the determination of the impacts that contaminated dredged materials exert on the environment prior to dredging.

II. Research Areas

A. Environmental Risk Assessment (EL-5)

Current research on the fate and effects of environmental contaminants occurs under the general paradigm of Environmental Risk Assessment. Specific studies fall into one or more of the following areas:

1. Hazard Identification. This is the process of showing causality (i.e., a chemical or complex mixture can cause some adverse effect). If this causality can be demonstrated, the chemical is referred to as a "hazard." If there is no causal link, risk need not be quantified. Important target receptors are also identified by this stage (for example, humans, endangered species, ecologically or economically important species). Research is conducted to develop the technology for hazard identification and the establishment of causality. (Contact: Dr. Todd Bridges, 601-634-3626)

2. Effects Assessment. While Hazard Identification decides if a chemical or complex mixture is toxic, Effects Assessment establishes the relationship of the toxicant dose and associated biological response. This is accomplished via experimental research in which surrogate species are exposed to gradients (spatial, concentration, etc.) of the hazard in question, and biological effects are monitored. Biologically important endpoints measured include survival, growth, reproduction and population-level parameters. These endpoints must be accompanied by technically sound interpretive guidance. Results are expressed in dose-response or exposure-response relationships. Research is conducted to develop the necessary experimental/statistical designs, technically sound tests (for example, chronic sublethal sediment bioassays) and appropriate extrapolations (for example, high dose to low environmentally realistic exposures, surrogate test species to receptor of interest). Analysis of the uncertainty associated with these effects assessments is also conducted. (Contact: Dr. Todd Bridges, 601-634-3626)

3. Exposure Assessment. In Exposure Assessment, the magnitude, frequency and duration of contaminant exposure relative to the target receptor(s) are determined. This research is model-intensive, with both descriptive and quantitative models being used to evaluate pathways and routes. A pathway exists if the hazard travels between the initial source of contamination and the ultimate biological receptor. An exposure route is pathway that the chemical contacts the receptor (for example, ingestion, inhalation, dermal absorption, bioaccumulation, trophic transfer). Analysis of the uncertainty associated with these exposure assessments is also conducted. (Contact: Dr. Todd Bridges, 601-634-3626)

4. Risk Characterization, Management, Communication, and Analysis. Outputs from the Effects Assessment and Exposure Assessments are joined in Risk Characterization to yield an estimate of risk. Research is conducted to determine the best ways to characterize risk both numerically and descriptively. Also, uncertainty analysis is undertaken to identify the qualitative and quantitative important sources of uncertainty. Techniques employed include error propagation, probability distributions, sensitivity analysis, Monte Carlo simulation and others.

Once environmental risk has been quantified, management action may be required. Research is conducted to develop management alternatives, which range from no action to extensive (and expensive) remediation. Results of the Environmental Risk Assessment are weighed and balanced with other factors such as applicable laws and regulations, engineering feasibility, potential benefits, costs, economic impacts, and the socio-political decision environment. Risk Communication is a dialogue that occurs at two levels: between the risk assessor and the risk manager, and between the risk manager and the public. Research is conducted to identify optimal procedures for communicating environmental risks, including an appreciation for the limits and uncertainties of the numerical results. Risk Analysis is a broad, inclusive term encompassing the processes of Risk Assessment, Risk Management, and Risk Communication as well as any field verification or monitoring activities. Field verification is a study or studies carried out to determine the accuracy of laboratory observations and predictions. Field monitoring (in the context of Risk Assessment) is undertaken to ensure that steps taken to manage the chemical risks were successful. Field research studies are carried out for both verification and monitoring purposes. (Contact: Dr. Todd Bridges, 601-634-3626)

5. Technology Transfer. Develop and analyze technology transfer concepts; analyze target audiences for technical information; test innovative methods of transferring dredging research results and technology to supplement conventional technology transfer. Included may be such items as interactive CD-ROM and PC technology applied to training and general information transfer; technology applications of electronic media using the Internet; and innovative public information systems/products. The Dredging Operations and Environmental Research (DOER) program audiences include Corps of Engineers and the Department of Defense; Congress and other Federal, State, and local agencies; port and transportation authorities; universities; environmentalists and other public interest groups; and the general public. (Ms. Janean Shirley, 601-634-3616)

B. Sediment Water Interactions (EL-6)

Current research encompasses a wide range of investigations designed to increase understanding of sediment-water interactions. Emphasis is on conduct of investigations for determining the impacts that sediment/soil properties have on sorption and transformation of explosives and release of semi-volatile contaminants to the atmosphere. Factors responsible for sorption and transformation of explosives include redox potential, pH, and the geochemical characteristics of the soil or sediment. Factors affecting the release of semivolatile contaminants from soil or sediment to the atmosphere include relative humidity, wind speed,

contaminant concentration, moisture content, porosity, and organic carbon content. Research is also conducted on collodial system contaminant transport, accelerated sediment oxidation, and the role of solution chemistry in contaminant partitioning between sediment and water. (Contact: Dr. Judith Pennington, 601-634-2802)

Biodegradation of Contaminants. Studies in the biodegradation area emphasize destruction of organic contaminants for remediation purposes. Emphasis is on (1) delineating biodegrative pathways; (2) determining intermediate and final products and by-products; (3) assessing the role of environmental factors in regulating the pathways utilized and the rate and extent of destruction of the parent compound; (4) determining the survival and activity of microorganisms added to soils, sediments, and biotreatment systems; and (5) enhancing biodegradation to obtain the maximum destruction of organic contaminants within a soil, sediment, or treatment system. (Contacts: Dr. Herb Fredrickson, 601-634-3716)

C. Techniques for Contaminated Dredged Material Disposal and Treatment (EL-7)

Specific areas of required or anticipated research include the following:

1. Application of innovative techniques, equipment, and control measures for dredging, transport, and placement of contaminated sediments. (Contact: Mr. Mike Channell, 601-634-2386.)

2. Development of cost-efficient technologies for control-treatment of contaminated dredged material, including assessment of physical/chemical processing technologies for application to contaminated dredged material slurries, supernatant, and leachate; techniques for evaluating the processing technologies; methods for site evaluation; and techniques for evaluating cost-effectiveness. (Contact: Mr. Mike Channell, 601-634-2386.)

3. Development or enhancement of computer models to be included in the ADDAMS to evaluate the environmental impacts of dredged material disposal. Evaluations include water quality impacts of initial release in open water, effluent discharge, runoff and leachate, benthic impacts, plant and animal uptake, and volatilization. (Contact: Dr. Paul R. Schroeder, 601-634-3709)

4. Development and/or application of new or improved environmental chemistry methodologies to assess contaminant concentrations of dredged material focusing on cost-effectiveness, quality assurance, and lower detection limits. (Contact: Dr. Vic McFarland, 601-634-3721)

5. Demonstration of bioremediation technology to recalcitrant organic compounds in confined disposal facilities for dredged material, including evaluation of amendments needed to successfully utilize composting, land treatment, and land farming technologies, assessment of cost versus performance, and development of techniques for enhancing intrinsic bioremediation. (Contact: Dr. Tommy E. Myers, 601-634-3939)

Water Quality Modeling

I. Introduction

The Corps of Engineers is involved in research and development related to water quality and contaminant fate/transport modeling for surface water, watersheds, and the subsurface, or groundwater. The research encompasses a wide range of environmental issues, such as water quality and ecosystem linkages, contaminant transport and fate, eutrophication, effects of land use/management on watershed runoff quality, total maximum daily loads (TMDL's), and ecological and human health risk assessment as related to contaminants in the environment. Research may include model development and field and laboratory investigations to improve model descriptions and to provide required data for model validation.

II. Research Area

Numerical Water Quality and Contaminant Modeling (EL-8)

This area of work is oriented toward development and application of water quality and contaminant fate/transport models for surface water and the subsurface, or groundwater. Surface water modeling includes watersheds and receiving waters, e.g., riverine, reservoir, wetland, estuarine, and coastal water bodies. Groundwater modeling includes modeling both the unsaturated and saturated zones, as well as multi-component flow and transport. Models are utilized for conventional water quality (e.g., nitrogen, phosphorus, carbon, dissolved oxygen, etc.) and contaminants, i.e., toxic substances, such as organic chemicals, trace metals, radionuclides, explosives, and other military unique compounds. Emphasis includes the following: formulation of appropriated physical, chemical, and biological algorithms; improvement of mathematical and numerical methods; collection and assemblage of data for model evaluation; conduct of field and laboratory process investigations designed to develop/improve model descriptions, dynamic linkage of water quality and biological models, including biomass-based, individual-based, and population-based biological models; integration of contaminant exposure models with biological effects data or models to quantify risk; incorporation of uncertainty analysis into modeling; linkage of physical/chemical models with biological population models; linkage of cross-domain models for system wide modeling; development of routines/linkages to include the effects on water quality of watershed landscape features (e.g., buffer zones) and vegetation management; development of a risk assessment modeling system; and development of software to provide graphical user interfaces and modeling environments to enhance model utility and ease of application. (Contact: Dr. Barry Bunch, 601-634-3617)

CONSERVATION

Environmental Database Development

I. Introduction

Engineers, scientists and managers require well organized, easily accessible environmental natural resources databases to make sound conservation and stewardship decisions. Research in this area ad-dresses techniques to effectively characterize, quantify and analyze the spatial and temporal components of the environment at various resolutions.

II. Research Areas

A. Geospatial Environmental Database Development (EL-9)

This research area is concerned with techniques for developing holistic, geographically referenced environmental databases at a wide range of spatial and temporal resolutions. Holistic environmental databases integrate quantitative characterizations of the hydrosphere, biosphere, geosphere, and atmosphere. Spatial resolutions range from the characterization of regional watersheds to the characterization of the internal canopy conditions for individual trees. Temporal resolutions range from decades to minutes. The research includes investigations onsite and remote techniques for characterizing and monitoring single environmental factors such as vegetation height, density and biomass; soil moisture content; and water quality parameters. The research includes investigations on techniques for collecting, quantifying, integrating, storing and accessing geospatial and statistical data. (Contacts: Mr. Mark Graves, 601-634-2557; and Dr. Rose Kress; 601-634-3665)

B. Geospatial Data Analysis Techniques (EL-10)

This research area is concerned with developing methods to include the spatial and temporal properties of environmental factors in all aspects of environmental stewardship. It includes development of geospatial statistical measures and quantitative indices for use in numerical modeling, impact assessment, risk assessment and management trade-off analysis. It includes techniques for quantitative regional characterization of the natural resource base. The research investigates methods for modeling spatial patterns of environmental conditions over time. (Contacts: Mr. Mark Graves, 601-634-2557, and Dr. Rose Kress; 601-634-3665)

Environmental Impact Prediction, Assessment, and Management

I. Introduction

This research program addresses environmental impact prediction, assessment, and remediation and is intended to provide Corps, Army, and other field operating elements with techniques and methodologies for environmental assessments and EIS preparation, guidance on selecting appropriate planning, design, construction, and operation alternatives, and implementation of the planning function pursuant to NEPA and other legislation and guidance. Specific objectives include:

A. Developing, verifying, and demonstrating practical prediction and assessment techniques including applying and refining habitat-based evaluation methods, evaluating mitigation measures, developing streamlined frameworks for environmental monitoring, applying ecosystem simulation principles to environmental analysis, and estimating future habitat quality.

B. Documenting and quantifying environmental effects associated with various types of Corps, Army, and other activities. Research has included the effects of aquatic habitat modification on anadromous fishes, the effects of selective clearing and snagging on in stream habitat, and the benefits of channel modification for aquatic habitat in reservoir tailwaters and local flood control channels.

C. Developing and demonstrating design, construction, and management alternatives that will minimize adverse effects and protect natural and cultural resources. Research has included techniques for managing wildlife habitats, preserving archeological sites, and stabilizing eroding shorelines.

II. Research Areas

A. Biotechnical Shore Stabilization (EL-11)

Biotechnical (sometimes called bioengineering) shore stabilization is the use of a combination of live vegetation and structural materials (for example, breakwaters, geotextiles, erosion control fabrics/mats, building materials) for erosion control of shores. Shores of particular interest are those of streams, lakes, or dredged material deposits and subject to erosion from waves, surface runoff, and wind. Research is needed to determine the causes and amounts of erosion and to identify and assess cost-effective biotechnical erosion control methods. Studies may include, but are not limited to, identifying, developing, and cultivating appropriate flood-tolerant plants and varieties or cultivars and cost-effective installation procedures of biotechnical techniques. (Contact: Dr. Michael F. Passmore, 601-634-4862.

B. Freshwater Fishery Investigations (EL-12)

Primary areas of research are predicting environmental impacts of navigation and flood control projects on fishes and other aquatic fauna, restoration of aquatic habitats, conservation of endangered fish species, evaluating wetland fish communities, and fishery management in vegetated waterbodies. New and innovative approaches to determine physiological, behavioral, population, and community level responses of fishes to dynamic habitat variables are of interest, along with technological advancements in sampling capability. Demographic and landscape models are anticipated products of this research. (Contact: Dr. Jack Killgore, 601-634-3397)

C. Freshwater Macro invertebrate Investigations (EL-13)

This research addresses the development and application of methods for assessing the environmental effects of Corps of Engineers activities by analysis of macro invertebrate

populations and communities. Studies involve laboratory evaluation of behavior and physical condition, or field studies that involve secondary production or the determination of selected biotic indices (such as species richness, diversity, evenness, relative species abundance, etc.) of naturally occurring mollusk, chironomid, or oligochaete communities. (Contact: Dr. Andrew C. Miller, 601-634-2141)

D. Mitigation (EL-14)

An avoidance, minimization, and/or compensation process is required for impacts from water resources projects on ecological resources (fish, wildlife, habitat, or installation activities). Planning and implementing mitigation is a complex process, and new ideas that contribute to success of mitigation are invited. Subjects such as Best Management Practices for avoiding or minimizing impacts, planning for mitigation based on impact analysis, incremental analysis to justify mitigation, mitigation banking, future predictions, and mitigation for indirect or cumulative impacts are included. (Contact: Dr. Jean O'Neil, 601-634-3641)

E. In stream Flow Requirements for Aquatic Biota (EL-15)

Research focuses on development and application of fish habitat assessment methods. Currently, the most widely used system, the Physical Habitat Simulation System (PHABSIM), is used to assess the effects of reservoir operations on downstream fish habitat. Research is needed to better quantify the relationships for fish preference and flow conditions, as well as habitat requirements for aquatic invertebrates. Verification studies of these models will be required as development continues. Assessment methods must be able to evaluate the impacts of a variety of reservoir operations such as base load or peaking hydropower releases and at multiple scales from single project to basin – wide studies. (Contact: Dr. John Nestler, 601-634-3870)

F. Behavioral and Structural Fish Barriers (EL-16)

Entrainment of fish at Corps hydropower projects may result in passage of fish through turbines with attendant death or injury from impact with runner blades, pressure changes, or shear forces. Evaluations of a number of behaviorally based technologies and structural barrier designs conducted under laboratory and field conditions have yielded results that are generally inconsistent. Consequently, there currently exist no consistent guidelines for selection of appropriate technology for site-specific applications at Corps dams. Research is required to relate effectiveness of different technologies to size and species of fish, dam design, operations, season, and other site-specific conditions. The information produced by this research will be used to develop specifications and guidelines for fish protection technologies at Corps dams to reduce entrainment and mortality. This effort may involve literature synthesis, laboratory research, design and fabrication of prototype systems, or field studies. (Contact: Dr. John Nestler, 601-634-3870)

G. Fish Guidance and Bypass Systems (EL-17)

CE water resource activities may result in blockage of historical fish migration routes

through waterways. These blockages, with associated fragmentation of habitats, may have severe impacts on anadromous and catadromous fish populations. A variety of bypass system technologies are available to guide fish around dams. However, many of these systems operate at reduced efficiencies because they damage fish, fish are unable to locate entrances to the systems, or because fish become disoriented and "fall back" after an initial successful passage. Research is required to better understand the hydraulic and behavioral characteristics of fish bypass systems, including the use of behavioral technologies to guide fishes towards these systems and to successfully orient them within the system. (Contact: Dr. John M. Nestler, 601-634-3870)

H. Coastal Ecology (EL-18)

Research topics in coastal ecology include multidisciplinary investigations of the environmental impacts of engineering activities in the coastal zone, such as dredging, dredged material disposal, and construction of coastal structures (e.g., jetties, breakwaters, groins, seawalls, marinas). Emphasis is placed on improved technologies for assessment, protection, and management of fish and shellfish resources and their habitats. Of particular relevance are proposals dealing with endangered species (e.g., sea turtles, marine mammals), beneficial uses of dredged material and habitat restoration in the coastal zone (e.g., marsh, oyster reef or mudflat creation), and application of population dynamics and ecological models for impact prediction and assessment at population/community/ecosystem/watershed levels. Other areas of interest include effects of beach nourishment and use of offshore borrows areas, seasonal restrictions on dredging and disposal operations, artificial reef technologies, and cumulative impact determination and mitigation techniques. (Contact: Dr. Douglas Clarke, 601-634-3770)

I. Techniques for Designing, Operating and Managing Dredged Material Disposal Facilities and Beneficial Use Projects (EL-19)

A. Refinement and verification of techniques for designing, operating, and managing dredged material disposal areas.

B. Development of a computerized economic database for costs associated with dredging sediments; disposing of dredged material; and constructing, rehabilitating, and operating and managing dredged material disposal areas.

C. Development and refinement of computer models for dredged material management and beneficial use to be included in the ADDAMS. (Contact: Dr. Paul R. Schroeder, 601-634-3709)

Environmental Criteria for Stream Channel Alteration Projects

I. Introduction

The Corps of Engineers is involved in the alteration of stream channels for flood

control, navigation, channel stabilization, and stream relocation. Modifications to channels include removal of snags and vegetation, channel alignment (straightening), channel enlargement, construction of levees, stream bank protection, and grade control. The Corps is also involved in regulating and furnishing technical assistance to States in regard to other types of channel alterations such as gravel mining. Work at the EL and elsewhere has generated environmental design criteria for stream channel alterations to improve the net effect of these projects. Examples of environmental design features include low-flow channels, combinations of structure and vegetation, management of cutoff bendways and other backwater areas, and recreational trails.

II. Research Areas

A. Riparian and Instream Habitat Restoration (EL-20)

Current research includes formulating guidelines for stream restoration and environmental enhancement of flood control projects. Among the general issues addressed are, instream and riparian habitat assessment; benefits of habitat improvement, structures and techniques; impacts of vegetation on flow conveyance, channel stability, and sediment transport; construction practices; and monitoring and maintenance. Proposals are invited in these general areas and related efforts. In addition, specific needs include the following: (1) Techniques to quantify habitat and other environmental benefits of restoration efforts, (2) Algorithms that account for momentum losses at vegetated floodplain/channel interfaces, (3) Data supporting evaluations of the hydraulic impacts of instream structures, (4) Case studies of monitoring and maintenance plans, and (5) Development and refinement of related computerized databases and models. (Contact: Dr. J. Craig Fischenich, 601-634-3449)

B. Assessing Benefits of Channel Modifications (EL-21)

Dams and local flood control structures may degrade aquatic habitat conditions in tailwaters and streams. In some cases, habitat degradation can be eliminated, stabilized or reversed through channel modification for aquatic habitat (i.e., construction of low-cost, low-head weirs to create pools) with minimal changes in dam operation or flood channel design. However, there are no widely accepted methods available to incrementally relate instream aquatic habitat value, channel modifications, and instream flows to allow trade-off analysis between cost, design, and habitat benefits. It is desirable to modify existing instream flow methods or develop new methods that will allow incremental assessment of habitat values, alternative flows, and different channel designs. This work may involve data collection, analysis, interpretation, and software development. (Contact: Dr. John Nestler, 601-634-3870)

Natural Resource Management

I. Introduction

As a part of its mission responsibilities, the Corps of Engineers must maintain and manage millions of acres of land, much of it surrounding over 700 water resource

development projects throughout the United States. This includes fish and wildlife habitat sites, specific communities such as riparian zones and wetlands, and recreation sites. Technology needed for managing and enhancing these facilities includes research areas that involve endangered species, waterfowl, riparian zone management, range and turfgrass management, insect pest management, and the general stewardship of these natural resources. Developed technology is provided to Corps Civil Works projects as well as military installations and other cooperating Federal agencies.

II. Research Areas

A. Natural Resources Stewardship (EL-22)

1. Integrated Natural Resources Management. Research includes biological diversity, holistic ecology, and the stewardship and management of habitat-related natural resources at Corps water resource projects and military installations. Emphasis is on integrated natural resources management, which includes the analysis of human-related activities on biological resources and the effects of biological resources on other resources. Current research includes integrated ecosystem management, analysis of impacts to natural landscapes and their components, habitat delineation and analysis, and program development for natural resources management. Related components to complete stewardship include management of information and databases. The work involves literature synthesis, field studies, data analysis, and report preparation. (Contact: Dr. Michael Passmore, 601-634-4862)

2. Riparian Zone Management. Research addresses riparian habitat assessment, restoration, and management for natural resources stewardship on Civil Works lands and Department of Defense military installations. Emphasis is on the development of methods and technical guidelines appropriate for managing riparian zones and associated habitats on multiple-use lands. This also includes research on transition areas between riparian areas and other systems. Research includes literature searches, field investigations, restoration projects, data analysis, and development of reports and management action plans. Priorities will depend on regional needs, as determined by study sponsors (that is, Corps districts/sponsors and military installations). (Contact: Mr. Chester O. Martin, 601-634-3958)

3. Tools for Natural Resources at Multiple Scales. Management of resources in today's climate requires an awareness of scale and context of those resources. Issues ranging from genetic diversity to watershed or landscape planning are relevant to management decisions. Planners, regulators, and land managers must be able to use existing tools (decision-support systems, models, databases, procedures, etc.) and to adapt new tools to their needs. Although the general processes of resource inventory, impact assessment, and management or mitigation will remain applicable, those activities may be conducted in a different context or at more scales than before. Work under this announcement would supply tools for natural resources management in an ecosystem or holistic context. (Contact: Dr. L. Jean O'Neil, 601-634-3641)

B. Wildlife Resource Management (EL-23)

The EL is developing user information for Department of Defense (DoD) personnel involved in the administration, planning, and operation of wildlife management programs and activities. The emphasis is to provide technology transfer on biologically sound, technically reliable, and cost-effective wildlife-related management strategies appropriate for Civil Works projects and DoD installations. The major product is the "U.S. Army Corps of Engineers Wildlife Resources Management Manual." Reports for the manual are arranged in nine chapters. Reports are currently needed on wildlife species, management techniques, and plant materials. Reports are primarily extensive literature reviews on a particular subject, which results in the presentation of appropriate information in a comprehensive and readable style. The basic format is established in the reports completed to date. Proposals should identify a specific section (or sections) to be prepared and should include an outline and description of topics to be developed for the report. Other tasks in this work area include habitat assessments, population surveys, and development of management plans. (Contact: Mr. Chester O. Martin, 601-634-3958)

C. Endangered Species (EL-24)

This effort involves studies of endangered and threatened species on DoD and other Federal agency lands. Tasks would include site-specific surveys, habitat analysis, and development of management plans for species of concern. Individual studies would involve literature searches and synthesis of information, field investigations, data analysis, coordination with Federal and state agencies and conservation organizations, and preparation of endangered species survey reports and management guidelines. Management recommendations will be specific to the region of study. Species of concern will vary, depending on requests from Civil Works projects and military installations. (Contact: Mr. Chester O. Martin, 601-634-3958)

D. Waterfowl Resources (EL-25)

Investigations include studies on waterfowl biology and habitat management on Civil Works projects and Department of Defense military installations. Emphasis is on waterfowl habitat assessment, population surveys, and development of stewardship and management plans for various waterfowl habitat management programs. Current studies involve developing management plans for various habitat management practices such as moist-soil systems, greentree subimpoundments, and created ponds. The effort would include literature reviews, field investigations, data analysis, development of techniques and management guidelines, and preparation of technical reports. (Contact: Dr. Richard Fischer, 601-634-3983)

E. Wetlands (EL-26)

Wetlands research, especially as it pertains to wetlands restoration and development, has been occurring as an ongoing activity of the Corps of Engineers for the past two decades, primarily as a secondary or minor objective of navigation or flood control objectives. The EL has been at the forefront in developing the technology that allowed this

important wetlands work to take place, has developed a number of these wetlands, and has developed long-term monitoring methodologies to document the progress and ecological succession of these wetlands. In addition, methodologies for delineating and evaluating wetlands on a national basis that have become the mandatory wetlands regulatory framework for Federal agencies have been developed. This research is expected to continue as part of a series of wetlands task areas. Research task areas outlined below will be conducted both in-house at EL, with other agencies, or will be contracted. Studies must be short term due to funding and time constraints, and must address one or more of the research tasks. (Contact: Mr. Glenn Rhett, 601-634-3717.)

1. Critical Processes of Wetlands. To examine the basic physical, chemical, and biological processes that cause wetlands to provide important functions, and to relate those processes and functions to other aspects of wetlands work in the Corps of Engineers. (Contact:: Dr. Ellis Clairain, 601-634-3774)

2. Wetlands Delineation and Evaluation. Objectives of this task are to examine technical assumptions in the 1987 "Corps of Engineers Wetland Delineation Manual" and to develop techniques to assess wetland functions. The first objective will be accomplished through a combination of field and laboratory studies to examine hydrology/vegetation/soil relationships, morphological development of hydric soils, and physiological response of vegetation to soil saturation in relation to the growing season. The second objective will also be accomplished through field and laboratory studies. Efforts will focus on model development employing the Hydrogeomorphic Approach to Assessment of Wetland Functions (HGM) and implementation of basic research to test assumption in the HGM models. Both national and regional models will be developed using regional experts and published literature. HGM models will be field tested and assumptions examined using field studies to ascertain physical, chemical, and biotic wetland characteristics associated with different wetland functions and wetland types. (Contact:: Dr. Ellis Clairain, 601-634-3774)

3. Wetlands Restoration, Protection and Creation. To study existing wetlands restoration, protection and creation sites built from dredged material for compensatory mitigation, and for other non-regulatory purposes such as shoreline stabilization and erosion control. To test wetlands techniques and further refine those techniques to be applicable for the broad range of wetlands projects encompassed within Corps of Engineers activities, including addressing erosion and subsidence on a large scale. To test guidelines for wetlands restoration, protection and creation that can be used for mitigation, O&M, general construction, and other Corps of Engineers projects, and that will also find use by permit applicants as they mitigate for lost wetlands. To test and verify the Corps wetlands engineering handbook. (Contact: Dr. Morris Mauney, 601-634-4258)

Nonindigenous Aquatic Nuisance Species Management

I. Introduction

In a 1993 report, the U.S. Congress, Office of Technology Assessment estimated that

non-indigenous pest species have resulted in U.S. losses of millions to perhaps billions of dollars annually.

They reported documented losses of $97 billion between 1906-1991. When environmental conditions are favorable, non-indigenous species, such as hydrilla (*Hydrilla verticillata*) and the zebra mussel (*Dreissena polymorpha*), become established and disrupt the aquatic environment and economy of infested areas.

The Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (Public Law 101-646) and the River Harbor Act of 1958; (Public Law 85-500) as amended, direct the Corps of Engineers to develop environmentally sound control methods to prevent, monitor, and control introductions of non-indigenous aquatic nuisance species.

II. Research Areas

A. Aquatic Plant Control (EL-27)

Aquatic plant research for the management of non-indigenous aquatic plant species in navigable waters, tributary streams, connecting channels, and other allied waters is a continuing activity of the Corps of Engineers. The research thrust is to reduce non-indigenous plant populations to non-problem levels, enhancing and/or replacing these non-indigenous species with indigenous species as more beneficial and productive aquatic habitat. Currently, research is focused on developing effective economical and environmentally compatible technologies for managing two emerging problem aquatic plants, hydrilla and Eurasian watermilfoil. Areas of technology development include advanced management strategies and applications, techniques for establishing desirable aquatic vegetation, and computer-based systems for aquatic plant management planning. (Contact: Dr. John Barko, 601-634-3654)

1. Aquatic Plant Ecology. Current ecological research on both nonindigenous nuisance-forming plants and desirable native aquatic plant species is needed; including plant propagule ecology, modes of spread, methods of propagation and restoration (particularly desirable native species). In addition, research evaluating the effectiveness of aquatic plant management techniques and their impact on the ecology of aquatic habitats is desired. Development and evaluation of aquatic plant community quantification techniques is needed to support both research and operational needs. In addition, the development of PC-based simulation models of plant growth or effectiveness of management techniques is desired. Expansion of these models to include spatial distribution to 2-D and 3-D graphical displays to enhance management planning and implementation are also sought. (Contact: Dr. Michael Smart, 972-436-2215, ext. 21.)

2. Techniques for Assessing Aquatic Plant-Infested Environments. Current techniques for quantitatively sampling and mapping aquatic plant-infested environments are highly labor intensive and only provide a low-resolution picture of environments that exhibit a high degree of spatial variability. High-resolution automated and semi-automated techniques are needed. Research area has focused on remote sensing techniques such as use of airborne scanners and state-of-the-art hydroacoustic equipment. Future research will focus on

developing theoretically feasible measurement systems into devices, which may be employed by operational aquatic plant managers. (Contact: Dr. Rose Kress, 601-634-3655 and Mr. Bruce M. Sabol, 601-634-2297)

3. Biological Control Methods for Aquatic Plants. Current research involves biological control of problem aquatic macrophytes using microorganisms, aquatic invertebrates and vertebrates. The objective is to develop an operational capability for biological agents to control aquatic plants. Research topics of interest include specificity and ecology of microflora of aquatic macrophytes, stimulants and attractants of invertebrates impacting aquatic macrophytes, and revegetation with desirable aquatic plants for the inhibition or prevention of problem plant species. (Contact: Dr. Alfred F. Cofrancesco, 601-634-3182)

4. Chemical Control Methods for Aquatic Plants. A need exists for development of aquatic plant management methods, which utilize both herbicides and plant growth regulators to selectively control or maintain plant populations below nuisance levels. Research is needed on the physiological weak points in the growth cycle of nuisance aquatic plants for application of control measures, herbicide delivery systems (water-dispersible granules, emulsifiable concentrations, flowable suspensions, etc.) to deliver the active ingredient to the target plant, and field evaluations of the effects of aquatic herbicides and plant growth regulators on nuisance species as well as selected non-target plant species. Evaluation of the effects of chemical control on plant growth, flowering/seed production and reproductive structures is also needed. (Contact: Dr. Kurt Getsinger, 601-634-2498)

5. Aquatic Plant Establishment and Succession. The creation of new submersed aquatic plant habitats by reservoir and waterway construction provides an ideal environment for the establishment of weedy submersed plants. These species are well adapted for colonizing new and/or disturbed substrates. Given time, ecological succession may lead to the development of more desirable plant communities composed of native vegetation. However, man-induced disturbances to the system maintain the aquatic environment in an ecologically immature state, favoring reestablishment of problematic weedy species. Proposals should examine methods establishing native aquatic plants or altering the species composition of submersed aquatic plant communities to minimize the growth of exotic weedy species and encourage the growth of more desirable nonproblem vegetation. (Contact: Dr. R. Michael Smart, 972-436-2215, Ext. 21)

6. Relationships Between Fish and Aquatic Plants. Aquatic plant control methods are developed to be environmentally compatible, regardless of the situation and/or the control method being implemented. Aquatic plants, though problems to water uses, provide habitat for fisheries and organisms that support fish populations. Currently, there is insufficient data for developing the relationships between fish and aquatic plants that are needed to dictate the degree of control of the plants without destroying the habitat, thus ensuring compatibility. (Contact: Dr. Jack Killgore, 601-634-3397)

B. Zebra Mussel Control (EL-28)

The Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 specified that the Assistant Secretary of the Army, Civil Works, would develop a program of research, technology development, and demonstration for the environmentally sound control of zebra mussels in and around public facilities.

Control strategies suitable for large waterways will be based primarily on physical rather than chemical methods to ensure that native biota and potable water supplies will not be negatively affected. Ongoing and planned studies consist of the following: analysis of the biology and physiology of zebra mussels; investigation of physical condition, habitat requirements, and size demography of naturally occurring populations of zebra mussels; and evaluation of the tolerance of zebra mussels to desiccation, elevated temperatures, anoxia and other controls. In addition to biological studies, considerable effort will be devoted to modifying existing operation, maintenance or design features of structural components of the facility. Interest exist for all public facilities along waterways and includes water intake plants, navigation locks, gated dams, outlet works, pumping plants, and drainage structures. (Contact: Dr. Alfred F. Cofrancesco, 601-634-3182.)

Water Quality and Ecological Systems

I. Introduction

The Corps of Engineers is involved in research to develop water quality and ecological system models for riverine, reservoir, wetland, coastal and marine surface and groundwater. Current research encompasses a wide range of environmental issues. Emphasis is on short- and long-term field and laboratory investigations to improve the techniques for evaluating water quality and developing water quality management guidelines. The research also emphasizes the development of biological models for terrestrial, lacustrine, palustrine, estuarine and coastal environments to assist in evaluating potential effects of natural and man-made alterations.

II. Research Areas

A. Limnological Investigations and Water Quality Management (EL-29)

Current research encompasses a wide range of investigations designed to increase the Corps' understanding of important limnological processes influencing tailwater, reservoir, wetland and coastal quality. Emphasis is on short- and long-term field and laboratory investigations, the development of improved techniques for evaluating water quality conditions, formulation of sample design methodologies, and development of improved water quality management guidelines. Research is also conducted in the area of simplified techniques for the description and prediction of water quality conditions and problems and watershed management. This includes TMDL's nutrient criteria and bioassessments. Integrated methods for water quality management are developed and evaluated. Proposals for research categories are invited. (Contact: Dr. Dave Soballe 601-634-4631)

B. Ecological Modeling (EL-30)

Research into the development and application of a variety of biological models for terrestrial, lacustrine, palustrine, estuarine, and coastal habitats. This research involves the use of traditional population and community dynamics models as well as spatially explicit, structured-population and individual oriented models for addressing a wide variety of biological problems. Research is also ongoing for the integration of physical and biological models spanning different spatial and temporal scales. The integrated models can be utilized to analyze interrelations and dependence across trophic levels in a simulation mode and to determine the potential effects of alterations (natural and man-made perturbations) to the ecological system. (Contact: Dr. John W. Barko, 601-634-3654)

Outdoor Recreation

I. Introduction

Research and development is conducted in support of outdoor recreation planning and management at 463 multipurpose reservoirs located in 43 states. These projects include 11.5 million acres of land and adjacent water and a total shoreline length over triple the coastline of the continental United States. The Corps of Engineers is the largest supplier of water-oriented outdoor recreation opportunities in the nation.

All aspects of public use of multi-purpose water resource development projects are considered in recreation research and development. The trend is, where feasible, to develop automated tools for use by the planner and manager in the interest of efficiency of operation. This objective is considered in the context of providing high quality recreation experiences for the visitors to these lakes in a safe and pleasant atmosphere. Some current examples of research thrust in this area follow.

II. Research Areas

A. Carrying Capacity (EL-31)

Ongoing research and technical support are currently concentrated on physical and social carrying capacity of lake water surface and lakeshores. Shoreline management aspects of this work addresses commercial marina development, public access for boating and related activities, and management of private use of public lands at approximately 450 projects. Land-based support facilities including boat-launching ramps, parking, and pedestrian access are important features. (Mr. Scott Jackson, 601-634-2105).

User Fees (EL-32)

Support for camping and day-use recreation fees is offered through development and application of automated systems for registration of users, collection and analysis of trends data, and special feature capabilities including differential pricing, reservations, and credit card

use. Automated systems are designed for on site use of personal computers (Mr. Scott Jackson, 601-634-2105.)

Economic Impacts of Recreation Management (EL-33)

Economic impacts of recreation-resource management and development of techniques for estimation of use in and beyond developed parks is currently in progress. Regional recreation demand models are also currently being developed and applied to water resource system studies. (Contact: (Mr. Scott Jackson, 601-634-2105.)

Customer Trends and Satisfaction (EL-34)

Methods for identification of needs and demands of the using public and for monitoring management to meet those expectations are currently in the development stages. (Contact: (Mr. Scott Jackson, 601-634-2105.)

B. Evaluation of Plant Growth Regulators for Turfgrass Management (EL-35)

Current research involves the use of plant growth-regulating compounds in grounds maintenance. The objectives are to evaluate current growth-regulating chemicals for their effects on various turfgrass species (both warm- and cool-season); determine the cost-effectiveness of incorporating these products into grounds maintenance operations; and provide guidance on application techniques (including timing of application, chemical combinations, and rates) to achieve maximum growth-regulating benefits. Research topics of interest include identifying long- and short-term effects of plant growth-regulating chemicals on rooting, density, recuperative capacity, and disease susceptibility of various turfgrass species; methods to predict time of application on various turfgrass species (i.e., growing degree day models); and effects of sequential and/or multiple application for season-long control of Southern turf species. (Contact: Dr. K. D. Getsinger, 601-634-2498)

C. Insect Pest Management (EL-36)

Integrated control programs are being developed and tested for various aquatic (*Diptera*) and terrestrial (*Dictyioptera* and *Isoptera*) pest insects. Research should address the development of programs, which utilize a multifaceted approach to control, including the use of biological pesticides as well as mechanical and cultural control practices. New and innovative approaches to control are being sought, especially those that utilize existing technologies incorporated into a working management program. (Contact: Dr. Alfred F. Cofrancesco, 601-634-3182).

INFORMATION TECHNOLOGY LABORATORY

Research Areas

A. Computer-Aided Engineering (ITL-1)

Through the Computer-Aided Structural Engineering (CASE) Project, research is performed in development of computer tools and procedures for use in the design of structures utilized in the Corps' Civil Works mission. Research is performed related to risk analysis, engineering reliability, and computer science techniques to enhance computational capabilities for solution of scientific and engineering problems. Graphical user interfaces and data presentation/visualization techniques are developed. Solid modeling techniques are being studied for three-dimensional (3-D) structure representation. Accuracy of computational results is a matter of deep concern for many of the numerical procedures used by ERDC and other Corps offices. Innovations in numerical analysis are continuously investigated to save costs in computer time and ensure confidence in computation results, especially as applied to different size computers. Interface systems for electronic transfer of computer-generated drawings between minicomputer- and microcomputer-based hardware are investigated. Military-related research work includes development of a rapid interactive 3-D structural computer modeling system to aid in the analysis/design of structures under 3-D dynamic and static loadings. Assessment of load capacity of structures when material data and geometry are incomplete is also being investigated. (Contact: Mr. Wayne Jones, 601-634-3758)

B. Information Technology (ITL-2)

Applied research is conducted in designing and deploying large information systems in enterprise-wide operating environments. An area of emphasis is large on-line databases to be used concurrently by many geographically dispersed users via Intranet and/or Internet access from a PC. Both thick and thin clients are of interest. Studies and evaluations are being conducted on state-of-the-art software engineering methodologies advocated by researchers in universities and industry. Investigations may be conducted on any phase of software development, deployment, and operation. Also subject to study are the operational infrastructure and the effect of the infrastructure on the performance of software systems as perceived by the end user. An area of special interest is the design and execution of many user performance tests. The purpose of these tests may be to predict operational performance of a given infrastructure under a specified workload or to design an infrastructure to achieve a given level of performance under a specified workload. (Contact: Dr. Cary Butler, 601-634-4410)

Research is planned in advancing collaborative capabilities combining evolving communications technology and multi-media presentation capability. This may involve automation/integration of media presentation considering such areas as documents, graphic arts, audio, video, and interactive presentations. Electronic flow of report information including management, searching, routing, tracking, and simultaneous review is also of interest. Additional research is planned in other information technology areas such as scientific visualization, advanced topics in data, voice, and video transmission using evolving

communication systems and their integrations with other information systems, innovations in library science to expand organization, and accessibility of all media and visual information. (Contact: Mrs. Alice Duke, 601-634-3667)

C. Computer-Aided Design and Drafting/Geographical Information System Technologies (ITL-3)

Through the CADD/GIS Technology Center for Facilities, Infrastructure, and Environment, research is performed to support the application of computer-aided design and drafting (CADD) and geographic information systems (GIS) technologies in new and existing mission areas within the DoD and other participating Federal agencies (particularly as applied to facilities, infrastructure, and the environment). CADD/GIS capability is being widely integrated into the planning, engineering, construction, and facility management responsibilities of the three Services, other Federal agencies, state and local governments, and industry. Due to the expanding development of computer methods to meet the demands of technological advancements, interfacing these methods with CADD/GIS platforms is especially crucial. As the usage of CADD/GIS evolves and expands, the need to integrate other existing design and analysis computer tools, including relational databases, spatial data analysis, automated cost estimating, and specification generation, etc., with CADD/GIS systems and to evaluate new CADD/GIS applications for use by Federal agencies, state and local governments, and industry is of primary interest. Applications would be expected to interface with a variety of CADD/GIS platforms, including UNIX, Windows 98, Windows NT, and DOS systems used by Federal agencies, state and local governments, and industry. Other research could include productivity studies, scope, and criteria requirements for new technology development, self-instructional training guides, pilot projects in technology usage, etc. (Contact: Mr. Harold L. Smith, 601-634-4190)

D. High Performance Computing (HPC) and Networking (ITL-4)

Through the U.S. Army Engineer Research and Development Center (ERDC) HPC Major Shared Resource Center, located in the Information Technology Laboratory, research is performed to support the application of advanced HPC systems and networking technologies to Science and Technology (S&T) R&D efforts within the Department of Defense (DoD). Of special interest is the application of scalable parallel architectures and associated algorithms to DoD S&T R&D applications; performance modeling and analysis of supercomputing architectures and applications; techniques for management and analysis of terabyte-scale data; and technologies, services, and techniques for innovative access to and workflow management on HPC resources by a distributed user community. (Contact: Mr. John E. West, 601-634-3629)

E. Corps of Engineers Enterprise Infrastructure Services (CEEIS) (ITL-5)

The Corps of Engineers Enterprise Infrastructure Services (CEEIS) Program Management Office, located in the ITL, supports research to maintain state-of-the-art systems and networks in the Corps of Engineers. Development and design of advanced networking and security technologies are applied to the Corps' corporate information technology

architecture as well as interfacing with U.S. Army, DoD, and public customers. In addition, development and design in systems and storage area network engineering are conducted to sustain a viable, robust enterprise computing infrastructure. (Contact: Dr. Peggy Wright, 601-634-4630)

F. Sensors, sensor systems, data acquisition, processing, and transmission systems (ITL-6)

Research and development is conducted in the general area of sensors, automatic data acquisition systems, automatic data processing and interpretation systems, data storage systems, and data and information transmission systems that support military engineering, civil engineering, environmental engineering, and homeland defense. Some specific areas of interest include artificial neural networks for processing and interpretation of sensory data; ultra-wideband radar beam steering; low-leakage, high-voltage microelectromechanical systems voltage generators; new methods for displaying data; graphical user interfaces for controlling sensors or displaying sensor output; sensors and sensor systems for intruder detection; feedback control systems for protecting structures and other assets from chemical and biological weapons; smart sensors that process and interpret their data and provide information to the user as opposed to just data; agent-based sensory systems; micro-sensors; advanced very-high-resolution acoustic imaging systems for inspecting underwater structures or monitoring marine life in turbid water; methods to classify underwater acoustical moving targets; advanced high-speed and/or very-high-shock data acquisition systems; advanced seismic, infrared, optical, and acoustic sensors; advanced charge-coupled device (CDD)-based sensory systems; high-shock, high-frequency sensors; stress, displacement, pressure, and chemical sensors; digital sensing methods; electromagnetic sensors for all parts of the spectrum (radar, infrared, microwave, x-ray, radio, visible light); sensors for monitoring structural response, for monitoring the conditions at dams or locks, for measuring sediment transport, for measuring roadbed or bridge response, for measuring stream velocity gradients, or for measuring pollutants; and novel supervisory control and data acquisition (SCADA) systems. (Contact: Dr. Charles R. Welch, 601-634-3297).

CONSTRUCTION ENGINEERING RESEARCH LABORATORY

Facilities Division

I. Research Areas

A. Measurement and Verification Procedures for Facility Energy System ReCx (CERL-1)

This research would develop measurement and verification (M&V) procedures for ReCx of facility energy systems. The procedures would be used to quantify the initial energy reductions obtained from the ReCx and could be used to annually verify that the savings are sustained over the facility's life. The procedures should require a minimum of collected performance data and be useable by an Army installation Public Works Business Center staff. (Contact: Dale Herron, 217-373-7278)

Innovative CBRN Protection for Facilities

Proposals are sought which address the need for an improved ability to protect mission critical facilities from attacks using CBRN (chemical, biological, radiological, or nuclear) agents in internal and/or external agent releases. In particular, methodologies for designing, constructing, operating & commissioning CBRN protection systems in a building system are sought. Ideally, the CBRN protection systems should be integrated into the building in such a way that other building systems and functions are not negatively impacted. We are also interested in intelligent control systems that optimize performance of the facility (security, fire, CBRN protective system, HVAC, energy), integration of control systems with IT networks for rapid data exchange & autonomous management, and modeling & simulation tools that analyze the effectiveness of CBRN protective systems, including their impact on energy efficiency, indoor air quality, operability, and maintainability. (Contact: James Miller, 217-352-6511, x7302)

Intelligent Building Control Systems

This research would advance the state-of-art for multi-vendor, multi-purpose holistic and integrated control systems that provide a productive work environment that is secure, reliable and efficient. It would build upon industry standard open-systems communication protocols to perform monitoring and control functions. It would also include identification and development of algorithms and applications such as integrated fire/emergency/security/HVAC response scenarios, self-optimizing and self-diagnosing utility and environmental control systems, enterprise-wide metering, and/or data collection, visualization, and analysis. (Contact: Dave Schwenk, 217-373-7241)

B. Continuous Commissioning Procedures (CERL-2)

This research would develop new and existing facility continuous commissioning procedures that are readily usable by Army Corps of Engineer construction personnel and Army

Installation Public Works personnel to insure that the mechanical and electrical systems in newly constructed Army facilities are operating correctly and efficiently upon completion of construction and that the mechanical and electrical systems in these facilities continue to operate correctly for the life of the facility. Procedures should include methods of continuously monitoring and correct the performance of existing facility mechanical and electrical systems. (Contact: Dale Herron, 217-373-7278)

C. Fiber Reinforced Polymer (FRP) Composites for Infrastructure Applications (CERL-3)

The application of structural FRP composite materials/systems to facility construction application involves working knowledge of composites manufacturing, interfacial behavior of composite materials, fracture mechanisms in composites, composite materials joining technologies, composite design criteria, composite durability, composite quality assurance, smart composites, composite repair techniques, and other appropriate phenomena and the ability to develop constitutive and other models of these phenomena for this application. Moreover the Government seeks development of concepts and prototype demonstrations for facility construction applications using composite materials systems. Of particular interest for further development is the application of FRP composites for navigational gates and gate components as well as heavy-duty FRP composite sheet pilings. (Contacts: Jonathan Trovillion, 217-352-6511, x7481 and Richard Lampo, 217-373-6765)

D. Reduced Footprint Technologies for Forward Facilities Early Entry & Sustainment (CERL-4). This research calls for structural/materials models, concepts, and/or applied research that support Forward Facilities early entry and sustainment to meet immediate Short-Term, Interim and Objective Force goals. Research under this BAA entry includes structural/materials innovations and technologies that can improve forward operating base (FOB) and point of debarkation (POD) facility construction practices and systems. R&D supporting this activity should emphasize innovations and technologies that offer strong potential to deliver or upgrade facilities more efficiently and effectively at a minimal logistics footprint. This includes technologies that integrate indigenous and/or advanced materials/systems with state-of-the-art practices in design, construction, and deconstruction while considering environmental and total life cycle cost factors. This also includes models that address unique material constitutive behavior, structural-materials behavior or interactions and building envelope / structural analyses. Three target areas to focus R&D proposal include 1) Rapid POD facility upgrade and repair technologies, 2) Reduced footprint systems for conventional FOB construction and 3) Innovative systems for non-conventional FOB construction. (Contact: Jonathan Trovillion, 217-352-6511, x7481).

E. Roofing (CERL-5)

Research and development efforts are currently requested in the following areas:

1. Perform studies of roofing material degradation processes, including performance of accelerated weathering and laboratory testing of new and aged materials and development of

degradation models. Materials shall include the following:
elastomeric and thermoplastic polymeric sheets, modified bitumen, bituminous built-up, and asphalt shingle.

2. Development of standard serviceability tests and performance criteria for roofing materials and systems based on degradation models. (Contact: Dave Bailey, 217-352-6511, ext. 7480)

F. Construction Materials Made From Recycled Wastes (CERL-6)

Research is currently being conducted on construction materials made from recycled, post-consumer wastes with a primary focus on products made from recycled plastics. Work on these type materials is in support of Executive Order 13101, Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition. Required research on these polymeric materials includes, but is not limited to, studies concerning: relationship of fabrication techniques to end-product properties, degradation mechanisms in various environmental exposures, long-term mechanical properties and durability in severe and varying environments, creep behavior at varied temperatures and loads, behavior and design of bolted connections, quality assurance techniques, design criteria for structural applications, and modeling techniques to predict material behavior in different loading situations over the life-cycle of the product. (Contact: Richard Lampo, 217-373-6765)

G. Innovative Energy Efficiency and Energy Security Initiatives (CERL-7)

Proposals are sought which address the need for improved energy efficiency and improved energy security by federal, state, and private sector energy users. Federal agencies are required to meet stringent energy efficiency targets mandated by Executive Order. Products/methods/techniques that will improve overall energy efficiency or reduce reliance on non-renewable energy sources are of interest. These include but are not limited to: combined heat and power generation, fuel cells, low Nox boilers/burners, natural gas cooling and compressed air, storage cooling, wind, geothermal, and solar power generation, and high efficiency heating/ventilating/and air-conditioning systems. In addition, proposals are also sought for products/methods/techniques that will improve the robustness of energy delivery systems and reduce the risk of loss of energy services due to economic dislocations, depletion of natural resources, natural or man-made disasters, as well as for products/methods/techniques which will facilitate cost effective, reliable, and sustainable utility support to deployed forces in underdeveloped regions of the world. (Contact: James Miller, 217-352-6511, x7302)

H. Fuel Cell Technology Advancements (CERL-8)

Proposals are sought which address the following research areas for stationary fuel cell technology: a) development of an advanced technology base, b) innovative and/or lower-cost manufacturing, packaging, and assembly processes, c) balance-of-plant (BOP) components, and d) advanced field demonstrations of pre-commercial systems. (Contact: Frank Holcomb, 217-352-6511, ext 7412).

I. Industrial Process Optimization (CERL-9)

This research would identify new opportunities for industrial energy reduction achieved through new technologies, improved system and operational modifications, while simultaneously reducing toxic air emissions. Emphasis would be placed on implementing changes that could be applied to numerous military industrial installations. The research would provide data on latest technologies, and quantify the associated cost/benefits for any optimization change. (Contact John Vavrin 217-352-6511 ext. 7570 or Mike Lin 217-352-6511 ext. 7358)

J. Innovative Corrosion Control at Military Facilities (CERL-10)

This area focuses on research, development and field tests to reduce corrosion of electrical-mechanical systems and structural systems at military facilities. The components most susceptible to corrosion include: building structural components and utilities (that will not be privatized at some installations) such as: metal buildings, metal roofing and siding, doors, aircraft hangars, outdoor electrical sheet metal for air conditioners, electrical boxes, underground pipes (gas water, steam, high temperature hot water), pipes in buildings, boilers, chillers, condensate lines, water storage tanks, water treatment plants and sewage treatment plants. The general areas to be researched for corrosion reduction include corrosion control technologies using: (a) Coatings, (b) Cathodic Protection, (c) Advanced (Corrosion Resistant) Materials Selection and Design, (d) Water Treatment, and (e) Remote Corrosion Assessment and Management. Contact: Ashok Kumar, 217-373-7235.

K. Innovative Electrical-Mechanical Systems To Increase Efficiency, Reliability, Safety, and Security (CERL-11). Contact: Ashok Kumar, 217-373-7235.

The research program in this area supports both the Military and Civil Works missions of the U. S. Army Corps of Engineers. This work focuses on research, development and field tests to increase efficiency, reliability, safety and security using innovative electrical and mechanical systems.

For military installations, innovative electrical mechanical systems are needed to increase the efficiency, reliability, safety, and security of building and utility systems such as heating, ventilation, and air conditioning (HVAC) systems, chillers, boiler plants, water treatment plants and sewage treatment plants.

New technology to automate lock controls using programmable logic controllers (PLC) is needed. The technology will also include video surveillance and central pilothouse controls. Locks can also be operated remotely from off site locations. Remote control and communication technology to operate a number of locks from an off site lock control room needs to developed, field tested, demonstrated and validated. Monitoring technology can be used for predictive maintenance to monitor the condition of lock and dam operating equipment to avoid unscheduled breakdown. Various sensors and monitoring software need to be developed. Neural networks, artificial intelligence and trending software are needed to set up

alarms. Emerging technology for barge lashing, thrusters for barges, and automated pilot controls of barges needs to be developed and demonstrated to increase efficiencies and security.

L. Electro-osmotic technology for water and chemical containment (CERL-12)

Electro-osmosis is the transport of cations due to the application of an external electric field. Because of the molecular binding nature of water molecules, water molecules are transported along with the cations. This technique has been used in civil engineering to dewater dredgings and other high-water content waste solids, consolidate clays, strengthen soft sensitive clays, and increase the capacity of pile foundations. Electro-osmosis has received significant attention in the last 5 years as a method to remove hazardous contaminants from groundwater or to arrest water flow. Although results have shown the technique to be feasible, they have not been remarkable. Research is needed in overcoming the limitations of current techniques, determining new application and demonstrating application techniques. Contact: Vince Hock, 217-373-6753.

M. Seismic Engineering (CERL-13)

Reinforced concrete and masonry structures, and welded moment-resistant steel frames, are vulnerable to seismic events. Many critical and high potential loss facilities in the Department of Defense have some or all of these characteristics, making them and the missions they support susceptible to the effects of major earthquakes, endangering life safety, and impeding post-earthquake response efforts. Vulnerability of structures supporting in-theater operations is also a concern. Research areas include; seismic assessments, rehabilitation of existing structures, progressive collapse, and protective measures for designing new structures. Also of interest is the capability to protect critical equipment from damaging effects of seismic events, so that government facilities remain fully functional following seismic activity. (Contact: John Hayes, 217-373-7248)

N. Critical Infrastructure Protection for Utility Systems (CERL-14)

Utility systems provide the electricity, water, transportation fuel, heating, cooling, communications and compressed air that are required for carrying out military installation missions. The objective of this research is to develop methods, simulation tools, and models to enable installation and military planners to plan, assess, optimize, and monitor the ability of utility systems to support normal operations requirements, as well as, military force projection. New technologies and methods are needed for conducting utility system simulations using real-time data, as well as historical, generic, or hypothetical scenarios. (Contact: Vince Hock, 217-373-6753)

Installations Division

I. Research Areas

A. Inventory, Assessment, and Monitoring (CERL-15)

This research develops innovative and improved technologies and procedures for (1) inventorying threatened and endangered plant and animal populations and assessing long term population viability and habitat health and (2) inventorying archeological sites, traditional cultural sites, and historic structures and landscapes; assessing their eligibility for listing on the National Register of Historic Places; and monitoring impacts to significant sites, structures, and landscapes. Research efforts should consider ecosystem and regional as well as local installation contexts when evaluating population viability, habitat health, and the significance of cultural sites. (Contact: Lucy Whalley, 217-373-7243). Specific research efforts are requested in the following areas:

1. Improved methods for inventorying threatened and endangered species and collecting related environmental data pertaining to endangered species management,

2. Improved methods for measuring a full range of habitat conditions and biological and abiotic environmental parameters,

3. Inventory and assessment of invasive species,

4. Predictive modeling of archeological sites,

5. Environmental reconstruction and geomorphological analysis related to identifying areas of past human habitation and use,

6. Geophysical techniques for surveying and assessing archeological sites,

7. Identifying, documenting, and assessing the significance of historic structures and landscapes and archeological sites,

8. Condition assessment and monitoring systems for historic structures and landscapes,

9. Inventory and monitoring systems for archeological sites,

10. Acquiring, processing, integrating, and/or analyzing remotely sensed data and imagery for natural and cultural resources inventory, assessment, and monitoring.

B. Land Management (CERL-16)

The goal of research in land management is to develop and improve planning and management tools and procedures that enable land managers to address the priorities of the military mission, meet the requirements of environmental legislation, and support the stewardship of natural and cultural resources on military lands. (Contact: Steve Hodapp, 217-373-7228). Specific research efforts are requested in the following areas:

1. Impacts of military land use activities on species listed pursuant to the Endangered Species Act and developing management plans and mitigation strategies,

2. Fragmentation of habitat of threatened and endangered species,

3. Developing technologies for integrating cultural and natural resources management planning,

4. Predicting and controlling erosion and dust associated with military training activities,

5. Evaluating the carrying capacity of training lands and improving understanding of the impacts of military training on the environment,

6. Developing new technologies designed to mitigate environmental effects of training on the landscape,

7. Assessing and modeling the effects of helicopter, aircraft, blast, and small arms noise on animals and humans,

8. Designing noise data collection systems for installations,

9. Developing noise impact mitigation techniques,

10. Developing technologies for control of invasive species,

11. Developing sustainability indices and risk assessments for military training lands,

12. Designing predictive computer models and decision support tools for assessing environmental change, the effects of both human and natural influences on the environment, and the integrated management of natural and cultural resources,

13. Developing a full range of land use planning tools to facilitate long term sustainability of defense installations,

14. Developing databases relevant to land and ecosystem management and improving information flow for modeling and decision support purposes,

15. Identifying, designing, and/or developing a computing system environment and/or protocols to facilitate interactions between analysis tools and common delivery mechanisms under development by CERL and ERDC.

C. Pollution Abatement/Pollution Prevention at Industrial Operations (CERL-17)

Proposals are sought in the general area of Army industrial waste treatment which provide field work, scientific, engineering and laboratory analysis, and special studies within the thrust areas listed in Table A below. The studies can range in scope from literature review, to field data collection, laboratory testing to pilot demonstration, and review of engineering plans and designs (Contact: Dr. Steve Maloney, 217-373-3482, except as otherwise noted)

TABLE A. Thrust Areas Identified by the U.S. Army for Pollution Abatement/Pollution Prevention Operations Thrust Areas

Depot Waste Treatment Technologies:
- Industrial wastewater sludge treatment
- Conversion of heavy metals to nonleachable waste
- Plasma-arc technology for solid/hazardous waste

Reprocessing Alternatives:
- Separation of hazardous waste from paint-blast area
- Alternative paint strippers
- Evaluation of rotary aircraft cleaning agents
- Paint strippers for powder and electro-deposition coatings

Ordinance Waste Treatment Technologies:
- Alternatives to open burning/open detonation (OB/OD)
- Propellant waste treatment, e.g., nitrocellulose (NC) fines, and dinitrotoluene (DNT)
- TNT redwater treatment
- VOC control in propellant production

Out of Process Reuse:
- Reduced smoke propellant as fuel source
- Recovery/reuse of ammonium nitrate
- Reuse of energetics in explosive welding

Troop Installation Air Pollution Control:
- Compliance with the Clean Air Act
- Indoors air pollution
- Radon management

- Control of solvent emissions from painting, cleaning, and depainting

Depot Operations Air Pollution Control (Contact: James Hay, 217-373-3485)
- Compliance with the Clean Air Act
- Industrial air pollution control
- Emission monitoring

Water/Wastewater Treatment Technology:
- Compliance with the Safe Drinking Water Act
- Water recycling, conservation, and demand optimization
- Compliance with the Clean Water Act
- Wastewater treatment plant retrofit and upgrade
- Collection system rehabilitation and optimization

Solid Waste Management:
- Solid waste minimization
- Solid waste characterization
- Solid waste reduction/recycling/composting
- Solid waste incineration/landfilling

Hazardous Waste Management:
- Lead-based paints
- PCB management
- Waste oil management
- HAZMIN plan optimization
- Bar code tracking of hazardous materials/wastes

D. Treatment of Waste Streams Using New Generation Adsorbents (CERL-18)

The technical objective is to develop, modify and evaluate new resins and surface reactive adsorbents with characteristics of controlled clarity and surface properties. The materials will be developed using biopolymers and other recalcitrant materials such as surface reactive ceramics and metal oxides. Toxic/hazardous organic compounds such as nitroaromatics, phenols, and heavy metals, etc., are present in Army aqueous and vapor streams generated by manufacturing processes, which produce energetic materials. Regulatory compliance problems may occur as a result of these emissions. Development of a new generation of adsorbents will provide another treatment option which can be evaluated for appropriateness to the Army in terms of resources, capital costs, operation/maintenance, etc. (Contact: Dr. Ed Smith, 217-373-3488)

E. Compliance at Industrial Processes (CERL-19)

Research is requested in the following areas:

1. Technologies to reduce the cost to treat wastewaters from energetic production and demilitarization.

2. Heavy metal discharges from industrial operations.
3. Environmental impacts of privatized collection and treatment systems.
4. Methods for demolishing buildings contaminated with energetics.
5. Faster and cheaper technologies for treating and disposing of military unique and energetic production wastes including alternatives to Open Burning/Open Detonation (OB/OD).
(Contact: Debbie Curtin, 217-398-5567)

F. Compliance at Troop Installations (CERL-20)

Research is requested in the following areas (Contact: Debbie Curtin, 217-398-5567):

1. Environmental impacts of privatized collection and treatment systems.

2. Army guidance for more effective oil/water separation and water conservation, reuse, and recycling.

3. Air contaminant planning to include: integrated monitoring networks, continuous emissions monitors, and permit reporting systems (including Greenhouse Gas (GHG) emissions control).

4. New guidelines for landfills including more precise location and perimeter definition technology, landfill mining technologies, and stabilization, processing/recycling of military unique materials.

5. Impulse noise technologies to include terrain considerations in blast noise modeling, more accurate land-water propagation interfaces, and noise source characteristics, building codes and construction practices to minimize impulse noise transmission into structures, and mitigation procedures for large explosions. Research is also requested on better rotary-wing aircraft noise control to include newer aircraft not presently characterized for modeling, and source data for all helicopters.

6. Consistent analysis of environmental assessment data and guidance for consistency in applying root cause analysis to incorporate pollution prevention standard solutions for identified non-compliance. Includes a review of programmatic issues across media areas to incorporate ISO 14001 principals.

7. Cheaper lead-based paint hazard abatement, including totally enclosed treatment for steel structures, environmentally acceptable chemical strippers for wood and steel, and criteria for encapsulating paint versus removing it.

8. Develop/update Environmental Governing Standards for OCONUS installations and provide them with the technical assistance/technology infusion to effectively comply with the Standards.

9. Research, develop, test, evaluate, and demonstrate environmental compliance/pollution prevention technologies for OCONUS installations.

G. Pollution Prevention (CERL-21)

Research is requested in the following areas (Contact: Debbie Curtin, 217-398-5567):

1. Better Data Collection and Inventory Databases.

2. Contaminant Reduction from Stormwater at Army Facilities (including new methods for oil/water separation).

3. Improved Techniques for Pollution Control
-Indoor air pollution
-Radon management

4. Greenhouse Gas (GHG)
-Prediction modeling for all sources
-Low GHG emitting processes
-Effects of policy changes on GHG inventory

5. Solid Waste
-Minimization
-Characterization
-Recycle/reuse (including building materials)
-Composting
-Incineration/landfilling
-deployable technologies to minimize waste

6. Hazardous Waste
-Lead based paints
-PCB management
-Waste oil management
-HAZMIN plan optimization
-Less hazardous (and costly) weed/pest control
-Asbestos
-UST/AST
-deployable technologies to minimize waste

7. Water/Wastewater Treatment Technology
-Water recycling, conservation, and demand optimization
-Wastewater treatment plant retrofit and upgrade
-Collection system rehabilitation and optimization

8. Environmental Baseline Survey for in-theater operations
- Identification
- Develop, test and implement processes and methodologies

COLD REGIONS RESEARCH AND ENGINEERING LABORATORY (CRREL)

Cold Regions Environmental Effects on Sensors

I. Introduction.

Current research deals with examination of the potential influence of cold regions background and atmospheric conditions on the performance of sensor systems, primarily those operating in electromagnetic, seismic, and acoustic spectra. Emphasis is on defining the physical principles involved and characterizing those environmental properties that affect the performance of sensors and equipment. Research is conducted in the fields of heat and mass transport, turbulent and radiation exchange, and their effect on the scattering and propagation of electromagnetic, seismic, and acoustic waves.

II. Research Areas

A. Signature and Scene Prediction and Synthesis for the Millimeter-Wave Spectral Region (CRREL-1)

The objective is to seek to improve understanding of the relationships between the material properties of cold regions, including snow, ice, and vegetation and the scattering and emission of millimeter-wave energy. Technical issues include:

1. Development of improved modeling to predict signature at a point;

2. Modeling the dynamics associated with changing material properties over time, such as change of phase; and

3. Scene generation using the estimated signatures and land feature maps. (Contact: Dr. R. Davis, 603 646-4219)

B. Algorithms to Recover Geophysical Products from Remote Sensing Measurements to Drive Models of Surface Energy Balance and Signature Prediction (CRREL-2)

The objective is to seek to improve capability to measure land surface features that affect millimeter-wave and infrared signatures in a changing environment. Technical issues include:

1. Synthesis of multispectral and polarimetric measurements from airborne or spaceborne systems to exploit synergistic relationships across the electromagnetic spectrum;

2. Enhanced algorithms to map snow and ice in all-weather conditions; and

3. Improving below-cloud products using measurements made over clear-sky conditions. (Contact: Dr. R. Davis, 603 646-4219)

C. Methods to Spatially Distribute Models of Snow Cover, Soil and Vegetation Energy and Mass Interactions in the boundary Layer (CRREL-3)

The objective is to seek to develop improved methods to segment land cover data layers, spatially distributed meteorological forcing and validate model output of energy budget models for snow cover and other land cover in cold regions. Technical issues include:

1. Region growing from land covers data layers to define model polygons;

2. Mesoscale and higher-resolution gridding of meteorological parameters, notably radiation; and

3. Parameterization of subresolution processes and properties. (Contact: Dr. R. Davis, 603 646-4219)

D. Penetration of Energy Transfer Components into Snow (CRREL-4)

The objective is to investigate energy exchange through the surface of a snow cover by radiation and turbulent transfer. Recent studies have shown that the transmission of solar radiation beneath the snow surface causes asymmetric heating and cooling cycles, which can have significant effects on grain growth and liquid water production. Problematic situations occur when subsurface melt is undetectable by remote means other than microwaves. Turbulent transfer through the snow surface in the form of wind pumping and forced vapor convection is poorly understood, and also may affect subsurface metamorphism and melt. These processes can have strong effects on radar backscatter, primarily owing to phase change and gain growth below the snow surface. Models to predict the transfer of energy through the snow surface by radiation and wind pumping are required. (Contacts: Dr. R. Jordan, 603-646-4298, Dr. M. Albert, 603-646-4422, and Dr. R. Davis, 603-646-4219)

E. Concepts for Spatial Winter Boundary Layer Description (CRREL-5)

The objective of this work unit is to identify, describe, and model winter weather conditions that are not well understood and are not measured and forecast by traditional weather services. These limiting winter weather conditions result from either natural airborne obscurants such as snow or dust, or from meteorologically created surface conditions such as snow cover, glaze, frost, freezing and thawing soil, and rime icing of communications and airborne hardware. This involves relating standard weather service products to degraded winter weather conditions, such as natural and synthetic obscurants, to improve understanding of the physics of the phenomenon. It involves pure climatology for generating a broad spatial perspective to identify where the phenomena occur, and to identify patterns of the phenomena that relate to better understand weather patterns for testing theoretical relationships. It also involves fieldwork for background characterization of both weather and terrain conditions that are not ordinarily measured by standard weather observers. (Contact: Dr. C. Ryerson, 603-646-4487)

F. Environmental Effects on Seismic and Acoustic Wave Propagation and Sensors (CRREL-6)

The objectives are to investigate environmental effects (including winter) on seismic and acoustic wave propagation and to develop methods to enhance the performance of many existing sensor systems in winter environmental conditions. Current efforts are focused on measuring and characterizing the effects of wind, forest vegetation, snow, ice, and frozen ground on the coupling and propagation of acoustic and seismic waves. Field measurements are being analyzed and used to develop and validate propagation models for these conditions.

A suite of models is used to predict:

1. Environmental effects on vehicle signatures and sensor performance.
2. Vehicle source seismic inputs of tracked and wheeled vehicles for sophisticated seismic simulations.
3. Propagation through complex geology and meteorology.

Algorithms are required for:

1. Improved sensor performance for vehicle tracking and identification, route surveillance, intelligence gathering, and other uses are being tested and evaluated.
2. Data analysis of time series analysis, signal processing, and array processing methods to improve sensor system performance.
3. Inferring geological properties from remote sensing data.

New methods of making measurements are required to obtain needed data under harsh environmental conditions. (Contact: Dr. M. Moran, 603-646-4274)

G. Evaluation of Targeting Success Over Cold Regions (CRREL-7)

The objective is to use statistical techniques to develop methods to evaluate and predict targeting success based on scene characteristics. Target identification requires contrast with the background in the optical, near infrared, or microwave parts of the spectrum. Methods are needed to use clustering algorithms, such as nearest neighbors, or decision algorithms, such as correlation or regression trees, to evaluate scene contrast from data sets, which may contain nonparametric distributions. (Contacts: Dr. R. Davis, 603-646-4219 and Dr. R. Detsch, 603-646-4625)

H. Tactical Decision Aids (CRREL-8)

The objective is to develop Tactical Decision Aids (TDAs) from the results of research being conducted at CRREL that predict the effects of winter environmental conditions on battlefield operations. This effort serves to coordinate CRREL's participation in modeling efforts like TACDAM and CAMS. Current focus is on identifying research products that are needed to produce winter TDAs and integrating these products into predictive models of smart weapon performance and mobility. (Contact: Mr. J. Fiori, 603-646-4515).

I. Environmental and Atmospheric Effects on Winter Battlefields (CRREL-9)

The object is to develop winter climatological and environmental guidance for use by materiel developers, modelers, and environmental scientists, in system design, test planning, model evaluation, and system performance analysis. The approach is to compare winter atmospheric and environmental data from field experiments with NOAA, ETAC, and other databases to produce comprehensive summaries of average and extreme conditions expected in theaters of operation and at test sites. One goal is to be able to determine quantitatively the representativeness of CONUS test sites and conditions during weapon systems tests to conditions expected in theaters of operations. This information will be incorporated into requirement documents and used to evaluate the adequacy of developmental and operational testing. (Contact: Mr. J. Fiori, 603- 646-4515)

J. Effects of Turbulence in the Atmospheric Boundary Layer on the Winter Battlefield (CRREL-10)

The objective is to investigate, both theoretically and experimentally, turbulence processes in the atmospheric boundary layer (ABL) over snow-covered ground, sea ice, and the ocean. This work focuses especially on studying turbulence processes in the ABL, on understanding turbulence effects on acoustic and electro-optical (E-O) propagation, and on inferring turbulence structure and turbulent fluxes from path-averaging E-O instruments. The approach will combine field measurements, data analysis, and modeling. The turbulence sampling may be with fast-responding meteorological instruments and with path-averaging instruments. Data analysis will involve time series, spectral and statistical analyses, and similarity theory. (Contact: Dr. E. Andreas, 603-646-4436)

K. Physics Accurate Modeling to Produce Synthetic Scenes and Data for a Global Range of Environmental Conditions (CRREL-11)

The objective is to provide the Department of Defense (DoD) smart weapons community with the capability to incorporate the effects of environmental condition in the design, development, test, and evaluation of smart weapon systems including sensors, logic, target detection, recognition, classification, and identification algorithms and techniques. Additionally to provide environmental drives for training simulators, mission planning, and mission rehearsal. The environmental conditions will include urban terrain, weather (fog, rain, snow, smoke, etc.) for a global range of potential operational scenarios. This capability will involve products in two major areas:

1. Modeling of environmental features and process; and
2. Generation of physics accurate synthetic scenes and data.

Models are required to compute the energy budgets of environmental and man-made features with correct geophysical properties. Energy budget models for natural and man-made features will be driven by basic environmental variables and parameters. Physics accurate synthetic scenes and data that are spatially and temporarily correct are required. Techniques to validate the “goodness” of the synthetic scenes are also required. The total is to have an

integrated physics accurate capability to model and simulate natural and man-made features that are part of the target set and non-target set (the environment).
(Contact: Dr. G. Koenig, 603-646-4556)

L. Inflight Aircraft Icing Prediction Detection System (CRREL-12)

Aircraft can avoid inflight icing with "prediction" detection systems that remotely sense the range, azimuth and altitude of an icing environment in the flight path enabling the flight crew to adjust the airplane's flight path to avoid that environment. Icing prediction systems use remote sensing technology to sense icing potential (supercooled cloud, drizzle and raindrop size drops) in the flight path. Airborne remote sensing of icing conditions is envisioned as an important capability of manned aircraft and unmanned aerial vehicles (UAVs) in accordance with the "avoid and exit" concept. It should provide opportunity to avoid inadvertent icing encounters, provide the ability to discern dangerous icing conditions such as supercooled large drops, and allow areas of minimal icing potential to be detected while in intense conditions for escape. Development of instrumentation and algorithms to remotely detect icing conditions from aircraft is of interest, including range-resolved detection and quantification of liquid water content, drop sizes and temperature ahead, above, below, and to the sides of the flight path. Development of operational concepts for reporting icing encounters by data links to meteorologists and other aircraft, displaying information to pilots, integration of icing remote sensing systems with other on-board remote sensing systems, avoid and exit techniques, and utility for UAVs and weapons systems are desirable. Similarly, methods of measurement and characterization of icing conditions such as liquid water content, drop size distribution and temperature and their spatial organization at the microphysical to submesoscale, are of interest. (Contact: Dr. C. Ryerson, 603-646-4487)

M. Environmental Investigations at Cold Regions Sites (CRREL-13)

State-of-art geological and geophysical techniques are used to investigate complicated environmental problems associated with soil and ground water contamination at cold region's sites. Innovative technologies for site characterization, remediation and restoration are applied to problems resulting from complex geological and hydrogeological conditions. Subsurface investigations use non-intrusive techniques, such as ground penetrating radar and electrical resistivity, combined with drilling and borehole analyses and other techniques. Site-specific ground water measurements include in situ sensors for water quality, contaminant and flow. Modern environments (e.g., glacial, periglacial, river, marine, etc.) are studied and used as analogs for developing and interpreting geophysical and other data on the subsurface stratigraphy of sites. Three- and four-dimensional hydrogeological models are developed for application to multi-dimensional models of subsurface contaminant migration. State-of-art GIS technologies are used to provide multiple parameter datasets for modeling and a platform for research and model development and application. (Contacts: Dr. D. Lawson, 907-384-0510; Dr. S. Arcone, 603-646-4368 and Ms. B. Astley, 907-384-0513)

N. Weather and Terrain Effects on Intrusion Detection (CRREL-14)

The objective is to develop products that will assist security designers/personnel in the selection and operation of exterior intrusion detection systems (IDSs), such that the occurrence of environmentally caused security vulnerabilities can be avoided. Weather and terrain effects are not limited to cold regions conditions. Tasks may include conducting or evaluating sensor performance trials, assessing the likely impact of local weather conditions or terrain on IDS performance, or predicting the frequency of occurrence of troublesome site conditions from distributed climatological information. (Contact: Dr. L. Peck, 603-646-4261.)

Snow and Ice Properties and Processes

I. Introduction

Interests are in the growth, formation, and decay of ice covers in water bodies (rivers, lakes, estuaries, and oceans), in the metamorphic changes of snow covers, and in the accretion of atmospheric and sea spray ice. The effects of solar radiation as well as the interaction of radar, light, and sound with the ice covers provide mechanisms for investigating the processes as well as the utility of sensors for operation in polar environments.

II. Research Areas

A. Materials Science (CRREL-15)

The objective of this research area is to understand the fundamental properties of snow, ice, and frozen soils. Engineering solutions to cold regions problems required the characterization and quantification of the response of snow, ice, and frozen soil to mechanical, thermal, electrical, and other action. (Contact: Dr. D. Cole, 603-646-4217)

B. Polar Marine Engineering (CRREL-16)

This area covers the influence of ice covers on structures, transportation systems, etc., in marine, river, and lake environments. Icebreakers, ice forces on structures, and icing are being investigated. The use of artificially thickened ice for barriers, roads, causeways, platforms, and airstrips also is investigated in this research area. (Contact: Ms. J. Richter-Menge, 603-646-4266)

C. Geophysics of Snow, Ice, and Frozen Ground (CRREL-17)

The large-scale behavior of snow, ice, and frozen soils in response to natural forcing fields must be understood. The movement of sea ice driven by winds and currents, the deformation of large ice sheets by gravity, the impact of frozen ground on runoff production from snowmelt, and the freezing and thawing of lakes are some of the areas under investigation. The effects of snow and ice on the incorporation, transport, and release of particulates, chemical species, biological material, and contaminants are also studied. (Contacts: Dr. D. Perovich, 603-646-4255 and Dr. M. Sturm, 603-353-5183)

D. Atmospheric and Sea Spray Ice (CRREL-18)

The accretion of rime and glaze ice and wet snow on structures, wires, aircraft, and ships is under investigation. The design of structural components to mitigate ice accretions as well as deicing techniques and ice-phobic coatings and materials are of interest. Instrumentation, methods of predicting, measuring and modeling icing intensity, persistence, and combined wind and ice loads on components are necessary. Similarly, methods of measuring, modeling, and characterizing liquid water content and droplet size distribution in icing conditions and the resultant accreted ice, in the near-ground and free-air environments, are investigated. (Contact: Dr. C. Ryerson, 603-646-4487; and Ms. K. Jones, 603-646-4417)

E. Geological and Geophysical Processes of Glaciers and Ice Sheets (CRREL-19)

Research in this area considers the fundamental glaciological processes controlling ice flow and glacier movement, englacial and subglacial processes of erosion, transport and deposition of debris by water and ice, and englacial and subglacial drainage systems. Geophysical techniques, such as impulse radar or shallow seismic, and geological analyses, including drilling, downhole in situ measurements and sampling and related techniques, provide data for theoretical treatments. (Contacts: Dr. D. Lawson, 907-384-0510 and Dr. S. Arcone, 603-646-4368)

F. Geological and Geophysical Analyses of Permafrost Terrain (CRREL-20)

Research in this area considers the fundamental physical processes controlling permafrost aggradation, stability and degradation, basic properties of permafrost including ice and unfrozen water content, ground ice origins and distribution, and the effects of human and natural disturbances on permafrost terrain. Permafrost hydrology including surface flow and ground water conditions are examined for development of conceptual hydrologic models. Site characterization methods including geophysical techniques are evaluated for locating and analyzing contaminant plumes in aquifer of permafrost terrain. Geophysical techniques for analyzing permafrost are developed. Geological research on permafrost sedimentary sequences may focus on the analysis of paleoclimatic trends and paleotemperatures and of the potential impacts of climatic change on permafrost terrain. (Contact: Dr. D. Lawson, 907-384-0510)

G. Spatial Distribution of Snow Properties (CRREL-21)

Snow cover can be an extremely heterogeneous land surface cover. Wind, sun and natural forcing factors lead to a cover that can have large lateral variations in depth, density, stratigraphy and other properties. As a consequence of this spatial variation, heat transfer from the underlying ground or ice cover is affected, and the surface energy balance is changed through snow albedo effects. The spatial variability can be studied either using statistical methods, or through understanding of the underlying processes that cause the heterogeneity. Remote sensing products need to be used in conjunction with ground based statistics and process models in order to develop local to region-scale models that can predict the snow cover and its material, physical and thermal properties with sufficient

accuracy. (Contact: Dr. M. Sturm, 907-353-5183).

H. New Methods for Studying Particles Found in Ice (CRREL-22)

The objective of this work is to develop innovative techniques to analyze particles found in ice. Techniques would include rapid, non-destructive scanning techniques to determine the bulk composition of the particles, methods to physically separate extraterrestrial from similarly sized terrestrial particles and new analytical techniques that can provide novel information about the extraterrestrial component. (Contact Dr. Susan Taylor, 603-646-4239)

Physics of Frozen Ground

I. Introduction

Questions regarding the mobility, nature of the phases, and factors that govern the quantity of water in frozen and freezing soils have been answered in qualitative terms. Techniques must be developed to determine quantitatively the mechanisms that cause water and solute movement through frozen soil. This information is needed to predict the effects of water movement toward cold buried pipelines and changes in mechanical properties of soils under pavements, runways, and building foundations that result from seasonal freezing and thawing, and that cause frost heaving.

II. Research Areas

A. Unfrozen Water Content in Frozen Soils (CRREL-23)

Determine quantitatively the amounts of unfrozen water in frozen soil, and from the results develop algorithms that can be applied to engineering design of structures in cold regions. Investigations will be undertaken regarding the factors affecting the mass transport of water, solutes, and contaminants in freezing and frozen soils. Experiments will be designed to measure the transport mechanisms under isothermal and temperature gradient situations. Develop algorithms for predicting frozen soil behavior and properties. This will be accomplished by utilizing an existing database consisting of physical and chemical properties of soil. (Contact: Dr. S. Grant, 603-646-4446)

Contaminants in Soils and Groundwater

I. Introduction

The U.S. Army is responsible for manufacturing explosives and propellants used in the production of munitions. Wastewater containing chemicals produced during these manufacturing operations is treated prior to disposal. Previously, untreated waste waters were disposed of in unlined evaporation ponds. If the ponds leak, contamination of underlying ground water results.

II. Research Areas

A. Innovative Detection Methods for Contaminants in Groundwater (CRREL-24)

The objective of this research area is to develop innovative methods capable of early detection of contaminants in groundwater wells or soils and remote monitoring techniques to maintain surveillance of groundwater quality. The chemicals of interest are primarily TNT (2-, 4-, 6-trinitrotoluene) and RDX (1-, 3-, 5-hexahydro-1-, 3-, 5-trinitrotriazine), the two major high explosives used by the U.S. Army, and volatile organic compounds from oil products in fuel tanks. (Contact: Dr. T. Jenkins, 603-646-4385)

B. Numerical Models of Contaminant Transport in Cold Regions Soils and Groundwater (CRREL-25)

Numerical modeling techniques for groundwater flow and contaminant transport are modified and adapted for cold regions application, including discontinuous permafrost and seasonally frozen conditions. Mathematical models for analysis and prediction on transport of heavy metals, explosives, and organics in the subsurface are developed, with application to freezing and frozen ground. Heat transport aspects are coupled with mass transport. Calculation modules are developed for incorporation into the DOD Groundwater Modeling System and supported numerical codes. (Contact: Dr. S. Grant, 603-646-4446)

C. Development of Predictive Methods (CRREL-26)

Mathematical models need to be developed and evaluated for prediction of chemical transport of heavy metals, explosive residues, and organic chemicals in soils and groundwater under different environmental conditions. (Contact: Dr. S. Grant, 603-646-4446)

D. Site Restoration and Revegetation (CRREL-27)

Vegetation failure on Army training land and at sites contaminated with hazardous materials has created imbalance in the ecosystem. Research at CRREL is underway to screen plants with a deep-rooted system, cold tolerance, and sustainability in this adverse environment. (Contact: Mr. A. Palazzo, 603-646-4374)

E. Low Cost Remediation for Cold Region Soils (CRREL-28)

Research is being conducted on low cost bioremediation systems applicable to cold regions, remote sites, or inaccessible areas. Thrust areas include temperature effects, plant-soil interactions, microbial populations, soil nutrient status, innovative methods to measure treatment processes, and aggregate-contaminant interactions. (Contact: Dr. C. Reynolds, 603-646-4394)

F. Soil Microbiology in Extreme Conditions (CRREL-29)

Research is being conducted to elucidate the effects of extreme conditions on

microbial activity, fate, and persistence. Factors under consideration include temperature, pressure, osmotic potential, and the frequency and rate of change of these conditions. Influence of these parameters on both indicator and community populations and on the net function of soil communities are examined. (Contact: Dr. C. Reynolds, 603- 646-4394).

G. Cs137 and Pb210 Distributions for Estimating Sediment Erosion/Deposition (CRREL-30)

Cs137 and Pb210 distributions are frequently used to measure sediment erosion and deposition in different topographic and land-use settings. Soil samples are usually collected across the terrain of interest, the Cs137 and Pb210 content is measured, and the distributions of the radioisotopes are compared to those in control samples collected in a nearby area that is assumed to have no erosion or deposition. Variations between the study site and the control are converted to volumes of sediment eroded or deposited. However, little attempt has been made to understand the natural variability of Cs137 and Pb210 across different landforms. This CRREL research focuses on 1) defining the relationships among landscape position, soil chemistry and mineralogy, and Cs137 and Pb210 distributions in a soil column, 2) identifying how soil disturbances caused during military training changes Cs137 and Pb210 distributions, and 3) determining if other markers are useful for monitoring soil erosion and deposition. Research results will provide the military land managers a more reliable and robust method to monitor soil erosion and deposition and to define basin-wide spatial variability. (Contact: Mr. Lawrence W. Gatto; 603-646-4273)

Vehicle Mobility

I. Introduction

The mobility research area addresses engineering research on the performance of vehicles operating cross-country and on-road, and negotiating natural obstacles in cold regions. This is a highly specialized technical area, involving mechanics; dynamics; mathematics; computer specialties; geology; and snow, ice, and soil mechanics.

II. Research Areas

A. Engineering Snow Properties (CRREL-31)

Research in this area is aimed at understanding the relationship between snow's mechanical strength (e.g., bearing capacity and shear strength) and its physical properties (e.g., temperature, density, free water content, grain size, and structure). The variation of both physical and mechanical properties is also of interest as a function of time, space, and measurement technique.
(Contact: Mr. G. Blaisdell, 603-646-4474)

B. Deformable Terrain Mobility Measurement (CRREL-32)

This area of study seeks to develop reliable and efficient hardware, software, and test techniques for accurate, repeatable mobility measurements in typical cold regions materials. Equipment and test development, validation, and the proposal of standards are seen as logical steps in this study. (Contact: Mr. G. Blaisdell, 603-646-4474)

C. Mobility on Thawing Soils (CRREL-33)

This area of study addresses the unique nature of thawing terrain, particularly the effects of soil's layered nature. Our goal is to understand the relationship between vehicle mobility and thaw depth, frozen layer thickness, water content in the thawed layer, ice lens frequency, etc., for various soil types and tractive systems. The environmental impact of off-road traffic and stabilization on thawing ground is also a concern. (Contact: Dr. S. Shoop, 603-646-4321)

D. Numerical Modeling of Mobility on Deformable Terrain (CRREL-34)

Finite-element and other numerical models are being considered for application to tires and tracks traveling on deformable, rate-dependent earth materials. Parametric and design studies may be significantly aided by such a model that can be shown to be accurate. (Contacts: Dr. S. Shoop, 603-646-4321; and Dr. P. Richmond, 603-646-4461)

E. Vehicle Dynamic Codes, Algorithms and Procedures (CRREL-35)

Appropriate algorithms and procedures need to be developed for use in vehicle dynamics codes to accurately model vehicle dynamic performance for all-season terrain and road surfaces. Vehicle dynamics codes such as DADS, ADAM, and VEHDYN, need to be examined and tested using traction and braking algorithms for winter surface conditions, both on and off-road.
(Contact: Dr. P. Richmond, 603-646-4461)

F. Areal Distribution of Weather Conditions for Mobility Analysis (CRREL-36)

Areal distribution of weather conditions for mobility analysis need to be examined, these studies of specific areas of interest could include monthly summaries, number of occurrences, and other climatological data analysis. (Contact: Dr. P. Richmond, 603- 646-4461)

G. Weather Effects on New Vehicle Technology (CRREL-37)

Evaluation of the effects of winter on new vehicle technologies and monitoring systems such as Smart tires, stability control, electric, hybrid, robotic and autonomous vehicles. (Contact: Dr. S. Shoop, 603-646-4321)

H. Environmental Impacts Due to Vehicle Operations (CRREL-38)

Research and evaluation of the impacts of vehicles and engineering equipment operating on

all-season on- and off-road terrain surfaces on soil, vegetation, and ecological systems. (Contact: Dr. S. Shoop, 603-646-4321)

Roads And Airfields In Cold Regions

I. Introduction

Current research includes methods of predicting and enhancing the long- and short-term performance of roads and airfields in seasonal frost and permafrost areas of the world. Emphasis is on facilities paved with Portland cement concrete or asphaltic concrete, but unpaved areas also are studied. The objective of this research is to improve performance of roads and airfields by decreasing the life-cycle costs of the facilities. To meet this overall objective, research is being conducted in six general areas:

1. Analytical and Predictive Models;
2. Nondestructive Testing and Evaluation;
3. Material Characterization and Improvements;
4. Maintenance Practices;
5. Laboratory Testing; and
6. Accelerated Pavement Testing.

Work in this field is applicable to a wide variety of developmental efforts and contributes to the solution of many technology-related problems.

II. Research Areas

A. Analytical and Predictive Models (CRREL-39)

Emphasis is on the development and/or refinement of PC-base computer models to characterize the effects of freezing and thawing on roads and airfields in seasonal frost and permafrost areas. Models include those for determining the overall roadway or airfield performance, as well as the behavior of individual components such as geosynthetics, drainage layers, thermal barriers, granular materials and fine-grained soils, Portland cement concrete pavements, and asphaltic concrete pavements. Environmental effects are generally the primary factor in the models. Examples of models now under development, refinement, or consideration are:

1. Frost Heave and Thaw Settlement of Pavement Structures.
2. Subsurface Moisture Migration.
3. Low-Temperature Cracking of Asphalt Pavements.
4. Layered Elastic Pavement Response Under Freeze/Thaw Conditions.
5. Layered Visco-Elastic Pavement Response Under Freeze/Thaw Conditions.

(Contacts: Dr. V. Janoo, 603-646-4207 and Dr. K. Henry, 603-646-4188)

B. Nondestructive Testing and Evaluation (CRREL-40)

Efforts in this area include the development of new and innovative concepts for nondestructive testing and evaluation for use in laboratory testing, full-scale field tests, and in-service road and airfield monitoring. Development of pavement instrumentation for use in the field or laboratory is another area of effort. Studies include data acquisition, analysis, and interpretation. CRREL owns a Falling Weight Deflectometer, a Heavy Weight Falling Deflectometer and a Heavy Vehicle Simulator and has experience with a variety of stress, strain, temperature and moisture sensors for laboratory and field use. Some of the problems that must be considered in the development and placement of sensors in freezing and thawing soils are that vertical and horizontal movements of one to six inches are common, as are changes in modulus values of one to four orders of magnitude. Sensors for monitoring static (or slowly changing) and dynamic changes are necessary, and devices that can be interfaced with automatic data collection equipment are emphasized. Data collection needs include:

1. Monitoring the condition of pavement surfaces, e.g., wet, dry, snow-or ice-covered, depth of snow or ice, etc.

2. Measuring subsurface in situ stresses.

3. Measuring subsurface in situ deflections or strains due to loading and varying environmental conditions.

4. Measuring subsurface in situ moisture content or negative and positive pore water pressure.

5. Measuring subsurface in situ density.

(Contacts: Dr. V. Janoo, 603-646-4207 and Dr. R. Rollings, 603-646-4281)

C. Material Improvement (CRREL-41)

Improving the performance of paved or unpaved roads and airfields by modifying current materials, using new materials, or altering current practices is investigated in these studies. Modifiers to the surface layer, the base course, the subbase course or the subgrade are considered. Inclusion of geosynthetics, thermal barriers, or lateral drains may be beneficial, and may be used in some instances. Efforts include investigations to improve the performance of new roads and airfields, as well as to improve existing facilities by recycling, retrofitting, or modification.
(Contacts: Dr. K. Henry, 603-646-4188 and Dr. V. Janoo, 603-646-4207

D. Maintenance Practices (CRREL-42)

This effort includes the development of maintenance strategies as well as the evaluation or development of materials and methods for the maintenance and repair of in-

service roads and airfields. Studies may include joint fillers, crack sealers, seal coats, spill repair methods, pothole repair methods and materials, dust control, soil stabilizers, etc. Of interest are maintenance management techniques using manual and computerized methods for both paved and unpaved roads and airfields. Other efforts include development and implementation of snow and ice control on highway and airport pavements. (Contacts: Dr. R. Rollings, 603-646-4821 and Mr. G. Blaisdell, 603-646-4474)

E. Laboratory Testing (CRREL-43)

This effort includes upgrading current material characterizing tests and development of new test methodology for materials in cold regions. Other efforts include the development of a database on material properties such as saturated and/or unsaturated hydraulic properties, thermal characteristics and/or freeze or thaw response of soils, granular base and subbase materials, as well as stabilized materials, etc. The materials may be natural or treated to modify their properties. This effort can include obtaining samples and preparing a laboratory specimen for each type of test described above. (Contact: Dr. V. Janoo, 603- 646-4207; and Dr. K. Henry, 603-646-4188)

F. Pavement Performance Under Accelerated Loading (CRREL-44)

Efforts in this area include the development of failure criteria for asphalt and PCC pavements in cold regions under repeated loading. The failure criteria developed will be for all the pavement layers. The effort will include laboratory studies, computer simulations and full-scale test sections. Emphasis will be on pavement performance during thaw weakening periods. The other effort in this area is the development of accelerated loading machines that can be used in the study. The accelerated loading machine will be predominately used on controlled test sections in CRREL's Frost Effects Research Facility (FERF). (Contact: Dr. V. Janoo, 603-646-4207)

G. Road Design and Construction on Permafrost (CRREL-45)

Permafrost conditions pose unique challenges to road construction. Altered surface conditions produced by construction cause changes in thermal regime of the underlying subgrade that, in turn, can have considerable detrimental effect on the stability and performance of a roadway. Necessary research efforts in this area include developing new and assessing existing construction techniques, evaluating traditional and non-traditional materials for road design, and assessing methods for remotely identifying road/trail corridors and identifying locally available natural construction materials. Ease of construction, availability of materials, survivability, stability, cost, and long-term performance all require evaluation. The effort can include field testing, testing in CRREL's Frost Effects Research Facility, and conducting computer simulations using traditional and non-traditional construction materials on permafrost. (Contact: Dr. V. Janoo, 603-646-4207 and Dr. K. Henry, 603-646-4188)

H. Thaw Weakening (CRREL-46)

Each year significant money is spent on road maintenance because of damage incurred to pavements during thawing. As pavements thaw, underlying, still-frozen layers trap excess water. This leaves the supersaturated, unconsolidated pavement structure highly susceptible to damage from trafficking. Such thaw weakening occurs in both seasonal frost areas, and in permafrost areas in the active layer. Needed research to reduce thaw-induced damage includes improved construction and re-construction techniques (such as insulated pavements and appropriately designed drainage systems), modified road-usage techniques (such as improved load restriction guidelines and development of tire pressure guidelines), and validation and advancement of current thaw weakening models. Efforts in this area include laboratory and field-testing, testing in CRREL's Frost Effects Research Facility (FERF), and analytical and computer modeling efforts. (Contact: Dr. K. Henry, 603-646-4188 and Dr. M. Rollings, 603-646-4822)

Building and Infrastructure Technology

I. Introduction

Current research deals with the durability, thermal characteristics, and moisture resistance of building envelopes in cold regions. Emphasis is on developing correlations between laboratory studies, exposure tests, and the actual performance of buildings. Snow, ice, and wind loads on structures also are of concern.

II. Research Areas

A. Innovative Building Envelopes (CRREL-47)

The objective is to document the performance of conventional and innovative wall and roof systems and relate that performance to laboratory tests so that such tests can be used to predict the durability, thermal performance, and moisture sensitivity of other systems before they are built. (Contacts: Mr. J. Buska, 603-646-4588; and Mr. S. Flanders, 603-646-4302)

B. Moisture-Related Problems (CRREL-48)

The objective is to reduce the extent of moisture-related problems in facilities by developing a better understanding of the mechanisms of moisture migration in existing buildings where moisture problems are present. (Contacts: Mr. J. Buska, 603-646-4588; and Mr. S. Flanders, 603-646-4302)

C. Environmental Loads (CRREL-49)

The objective is to update and improve design criteria for buildings in cold regions. This requires research to define appropriate meteorological factors. Also at issue is the method of analyzing that information to produce meaningful loads and factors. Exposure

studies and other field measurements are needed, as are design guides. Of particular interests are snow, ice, and wind loads on structures. (Contact: Mr. J. Buska, 603-646-4588 and Mr. S. Flanders, 603-646-4302)

D. Extension of the Construction Season (CRREL-50)

CRREL is studying the behavior of engineering materials in cold regions environments. Specific areas of study include composites, recycled materials, reinforced plastics, geotextiles and other synthetic materials, metals and nonmetals, frozen soils, rocks, concrete, and ice. Interest exists in the behavior of these materials under load at low temperatures. Both theoretical developments and experimental tests and analysis are considered. Special interest exists in the placement of Portland cement concrete at below freezing temperatures. Also of interest is the long-term durability of concrete exposed to freeze-thaw cycling and the mechanisms that cause deterioration. Studies may include low-temperature performance of adhesives, aggregates, chemical admixtures, bridges, coatings, cement types, pozzolans, and roller-compacted concrete in structural, pavement and other applications. (Contact: Mr. C. Korhonen, 603-646-4438)

Cold Regions Materials Engineering

I. Introduction

Newer materials and products are being constantly added to the Army's inventory. Traditional materials are finding newer use. Cold regions climatic conditions should not impair the reliability and durability of these systems under the Army's service conditions, which may include a wide range of loading rates. Current research deals with examination of the influence of low temperature on durability and performance of materials over a wide loading range.

II. Research Areas

A. Low-Temperature Behavior of Materials (CRREL-51)

The objective is to seek improved understanding of the changes in mechanical properties of both natural (rock, ice, etc.) and man-made materials including plastics, elastomers, thermoset and thermoplastic composites, recycled and reinforced plastics, geotextiles, special purpose concretes, and other synthetic materials, including nano and acoustic materials. High performance materials fabricated with high strength and high modulus fibers, including glass, carbon, aramid and Spectra, are of special interest. Research interest exists in the responses of these materials under fatigue, impact, vibrations, or exposure to electromagnetic, ultraviolet or acoustic pulses or radiation, in presence of moisture, water or corrosive chemicals. Emphasis is placed on both micro and macro-level damage growth and freezing fracture. Studies include the effects of freeze-thaw cycling on durability, degradation and damage detection. Materials impregnated with sensors to make them smart are also studied for their low temperature behavior. Studies extend to include testing of prototype structural sub-elements especially made of advanced materials for use in

infrastructure, sheet piling and other hydraulic structures, and resistances to impact load and exposed to a wide thermal and loading range. These include joints and adhesive bonds used for fabricating composite structures. (Contact: Dr. P. Dutta, 603-646-4212 and Dr. J. Berman, 603-646-4794)

Cold Regions Revegetation

I. Introduction

One of the thrusts of the Cold Regions Revegetation Program is to determine physiological changes in plants subjected to low temperatures under a variety of conditions. This basic research information is used alone or with other basic or applied research results to improve our knowledge of plants to assist in the development of the Army's land management plans and to modify terrain for training purposes.

II. Research Areas

A. Cold Regions Revegetation (CRREL-52)

The objective of the research is to provide fundamental information on the effects of soil compaction and low temperatures on vegetation growth and survival in fine turf and low maintenance areas. The present work will include measurement of soil compaction, plant breeding and genetics and plant persistence in low- and high-traffic areas. During the plant breeding and genetics study, various management techniques will be implemented and their effects on improving grass physiology, dominance and growth will be documented. The results will be used to develop management techniques to improve or maintain a vegetation cover and alleviate soil compaction under a variety of environmental conditions. (Contacts: Mr. A. Palazzo, 603-646-4374)

Ice Engineering

I. Introduction

On-going research deals with winter navigation problems on our inland waterways as well as high water, flooding, sediment transport, and damages resulting from river ice, especially ice jams. Additional research topics include ice mechanics, ice forces on riverine and offshore structures, ice transport, ice ride-up and pile-up, ice adhesion, ice effects on river and lake environments, as well as snow drifting and avalanche control.

II. Research Areas

A. Ice Engineering (CRREL-53)

1. Effects of an ice cover on river stage, flow routing, sediment transport, and bed and bank erosion.
2. In-situ measurements and modeling of river bed scour, sediment

resuspension, and bank damages due to ice covers.

3. Ice forces on structures and design criteria for protecting riverine and marine structures against ice action, including (but not limited to) bridge piers, dikes, levees, and rip rap.

4. Environmental impacts of river and lake ice.

5. Effects of channel modifications on river ice transport. (Contact: Dr. S. Daly, 603-646-4218)

B. Winter Navigation and Flow Control (CRREL-54)

1. Forecast of river ice formation, growth, and progression in waterways.

2. Brash ice control and passage at inland navigation and flow control structures.

3. Alleviation of icing problems at inland navigation and flow control structures.

4. Development of economical methods to enhance winter operation of inland navigation structures (locks & dams) and flow control structures. Contact: Mr. A. Tuthill, 603-646-4225)

C. Ice Jams (CRREL-55)

1. Prediction of river ice breakup and transport, and forecast of ice jam formation and development (location, frequency and severity).

2. Analytical, numerical, and physical modeling of ice jams.

3. Development of equipment and instrumentation for in-situ observation and measurements of ice jam characteristics, especially of hydraulic and mechanical properties.

4. Development of cost-effective and environmentally acceptable structural and non-structural ice jam mitigation techniques.

5. Effects of Corps projects and other hydraulic structures on ice jamming and vice versa.

6. Gathering and interpretation of historical data on ice jams (jam characteristics and resulting stages and damages). (Contact: Dr. K. White, 603-646-4187)

D. Miscellaneous Topics (CRREL-56)

1. Analytical, numerical, and physical modeling of snow drifting (Contact: Dr. J. Lever, 603-646-4309)

2. Ice adhesion properties (Contact: Mr. R. Haehnel, 603-646-4325)

Remote Sensing and Artificial Intelligence

I. Introduction

The Remote Sensing (RS)/Geographic Information Systems (GIS) Research Program is actively examining methods to measure and extract feature information from both active and passive sensors, and to integrate the spatial information into intelligent GIS and Image Processing Systems (IPS). In particular:

* Evaluation and integration of in situ, aircraft/radar, and satellite data for Corps of Engineers (CoE) water resource programs.

* Development of CoE standards for remote sensing technology and cost/benefit comparisons versus standard data collection techniques.

* Integration of intelligent data management and graphical modeling and analysis using Artificial Intelligence (AI) techniques.

II. Research Areas

A. Spatial Averaging (CRREL-57)

A common task in regional studies of soil and groundwater transport is to determine sample size, mean sample values, and associated standard errors for spatially distributed soil properties (e.g., dependent rates of infiltration and volumetric soil moisture) using point data at specified locations. Estimates for the number of observations required to meet 'a priori' tolerances largely have been based on classical sampling theory without regard to the spatial dependence of the data. New techniques for determining sample size (number and location of point data) and further investigation of spatial averaging methods for point source information should be examined. Volumetric soil moisture is the major state variable for testing each sample size/sample placement algorithm. (Contact: Mr. T. Pangburn, 603-646-4276)

B. Real-Time Runoff Prediction (CRREL-58)

CRREL research objectives are to improve the precipitation and snowmelt algorithms used for stream and river runoff and to evaluate in situ sensors for measuring hydrologic input parameters such as precipitation, snow water equivalency, soil moisture, soil frost, and soil and water temperatures. Input energy flux data are being gathered and the dynamics of precipitation and snow areal extent are being measured to improve hydrologic predictive models. Additionally, snow accumulation gauges are under evaluation in cooperation with the WMO. A GIS database is under development for use with remote sensor data in the evaluation of distributed methods of runoff prediction. The integration of remote sensing and GIS technologies will have significant management and operations implications for the CoE water control programs, will increase the utility of remote sensor data for a wide range of CoE programs, and should provide a basis for the development of automated operations systems

employing remotely sensed spatially variable data. (Contact: Mr. T. Pangburn, 603-646-4296)

C. Artificial Intelligence (CRREL-59)

1. Data Structure and Parallel Distribution Processing (PDP) -- Standard binary data formats are used to import and export satellite images to geographic information and image processing systems. These data structures provide a standard sequential method to read and write large volumes of information in a semi-compressed format. Although the binary structure is adequate for strict import and export of image data, it is poorly adapted to fast image processing at the microcomputer level. New data structures should be investigated that use operating codes to quickly convert raster binary image data and vector overlay files into a high-speed graphical language for efficient display and processing.

2. Neural Networks and Pattern Recognition/Feature Predictions and Extractions -- The important class of Perception Neural Networks should be examined, and optimal discriminating functions derived. Although analytical in form, the discriminators can greatly simplify the simulation and analysis of feed-forward neural networks that are capable of detecting subtle patterns and other intrinsic features. (Contact: Mr. T. Pangburn, 603-646-4296)

D. Remote Sensing (CRREL-60)

The objective of this research initiative is to collect and analyze airborne electromagnetic sea ice thickness data for the purpose of assessing the variability of the Arctic pack mean thickness from year to year and season to season and over a period of time relating these findings to climatic change. (Contact: Mr. T. Pangburn, 603-646-4296)

E. Surface and Subsurface Sensing (CRREL-61)

Remote sensing of surface and subsurface ground features is centrally important to many civil engineering missions. Research continues in exploring the need to use radar, magnetic, and electromagnetic means to characterize things such as ground surface type and condition, surface and subsurface moisture content, frozen or thawed state and depth thereof, layering, location and type of objects on or below the surface, such as pipes, mines, or unexploded ordinances. Innovation in sensing devices and systems, sensing strategies, data processing, numerical modeling and analysis of relevant physics is included under this topic. (Contact: Dr. K. O'Neill, 603-646-4312)

F. GIS Technologies for Environmental and Geological Applications (CRREL-62)

Geophysical Information Systems (GIS) are developed for basic and applied research in the geological and environmental sciences. GIS technologies are also applied to investigation and analysis of environmental, engineering and other problems in cold regions environments. GIS programs are written to interface with custom and commercial software, particularly three- and four-dimensional models that utilize spatial databases accessed by GIS's. Custom WEBB

interfaces are developed for remote GIS and spatial database access. WEBB and GIS technologies are developed for real-time remote data acquisition and near real-time model analyses for application to research, engineering and environmental problems. (Contacts: Dr. D. Lawson, 907-384-0510; and Mr. J. Schlagel, 603-646-4387)

Cold Regions Water Resources

I. Introduction

Cold regions water resources is a broad field of study that deals with the effects and impacts of low temperature and the environment on surface and subsurface waters. The objectives are to improve general understanding of winter hydrologic and hydraulic processes with specific emphasis on forecasting techniques for snowmelt runoff prediction, temporal and spatial distribution of winter low flows, and winter geomorphology for watersheds where seasonal and permanently frozen soils are encountered.

II. Research Areas

A. Hydraulics and Hydrology in Cold Regions (CRREL-63)

The presence of an ice cover on rivers and lakes and the formation and movement of ice in these bodies as a two-phase flow create a set of problems not yet adequately addressed. Snow-cover characteristics, the movement of water through snow, and snowmelt and runoff prediction are considered in this research area. (Contact: Dr. S. Daly, 603-646-4218)

B. Wetlands and Winter Ecology (CRREL-64)

Research includes field studies of fisheries, wildlife, and waterfowl habitats in rivers and wetlands, concentrating on the impact of the winter season. (Contact: Dr. K. White, 603-646-4187)

C. Runoff and Sediment Yield of Glacierized Basins (CRREL-65)

The hydrology and hydraulics of glacierized basins are inherently more complex than those of nonglacierized basins. Glaciohydrologic processes and factors determine water storage, routing and discharge into glacial rivers, while glaciohydraulic processes determine sediment entrainment, transport, release and ultimately sediment yield of glacierized basins. Improved models that incorporate these processes are required to predict runoff and sediment yield from glacierized basins. Analysis and predictive methods using GIS are developed for basin-wide runoff and sediment yield analysis. Research in this area includes geophysical and geological analyses of the internal processes and drainage system as well as the relationship of climate, glacier and mass balance, melt water production and flow, and runoff. Research evaluates stable and radioactive isotopes for defining basin runoff and hydrologic parameters of glacierized basins. Predictive physical models are developed using field analyses. (Contact: Dr. D. Lawson, 907-384-0510)

Cold Regions Instrumentation

I. Introduction

Primary interest is in new methods to sample and measure physical, mechanical, and chemical properties of indigenous cold regions materials. As advances in research occur, new methods are required to acquire more precise data. Also, as advances in materials, sensors, and electronics technologies occur, measurements not previously possible can be obtained.

II. Research Areas

A. Electronics Design for Cold Environments (CRREL-66)

The objective is to improve operation of sensors and electronic data collection equipment in cold regions environments. Primary emphasis is on sensors and instrumentation for remote data collection, storage, and transmission. Areas of consideration include accuracy, thermal stability, low power consumption, portability, ruggedness, and reliability. (Contact: Mr. T. Tantillo, 603-646-4299)

B. Mechanical Design for Cold Environments (CRREL-67)

The objective is to improve the operation of mechanical equipment in cold environments. This includes equipment for construction, equipment to sample and test indigenous cold regions materials (snow, ice, frozen soil), and other materiel introduced into cold environments. Design concepts must account for material properties and equipment functions adversely affected by extreme environmental conditions. (Contact: Mr. T. Tantillo, 603-646-4299)

C. Delivery and Mass Transfer Mechanisms for Chemical Oxidation Technologies (CRREL-68)

Studies are sought to develop and evaluate effective and efficient in-situ delivery and mass transfer mechanisms for chemical oxidants used to treat soils contaminated with chlorinated organics(with particular emphasis on trichloroethylene). A related research area applies fate and transport modeling of resultant chemical species to assess the impact of source-area reduction via chemical oxidation technologies on soil and groundwater quality. (Contact: Dr. Daniel McKay (603-646-4738).

Abandoned Mine Land (AML) Remediation

I. Introduction

Engineers, project managers, and researchers involved in the remediation of coal and non-

coal abandoned mine lands require access to design guidance and remediation measures, including a comprehensive, well-organized and maintained database of conventional and innovative remediation technologies that identify and quantify the success of remediation techniques in order to effectively and efficiently carry out their mission.

II. Research Areas

A. Database of Remediation Measures for Abandoned Mine Lands (CRREL-69)

This research area is concerned with populating a national database of remediation measures for abandoned mine lands. The database is intended to be a holistic database encompassing geological, hydrological, biological, chemical, meteorological, and geographical characteristics of remediated abandoned mine lands. Of primary importance is the quantification of the success of the various conventional or innovative technologies applied. Data collected for each site will include geospatial reference data, the type of mine facility and commodity produced, access, cultural resources, the compounds of concern and the remediation measures taken, and the success level of the remediation measures. Stakeholders and points of contact will be identified, as well as a bibliography. (Contact: Dr. K. White, 603-646-4187.)

B. Innovative Acid Mine Drainage Remediation Measures (CRREL-70)

This research area addresses innovative methods for the remediation of acid mine drainage (AMD) from coal and non-coal mines. Research efforts that aid in the characterization and prioritization of watersheds affected by AMD are desired. Methods and guidance for AML-related hydrologic and hydraulic modeling, remote sensing, and GIS modeling are required. Research and development of methods that will prevent or mitigate AMD problems, such as new or improved passive treatment options and constructed wetlands; methods that consider the use of alternative borrow materials or coal combustion by-products in ADM remediation; and the development of low O&M mitigation technologies will be considered. Other research needs include developing tools for use in quantifying environmental benefits for AMD projects; exploring AML-TMDL (total maximum daily load) issues; and evaluating performance criteria. Guidance and support for environmental monitoring necessary to characterize AMD sites, determine long-term effectiveness of remediation technologies, and develop data on success and failure are required. (Contact: Dr. K. White, 603-646-4187).

TOPOGRAPHIC ENGINEERING CENTER (TEC)

TOPOGRAPHY, IMAGERY AND GEOSPATIAL (TIG) RESEARCH DIVISION

Geospatial Applications Branch/Surveying and Mapping

I. Introduction

TEC serves as the USACE Survey Engineering and Mapping Center of Expertise to provide consistency of surveying and mapping products and to maintain the capability to manage complex, nation-wide survey systems, such as differential Global Positioning System networks, electronic chart databases of USACE river and harbor projects, and structural deformation/monitoring systems. The emphasis is on research to develop new techniques, equipment and procedures for surveying and mapping in support of USACE Civil Works, Military applications, Environmental Restoration and Military Construction applications; and transfers new technology to USACE districts and divisions through reimbursable consulting, training, and standards development.

II. Research Areas

A. Surveying and Navigation (TEC-1)

The object is to develop new techniques, methods, and procedures for determining the precise position of points on the ground using existing or developing Positioning/Navigation (POS/NAV) equipment. New equipment is developed based on the integration of several new or developing POS/NAV sensors in order to meet Corps Civil Works requirements and Field Military needs.

B. Hydrographic Surveying (TEC-2)

The object of this research is to improve or develop new techniques, methods and procedures for determining the position of surface and subsurface objects and the depth of the bottom of harbors, lakes, and rivers. New or exiting hardware or suites of hardware are used to provide precise locations. In addition, improved capabilities are needed to remotely determine the Geotechnical characteristics of river bottom sediments and their distribution.

C. Deformation (TEC-3)

The object is to improve or develop new techniques, methods and procedures for measuring and monitoring the deformation of structures such as dams, locks, levees, etc. New or exiting hardware or suites of hardware are used to provide precise locations and changes in structures.

D. Database Development (TEC-4)

The object is to provide technical leadership to Corps districts and division and support to HQ USACE in the definition and establishment of Geospatial data standards, plans,

policies, and procedures. In this research area TEC identifies, develops, analyzes, reviews, and evaluates applications and technologies that manipulate and process varying levels of topographic and hydrographic geospatial information. New or existing database manipulation techniques, methods and procedures are sought to manage information on Corps projects, dams, river charts, harbors and other information of interest to the Corps Districts, Division, Military Engineers and national emergency and defense objectives. Investigations include the use of information from new terrain sensors such as IFSAR and LIDAR to populate databases. Activities also include data dissemination approaches and system development using Web-based GIS and map applications. (Contact Mr. Robert J. Heidelbach, 703-428-6819, Ext: 2525)

Development of E-Chart Capability in the Corps of Engineers

I. Introduction

The Corps of Engineers has initiated and effort to produce and disseminate to the public electronic chart (e-chart) data to benefit the safety of navigation. This initiative arises from needs and demands of industry, deficiencies of current inland chart products, legal obligation to provide channel information to NOAA in coastal areas, and commitment by the Corps to make mission-related geospatial data holdings available to the public. The E-chart Initiative consists of a coastal and inland component, with a development and implementation period over four years to produce Electronic Navigation Channel Data (ENCD) in coastal waterways and Inland Electronic Navigation Charts (IENCs) in inland waterways. ENCDs will focus on channel surveys and condition information that could benefit or are required for NOAA's nautical chart program. IENCs will be complete chart databases that could be used by electronic chart systems for navigation users. Both products are to follow the international S-57 hydrographic data exchange standard, which is recognized and intended for such applications, and are to be available on the internet for free and open access. ENCD and IENC production and maintenance will be dispersed among the Corps districts that maintain the charted waterways.

II. Research Areas

A. Quality Assurance (TEC-5)

The object is to research approaches and methods to perform centralized quality checks of all e-chart products to ensure compliance with product specifications.

B. Production Process (TEC 6)

The object is to research approaches and develop software tools to efficiently and consistently structure tabular and computer-aided design and drafting (CADD) data for waterways and convert to S-57 format.

C. Technology Benefits (TEC-7)

The object of this research is to investigate potential benefits of electronic chart technology to barge and towing navigation on rivers.

D. Maintenance of Aids to Navigation (TEC-8)

The object of this research is the development of data management systems to track buoy locations based on coordinates provided by buoy tenders and other maintenance vessels. (Contact Mr. Tony Niles, 703-428-6816, Ext. 2269)

Data Representation Branch

I. Introduction

Conducts research to provide the Army/DoD with advanced techniques for merging, visualizing, and analyzing battlefield terrain and environment information. Applies results of research to battlefield operations, military crisis support, and infrastructure problems. Develops, demonstrates, and implements the latest techniques for integration and exploitation of digital topographic data bases, aerial and satellite imagery, 3-D solids models and network-based geospatial information to produce computer-generated images and future map representations. Develops terrain evaluation and terrain reasoning capabilities to provide the war fighter with improved situational awareness.

II. Research Areas

A. Rendering and Display (TEC-9)

The object is to develop new capabilities and techniques for rendering and displaying terrain and environment information.

B. Integration and Exploitation (TEC-10)

The object is to develop techniques for integration and exploitation of digital topographic databases, aerial and satellite imagery, 3-D solids models and network-based geospatial information to produce computer generated images and future map representations.

C. Terrain Evaluation and Reasoning (TEC-11)

The object is to develop new terrain evaluation and terrain reasoning capabilities to provide the war fighter with improved situation awareness.

D. Battlefield Terrain and Environment (TEC-12)

The object is to provide the Army/DoD with advanced techniques for merging,

visualizing, and analyzing battlefield terrain and environment information.

E. Application of Results (TEC-13)

The object is to develop better means of applying results of research to battlefield operations, military crisis support, and infrastructure problems. (Contact Mr. Thomas Jorgensen, 703-428-6838, Ext. 2858)

Data and Signature Analysis Branch

I. Introduction

Conducts research in remote sensing as well as field and laboratory research to determine relations between earth surface components, target/background characteristics, and their imaged patterns or measured spectral signatures (as recorded by airborne or satellite remote sensing systems. Explores and develops methods and processes that exploit geospatial information to enhance understanding of battlespace environmental effects on missions across the spectrum of military operations.

II. Research Areas

A. Terrain Reasoning (TEC-14)

The object is to conduct terrain-reasoning research, which evaluates dynamic terrain controls on military functions of a force/unit/warfighter (multi-echelon) in a mission context.

B. Decision Support Tools (TEC-15)

The object is the development of a comprehensive suite of Physical Combat Environment Decision Support Tools that exploits the geospatial context of battlespace environmental information necessary to support the decision and execution process across military systems and platforms of existing forces, the Objective Force and Future Combat Systems.

C. Imaged and Spectral Patterns (TEC-16)

The object is to conduct research in remote sensing as well as field and laboratory research to determine relations between earth surface components, target/background characteristics, and their imaged patterns or spectral reflectance, luminescence, and emittance values as recorded by airborne or satellite remote sensing systems. (Contact Mr. Mike Collins, 703-428-6735, Ext. 2598)

Information Generation and Management Branch

I. Introduction

Conducts research of techniques, equipment, and systems for creating and maintaining

spatial data bases from remotely sensed imagery and existing terrain data products. Develops techniques and methodologies for storing, retrieving, manipulating, and disseminating these data for use in a broad range of military and civil applications. Conducts research in the areas of geospatial information exploitation, management and dissemination to provide the war fighter with improved intelligence, command and control (C2) and targeting. Monitors and evaluates government and industry developments in the areas of spatial data bases generation technologies and geographic information processing.

II. Research Areas

A. Spatial Data Bases (TEC-17)

The object is to conduct research on techniques, equipment, and systems for creating and maintaining spatial data bases from remotely sensed imagery and existing terrain data products.

B. Data Manipulation (TEC-18)

The object is to develop techniques and methodologies for storing, retrieving, manipulating, and disseminating these data for use in a broad range of military and civil applications. Assessing the contribution of data derived from variable sources and with differing levels of certainty is critical.

C. Geospatial Information Exploitation (TEC-19)

The object is to conduct research in the areas of geospatial information exploitation, management and dissemination to provide the war fighter with improved intelligence, command and control (C2) and targeting. Geospatial data is acquired via direct remote measurement and/or estimation through modeling approaches with emphasis placed on exploitation/integration using existing commercial off the shelf technology.

D. Government and Industry Developments (TEC-20)

The object is to evaluate government and industry developments in the areas of spatial data base generation technologies and geographic information processing. (Contact Mr. Jerry Breen, 703-428-6802, Ext. 2578)

TOPOGRAPHY, IMAGERY AND GEOSPATIAL SYSTEMS DIVISION

Topographic Systems Branch

I. Introduction

Conducts acquisition, testing, and fielding of topographic systems and digital reproduction systems until handoff to the appropriate Readiness Command. After handoff, provides technical support for production engineering to the Readiness Command that is

serving in the role of system/item manager. Evaluates currently available commercial topographic equipment for military adaptation in support of force modernization. Provides Technical Data Package maintenance of topographic and related equipment in support of spare/repair parts and obsolete component procurements by the Readiness Command. Provides a standardization function through the maintenance of Performance Specifications, Commercial Item Descriptions and topographic related Sets, Kits and Outfits. Conducts and assists in the fielding of topographic equipment.

II. Research Areas

A. Acquisition, Testing, and Fielding (TEC-21)

The object is to conduct research that will improve the efficiency and quality of acquiring, testing, and fielding topographic systems and digital reproduction systems, thereby facilitating more rapid handoff to appropriate Readiness Command.

B. Technical Support (TEC-22)

The object is to conduct research that will assist in providing more effective technical support to the Readiness Command serving in the role of system/item manager for production engineering.

C. Systems Evaluation (TEC-23)

The object is to conduct research that will improve speed, quality, and efficiency of evaluation of currently available commercial topographic equipment for military adaptation in support of force modernization.

D. Technical Data Package Maintenance (TEC-24)

The object is to conduct research to more effectively provide Technical Data Package maintenance of topographic and related equipment in support of spare/repair parts and obsolete component procurements by the Readiness Command.

E. Standardization (TEC-25)

The object is to conduct research to improve the standardization function in the maintenance of Performance Specifications, Commercial Item Descriptions and topographic related Sets, Kits and Outfits. (Contact Mr. Mark Hainsey, 703-428-6734, ext. 2506)

Imagery Systems Branch

I. <u>Introduction</u>

Conducts advanced and engineering development and provides support for fielding, operations and maintenance of space- related, ground-based Army Tactical Exploitation of

National Capabilities (TENCAP) systems. Serves as the TEC interface to the Army Space Programs Office (ASPO). Provides engineering and program management support and consultation to ASPO and other Army organizations to include identification of emerging technologies and new concepts that have potential application to ASPO/TENCAP systems implementations. Interfaces with elements of the National Imagery Intelligence community dealing with imagery systems and imagery architectures.

II. Research Areas

A. Advanced and Engineering Development (TEC-26)

The object is to conduct research on space- and ground-based imagery systems and architectures, along with development of support systems for their fielding, operations, and maintenance.

B. Program Management (TEC-27)

The object is to conduct research in engineering and program management to enhance support and consultation to Army Space Programs Office (ASPO) and other Army organizations to include identification of emerging technologies and new concepts that have potential application to ASPO/TENCAP systems implementations. (Contact Mr. James Hohman, 703-428-6965)

Force Projection Branch

I. Introduction

Conducts research and development in the areas of imagery exploitation, digital image acquisition, processing, and dissemination, and intelligence data exploitation architectures in support of Army/DoD space and Intelligence and Electronic Warfare (IEW) programs. Develops and demonstrates capabilities to support improvements in the Army's/DoD's ability to conduct surveillance, target acquisition, strike planning, weapons delivery and battle damage assessments in support of precision strike, early entry and depth and simultaneous attack operations. Integrates and demonstrates technologies to improve the representation of realistic synthetic environments in Army and Joint simulations. Provides technical, administrative and program management support required to execute the space, intelligence and topographic programs assigned by TEC, the Army and DoD.

II. Research Areas

A. Imagery Exploitation (TEC-28)

The object is to conduct research and development in the areas of imagery exploitation, digital image acquisition, processing, and dissemination, and intelligence data exploitation architectures in support of Army/DoD space and Intelligence and Electronic Warfare (IEW) programs.

B. Surveillance (TEC-29)

The object is to conduct research supporting improvements in the Army's/DoD's ability to conduct surveillance, target acquisition, strike planning, weapons delivery and battle damage assessments in support of precision strike, early entry and depth and simultaneous attack operations.

C. Army and Joint Simulations (TEC-30)

The object is to integrate and demonstrate technologies to improve the representation of realistic synthetic environments in Army and Joint simulations.

D. Technical Support (TEC-31)

The object is to provide technical, administrative and program management support required to execute the space, intelligence and topographic programs assigned by TEC, the Army and DoD. (Contact Mr. Michael Tolson, 703-428-6704, Ext. 2234)

TOPOGRAPHY, IMAGERY AND GEOSPATIAL OPERATIONS DIVISION

Geospatial Information and Imagery (GII) Requirements Branch

I. Introduction

Research is performed in areas related to the use of geospatial information in Army applications to include modeling & simulation, command and control systems and weapon systems. Topics of interest include issues associated with data accuracy and its effect on the reliability of tactical decision aids; data integrity issues that include collection and use of information from sources of differing dates and geometry; sensitivity of tactical decision aids to variations in quality of input data; presentation of confidence information associated with tactical decision aids; flexible decision aids that accommodate input data of varying levels of density and completeness; and tools that facilitate integration of information from dissimilar sources. In addition, means of symbolizing and displaying vector topographic data as a map background is of interest.

II. Research Areas

A. Data Accuracy (TEC-32)

Research is directed toward knowledge that will improve our ability to incorporate data accuracy in tactical decision aids.

B. Data Integrity (TEC-33)

Specific area of required research includes techniques to identify and remedy X, Y, and Z deltas between different data sets.

C. Presentation of Confidence Information (TEC-34)

Research is required to convey the degree of confidence that a user should place in a derived tactical decision aid.

D. Flexible Tactical Decision Aids (TEC-35)

Research is directed towards processes that will allow a tactical decision aid to "gracefully degrade" based upon the fidelity of information that is available at the time. Includes research to "fill in information voids" with the best available information.

E. Data Fusion (TEC-36)

Research is focused on techniques and procedures to reconcile differences in source data sets due to accuracy, quality, content, nomenclature, completeness, source date, compilation date, etc.

F. Vector Map Background Display

Research is required in design of map background symbols and display characteristics that retain interpretability at multiple display resolutions. (Contact Mr. Jeff Messmore, 703-428-6748, Ext. 2264)

Analytical Services Branch

I. Introduction

Oversees the Operations Division's modernization efforts. Assesses, develops, integrates, and trains solutions and improvements to the Operations Division's collection, management, production, and dissemination of products and services. Evaluates, develops and integrates hardware, software and techniques into the Division's information and production systems. Manages and maintains the Division's automated information systems. Manages and maintains TEC's classified network systems. Manages and maintains TEC's secure information assurance program. Acts as the Information Assurance Manager for the USACE DODIIS Site and its multiple locations. Provides miscellaneous cartographic and publishing technical services to all Operations Division projects and programs.

II. Research Areas

A. Modernization of Operations Division activities (TEC-37)

The object is to conduct research on advanced methods of collections, management, production, and dissemination of geospatial and imagery information.

B. Manage Classified Information Systems (TEC-38)

The object is to conduct research on advanced information management, network management, database management, and information assurance technologies.

C. Cartographic Technical Services(TEC-39)

The object is to conduct research on advanced electronic publishing, editing, printing, scanning and cartographic support equipment, techniques, and management. (Contact Mark Weipert, 703-428-6955, Ext. 2279)

Hydrologic and Environmental Analysis Branch

I. Introduction

Serves as DoD's primary agent for military hydrologic analysis and water detection. Prepares water resources analyses to support DoD and DA planning, training, and operations. Manages the DoD Water Detection Response Team in support of all DoD well drilling operations. Produces reimbursable studies to support DoD, DA, and Corps environmental remediation and compliance efforts.

II. Research Areas

A. Military Hydrology and Water Detection (TEC-40)

The object is to conduct research studies in military hydrology and water detection. Research includes development of advanced methods of water detection and hydrologic analysis, including improved methods of integrating new information with existing data systems in support of DoD, DA, and Corps planning, training, and operations.

B. Water Detection and Drilling Management (TEC-41)

The object is to conduct research into more efficient and capable management of DoD Water Detection Response Team and other functions in support of all DoD well drilling operations. Research includes methods of improving support to DoD, DA, and Corps environmental remediation and compliance efforts. (Contact Laura Dwyer, 703-428-6895)

Terrain Analysis Branch

I. Introduction

Serves as the Department of the Army's primary agent for terrain analysis. Meets high-priority requirements, validated by DA from Army components of Unified Combatant Commands for terrain analysis, urban, and country-scale products and services. Serves as TEC's management focus for military crisis support and civil works emergency operations.

A. Terrain Analysis (TEC-42)

The object is to conduct research into terrain analysis techniques and standards, and in their application to development of urban and country-scale products and services.

B. Crisis Support and Emergency Operations (TEC-43)

The object is to conduct research in information management as it relates to military crisis support and civil emergency operations. (Contact Charles Lopez, 703-428-6921)

Information Services Branch

I. Introduction

Collects, maintains, manages, and disseminates geospatial information and imagery from multiple sources, to support analyses at TEC and elsewhere within Army. Serves as the Acquisition Monitor for the Army's Commercial and Civil Imagery Programs.

II. Research Areas

A. Geospatial Information (TEC-44)

The object is to conduct research into improved methods of collection, maintenance, management, and dissemination of geospatial information and imagery from multiple sources.

B. Acquisition Monitoring (TEC-45)

The object is to conduct research into better means of monitoring imagery acquisition for purposes of serving the Army’s Commercial and Civil Imagery Programs. (Contact Mary-Pat Santoro, 703-428-6903, Ext. 2510)

PART II

PRE-PROPOSAL AND PROPOSAL EVALUATION

A. Upon receipt of a pre-proposal (not to exceed 5 pages), the ERDC staff will perform an initial review of its scientific merit and potential contribution to the Army mission and also determine if funds are expected to be available for the effort. Offerors of pre-proposals which show merit and are of interest to the ERDC will be encouraged to submit a full proposal (in the format outlined in Part III) and these proposals will be evaluated in accordance with the criteria detailed below:

B. Proposals submitted in response to this BAA which result in the award of a contract instrument will be evaluated as received using the following factors/criteria:

1. The overall scientific and/or technical merits of the proposal.

2. The potential contributions of the effort to the ERDC mission.

3. The offeror's capabilities, related experience, facilities, techniques, or unique combinations of these; which are integral factors for achieving the proposal’s objectives.

4. The qualifications, capabilities, and experiences of the proposed principal investigator, team leader, and other key personnel who are critical to achievement of the proposal’s objectives.

5. The reasonableness and realism of proposed costs and fee, if any, and the availability of funds.

6. Past Performance.

C. For grants and cooperative agreements, the two principal selection criteria, unless statute provides otherwise, will be: (1) the technical merits of the proposed research and development, and (2) the potential relationship of the proposed research and development to Department of Defense missions.

D. Pre-proposals and proposals not considered to have sufficient scientific merit or relevance to the Army's needs or those in areas for which funds are not expected to be available may be declined without further review.

PART III

PRE-PROPOSAL AND PROPOSAL PREPARATION

SECTION 1 - INTRODUCTION

This part is intended to provide information needed in preparing research proposals for submission to ERDC.

All offerors must be registered in the Central Contractor Registration (CCR) system at www.ccr.gov before award can be made.

Proposals should include details on expected use of the DoD High Performance Computing (HPC) Center systems.

Applicants for grants and cooperative agreements must also provide their DUNS number (Duns and Bradstreet Data Universal Numbering System).

Organizations or individuals interested in submitting research proposals to ERDC are encouraged to make preliminary inquiries as to the general need for the type of research effort contemplated before expending extensive effort in preparing a detailed research proposal or submitting proprietary information. Points of contact are listed with the specific research areas for each laboratory. The research proposal often represents a substantial investment of time and effort by the offeror, and it should present the proposed research effort in sufficient detail to allow ERDC to evaluate the scientific merit and relevance of the proposed research and to determine funding availability.

Pre-proposals and proposals must reference the code number for the specific research area (e.g., CHL-1, CRREL-10, CERL-15).

If the Contractor anticipates the efforts of foreign nationals on any proposal submitted hereunder, he must provide their name, nationality, and extent of involvement in the proposed research. Foreign nationals cannot work under a contract unless all ERDC-required security clearances and approvals have been obtained. Security requirements are further addressed in Attachment A, Fixed Price Contracts, FAR/DFARS Contract Clauses and Attachment B, Cost-Reimbursable Contracts, FAR/DFARS Contract Clauses. There is no exception to these requirements.

Note that no funds available to the Department of Defense may be provided to any institution of higher education that either has a policy of denying or that effectively prevents the Secretary of Defense from obtaining, for military recruiting purposes, entry to campuses or access to students on campuses or access to directory information pertaining to students.

SECTION 2 - GENERAL INFORMATION

A. AWARDS:

With the submittal of all required information as described herein and the favorable evaluation of your proposal, the Government may unilaterally make award; therefore, it is in the Contractor's best interest to review all requirements listed within. Note, that since contract clauses are self-deleting, there is neither a requirement nor need for a modification to the award if any clause is found not applicable.

Awards will be made on SF-33, SF-26, DD-1155, or other document as appropriate. Offerors shall provide a completed Attachment C with their technical and cost proposals. Awards will consist of all applicable clauses and contracts shall be in accordance with the Uniform Contract Format (UCF), which follows:

SECTION A- SOLICITATION/CONTRACT FORM SF 33

SECTION B- SUPPLIES OR SERVICES AND PRICES/COST

ITEM 1- Perform all work necessary for research and development efforts in accordance with Contractor's proposal dated _____, entitled _____, submitted under BAA Topic No. _____.

SECTION C- DESCRIPTION/SPECIFICATIONS/STATEMENT OF WORK

The Contractor's proposal entitled _____, dated _____, is incorporated herein by reference.

SECTION D (Packaging and Marking),

SECTION E (Inspection and Acceptance),

SECTION F (Deliveries or Performance),

SECTION G (Contract Administration Data),

SECTION H (Special Contract Requirements),

SECTION I (Contract Clauses). Note: If award is made unilaterally, offeror agrees to clauses mentioned within this BAA for their particular contract type.

SECTION K (Representations, Certifications, and Other Statements of Offerors) SEE ATTACHMENT C OF THIS BAA. ATTACHMENT C MUST BE COMPLETED BY EACH OFFEROR AND SUBMITTED WITH EACH PROPOSAL

SECTION L (Instructions, Conditions, and Notices to Offerors or Respondents) is included within the clause package of this BAA and is incorporated as applicable.

SECTION M (Evaluation Factors for Award)- includes evaluation criteria as listed in Part II of this BAA.

B. REPORT REQUIREMENTS:

Performance after the receipt of an award signed by the Contracting Officer indicates your full acceptance of all terms and conditions within the award.

The number and types of reports will be specified in the contractual document. The reports will be prepared and submitted in accordance with ERDC report procedures, which will be provided to the awardees.

C. PROPOSAL PREPARATION AND SUBMISSION:

Proposals should be submitted with a completed Attachment C, as stated in paragraph A of this Section 2, and also a signed and dated SF-33 (available at http://contacts.gsa.gov/webforms.nsf. For grants and cooperative assistance, use the SF-424 also located at the above website.

In preparing pre-proposals and proposals it is important that the offeror keep in mind the characteristics of a suitable proposal acceptable for formal evaluation. It should include all the information specified in this announcement in order to avoid delays in evaluation. Pre-proposal inquiries will be responded to within 60 days of receipt, either encouraging submission of a complete proposal or advising the offeror not to submit. Contract award may be made electronically. Offerors are requested to provide their e-mail address upon submission of proposal and also the name, address, and phone number of their cognizant Defense Contract Audit Agency (DCAA) office, if known.

Pre-proposals and proposals for CHL, GSL, EL, and ITL regarding this BAA should be submitted to:

U. S. Army Corps of Engineers, Vicksburg District
Vicksburg Consolidated Contracting Office (VCCO)
Attn: CEMVK-CT-T
4155 Clay Street
Vicksburg, MS 39183-3435

CRREL's pre-proposals and proposals regarding this BAA should be submitted to the following address:

U. S. Army Corps of Engineers, Engineer Research and Development Center
Cold Regions Research and Engineering Laboratory
Attn: Contracts Office
72 Lyme Road
Hanover, New Hampshire 03755-1290

CERL's pre-proposals and proposals regarding this BAA should be submitted either to email Rita.S.Brooks@erdc.usace.army.mil or to the following address:

U. S. Army Corps of Engineers, Engineer Research and Development Center
Construction Engineering Research Laboratory
Attn: Contracts Office
P. O. Box 9005
Champaign, Illinois 61826-9005

-OR 2902 Newmark Drive
Champaign, Illinois 61822-1076

TEC's pre-proposals and proposals regarding this BAA should be submitted to the following address:

U. S. Army Corps of Engineers, Engineer Research and Development Center
Topographic Engineering Center
Attn: Contracts Office
7701 Telegraph Rd., P. O. Box 9005
Alexandria, VA 22315-3802

SECTION 3 - TYPE OF CONTRACT

Selection of the type of contract is based upon various factors, such as the type of research to be performed, the contractor's experience in maintaining cost records, and the ability to detail and allocate proposed costs and performance of the work.

A document commonly used because of its flexibility in supporting research is a cost-reimbursable type contract. This type contract permits reimbursement for actual costs incurred in accomplishment of research. It also permits some flexibility in the redirection of efforts due to recent research experiment results or changes in Army guidance.

Fixed-price contracts are used when the research projects costs can be estimated accurately, the services to be rendered are reasonably definite, and the amount of property, if any, is fixed. The negotiated price is not subject to any adjustment on the basis of the Contractor's cost experience in performing the contract.

Contracts awarded by ERDC will contain, where appropriate, detailed special provisions concerning patent rights, rights in technical data and computer software, reporting requirements, equal employment opportunity, etc.

This BAA affords the offeror the option of submitting proposals for the award of a contract, grant, cooperative agreement, or other transaction. However, the type of agreement may change based on the nature of the effort and as a result of negotiation.

SECTION 4 - CONTENTS OF PRE-PROPOSAL

Pre-proposals should be limited to a brief letter (not to exceed five pages) and state the Topic Number under which they are being submitted. Three copies are requested (unless proposal is emailed to CERL). The pre-proposal should contain the following: (in addition to the Representations and Certifications at Attachment C)

1. A title descriptive of the research to be performed.

2. The name and address of the individual, company or educational institution submitting the pre-proposal (to include the email address).

3. The name and phone number of the principal investigator or senior researcher who would be in charge of the project.

4. The duration of the project.

5. The estimated labor cost, materials cost, burdens, and profit (if any).

6. One or more paragraphs describing the objective(s) or goals of the proposed research to include statement of the working hypothesis to be proved or disproved, if appropriate.

7. One or more paragraphs describing the technical approach to be taken in the course of the research. If experimental, it should include a description of the scope of the testing program. If analytical, it should include key assumptions to be made, the scientific basis for the analysis, and the numerical procedures to be used.

8. One or more paragraphs describing the potential military and/or civil payoffs that might ultimately derive from the proposed research to the Corps of Engineers.

9. A one-page curriculum vitae of the principal investigator.

SECTION 5 - CONTENTS OF FULL PROPOSALS

Proposals should be furnished in three copies (unless emailed to CERL), state the Topic Number under which they are being submitted, and contain the following: (in addition to the

Representations and Certifications at Attachment C)

TECHNICAL

The technical portion of the proposal should contain the following and any other information the offeror considers necessary to address the evaluation critieria mentioned in Part II:

1. A complete discussion stating the background and objectives of the proposed work, the approaches to be considered, the proposed level of effort, and the anticipated results/products, to include the proposed reports and deliverables to be furnished.

2. The names, brief biographical information, experience, and a list of recent publications of the offeror's key personnel who will be involved in the research.

3. The names of other agencies to which the proposal has also been submitted.

4. A brief description of offeror's organization, to include name, address, phone numbers, and email address.

5. Past performance information to include the name, address, point of contact, phone number, email address, contract identification number, contract award date and amount for a minimum of three (3) customers for whom the offeror has performed similar services in the last three years.

COST

The cost portion of the proposal should contain a cost estimate for the proposed effort sufficiently detailed by element of cost for meaningful evaluation. The estimate should be detailed for each year of the proposed work and should include the following:

1. A complete detail of direct labor to include, by discipline or individual, hours or percentage of time and salary.

2. Fringe benefits rate and base.

3. An itemized list of equipment showing cost of each item.

4. Description and cost of expendable supplies.

5. Complete detail of travel to include reason/need for travel, destination, airfare, per diem, rental car, etc.

6. Complete detail of any subcontracts.

7. Other direct costs (reproduction, computer, etc.).

8. Indirect cost rates and bases with an indication whether rates are fixed or provisional and the time frame to which they are applied.

9. Proposed fee, if any.

10. Any documentation, which supports the above.

11. Offerors should furnish the name and telephone number of their cognizant audit agency.

ATTACHMENT A
FIXED PRICE CONTRACTS
FAR/DFARS CONTRACT CLAUSES

ALL APPLICABLE CLAUSES WILL BE INCORPORATED WITHIN THE AWARD DOCUMENTS.

The full text of a clause and its complete prescription may be accessed electronically at the FAR site (clauses beginning with "52.") at http://www.arnet.gov/far/loadmain52.html and the DFARS site (clauses beginning with "252.") at http://www.acq.osd.mil/dp/dfars/tochtml.htm

52.252-1, Solicitation Provisions Incorporated by Reference.
This solicitation incorporates one or more provisions by reference.

52.252-2 Clauses Incorporated by Reference (Feb 1998).
This contract incorporates one or more clauses by reference.

Security Contract Language for all Corps of Engineers' Unclassified Contracts (PIL 2003-06, 19 Feb 03): All Contractor employees (U.S. citizens and Non- U.S. citizens) working under this contract (to include grants, cooperative agreements and task orders) who require access to Automated Information Systems (AIS), (stand alone computers, network computers/systems, e-mail) shall, at a minimum, be designated into an ADP-III position (non-sensitive) in accordance with DoD 5220-22-R, Industrial Security Regulation. The investigative requirements for an ADP-III position are a favorable National Agency Check (NAC), SF-85P, Public Trust Position. The contractor shall have each applicable employee complete a SF-85P and submit to the U. S. Army Engineer Research and Development Center Security Office, Attn: CEERD-SE-Z, 3909 Halls Ferry Rd., Vicksburg, MS 39180 (601-634-3527 or 4218) within three (3) working days after award of any contract or task order, and shall be submitted prior to the individual being permitted access to an AIS. Contractors that have a commercial or government entity (CAGE) Code and Facility Security Clearance through the Defense Security Service shall process the NACs and forward visit requests/results of NAC to the U. S. Army Engineer Research and Development Center Security Office, Attn: CEERD-SE-Z, 3909 Halls Ferry Rd., Vicksburg, MS 39180 (601-634-3527 or 4218). For those contractors that do not have a CAGE Code or Facility Security Clearance, the U. S. Army Engineer Research and Development Center Security Office, Vicksburg, MS, will process the investigation in coordination with the Contractor and contract employees.

In accordance with Engineering Regulation, ER 380-1-18, Section 4, foreign nationals who work on Corps of Engineers' contracts or task orders shall be approved by the HQUSACE Foreign Disclosure Officer or higher before beginning work on the contract/task order. This regulation includes subcontractor employees. (NOTE: exceptions to the above requirement include foreign nationals who perform janitorial and/or ground maintenance services.) The contractor shall submit to the Division/District Contract Office, the names of all foreign nationals proposed for performance under this contract/task order, along with documentation to verify that he/she was legally admitted into the United States and has authority to work

and/or go to school in the US. Such documentation may include a US passport, Certificate of US citizenship (INS Form N-560 or N-561), Certificate of Naturalization (INS Form N-550 or N-570), foreign passport with I-551 stamp or attached INS Form I-94 indicating employment authorization, Alien Registration Receipt Card with photograph (INS Form I-151 or I-551), Temporary Resident Card (INS Form I-688), Employment Authorization Card (INS Form I-688A), Reentry Permit (INS Form I-327), Refugee Travel Document (INS Form I-571), Employment Authorization Document issued by the INS which contains a photograph (INS Form I-688B).

Classified contracts require the issuance of a DD Form 254 (Department of Defense Contract Security Classification Specification).

(End of Clause)

252.201-7000, Contracting Officer's Representative

Insert the clause at 52.202-1, Definitions, in solicitations and contracts that exceed the simplified acquisition threshold. The contracting officer may include additional definitions, provided they are consistent with the clause and the FAR.

Insert the clause at 52.203-3, Gratuities, in solicitations and contracts with a value exceeding the simplified acquisition threshold.

Insert the clause at 52.203-5, Covenant Against Contingent Fees, in all solicitations and contracts exceeding the simplified acquisition threshold.

Insert the clause at 52.203-7, Anti-Kickback Procedures, in solicitations and contracts exceeding the simplified acquisition threshold.

252.203-7001, Prohibition on Persons Convicted of Fraud or Other Defense-Contract-Related Felonies, in all solicitations and contracts exceeding the simplified acquisition threshold.

Use the clause at 252.203-7002, Display of DoD Hotline Poster, in solicitations and contracts expected to exceed $5 million, except when performance will take place in a foreign country.

In solicitations and contracts that exceed the simplified acquisition threshold, insert the clauses at --(a) 52.203-8, Cancellation, Rescission, and Recovery of Funds for Illegal or Improper Activity, and (b) 52.203-10, Price or Fee Adjustment for Illegal or Improper Activity.

The clause at 52.203-12, Limitation on Payments to Influence Certain Federal Transactions, shall be included in solicitations and contracts expected to exceed $100,000.

Insert the clause at 52.204-2, Security Requirements, in solicitations and contracts when the contract may require access to classified information.

Insert the clause at 52.204-4, Printed or Copied Double-Sided on Recycled Paper, in solicitations and contracts that exceed the simplified acquisition threshold.

Insert the provision at 52.204-6, Data Universal Numbering System (DUNS) Number.

Use the clause at 252.204-7000, Disclosure of Information, in solicitations and contracts when the contractor will have access to or generate unclassified information that may be sensitive and inappropriate for release to the public.

252.204-7003, Control of Government Personnel Work Product.

252.204-7004, Required Central Contractor Registration.

Use the clause at 252.204-7005, Oral Attestation of Security Responsibilities, in solicitations and contracts that include the clause at FAR 52.204-2, Security Requirements.

252.205-7000 Provision of Information to Cooperative Agreement Holders, in solicitations and contracts expected to exceed $500,000.

Insert 52.207-5, Option to Purchase Equipment, in solicitations and contracts involving a lease with option to purchase.

Insert the clause at 52.208-8, Required Sources for Helium and Helium Usage Data, in solicitations and contracts if it is anticipated that performance of the contract involves a major helium requirement.

Insert the clause at 52.209-6, Protecting the Government's Interests when Subcontracting with Contractors Debarred, Suspended, or Proposed for Debarment, in solicitations and contracts where the contract value exceeds $25,000.

Use the clause at 252.209-7000, Acquisition from Subcontractors Subject to On-Site Inspection Under the Intermediate-Range Nuclear Forces (INF) Treaty, in all solicitations and contracts exceeding the simplified acquisition threshold.

252.209-7001, Disclosure of Ownership or Control by the Government of a Terrorist Country, in all solicitations expected to result in contracts of $100,000 or more. Any disclosure that the government of a terrorist country has a significant interest in an offeror or a subsidiary of an offeror shall be forwarded through the head of the agency to the Director of Defense Procurement, ATTN: OUSD(AT&L)DP/FC, 3060 Defense Pentagon, Washington, DC 20301-3060.

252.209-7002, Disclosure of Ownership or Control by a Foreign Government, in all solicitations when access to proscribed information is necessary for contract performance.

252.209-7004, Subcontracting with Firms That Are Owned or Controlled by the Government of a Terrorist Country, in solicitations and contracts with a value of $100,000 or more.

Use the clause at 252.209-7005, Reserve Officer Training Corps and Military Recruiting on Campus, in all solicitations and contracts with institutions of higher education.

Insert the provision at 52.211-14, Notice of Priority Rating for National Defense Use, in solicitations when the contract to be awarded will be a rated order.

Insert the clause at 52.211-15, Defense Priority and Allocation Requirements, in contracts that are rated orders.

Insert the clause at 52.213-4, Terms and Conditions -- Simplified Acquisitions (Other Than Commercial Items) in orders under the simplified acquisition threshold.

Insert the provision at 52.214-34, Submission of Offers in the English Language.

Insert the provision at 52.214-35, Submission of Offers in U.S. Currency.

Insert the provision at 52.215-1 (Alt I), Instructions to Offerors -- Competitive Acquisition, in all competitive solicitations where the Government intends to award a contract without discussions.

Insert the clause at 52.215-2, Audit and Records-Negotiation (10 U.S.C. 2313, 41 U.S.C. 254d, and OMB Circular No. A-133), in solicitations and contracts except those for acquisitions not exceeding the simplified acquisition threshold.

Insert the provision at 52.215-5, Facsimile Proposals.

Insert the clause at 52.215-8, Order of Precedence -- Uniform Contract Format.

Insert the clause at 52.215-10, Price Reduction for Defective Cost or Pricing Data.

Insert the clause at 52.215-11, Price Reduction for Defective Cost or Pricing Data – Modifications.

Insert the clause at 52.215-14, Integrity of Unit Prices, in solicitations and contracts except for acquisitions at or below the simplified acquisition threshold.

Insert the provision at 52.215-16, Facilities Capital Cost of Money, in solicitations expected to result in contracts that are subject to the cost principles for contracts with commercial organizations (see FAR 31.2).

If the prospective contractor does not propose facilities capital cost of money in its offer, the contracting officer shall insert the clause at 52.215-17, Waiver of Facilities Capital Cost of Money, in the resulting contract.

Insert the provision at 52.216-1, Type of Contract, in a solicitation unless it is for a fixed-price acquisition made under simplified acquisition procedures.

Use the clause at 252.219-7003, Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan (DoD Contracts), in solicitations and contracts that contain the clause at FAR 52.219-9, Small Business Subcontracting Plan. In contracts with contractors which have comprehensive subcontracting plans approved under the test program described in 219.702(a), use the clause at 252.219-7004, Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan (Test Program), instead of the clauses at 252.219-7003, Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan (DoD Contracts), and FAR 52.219-9, Small Business Subcontracting Plan. In contracts with contractors that have comprehensive subcontracting plans approved

under the test program described in 219.702(a), do not use the clause at FAR 52.219-16, Liquidated Damages--Subcontracting Plan.

Insert the clause at 52.219-8, Utilization of Small Business Concerns, in solicitations and contracts when the contract amount is expected to be over the simplified acquisition threshold unless the contract, together with all its subcontracts, is to be performed entirely outside of any State, territory, or possession of the United States, the District of Columbia, and the Commonwealth of Puerto Rico.

Insert the clause at 52.219-9, Small Business Subcontracting Plan, in solicitations and contracts that offer subcontracting possibilities, are expected to exceed $500,000 ($1,000,000 for construction of any public facility), and are required to include the clause at 52.219-8, Utilization of Small Business Concerns. When contracting by negotiation, and subcontracting plans are required with initial proposals as provided for in 19.705-2(d), the contracting officer shall use the clause with its Alternate II.

Insert the clause at 52.219-16, Liquidated Damages --Subcontracting Plan, in all solicitations and contracts containing the clause at 52.219-9, Small Business Subcontracting Plan, or the clause with its Alternate II.

Insert the clause at 52.222-3, Convict Labor, in solicitations and contracts above the micro-purchase threshold, when the contract is to be performed in the United States, Puerto Rico, the Northern Mariana Islands, American Samoa, Guam, or the U.S. Virgin Islands; unless --

(a) The contract will be subject to the Walsh-Healey Public Contracts Act (see Subpart 22.6), which contains a separate prohibition against the employment of convict labor;

(b) The supplies or services are to be purchased from Federal Prison Industries, Inc. (see Subpart 8.6); or

(c) The acquisition involves the purchase, from any State prison, of finished supplies that may be secured in the open market or from existing stocks, as distinguished from supplies requiring special fabrication.

Insert the clause at 52.222-26, Equal Opportunity.

Insert the clause at 52.222-21, Prohibition of Segregated Facilities.

Insert the provision at 52.222-24, Preaward On-Site Equal Opportunity Compliance Evaluation, in when the amount of the contract is expected to be $10 million or more.

Insert the clause at 52.222-29, Notification of Visa Denial, in contracts if the contractor is required to perform in or on behalf of a foreign country.

Insert the clause at 52.222-35, Equal Opportunity for Special Disabled Veterans, Veterans of the Vietnam Era, and Other Eligible Veterans, in solicitations and contracts if the expected value is $25,000 or more, except when work is performed outside the United States by employees recruited outside the United States.

Insert the clause at 52.222-36, Affirmative Action for Workers with Disabilities, in solicitations and contracts that exceed $10,000 or are expected to exceed $10,000, except when work is to be performed outside the United States by employees recruited outside the United States (for the purpose of this, United States includes the several states, the District of Columbia, the Virgin Islands, the Commonwealth of Puerto Rico, Guam, American Samoa, the Commonwealth of the Northern Mariana Islands, and Wake Island).

Insert the clause at 52.222-37, Employment Reports on Special Disabled Veterans, Veterans of the Vietnam Era, and Other Eligible Veterans, in solicitations and contracts containing the clause at 52.222-35, Equal Opportunity for Special Disabled Veterans, Veterans of the Vietnam Era, and Other Eligible Veterans.

Insert the clause at 52.223-3, Hazardous Material Identification and Material Safety Data, in solicitations and contracts if the contract will require the delivery of hazardous materials as defined in FAR 23.301.

Insert the clause at 52.223-5, Pollution Prevention and Right-to-Know Information, in all solicitations and contracts that provide for performance, in whole or in part, on a Federal facility.

Insert the clause at 52.223-6, Drug-Free Workplace, except as provided in paragraph (b) of this section, in solicitations and contracts of any dollar value if the contract is expected to be awarded to an individual or expected to exceed the simplified acquisition threshold if the contract is expected to be awarded to other than an individual. Contracting officers shall not insert the clause at 52.223-6, Drug-Free Workplace, in solicitations and contracts, if the resultant contract is to be performed entirely outside of the United States, its territories, and its possessions or inclusion of these requirements would be inconsistent with the international obligations of the United States or with the laws and regulations of a foreign country.

252.223-7001, Hazard Warning Labels, in solicitations and contracts which require submission of hazardous material data sheets.

252.223-7002, Safety Precautions for Ammunition and Explosives, and 252.223-7003, Change in Place of Performance--Ammunition and Explosives, in all solicitations and contracts for acquisition to which this section applies.

252.223-7004, Drug-Free Work Force, in all solicitations and contracts-(1) That involve access to classified information; or(2) When the contracting officer determines that the clause is necessary for reasons of national security or for the purpose of protecting the health or safety of those using or affected by the product of, or performance of, the contract.(b) Do not use the clause in solicitations and contracts when performance or partial performance will be outside the United States, its territories, and possessions, unless the contracting officer determines such inclusion to be in the best interest of the Government; or When the value of the acquisition is at or below the simplified acquisition threshold.

252.223-7006, Prohibition on Storage and Disposal of Toxic and Hazardous Materials, in all solicitations and contracts which require, may require, or permit contractor performance on a DoD installation. Use the clause at 252.223-7006 with its Alternate I, when the Secretary of

the military department issues a determination under the exception at 223.7102(a)(9).

252.223-7007, Safeguarding Sensitive Conventional Arms, Ammunition, and Explosives, in all solicitations and contracts to which DoD 5100.76-M applies, in accordance with the policy at 223.7201. Complete paragraph (b) of the clause based on information provided by cognizant technical or requirements personnel.

Insert the clause at 52.223-14, Toxic Chemical Release Reporting, in the resulting contract, if the contract is expected to exceed $100,000 (including all options).

When the design, development, or operation of a system of records on individuals is required to accomplish an agency function, insert the following clauses in solicitations and contracts:

(a) The clause at 52.224-1, Privacy Act Notification.

(b) The clause at 52.224-2, Privacy Act.

252.225-7026, Reporting of Contract Performance Outside the United States, in all solicitations and contracts with an estimated or actual value exceeding $500,000, including those modified to exceed $500,000.

252.225-7031, Secondary Arab Boycott of Israel.

252.225-7041, Correspondence in English, in solicitations and contracts when contract performance will be wholly or in part in a foreign country.

252.225-7042, Authorization to Perform, in solicitations and contracts when contract performance will be wholly or in part in a foreign country.

252.225-7043, Antiterrorism/Force Protection Policy for Defense Contractors Outside the United States, in solicitations and contracts that require performance or travel outside the United States

Insert the clause at 52.225-13, Restrictions on Certain Foreign Purchases, in solicitations and contracts with a value exceeding $2,500 ($15,000 for acquisitions as described in 13.201(g)), unless an exception applies (see 25.701(a)(2)).

Insert the clause at 52.225-14, Inconsistency Between English Version and Translation of Contract, in solicitations and contracts if anticipating translation into another language. Insert the clause with its Alternate I in all R&D solicitations and contracts unless both complete performance and delivery are outside the United States, its possessions, and Puerto Rico. When a proposed contract involves both R&D work and supplies or services, and the R&D work is the primary purpose of the contract, the contracting officer shall use this alternate. In all other proposed contracts involving both R&D work and supplies or services, the contracting officer shall use the basic clause. Also, when a proposed contract involves either R&D or supplies and materials, in addition to construction or architect-engineer work, the contracting officer shall use the basic clause.

FAR 52.226-2, Historically Black College or University and Minority Institution Representation,

in solicitations set aside for HBCU/MIs.

252.226-7000, Notice of Historically Black College or University and Minority Institution Set-Aside, in solicitations and contracts set-aside for HBCU/MIs.

252.226-7001, Utilization of Indian Organizations and Indian-Owned Economic Enterprises--DoD Contracts, in solicitations and contracts for supplies or services that are expected to exceed the simplified acquisition threshold.

If, in the Government's interest, it is appropriate to exempt one or more specific United States patents from the patent indemnity clause, the contracting officer shall obtain written approval from the agency head or designee and shall insert the clause at 52.227-5, Waiver of Indemnity, in solicitations and contracts in addition to the appropriate patent indemnity clause.

52.227-1 Alternate 1, Authorization and Consent.

52.227-6, Royalty Information.

252.227-7013, Rights in Technical Data--Noncommercial Items, in solicitations and contracts when the successful offeror(s) will be required to deliver technical data to the Government. Do not use the clause when the only deliverable items are computer software or computer software documentation (see 227.72), commercial items (see 227.7102-3), existing works (see 227.7105), special works (see 227.7106). Use the clause at 252.227-7013 with its Alternate I in research contracts when the contracting officer determines, in consultation with counsel, that public dissemination by the contractor would be-(1) In the interest of the Government; and (2) Facilitated by the Government relinquishing its right to publish the work for sale, or to have others publish the work for sale on behalf of the Government.

252.227-7014, Rights in Noncommercial Computer Software and Noncommercial Computer Software Documentation, in solicitations and contracts when the successful offeror(s) will be required to deliver computer software or computer software documentation. Do not use the clause when the only deliverable items are technical data (other than computer software documentation), commercial computer software or commercial computer software documentation, commercial items (see 227.7102-3), special works (see 227.7205). Use the clause at 252.227-7014 with its Alternate I in research contracts when the contracting officer determines, in consultation with counsel, that public dissemination by the contractor would be-(i) In the interest of the Government; and (ii) Facilitated by the Government relinquishing its right to publish the work for sale, or to have others publish the work for sale on behalf of the Government.

Except as provided in paragraph (b) of this subsection, use the clause at 252.227-7015, Technical Data--Commercial Items, in all solicitations and contracts when the contractor will be required to deliver technical data pertaining to commercial items, components, or processes. Do not require the contractor to include this clause in its subcontracts.

(b) Use the clause at 252.227-7013, Rights in Technical Data--Noncommercial Items, in lieu of the clause at 252.227-7015 if the Government will pay any portion of the development costs. Do not require the contractor to include this clause in its subcontracts for commercial items or

commercial components.

Use the following clauses in solicitations and contracts that include the clause at 252.227-7013: (1) 252.227-7016, Rights in Bid or Proposal Information; (2) 252.227-7030, Technical Data--Withholding of Payment; (3) 252.227-7036, Declaration of Technical Data Conformity; and (4) 252.227-7037, Validation of Restrictive Markings on Technical Data (paragraph (e) if the clause contains information that must be included in a challenge).

252-227-7017, IDENTIFICATION AND ASSERTION OF USE, RELEASE, OR DISCLOSURE RESTRICTIONS (JUN 1995)

252.227-7019 Validation of Asserted Restrictions--Computer Software.

252.227-7020 Rights in Special Works.

Use the clause at 252.227-7021, Rights in Data--Existing Works, in lieu of the clause at 252.227-7013, Rights in Technical Data--Noncommercial Items, in solicitations and contracts exclusively for existing works when-(1) The existing works will be acquired without modification; and (2) The Government requires the right to reproduce, prepare derivative works, or publicly perform or display the existing works; or (3) The Government has a specific need to obtain indemnity for liabilities that may arise out of the content, performance, use, or disclosure of such data. (b) The clause at 252.227-7021 provides the Government, and others acting on its behalf, a paid-up, non-exclusive, irrevocable, world-wide license to reproduce, prepare derivative works and publicly perform or display the works called for by a contract and to authorize others to do so for government purposes.(c) A contract clause is not required to acquire existing works such as books, magazines and periodicals, in any storage or retrieval medium, when the Government will not reproduce the books, magazines or periodicals, or prepare derivative works.

252.227-7025, Limitations on the Use or Disclosure of Government Furnished Information Marked with Restrictive Legends, in solicitations and contracts when it is anticipated that the Government will provide the contractor, for performance of its contract, technical data marked with another contractor's restrictive legend(s).

252.227-7028, Technical Data or Computer Software Previously Delivered to the Government, in solicitations when the resulting contract will require the contractor to deliver technical data. The provision requires offerors to identify any technical data specified in the solicitation as deliverable data items that are the same or substantially the same as data items the offeror has delivered or is obligated to deliver, either as a contractor or subcontractor, under any other federal agency contract.

252.227-7032, Rights in Technical Data and Computer Software (Foreign), may be used in contracts with foreign contractors to be performed overseas, except Canadian purchases (see paragraph (c) of this subsection), in lieu of the clause at 252.227-7013, Rights in Technical Data--Noncommercial Items, when the Government requires the unrestricted right to use, modify, reproduce, perform, display, release or disclose all technical data to be delivered under the contract. Do not use the clause in contracts for existing or special works. (b) When the Government does not require unlimited rights, the clause at 252.227-7032 may be

modified to accommodate the needs of a specific overseas procurement situation. The Government should obtain rights in the technical data that are not less than the rights the Government would have obtained under the data rights clause(s) prescribed in this part for a comparable procurement performed within the United States or its possessions. (c) Contracts for Canadian purchases shall include the appropriate data rights clause prescribed in this part for a comparable procurement performed within the United States or its possessions.

252.227-7034, Patents--Subcontracts, in solicitations and contracts containing the clause at FAR 52.227-11, Patent Rights--Retention by the Contractor (Short Form).

Use the clause at 252.227-7037, Validation of Restrictive Markings on Technical Data, in all solicitations and contracts for commercial items that include the clause at 252.227-7015 or the clause at 252.227-7013. Do not require the contractor to include this clause in its subcontracts for commercial items or commercial components.

Pursuant to FAR 27.304-1(e), the contracting officer shall insert the clause at 252.227-7039, Patents--Reporting of Subject Inventions, in solicitations and contracts containing the clause at FAR 52.227-11, Patent Rights--Retention by the Contractor (Short Form).

Insert the clause at 52.227-10, Filing of Patent Applications -- Classified Subject Matter, in all classified solicitations and contracts and in all solicitations and contracts where the nature of the work or classified subject matter involved in the work reasonably might be expected to result in a patent application containing classified subject matter.

Insert the clause at 52.227-11, Patent Rights -- Retention by the Contractor (Short Form), if all the following conditions apply: (i) The contractor is a small business concern or nonprofit organization as defined in 27.301 or, except for contracts of the Department of Defense (DOD), the Department of Energy (DOE), or the National Aeronautics and Space Administration (NASA), any other type of contractor. (ii) No alternative patent rights clause is used in accordance with paragraph (c) or (d) of this section or 27.304-2. To the extent the information is not required elsewhere in the contract, and unless otherwise specified by agency supplemental regulations, the contracting officer may modify 52.227-11(f) to require the contractor to do one or more of the following: (i) Provide periodic (but not more frequently than annually) listings of all subject inventions required to be disclosed during the period covered by the report. (ii) Provide a report prior to the closeout of the contract listing all subject inventions or stating that there were none. (iii) Provide, upon request, the filing date, serial number and title, a copy of the patent application, and patent number and issue date for any subject invention in any country in which the contractor has applied for patents. (iv) Furnish the Government an irrevocable power to inspect and make copies of the patent application file when a Federal Government employee is a coinventor. If the acquisition of patent rights for the benefit of a foreign government is required under a treaty or executive agreement, or if the agency head or a designee determines at the time of contracting that it would be in the national interest to acquire the right to sublicense foreign governments or international organizations pursuant to any existing or future treaty or agreement, the contracting officer shall use the clause at 52.227-11, with its Alternate I. If other rights are necessary to effectuate the treaty or agreement, Alternate I may be appropriately modified. In long term contracts, Alternate II shall be added if necessary to effectuate treaties or

agreements to be entered into.

Insert the clause at 52.227-12, Patent Rights -- Retention by the Contractor (Long Form), if all the following conditions apply: (i) The contractor is other than a small business firm or nonprofit organization. (ii) No alternative clause is used in accordance with paragraph (c) or (d) of this section or 27.304-2. (iii) The contracting agency is one of those excepted under subdivision (a)(1)(i) of this section. If the acquisition of patent rights for the benefit of a foreign government is required under a treaty or executive agreement or if the agency head or a designee determines at the time of contracting that it would be in the national interest to acquire the right to sublicense foreign governments or international organizations pursuant to any existing or future treaty or agreement, the contracting officer shall use the clause at 52.227-12, with its Alternate I. If other rights are necessary to effectuate the treaty or agreement, Alternate I may be appropriately modified. In long term contracts, Alternate II shall be added if necessary to effectuate treaties or agreements to be entered into.

Insert the clause at 52.227-13, Patent Rights -- Acquisition by the Government, if any of the following conditions apply: If the acquisition of patent rights for the benefit of a foreign government is required under a treaty or executive agreement or if the agency head or a designee determines at the time of contracting that it would be in the national interest to acquire the right to sublicense foreign governments or international organizations pursuant to any existing or future treaty or agreement, the contracting officer shall use the clause with its Alternate I. If other rights are necessary to effectuate the treaty or agreement, Alternate I may be appropriately modified. In long term contracts, Alternate II shall be added if necessary to effectuate treaties or agreements to be entered into.

Insert the clause at 52.227-14, Rights in Data -- General, including its use with Alternate I through Alternate V as may be required or authorized in accordance with paragraphs (b) through (f) of this section, in solicitations and contracts if it is contemplated that data will be produced, furnished, or acquired under the contract, unless the contract is --(i) For the production of special works of the type set forth in 27.405(a), but the clause at 52.227-14, Rights in Data -- General, shall be included in the contract and made applicable to data other than special works, as appropriate; (ii) For the acquisition of existing data works, as described in 27.405(b); (iii) To be performed outside the United States, its possessions, and Puerto Rico, in which case agencies may prescribe different clauses (see paragraph (n) of this section); (iv) A contract involving cosponsored research and development in which a clause providing for less than unlimited right has been authorized. (See 27.408.) (b) If an agency determines, in accordance with 27.404(c), to adopt the alternate definition of "Limited Rights Data" in paragraph (a) of the clause, the clause shall be used with its Alternate I. (c) In accordance with 27.404(d), if a contracting officer determines it is necessary to obtain the delivery of limited rights data, the clause shall be used with its Alternate II. The contracting officer shall, when Alternate II is used, assure that the purposes, if any, for which limited rights data are to be disclosed outside the Government are included in the "Limited Rights Notice" of subparagraph (g)(2) of the clause. (d) In accordance with 27.404(e), if a contracting officer determines it is necessary to obtain the delivery of restricted computer software, the clause shall be used with its Alternate III. Any greater or lesser rights regarding the use, duplication, or disclosure of restricted computer software than those set forth in the Restricted Rights Notice of subparagraph (g)(3) of the clause must be specified in the contract and the notice

modified accordingly. (e) The clause shall be used with its Alternate IV in contracts for basic or applied research (other than those for the management or operation of Government facilities or where international agreements require otherwise), to be performed solely by universities and colleges. The clause may be used with its Alternate IV in other contracts if in accordance with 27.404(f)(1) an agency determines to grant blanket permission for the contractor to establish claim to copyright subsisting in all data first produced without further request being made by the contractor. When Alternate IV is used, the contract may exclude items or categories of data from the blanket permission granted, either by express provisions in the contract or by the addition of a subparagraph (d)(3) to the clause (see 27.404(g)(1)). (f) In accordance with 27.404(i), if a contracting officer needs to have the right to inspect certain data at a contractor's facility or if by an agency, generally the clause shall be used with its Alternate V. (g) N/A; (h) The contracting officer shall normally insert the clause at 52.227-16, Additional Data Requirements, in solicitations and contracts involving experimental, developmental, research, or demonstration work (other than basic or applied research to be performed solely by a university or college where the contract amount will be $500,000 or less) unless all the requirements for data are believed to be known at the time of contracting and specified in the contract. (See 27.406(b).) This clause may also be used in other contracts when considered appropriate. (i) N/A (j) N/A; (k) In accordance with 27.405(b)(2), when contracting (other than from GSA's Multiple Award Schedule contracts) for the acquisition of existing computer software, the clause at 52.227-19, Commercial Computer Software-Restricted Rights, may be used in the solicitation and contract. In any event, the contracting officer shall assure that the contract contains terms to obtain sufficient rights for the Government to fulfill the need for which the software is being acquired and is otherwise consistent with 27.405(b)(2). (l) N/A ; (m) N/A; (n) Agencies may prescribe in their procedures, as appropriate, a clause consistent with the policy of 27.402 in contracts to be performed outside the United States, its possessions, and Puerto Rico. (o) N/A; (p) N/A; (q) N/A; (r) N/A; (s) In accordance with 27.407, if a contracting officer desires to acquire unlimited rights in technical data contained in a successful proposal upon which a contract award is based, the contracting officer shall insert the clause at 52.227-23, Rights to Proposed Data (Technical). Rights to technical data in a proposal are not acquired by mere incorporation by reference of the proposal in the contract, and if a proposal is incorporated by reference, Section 27.404 must be followed to assure that such rights are appropriately addressed.

Insert the clause at 52.228-5, Insurance -- Work on a Government Installation, in solicitations and contracts when a fixed-price contract is contemplated, the contract amount is expected to exceed the simplified acquisition threshold, and the contract will require work on a Government installation.

Insert the clause at 52.228-7, Insurance -- Liability to Third Persons.

Insert the clause at 52.229-3, Federal, State, and Local Taxes, in solicitations and contracts if the contract is to be performed wholly or partly within the United States, its possessions, or Puerto Rico, when the contract is expected to exceed the simplified acquisition threshold.

Insert the clause at 52.229-6, Taxes -- Foreign Fixed-Price Contracts, in solicitations and contracts expected to exceed the simplified acquisition threshold when a fixed-price contract

is contemplated and the contract is to be performed wholly or partly in a foreign country, unless it is contemplated that the contract will be with a foreign government..

Insert the clause at FAR 52.230-2, Cost Accounting Standards, in negotiated contracts, unless the contract is exempted (see 48 CFR 9903.201-1 (FAR Appendix)), the contract is subject to modified coverage (see 48 CFR 9903.201-2 (FAR Appendix)), or the clause prescribed in paragraph (c) of this subsection is used.

(2) The clause at FAR 52.230-2 requires the contractor to comply with all CAS specified in 48 CFR 9904 (FAR Appendix), to disclose actual cost accounting practices (applicable to CAS-covered contracts only), and to follow disclosed and established cost accounting practices consistently.

(b) Disclosure and Consistency of Cost Accounting Practices.

(1) Insert the clause at FAR 52.230-3, Disclosure and Consistency of Cost Accounting Practices, in negotiated contracts when the contract amount is over $500,000, but less than $50 million, and the offeror certifies it is eligible for and elects to use modified CAS coverage (see 48 CFR 9903.201-2 (FAR Appendix)), unless the clause prescribed in paragraph (c) of this subsection is used.

(2) The clause at FAR 52.230-3 requires the contractor to comply with 48 CFR 9904.401, 9904.402, 9904.405, and 9904.406 (FAR Appendix) to disclose (if it meets certain requirements) actual cost accounting practices, and to follow consistently its established cost accounting practices.

(c) Consistency in Cost Accounting Practices. The contracting officer shall insert the clause at FAR 52.230-4, Consistency in Cost Accounting Practices, in negotiated contracts that are exempt from CAS requirements solely on the basis of the fact that the contract is to be awarded to a United Kingdom contractor and is to be performed substantially in the United Kingdom (see 48 CFR 9903.201-1(b)(12) (FAR Appendix)).

(d) Administration of Cost Accounting Standards.

(1) The contracting officer shall insert the clause at FAR 52.230-6, Administration of Cost Accounting Standards, in contracts containing any of the clauses prescribed in paragraphs (a), (b), or (e) of this subsection.

(2) The clause at FAR 52.230-6 specifies rules for administering CAS requirements and procedures to be followed in cases of failure to comply.

(e) Cost Accounting Standards -- Educational Institutions.

(1) The contracting officer shall insert the clause at FAR 52.230-5, Cost Accounting Standards -- Educational Institution, in negotiated contracts awarded to educational institutions, unless the contract is exempted (see 48 CFR 9903.201-1 (FAR Appendix)), the contract is to be performed by an FFRDC (see 48 CFR 9903.201-2(c)(5) (FAR Appendix)), or the provision at 48 CFR 9903.201-2(c)(6) (FAR Appendix) applies.

(2) The clause at FAR 52.230-5 requires the educational institution to comply with all CAS specified in 48 CFR 9905 (FAR Appendix), to disclose actual cost accounting practices as required by 48 CFR 9903.202-1(f) (FAR Appendix), and to follow disclosed and established cost accounting practices consistently.

252.231-7000, Supplemental Cost Principles, in all solicitations and contracts, which are subject to the principles and procedures described in FAR Subparts 31.1, 31.2, 31.6, and 31.7.

Insert 52.232-2, Payment under Fixed-Price Research and Development Contracts.

252.232-7007, Limitation of Government's Obligation, in solicitations and resultant incrementally funded fixed-price contracts. The contracting officer may revise the contractor's notification period, in paragraph (c) of the clause, from "ninety" to "thirty" or "sixty" days, as appropriate.

Insert 52.232-9, Limitation on Withholding of Payments, in solicitations and contracts when a supply contract, research and development contract, service contract, time-and-materials contract, or labor-hour contract is contemplated that includes two or more terms authorizing the temporary withholding of amounts otherwise payable to the contractor for supplies delivered or services performed.

Insert the clause at 52.232-16, Progress Payments, in solicitations that may result in contracts providing for progress payments based on cost. If the contractor is a small business concern, use the clause with its Alternate I.

Insert the clause at 52.232-17, Interest, in solicitations and contracts. It may be inserted if the contract will be in one or more of the following categories: Contracts at or below the simplified acquisition threshold; Contracts without any provision for profit or fee with a nonprofit organization; Any other exceptions authorized under agency procedures.

Insert the clause at 52.232-23, Assignment of Claims, in solicitations and contracts expected to exceed the micro-purchase threshold, unless the contract will prohibit the assignment of claims (see 32.803(b)). The use of the clause is not required for purchase orders. However, the clause may be used in purchase orders expected to exceed the micro-purchase threshold, that are accepted in writing by the contractor, if such use is consistent with agency policies and regulations. If a no-setoff commitment has been authorized (see 32.803(d)), the contracting officer shall use the clause with its Alternate I.

Insert the clause at 52.232-24, Prohibition of Assignment of Claims, in solicitations and contracts for which a determination has been made under agency regulations that the prohibition of assignment of claims is in the Government's interest.

Insert the clause at 52.232-25, Prompt Payment, in all solicitations and contracts, except when payment terms and the late payment penalties are established by other governmental authority (*e.g.*, tariffs). (1) As authorized in 32.904(b)(1)(ii)(B)(4), the contracting officer may modify the date in paragraph (a)(5)(i) of the clause to specify a period longer than 7 days for constructive acceptance, if required to afford the Government a reasonable opportunity to

inspect and test the supplies furnished or to evaluate the services performed, except in the case of a contract for the purchase of a commercial item, including a brand-name commercial item for authorized resale (*e.g.*, commissary items). (2) As provided in 32.903, agency policies and procedures may authorize amendment of paragraphs (a)(1)(i) and (ii) of the clause to insert a period shorter than 30 days (but not less than 7 days) for making contract invoice payments. (3) If the contract is a cost-reimbursement contract for services, use the clause with its Alternate I.

Insert the clause at 52.232-33, Payment by Electronic Funds Transfer--Central Contractor Registration.

Insert the clause at 52.233-1, Disputes. If it is determined under agency procedures that continued performance is necessary pending resolution of any claim arising under or relating to the contract, the contracting officer shall use the clause with its Alternate I.

Insert the provision at 52.233-2, Service of Protest, in solicitations for contracts expected to exceed the simplified acquisition threshold.

Insert the clause at 52.233-3, Protest After Award, in all solicitations and contracts. If a cost reimbursement contract is contemplated, the contracting officer shall use the clause with its Alternate I.

252.235-7010, Acknowledgment of Support and Disclaimer.

252.235-7011, Final Scientific or Technical Report.

Insert 52.239-1, Privacy or Security Safeguards, in solicitations and contracts for information technology which require security of information technology, and/or are for the design, development, or operation of a system of records using commercial information technology services or support services.

252.242-7000, Postaward Conference

Insert the clause at 52.242-13, Bankruptcy, in all solicitations and contracts exceeding the simplified acquisition threshold.

Insert the clause at 52.242-15, Stop-Work Order. If a cost-reimbursement contract is contemplated, the contracting officer shall use the clause with its Alternate I.

Insert the clause at 52.243-1, Changes -- Fixed-Price, Alternate V.

Insert 52.243-6, Change Order Accounting, in solicitations and contracts for research and development contracts of significant technical complexity, if numerous changes are anticipated.

Insert 52.243-7, Notification of Changes, in research and development for principal subsystems.

252.243-7001, Pricing of Contract Modifications, in solicitations and contracts when

anticipating and using a fixed price type contract.

252.243-7002, Requests for Equitable Adjustment, in solicitations and contracts estimated to exceed the simplified acquisition threshold.

Insert the clause at 52.245-1, Property Records, in solicitations and contracts when the following conditions exists and the Government maintains the Government's official Government property records: Contracts may provide for the contracting office to maintain the Government's official Government property records when the contracting office retains contract administration and Government property is furnished to a contractor for use on a Government installation; under a contract with a short performance period; or when otherwise determined by the contracting officer to be in the Government's interest.

Insert the clause at 52.245-2, Government Property (Fixed-Price Contracts), in solicitations and contracts when a fixed-price contract is contemplated, except as provided in paragraphs (d) and (e) of this section which follow: (d) The contracting officer may insert the clause at 52.245-4, Government-Furnished Property (Short Form), in solicitations and contracts when a fixed-price, time-and-material, or labor-hour contract is contemplated and the acquisition cost of all Government-furnished property to be involved in the contract is $100,000 or less; unless a contract with an educational or nonprofit organization is contemplated. (e) When the cost of the item to be repaired does not exceed the simplified acquisition threshold, purchase orders for property repair need not include a Government property clause.

252.245-7001, Reports of Government Property

Insert the clause at 52.245-9, Use and Charges, in solicitations and contracts when a fixed-price contract is contemplated, and Government production and research property is provided other than on a rent-free basis.

Insert the clause at 52.245-18, Special Test Equipment, in solicitations and contracts when the Contractor will acquire or fabricate special test equipment for the Government but the exact identification of the special test equipment to be acquired or fabricated is unknown.

Insert the clause at 52.245-19, Government Property Furnished "As Is," in solicitations and contracts when Government production and research property is to be furnished "as is."

Insert the clause at 52.246-7, Inspection of Research and Development -- Fixed-Price, in solicitations and contracts for research and development when the primary objective of the contract is the delivery of end items other than designs, drawings, or reports, and the contract amount is expected to exceed the simplified acquisition threshold; unless use of the clause is impractical and the clause prescribed in 46.309 is considered to be more appropriate.

Use a clause substantially the same as the clause at 252.246-7001, Warranty of Data, in solicitations and contracts that include the clause at 252.227-7013, Rights in Technical Data and Computer Software, and there is a need for greater protection or period of liability than provided by other contract clauses, such as the clauses at-(i) FAR 52.246-3, Inspection of Supplies--Cost-Reimbursement;(ii) FAR 52.246-6, Inspection--Time-and-Material and Labor-Hour;(iii) FAR 52.246-8, Inspection of Research and Development--Cost-Reimbursement;

and(iv) FAR 52.246-19, Warranty of Systems and Equipment Under Performance Specifications or Design Criteria.(2) Use the clause at 252.246-7001, Warranty of Data, with its Alternate I when extended liability is desired and a fixed price incentive contract is contemplated.(3) Use the clause at 252.246-7001, Warranty of Data, with its Alternate II when extended liability is desired and a firm fixed price contract is contemplated.

Insert the clause at 52.246-9, Inspection of Research and Development (Short Form), in solicitations and contracts for research and development when the clause prescribed in 46.307 or the clause prescribed in 46.308 is not used.

Insert the clause 52.246-11, Higher-Level Contract Quality Requirement, in solicitations and contracts when the inclusion of a higher-level contract quality requirement is appropriate (see 46.202-4).

Insert the clause at 52.246-16, Responsibility for Supplies.

Insert 52.246-18, Warranty of Supplies of a Complex Nature, in solicitations and contracts for deliverable complex items when a fixed-price supply or research and development contract is contemplated and the use of a warranty clause has been approved under agency procedures. If the contractor's design rather than the Government's design will be used, insert the word "design" before "material" in paragraph (b)(1). If it is anticipated that recovery of the warranted item will involve considerable Government expense for disassembly and/or reassembly of larger items, the contracting officer may use the clause with its Alternate IV.

Insert 52.246-19, Warranty of Systems and Equipment under Performance Specifications or Design Criteria, in solicitations and contracts when performance specifications or design are of major importance; a fixed-price research and development contract for systems and equipment is contemplated; and the use of a warranty clause has been approved under agency procedures.

In (1) contracts requiring delivery of end items that are not high-value items, insert the clause at 52.246-23, Limitation of Liability. (2) In contracts requiring delivery of high-value items, insert the clause at 52.246-24, Limitation of Liability -- High Value Items. (3) In contracts requiring delivery of both high-value items and other end items, insert both clauses prescribed in (1) and (2) of this section, Alternate I of the clause at 52.246-24, and identify clearly in the contract schedule the line items designated as high-value items.

In (1) contracts requiring delivery of end items that are not high-value items, insert the clause at 52.246-23, Limitation of Liability.

(2) In contracts requiring delivery of high-value items, insert the clause at 52.246-24, Limitation of Liability -- High Value Items.

(3) In contracts requiring delivery of both high-value items and other end items, insert both clauses prescribed in (1) and (2) of this section, Alternate I of the clause at 52.246-24, and identify clearly in the contract schedule the line items designated as high-value items.

52.247-63, Preference for U. S. Flag Air Carriers.

52.247-64, Preference for Privately Owned U. S. Flag Commercial Vessels.

252.247-7023, Transportation of Supplies by Sea.

252.247-7024, Notification of Transportation of Supplies by Sea, in all contracts for which the offeror made a negative response to the inquiry in the provision at 252.247-7022, Representation of Extent of Transportation by Sea.

Insert the clause at 52.249-1, Termination for Convenience of the Government (Fixed-Price) (Short Form), in solicitations and contracts when a fixed-price contract is contemplated and the contract amount is expected to be $100,000 or less, except --

(i) If use of the clause at 52.249-4, Termination for Convenience of the Government (Services) (Short Form) is appropriate,

(ii) In contracts for research and development work with an educational or nonprofit institution on a no-profit basis,

(iii) if one of the clauses prescribed or cited at 49.505(a), (b), or (e), is appropriate.

(b) Fixed-price contracts over $100,000.

(1) (i) General use. The contracting officer shall insert the clause at 52.249-2, Termination for Convenience of the Government (Fixed-Price), in solicitations and contracts when a fixed-price contract is contemplated and the contract amount is expected to be over $100,000, except in contracts for Research and development work with an educational or nonprofit institution on a no-profit basis, or research and development contracts. The contracting officer shall insert the clause at 52.249-5, Termination for the Convenience of the Government (Educational and Other Nonprofit Institutions), in solicitations and contracts when either a fixed-price or cost-reimbursement contract is contemplated for research and development work with an educational or nonprofit institution on a nonprofit or no-fee basis.

(e) Subcontracts.

(1) General use. The prime contractor may find the clause at 52.249-1, Termination for Convenience of the Government (Fixed-Price) (Short Form), or at 52.249-2, Termination for Convenience of the Government (Fixed-Price), as appropriate, suitable for use in fixed-price subcontracts, except as noted in subparagraph (e)(2) of this section; provided, that the relationship between the contractor and subcontractor is clearly indicated. Inapplicable conditions (e.g., paragraph (d)) in 52.249-2 should be deleted and the periods reduced for submitting the subcontractor's termination settlement proposal (e.g., 6 months), and for requesting an equitable price adjustment (e.g., 45 days).

(2) Research and development. The prime contractor may find the clause at 52.249-5, Termination for the Convenience of the Government (Educational and Other Nonprofit Institutions), suitable for use in subcontracts placed with educational or nonprofit institutions on a no-profit or no-fee basis; provided, that the relationship between the contractor and subcontractor is clearly indicated. Inapplicable conditions (e.g., paragraph (h)) should be deleted, the period for submitting the subcontractor's termination settlement proposal should

be reduced (e.g., 6 months), the subcontract should be placed on a no-profit or no-fee basis, and the subcontract should incorporate or be negotiated on the basis of the cost principles in Part 31 of the Federal Acquisition Regulation.

Insert the clause at 52.249-9, Default (Fixed-Price Research and Development), in solicitations and contracts for research and development when a fixed-price contract is contemplated and the contract amount is expected to exceed the simplified acquisition threshold, except those with educational or nonprofit institutions on a no-profit basis.

Insert the clause at 52.251-1, Government Supply Sources, in solicitations and contracts when the contracting officer may authorize the contractor to acquire supplies or services from a Government supply source.

252.251-7000, Ordering From Government Supply Sources, in solicitations and contracts which include the clause at FAR 52.251-1, Government Supply Sources.

Insert the clause at 52.253-1, Computer Generated Forms, in solicitations and contracts that require the contractor to submit data on Standard or Optional Forms prescribed by this regulation and forms prescribed by agency supplements.

ATTACHMENT B
COST-REIMBURSABLE CONTRACTS
FAR/DFARS CONTRACT CLAUSES

ALL APPLICABLE CLAUSES WILL BE INCORPORATED WITHIN THE AWARD DOCUMENTS.

The full text of a clause and its complete prescription may be accessed electronically at the FAR site (clauses beginning with "52.") at http://www.arnet.gov/far/loadmain52.html and the DFARS site (clauses beginning with "252.") at http://www.acq.osd.mil/dp/dfars/tochtml.htm

52.252-1, Solicitation Provisions Incorporated by Reference.
This solicitation incorporates one or more provisions by reference.

52.252-2 Clauses Incorporated by Reference (Feb 1998).
This contract incorporates one or more clauses by reference.

Security Contract Language for all Corps of Engineers' Unclassified Contracts (PIL 2003-06, 19 Feb 03): All Contractor employees (U.S. citizens and Non- U.S. citizens) working under this contract (to include grants, cooperative agreements and task orders) who require access to Automated Information Systems (AIS), (stand alone computers, network computers/systems, e-mail) shall, at a minimum, be designated into an ADP-III position (non-sensitive) in accordance with DoD 5220-22-R, Industrial Security Regulation. The investigative requirements for an ADP-III position are a favorable National Agency Check (NAC), SF-85P, Public Trust Position. The contractor shall have each applicable employee complete a SF-85P and submit to the U. S. Army Engineer Research and Development Center Security Office, Attn: CEERD-SE-Z, 3909 Halls Ferry Rd., Vicksburg, MS 39180 (601-634-3527 or 4218) within three (3) working days after award of any contract or task order, and shall be submitted prior to the individual being permitted access to an AIS. Contractors that have a commercial or government entity (CAGE) Code and Facility Security Clearance through the Defense Security Service shall process the NACs and forward visit requests/results of NAC to the U. S. Army Engineer Research and Development Center Security Office, Attn: CEERD-SE-Z, 3909 Halls Ferry Rd., Vicksburg, MS 39180 (601-634-3527 or 4218). For those contractors that do not have a CAGE Code or Facility Security Clearance, the U. S. Army Engineer Research and Development Center Security Office, Vicksburg, MS, will process the investigation in coordination with the Contractor and contract employees.

In accordance with Engineering Regulation, ER 380-1-18, Section 4, foreign nationals who work on Corps of Engineers' contracts or task orders shall be approved by the HQUSACE Foreign Disclosure Officer or higher before beginning work on the contract/task order. This regulation includes subcontractor employees. (NOTE: exceptions to the above requirement include foreign nationals who perform janitorial and/or ground maintenance services.) The contractor shall submit to the Division/District Contract Office, the names of all foreign nationals proposed for performance under this contract/task order, along with documentation to verify that he/she was legally admitted into the United States and has authority to work

and/or go to school in the US. Such documentation may include a US passport, Certificate of US citizenship (INS Form N-560 or N-561), Certificate of Naturalization (INS Form N-550 or N-570), foreign passport with I-551 stamp or attached INS Form I-94 indicating employment authorization, Alien Registration Receipt Card with photograph (INS Form I-151 or I-551), Temporary Resident Card (INS Form I-688), Employment Authorization Card (INS Form I-688A), Reentry Permit (INS Form I-327), Refugee Travel Document (INS Form I-571), Employment Authorization Document issued by the INS which contains a photograph (INS Form I-688B).

Classified contracts require the issuance of a DD Form 254 (Department of Defense Contract Security Classification Specification).

(End of Clause)

252.201-7000, Contracting Officer's Representative.

Insert the clause at 52.202-1, Definitions, in solicitations and contracts that exceed the simplified acquisition threshold. The contracting officer may include additional definitions, provided they are consistent with the clause and the FAR.

Insert the clause at 52.203-3, Gratuities, in solicitations and contracts with a value exceeding the simplified acquisition threshold.

Insert the clause at 52.203-5, Covenant Against Contingent Fees, in all solicitations and contracts exceeding the simplified acquisition threshold.

Insert the clause at 52.203-7, Anti-Kickback Procedures, in solicitations and contracts exceeding the simplified acquisition threshold.

252.203-7001, Prohibition on Persons Convicted of Fraud or Other Defense-Contract-Related Felonies, in all solicitations and contracts exceeding the simplified acquisition threshold.

Use the clause at 252.203-7002, Display of DoD Hotline Poster, in solicitations and contracts expected to exceed $5 million, except when performance will take place in a foreign country.

In solicitations and contracts that exceed the simplified acquisition threshold, insert the clauses at --(a) 52.203-8, Cancellation, Rescission, and Recovery of Funds for Illegal or Improper Activity, and (b) 52.203-10, Price or Fee Adjustment for Illegal or Improper Activity.

The clause at 52.203-12, Limitation on Payments to Influence Certain Federal Transactions, shall be included in solicitations and contracts expected to exceed $100,000.

Insert the clause at 52.204-2, Security Requirements, in solicitations and contracts when the contract may require access to classified information.

Insert the clause at 52.204-4, Printed or Copied Double-Sided on Recycled Paper, in

solicitations and contracts that exceed the simplified acquisition threshold.

Insert the provision at 52.204-6, Data Universal Numbering System (DUNS) Number.

Use the clause at 252.204-7000, Disclosure of Information, in solicitations and contracts when the contractor will have access to or generate unclassified information that may be sensitive and inappropriate for release to the public.

252.204-7003, Control of Government Personnel Work Product.

252.204-7004, Required Central Contractor Registration.

Use the clause at 252.204-7005, Oral Attestation of Security Responsibilities, in solicitations and contracts that include the clause at FAR 52.204-2, Security Requirements.

252.205-7000 Provision of Information to Cooperative Agreement Holders, in solicitations and contracts expected to exceed $500,000.

Insert 52.207-5, Option to Purchase Equipment, in solicitations and contracts involving a lease with option to purchase.

Insert the clause at 52.208-8, Required Sources for Helium and Helium Usage Data, in solicitations and contracts if it is anticipated that performance of the contract involves a major helium requirement.

Insert the clause at 52.209-6, Protecting the Government's Interests when Subcontracting with Contractors Debarred, Suspended, or Proposed for Debarment, in solicitations and contracts where the contract value exceeds $25,000.

Use the clause at 252.209-7000, Acquisition from Subcontractors Subject to On-Site Inspection Under the Intermediate-Range Nuclear Forces (INF) Treaty, in all solicitations and contracts exceeding the simplified acquisition threshold.

252.209-7001, Disclosure of Ownership or Control by the Government of a Terrorist Country, in all solicitations expected to result in contracts of $100,000 or more. Any disclosure that the government of a terrorist country has a significant interest in an offeror or a subsidiary of an offeror shall be forwarded through the head of the agency to the Director of Defense Procurement, ATTN: OUSD(AT&L)DP/FC, 3060 Defense Pentagon, Washington, DC 20301-3060.

252.209-7002, Disclosure of Ownership or Control by a Foreign Government, in all solicitations when access to proscribed information is necessary for contract performance.

252.209-7004, Subcontracting with Firms That Are Owned or Controlled by the Government of a Terrorist Country, in solicitations and contracts with a value of $100,000 or more.

252.209-7005, Reserve Officer Training Corps and Military Recruiting on Campus, in all solicitations and contracts with institutions of higher education.

Insert the provision at 52.211-14, Notice of Priority Rating for National Defense Use, in

solicitations when the contract to be awarded will be a rated order.

Insert the clause at 52.211-15, Defense Priority and Allocation Requirements, in contracts that are rated orders.

Insert the clause at 52.213-4, Terms and Conditions -- Simplified Acquisitions (Other Than Commercial Items) in orders under the simplified acquisition threshold.

Insert the provision at 52.214-34, Submission of Offers in the English Language.

Insert the provision at 52.214-35, Submission of Offers in U.S. Currency.

Insert the provision at 52.215-1 (Alt I), Instructions to Offerors -- Competitive Acquisition, in all competitive solicitations where the Government intends to award a contract without discussions.

Insert the clause at 52.215-2, Audit and Records-Negotiation (10 U.S.C. 2313, 41 U.S.C. 254d, and OMB Circular No. A-133), in solicitations and contracts except those for acquisitions not exceeding the simplified acquisition threshold. For cost-reimbursement contracts with educational institutions, and other nonprofit organizations, the contracting officer shall use the clause with its Alternate II.

Insert the provision at 52.215-5, Facsimile Proposals.

Insert the clause at 52.215-8, Order of Precedence -- Uniform Contract Format.

Insert the clause at 52.215-10, Price Reduction for Defective Cost or Pricing Data.

Insert the clause at 52.215-11, Price Reduction for Defective Cost or Pricing Data – Modifications.

Insert the clause at 52.215-14, Integrity of Unit Prices, in solicitations and contracts except for acquisitions at or below the simplified acquisition threshold.

Insert the provision at 52.215-16, Facilities Capital Cost of Money, in solicitations expected to result in contracts that are subject to the cost principles for contracts with commercial organizations (see FAR 31.2).

If the prospective contractor does not propose facilities capital cost of money in its offer, the contracting officer shall insert the clause at 52.215-17, Waiver of Facilities Capital Cost of Money, in the resulting contract.

Insert the provision at 52.216-1, Type of Contract, in a solicitation unless it is for a fixed-price acquisition made under simplified acquisition procedures.

Insert the clause at 52.216-7, Allowable Cost and Payment, in solicitations and contracts when a cost-reimbursement contract is contemplated. If the contract is with an educational institution, modify the clause by deleting from paragraph (a) the words "Subpart 31.2" and substituting for them "Subpart 31.3." ' If the contract is with a nonprofit organization other than an educational institution or a nonprofit organization exempted under OMB Circular No. A-

122, modify the clause by deleting from paragraph (a) the words "Subpart 31.2" and substituting for them "Subpart 31.7."

Insert the clause at 52.216-8, Fixed Fee, in solicitations and contracts when a cost-plus-fixed-fee contract is contemplated.

Insert the clause at 52.216-11, Cost Contract -- No Fee, in solicitations and contracts when a cost-reimbursement contract is contemplated that provides no fee. If a cost-reimbursement research and development contract with an educational institution or a nonprofit organization that provides no fee or other payment above cost is contemplated, and if the contracting officer determines that withholding of a portion of allowable costs is not required, the contracting officer shall use the clause with its Alternate I.

52.216-15, Price Redetermination Prospective.

Use the clause at 252.219-7003, Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan (DoD Contracts), in solicitations and contracts that contain the clause at FAR 52.219-9, Small Business Subcontracting Plan. In contracts with contractors which have comprehensive subcontracting plans approved under the test program described in 219.702(a), use the clause at 252.219-7004, Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan (Test Program), instead of the clauses at 252.219-7003, Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan (DoD Contracts), and FAR 52.219-9, Small Business Subcontracting Plan. In contracts with contractors that have comprehensive subcontracting plans approved under the test program described in 219.702(a), do not use the clause at FAR 52.219-16, Liquidated Damages--Subcontracting Plan.

Insert the clause at 52.219-8, Utilization of Small Business Concerns, in solicitations and contracts when the contract amount is expected to be over the simplified acquisition threshold unless the contract, together with all its subcontracts, is to be performed entirely outside of any State, territory, or possession of the United States, the District of Columbia, and the Commonwealth of Puerto Rico.

Insert the clause at 52.219-9, Small Business Subcontracting Plan, in solicitations and contracts that offer subcontracting possibilities, are expected to exceed $500,000 ($1,000,000 for construction of any public facility), and are required to include the clause at 52.219-8, Utilization of Small Business Concerns. When contracting by negotiation, and subcontracting plans are required with initial proposals as provided for in 19.705-2(d), the contracting officer shall use the clause with its Alternate II.

Insert the clause at 52.219-16, Liquidated Damages --Subcontracting Plan, in all solicitations and contracts containing the clause at 52.219-9, Small Business Subcontracting Plan, or the clause with its Alternate II.

Include the clause at 52.222-2, Payment for Overtime Premiums, in solicitations and contracts when a cost-reimbursement contract is contemplated and the contract amount is expected to be over $100,000.

Insert the clause at 52.222-3, Convict Labor, in solicitations and contracts above the micro-purchase threshold, when the contract is to be performed in the United States, Puerto Rico, the Northern Mariana Islands, American Samoa, Guam, or the U.S. Virgin Islands; unless --

(a) The contract will be subject to the Walsh-Healey Public Contracts Act (see Subpart 22.6), which contains a separate prohibition against the employment of convict labor;

(b) The supplies or services are to be purchased from Federal Prison Industries, Inc. (see Subpart 8.6); or

(c) The acquisition involves the purchase, from any State prison, of finished supplies that may be secured in the open market or from existing stocks, as distinguished from supplies requiring special fabrication.

Insert the clause at 52.222-26, Equal Opportunity.

Insert the clause at 52.222-21, Prohibition of Segregated Facilities.

Insert the provision at 52.222-24, Preaward On-Site Equal Opportunity Compliance Evaluation, in when the amount of the contract is expected to be $10 million or more.

Insert the clause at 52.222-29, Notification of Visa Denial, in contracts if the contractor is required to perform in or on behalf of a foreign country.

Insert the clause at 52.222-35, Equal Opportunity for Special Disabled Veterans, Veterans of the Vietnam Era, and Other Eligible Veterans, in solicitations and contracts if the expected value is $25,000 or more, except when work is performed outside the United States by employees recruited outside the United States.

Insert the clause at 52.222-36, Affirmative Action for Workers with Disabilities, in solicitations and contracts that exceed $10,000 or are expected to exceed $10,000, except when work is to be performed outside the United States by employees recruited outside the United States (for the purpose of this, United States includes the several states, the District of Columbia, the Virgin Islands, the Commonwealth of Puerto Rico, Guam, American Samoa, the Commonwealth of the Northern Mariana Islands, and Wake Island).

Insert the clause at 52.222-37, Employment Reports on Special Disabled Veterans, Veterans of the Vietnam Era, and Other Eligible Veterans, in solicitations and contracts containing the clause at 52.222-35, Equal Opportunity for Special Disabled Veterans, Veterans of the Vietnam Era, and Other Eligible Veterans.

Insert the clause at 52.223-3, Hazardous Material Identification and Material Safety Data, in solicitations and contracts if the contract will require the delivery of hazardous materials as defined in FAR 23.301.

Insert the clause at 52.223-5, Pollution Prevention and Right-to-Know Information, in all solicitations and contracts that provide for performance, in whole or in part, on a Federal facility.

Insert the clause at 52.223-6, Drug-Free Workplace, except as provided in paragraph (b) of this section, in solicitations and contracts of any dollar value if the contract is expected to be awarded to an individual or expected to exceed the simplified acquisition threshold if the contract is expected to be awarded to other than an individual. Contracting officers shall not insert the clause at 52.223-6, Drug-Free Workplace, in solicitations and contracts, if the resultant contract is to be performed entirely outside of the United States, its territories, and its possessions or inclusion of these requirements would be inconsistent with the international obligations of the United States or with the laws and regulations of a foreign country.

252.223-7001, Hazard Warning Labels, in solicitations and contracts which require submission of hazardous material data sheets.

252.223-7002, Safety Precautions for Ammunition and Explosives, and 252.223-7003, Change in Place of Performance--Ammunition and Explosives, in all solicitations and contracts for acquisition to which this section applies.

252.223-7004, Drug-Free Work Force, in all solicitations and contracts-(1) That involve access to classified information; or(2) When the contracting officer determines that the clause is necessary for reasons of national security or for the purpose of protecting the health or safety of those using or affected by the product of, or performance of, the contract.(b) Do not use the clause in solicitations and contracts when performance or partial performance will be outside the United States, its territories, and possessions, unless the contracting officer determines such inclusion to be in the best interest of the Government; or When the value of the acquisition is at or below the simplified acquisition threshold.

252.223-7006, Prohibition on Storage and Disposal of Toxic and Hazardous Materials, in all solicitations and contracts which require, may require, or permit contractor performance on a DoD installation. Use the clause at 252.223-7006 with its Alternate I, when the Secretary of the military department issues a determination under the exception at 223.7102(a)(9).

252.223-7007, Safeguarding Sensitive Conventional Arms, Ammunition, and Explosives, in all solicitations and contracts to which DoD 5100.76-M applies, in accordance with the policy at 223.7201. Complete paragraph (b) of the clause based on information provided by cognizant technical or requirements personnel.

Insert the clause at 52.223-14, Toxic Chemical Release Reporting, in the resulting contract, if the contract is expected to exceed $100,000 (including all options).

When the design, development, or operation of a system of records on individuals is required to accomplish an agency function, insert the following clauses in solicitations and contracts:

(a) The clause at 52.224-1, Privacy Act Notification.

(b) The clause at 52.224-2, Privacy Act.

252.225-7026, Reporting of Contract Performance Outside the United States, in all solicitations and contracts with an estimated or actual value exceeding $500,000, including those modified to exceed $500,000.

252.225-7031, Secondary Arab Boycott of Israel.

252.225-7041, Correspondence in English, in solicitations and contracts when contract performance will be wholly or in part in a foreign country.

252.225-7042, Authorization to Perform, in solicitations and contracts when contract performance will be wholly or in part in a foreign country.

252.225-7043, Antiterrorism/Force Protection Policy for Defense Contractors Outside the United States, in solicitations and contracts that require performance or travel outside the United States

Insert the clause at 52.225-13, Restrictions on Certain Foreign Purchases, in solicitations and contracts with a value exceeding $2,500 ($15,000 for acquisitions as described in 13.201(g)), unless an exception applies (see 25.701(a)(2)).

Insert the clause at 52.225-14, Inconsistency Between English Version and Translation of Contract, in solicitations and contracts if anticipating translation into another language. Insert the clause with its Alternate I in all R&D solicitations and contracts unless both complete performance and delivery are outside the United States, its possessions, and Puerto Rico. When a proposed contract involves both R&D work and supplies or services, and the R&D work is the primary purpose of the contract, the contracting officer shall use this alternate. In all other proposed contracts involving both R&D work and supplies or services, the contracting officer shall use the basic clause. Also, when a proposed contract involves either R&D or supplies and materials, in addition to construction or architect-engineer work, the contracting officer shall use the basic clause.

FAR 52.226-2, Historically Black College or University and Minority Institution Representation, in solicitations set aside for HBCU/MIs.

252.226-7000, Notice of Historically Black College or University and Minority Institution Set-Aside, in solicitations and contracts set-aside for HBCU/MIs.

252.226-7001, Utilization of Indian Organizations and Indian-Owned Economic Enterprises--DoD Contracts, in solicitations and contracts for supplies or services that are expected to exceed the simplified acquisition threshold.

If, in the Government's interest, it is appropriate to exempt one or more specific United States patents from the patent indemnity clause, the contracting officer shall obtain written approval from the agency head or designee and shall insert the clause at 52.227-5, Waiver of Indemnity, in solicitations and contracts in addition to the appropriate patent indemnity clause.

52.227-1 Alternate 1, Authorization and Consent.

52.227-6, Royalty Information.

252.227-7013, Rights in Technical Data--Noncommercial Items, in solicitations and contracts when the successful offeror(s) will be required to deliver technical data to the Government. Do not use the clause when the only deliverable items are computer software or computer

software documentation (see 227.72), commercial items (see 227.7102-3), existing works (see 227.7105), special works (see 227.7106). Use the clause at 252.227-7013 with its Alternate I in research contracts when the contracting officer determines, in consultation with counsel, that public dissemination by the contractor would be-(1) In the interest of the Government; and (2) Facilitated by the Government relinquishing its right to publish the work for sale, or to have others publish the work for sale on behalf of the Government.

252.227-7014, Rights in Noncommercial Computer Software and Noncommercial Computer Software Documentation, in solicitations and contracts when the successful offeror(s) will be required to deliver computer software or computer software documentation. Do not use the clause when the only deliverable items are technical data (other than computer software documentation), commercial computer software or commercial computer software documentation, commercial items (see 227.7102-3), special works (see 227.7205). Use the clause at 252.227-7014 with its Alternate I in research contracts when the contracting officer determines, in consultation with counsel, that public dissemination by the contractor would be-(i) In the interest of the Government; and (ii) Facilitated by the Government relinquishing its right to publish the work for sale, or to have others publish the work for sale on behalf of the Government.

Except as provided in paragraph (b) of this subsection, use the clause at 252.227-7015, Technical Data--Commercial Items, in all solicitations and contracts when the contractor will be required to deliver technical data pertaining to commercial items, components, or processes. Do not require the contractor to include this clause in its subcontracts.

(b) Use the clause at 252.227-7013, Rights in Technical Data--Noncommercial Items, in lieu of the clause at 252.227-7015 if the Government will pay any portion of the development costs. Do not require the contractor to include this clause in its subcontracts for commercial items or commercial components.

Use the following clauses in solicitations and contracts that include the clause at 252.227-7013: (1) 252.227-7016, Rights in Bid or Proposal Information; (2) 252.227-7030, Technical Data--Withholding of Payment; (3) 252.227-7036, Declaration of Technical Data Conformity; and (4) 252.227-7037, Validation of Restrictive Markings on Technical Data (paragraph (e) if the clause contains information that must be included in a challenge).

252-227-7017, IDENTIFICATION AND ASSERTION OF USE, RELEASE, OR DISCLOSURE RESTRICTIONS (JUN 1995)

252.227-7019 Validation of Asserted Restrictions--Computer Software.

252.227-7020 Rights in Special Works.

Use the clause at 252.227-7021, Rights in Data--Existing Works, in lieu of the clause at 252.227-7013, Rights in Technical Data--Noncommercial Items, in solicitations and contracts exclusively for existing works when-(1) The existing works will be acquired without modification; and (2) The Government requires the right to reproduce, prepare derivative works, or publicly perform or display the existing works; or (3) The Government has a specific need to obtain indemnity for liabilities that may arise out of the content, performance, use, or

disclosure of such data. (b) The clause at 252.227-7021 provides the Government, and others acting on its behalf, a paid-up, non-exclusive, irrevocable, world-wide license to reproduce, prepare derivative works and publicly perform or display the works called for by a contract and to authorize others to do so for government purposes.(c) A contract clause is not required to acquire existing works such as books, magazines and periodicals, in any storage or retrieval medium, when the Government will not reproduce the books, magazines or periodicals, or prepare derivative works.

252.227-7025, Limitations on the Use or Disclosure of Government Furnished Information Marked with Restrictive Legends, in solicitations and contracts when it is anticipated that the Government will provide the contractor, for performance of its contract, technical data marked with another contractor's restrictive legend(s).

252.227-7028, Technical Data or Computer Software Previously Delivered to the Government, in solicitations when the resulting contract will require the contractor to deliver technical data. The provision requires offerors to identify any technical data specified in the solicitation as deliverable data items that are the same or substantially the same as data items the offeror has delivered or is obligated to deliver, either as a contractor or subcontractor, under any other federal agency contract.

252.227-7032, Rights in Technical Data and Computer Software (Foreign), may be used in contracts with foreign contractors to be performed overseas, except Canadian purchases (see paragraph (c) of this subsection), in lieu of the clause at 252.227-7013, Rights in Technical Data--Noncommercial Items, when the Government requires the unrestricted right to use, modify, reproduce, perform, display, release or disclose all technical data to be delivered under the contract. Do not use the clause in contracts for existing or special works. (b) When the Government does not require unlimited rights, the clause at 252.227-7032 may be modified to accommodate the needs of a specific overseas procurement situation. The Government should obtain rights in the technical data that are not less than the rights the Government would have obtained under the data rights clause(s) prescribed in this part for a comparable procurement performed within the United States or its possessions. (c) Contracts for Canadian purchases shall include the appropriate data rights clause prescribed in this part for a comparable procurement performed within the United States or its possessions.

252.227-7034, Patents--Subcontracts, in solicitations and contracts containing the clause at FAR 52.227-11, Patent Rights--Retention by the Contractor (Short Form).

Use the clause at 252.227-7037, Validation of Restrictive Markings on Technical Data, in all solicitations and contracts for commercial items that include the clause at 252.227-7015 or the clause at 252.227-7013. Do not require the contractor to include this clause in its subcontracts for commercial items or commercial components.

Pursuant to FAR 27.304-1(e), the contracting officer shall insert the clause at 252.227-7039, Patents--Reporting of Subject Inventions, in solicitations and contracts containing the clause at FAR 52.227-11, Patent Rights--Retention by the Contractor (Short Form).

Insert the clause at 52.227-10, Filing of Patent Applications -- Classified Subject Matter, in all classified solicitations and contracts and in all solicitations and contracts where the nature of

the work or classified subject matter involved in the work reasonably might be expected to result in a patent application containing classified subject matter.

Insert the clause at 52.227-11, Patent Rights -- Retention by the Contractor (Short Form), if all the following conditions apply: (i) The contractor is a small business concern or nonprofit organization as defined in 27.301 or, except for contracts of the Department of Defense (DOD), the Department of Energy (DOE), or the National Aeronautics and Space Administration (NASA), any other type of contractor. (ii) No alternative patent rights clause is used in accordance with paragraph (c) or (d) of this section or 27.304-2. To the extent the information is not required elsewhere in the contract, and unless otherwise specified by agency supplemental regulations, the contracting officer may modify 52.227-11(f) to require the contractor to do one or more of the following: (i) Provide periodic (but not more frequently than annually) listings of all subject inventions required to be disclosed during the period covered by the report. (ii) Provide a report prior to the closeout of the contract listing all subject inventions or stating that there were none. (iii) Provide, upon request, the filing date, serial number and title, a copy of the patent application, and patent number and issue date for any subject invention in any country in which the contractor has applied for patents. (iv) Furnish the Government an irrevocable power to inspect and make copies of the patent application file when a Federal Government employee is a coinventor. If the acquisition of patent rights for the benefit of a foreign government is required under a treaty or executive agreement, or if the agency head or a designee determines at the time of contracting that it would be in the national interest to acquire the right to sublicense foreign governments or international organizations pursuant to any existing or future treaty or agreement, the contracting officer shall use the clause at 52.227-11, with its Alternate I. If other rights are necessary to effectuate the treaty or agreement, Alternate I may be appropriately modified. In long term contracts, Alternate II shall be added if necessary to effectuate treaties or agreements to be entered into.

Insert the clause at 52.227-12, Patent Rights -- Retention by the Contractor (Long Form), if all the following conditions apply: (i) The contractor is other than a small business firm or nonprofit organization. (ii) No alternative clause is used in accordance with paragraph (c) or (d) of this section or 27.304-2. (iii) The contracting agency is one of those excepted under subdivision (a)(1)(i) of this section. If the acquisition of patent rights for the benefit of a foreign government is required under a treaty or executive agreement or if the agency head or a designee determines at the time of contracting that it would be in the national interest to acquire the right to sublicense foreign governments or international organizations pursuant to any existing or future treaty or agreement, the contracting officer shall use the clause at 52.227-12, with its Alternate I. If other rights are necessary to effectuate the treaty or agreement, Alternate I may be appropriately modified. In long term contracts, Alternate II shall be added if necessary to effectuate treaties or agreements to be entered into.

Insert the clause at 52.227-13, Patent Rights -- Acquisition by the Government, if any of the following conditions apply: If the acquisition of patent rights for the benefit of a foreign government is required under a treaty or executive agreement or if the agency head or a designee determines at the time of contracting that it would be in the national interest to acquire the right to sublicense foreign governments or international organizations pursuant to any existing or future treaty or agreement, the contracting officer shall use the clause with its

Alternate I. If other rights are necessary to effectuate the treaty or agreement, Alternate I may be appropriately modified. In long term contracts, Alternate II shall be added if necessary to effectuate treaties or agreements to be entered into.

Insert the clause at 52.227-14, Rights in Data -- General, including its use with Alternate I through Alternate V as may be required or authorized in accordance with paragraphs (b) through (f) of this section, in solicitations and contracts if it is contemplated that data will be produced, furnished, or acquired under the contract, unless the contract is --(i) For the production of special works of the type set forth in 27.405(a), but the clause at 52.227-14, Rights in Data -- General, shall be included in the contract and made applicable to data otherthan special works, as appropriate; (ii) For the acquisition of existing data works, as described in 27.405(b); (iii) To be performed outside the United States, its possessions, and Puerto Rico, in which case agencies may prescribe different clauses (see paragraph (n) of this section); (iv) A contract involving cosponsored research and development in which a clause providing for less than unlimited right has been authorized. (See 27.408.) (b) If an agency determines, in accordance with 27.404(c), to adopt the alternate definition of "Limited Rights Data" in paragraph (a) of the clause, the clause shall be used with its Alternate I. (c) In accordance with 27.404(d), if a contracting officer determines it is necessary to obtain the delivery of limited rights data, the clause shall be used with its Alternate II. The contracting officer shall, when Alternate II is used, assure that the purposes, if any, for which limited rights data are to be disclosed outside the Government are included in the "Limited Rights Notice" of subparagraph (g)(2) of the clause. (d) In accordance with 27.404(e), if a contracting officer determines it is necessary to obtain the delivery of restricted computer software, the clause shall be used with its Alternate III. Any greater or lesser rights regarding the use, duplication, or disclosure of restricted computer software than those set forth in the Restricted Rights Notice of subparagraph (g)(3) of the clause must be specified in the contract and the notice modified accordingly. (e) The clause shall be used with its Alternate IV in contracts for basic or applied research (other than those for the management or operation of Government facilities or where international agreements require otherwise), to be performed solely by universities and colleges. The clause may be used with its Alternate IV in other contracts if in accordance with 27.404(f)(1) an agency determines to grant blanket permission for the contractor to establish claim to copyright subsisting in all data first produced without further request being made by the contractor. When Alternate IV is used, the contract may exclude items or categories of data from the blanket permission granted, either by express provisions in the contract or by the addition of a subparagraph (d)(3) to the clause (see 27.404(g)(1)). (f) In accordance with 27.404(i), if a contracting officer needs to have the right to inspect certain data at a contractor's facility or if by an agency, generally the clause shall be used with its Alternate V. (g) N/A; (h) The contracting officer shall normally insert the clause at 52.227-16, Additional Data Requirements, in solicitations and contracts involving experimental, developmental, research, or demonstration work (other than basic or applied research to be performed solely by a university or college where the contract amount will be $500,000 or less) unless all the requirements for data are believed to be known at the time of contracting and specified in the contract. (See 27.406(b).) This clause may also be used in other contracts when considered appropriate. (i) N/A (j) N/A; (k) In accordance with 27.405(b)(2), when contracting (other than from GSA's Multiple Award Schedule contracts) for the acquisition of existing computer software, the clause at 52.227-19, Commercial Computer Software-

Restricted Rights, may be used in the solicitation and contract. In any event, the contracting officer shall assure that the contract contains terms to obtain sufficient rights for the Government to fulfill the need for which the software is being acquired and is otherwise consistent with 27.405(b)(2). (l) N/A ; (m) N/A; (n) Agencies may prescribe in their procedures, as appropriate, a clause consistent with the policy of 27.402 in contracts to be performed outside the United States, its possessions, and Puerto Rico. (o) N/A; (p) N/A; (q) N/A; (r) N/A; (s) In accordance with 27.407, if a contracting officer desires to acquire unlimited rights in technical data contained in a successful proposal upon which a contract award is based, the contracting officer shall insert the clause at 52.227-23, Rights to Proposed Data (Technical). Rights to technical data in a proposal are not acquired by mere incorporation by reference of the proposal in the contract, and if a proposal is incorporated by reference, Section 27.404 must be followed to assure that such rights are appropriately addressed.

Insert the clause at 52.228-7, Insurance -- Liability to Third Persons.

Insert the clause at 52.229-8, Taxes -- Foreign Cost-Reimbursement Contracts, in solicitations and contracts when a cost-reimbursement contract is contemplated and the contract is to be performed wholly or partly in a foreign country.

Insert the clause at 52.229-10, State of New Mexico Gross Receipts and Compensating Tax, in solicitations and contracts when all three of the following conditions exist:

(1) The contractor will be performing a cost-reimbursement contract.

(2) The contract directs or authorizes the contractor to acquire tangible personal property as a direct cost under a contract and title to such property passes directly to and vests in the United States upon delivery of the property by the vendor.

(3) The contract will be for services to be performed in whole or in part within the State of New Mexico.

Insert the clause at FAR 52.230-2, Cost Accounting Standards, in negotiated contracts, unless the contract is exempted (see 48 CFR 9903.201-1 (FAR Appendix)), the contract is subject to modified coverage (see 48 CFR 9903.201-2 (FAR Appendix)), or the clause prescribed in paragraph (c) of this subsection is used.

(2) The clause at FAR 52.230-2 requires the contractor to comply with all CAS specified in 48 CFR 9904 (FAR Appendix), to disclose actual cost accounting practices (applicable to CAS-covered contracts only), and to follow disclosed and established cost accounting practices consistently.

(b) Disclosure and Consistency of Cost Accounting Practices.

(1) Insert the clause at FAR 52.230-3, Disclosure and Consistency of Cost Accounting Practices, in negotiated contracts when the contract amount is over $500,000, but less than $50 million, and the offeror certifies it is eligible for and elects to use modified CAS coverage (see 48 CFR 9903.201-2 (FAR Appendix)), unless the clause prescribed in

paragraph (c) of this subsection is used.

(2) The clause at FAR 52.230-3 requires the contractor to comply with 48 CFR 9904.401, 9904.402, 9904.405, and 9904.406 (FAR Appendix) to disclose (if it meets certain requirements) actual cost accounting practices, and to follow consistently its established cost accounting practices.

(c) Consistency in Cost Accounting Practices. The contracting officer shall insert the clause at FAR 52.230-4, Consistency in Cost Accounting Practices, in negotiated contracts that are exempt from CAS requirements solely on the basis of the fact that the contract is to be awarded to a United Kingdom contractor and is to be performed substantially in the United Kingdom (see 48 CFR 9903.201-1(b)(12) (FAR Appendix)).

(d) Administration of Cost Accounting Standards.

(1) The contracting officer shall insert the clause at FAR 52.230-6, Administration of Cost Accounting Standards, in contracts containing any of the clauses prescribed in paragraphs (a), (b), or (e) of this subsection.

(2) The clause at FAR 52.230-6 specifies rules for administering CAS requirements and procedures to be followed in cases of failure to comply.

(e) Cost Accounting Standards -- Educational Institutions.

(1) The contracting officer shall insert the clause at FAR 52.230-5, Cost Accounting Standards -- Educational Institution, in negotiated contracts awarded to educational institutions, unless the contract is exempted (see 48 CFR 9903.201-1 (FAR Appendix)), the contract is to be performed by an FFRDC (see 48 CFR 9903.201-2(c)(5) (FAR Appendix)), or the provision at 48 CFR 9903.201-2(c)(6) (FAR Appendix) applies.

(2) The clause at FAR 52.230-5 requires the educational institution to comply with all CAS specified in 48 CFR 9905 (FAR Appendix), to disclose actual cost accounting practices as required by 48 CFR 9903.202-1(f) (FAR Appendix), and to follow disclosed and established cost accounting practices consistently.

252.231-7000, Supplemental Cost Principles, in all solicitations and contracts, which are subject to the principles and procedures described in FAR Subparts 31.1, 31.2, 31.6, and 31.7.

Insert 52.232-9, Limitation on Withholding of Payments, in solicitations and contracts when a supply contract, research and development contract, service contract, time-and-materials contract, or labor-hour contract is contemplated that includes two or more terms authorizing the temporary withholding of amounts otherwise payable to the contractor for supplies delivered or services performed.

Insert the clause at 52.232-16, Progress Payments, in solicitations that may result in contracts providing for progress payments based on cost. If the contractor is a small business concern, use the clause with its Alternate I.

Insert the clause at 52.232-17, Interest, in solicitations and contracts. It may be inserted if the contract will be in one or more of the following categories: Contracts at or below the simplified acquisition threshold; Contracts without any provision for profit or fee with a nonprofit organization; Any other exceptions authorized under agency procedures.

Insert the clause at 52.232-20, Limitation of Cost, in solicitations and contracts if a fully funded cost-reimbursement contract is contemplated whether or not the contract provides for payment of a fee.

Insert the clause at 52.232-22, Limitation of Funds, in solicitations and contracts if an incrementally funded cost-reimbursement contract is contemplated.

Insert the clause at 52.232-23, Assignment of Claims, in solicitations and contracts expected to exceed the micro-purchase threshold, unless the contract will prohibit the assignment of claims (see 32.803(b)). The use of the clause is not required for purchase orders. However, the clause may be used in purchase orders expected to exceed the micro-purchase threshold, that are accepted in writing by the contractor, if such use is consistent with agency policies and regulations. If a no-setoff commitment has been authorized (see 32.803(d)), the contracting officer shall use the clause with its Alternate I.

Insert the clause at 52.232-24, Prohibition of Assignment of Claims, in solicitations and contracts for which a determination has been made under agency regulations that the prohibition of assignment of claims is in the Government's interest.

Insert the clause at 52.232-25, Prompt Payment, in all solicitations and contracts, except when payment terms and the late payment penalties are established by other governmental authority (*e.g.*, tariffs). (1) As authorized in 32.904(b)(1)(ii)(B)(4), the contracting officer may modify the date in paragraph (a)(5)(i) of the clause to specify a period longer than 7 days for constructive acceptance, if required to afford the Government a reasonable opportunity to inspect and test the supplies furnished or to evaluate the services performed, except in the case of a contract for the purchase of a commercial item, including a brand-name commercial item for authorized resale (*e.g.*, commissary items). (2) As provided in 32.903, agency policies and procedures may authorize amendment of paragraphs (a)(1)(i) and (ii) of the clause to insert a period shorter than 30 days (but not less than 7 days) for making contract invoice payments. (3) If the contract is a cost-reimbursement contract for services, use the clause with its Alternate I.

Insert the clause at 52.232-33, Payment by Electronic Funds Transfer--Central Contractor Registration.

Insert the clause at 52.233-1, Disputes. If it is determined under agency procedures that continued performance is necessary pending resolution of any claim arising under or relating to the contract, the contracting officer shall use the clause with its Alternate I.

Insert the provision at 52.233-2, Service of Protest, in solicitations for contracts expected to exceed the simplified acquisition threshold.

Insert the clause at 52.233-3, Protest After Award, in all solicitations and contracts. If a cost

reimbursement contract is contemplated, the contracting officer shall use the clause with its Alternate I.

252.235-7010, Acknowledgment of Support and Disclaimer.

252.235-7011, Final Scientific or Technical Report

Insert 52.239-1, Privacy or Security Safeguards, in solicitations and contracts for information technology which require security of information technology, and/or are for the design, development, or operation of a system of records using commercial information technology services or support services.

52.242-1, Notice of Intent to Disallow Costs.

Insert 52.242-3, Penalties for Unallowable Costs, in all solicitations and contracts, over $500,000.

Insert the clause at 52.242-4, Certification of Indirect Costs, into all solicitations and contracts which provide for establishment of final indirect cost rates.

252.242-7000, Postaward Conference.

Insert the clause at 52.242-13, Bankruptcy, in all solicitations and contracts exceeding the simplified acquisition threshold.

Insert the clause at 52.242-15, Stop-Work Order. If a cost-reimbursement contract is contemplated, the contracting officer shall use the clause with its Alternate I.

Insert the clause at 52.243-2, Changes -- Cost-Reimbursement, Alternate V.

Insert 52.243-6, Change Order Accounting, in solicitations and contracts for research and development contracts of significant technical complexity, if numerous changes are anticipated.

Insert 52.243-7, Notification of Changes, in research and development for principal subsystems.

252.243-7001, Pricing of Contract Modifications, in solicitations and contracts when anticipating and using a fixed price type contract.

252.243-7002, Requests for Equitable Adjustment, in solicitations and contracts estimated to exceed the simplified acquisition threshold.

Insert the clause at 52.244-2, Subcontracts, Alternate 1.

Insert the clause at 52.244-5, Competition in Subcontracting, when the contract amount is expected to exceed the simplified acquisition threshold.

Insert the clause at 52.245-1, Property Records, in solicitations and contracts when the following conditions exists and the Government maintains the Government's official

Government property records: Contracts may provide for the contracting office to maintain the Government's official Government property records when the contracting office retains contract administration and Government property is furnished to a contractor for use on a Government installation; under a contract with a short performance period; or when otherwise determined by the contracting officer to be in the Government's interest.

Insert the clause at 52.245-5, Government Property (Cost-Reimbursement, Time-and-Material, or Labor-Hour Contracts), in solicitations and contracts when a cost-reimbursement, time-and-material, or labor-hour contract is contemplated, except as provided in paragraph (d) of this section which follows: (d) The contracting officer may insert the clause at 52.245-4, Government-Furnished Property (Short Form), in solicitations and contracts when a fixed-price, time-and-material, or labor-hour contract is contemplated and the acquisition cost of all Government-furnished property to be involved in the contract is $100,000 or less; unless a contract with an educational or nonprofit organization is contemplated.

252.245-7001, Reports of Government Property.

Insert the clause at 52.245-18, Special Test Equipment, in solicitations and contracts when the Contractor will acquire or fabricate special test equipment for the Government but the exact identification of the special test equipment to be acquired or fabricated is unknown.

Insert the clause at 52.245-19, Government Property Furnished "As Is," in solicitations and contracts when Government production and research property is to be furnished "as is."

Use a clause substantially the same as the clause at 252.246-7001, Warranty of Data, in solicitations and contracts that include the clause at 252.227-7013, Rights in Technical Data and Computer Software, and there is a need for greater protection or period of liability than provided by other contract clauses, such as the clauses at-(i) FAR 52.246-3, Inspection of Supplies--Cost-Reimbursement;(ii) FAR 52.246-6, Inspection--Time-and-Material and Labor-Hour;(iii) FAR 52.246-8, Inspection of Research and Development--Cost-Reimbursement; and(iv) FAR 52.246-19, Warranty of Systems and Equipment Under Performance Specifications or Design Criteria.(2) Use the clause at 252.246-7001, Warranty of Data, with its Alternate I when extended liability is desired and a fixed price incentive contract is contemplated.(3) Use the clause at 252.246-7001, Warranty of Data, with its Alternate II when extended liability is desired and a firm fixed price contract is contemplated.

Insert the clause at 52.246-8, Inspection of Research and Development -- Cost-Reimbursement, in solicitations and contracts for research and development when the primary objective of the contract is the delivery of end items other than designs, drawings, or reports, unless use of the clause is impractical and the clause prescribed in 46.309 is considered to be more appropriate. If it is contemplated that the contract will be on a no-fee basis, the contracting officer shall use the clause with its Alternate I.

Insert the clause at 52.246-9, Inspection of Research and Development (Short Form), in solicitations and contracts for research and development when the clause prescribed in 46.307 or the clause prescribed in 46.308 is not used.

Insert the clause 52.246-11, Higher-Level Contract Quality Requirement, in solicitations and

contracts when the inclusion of a higher-level contract quality requirement is appropriate (see 46.202-4).

In (1) contracts requiring delivery of end items that are not high-value items, insert the clause at 52.246-23, Limitation of Liability. (2) In contracts requiring delivery of high-value items, insert the clause at 52.246-24, Limitation of Liability -- High Value Items. (3) In contracts requiring delivery of both high-value items and other end items, insert both clauses prescribed in (1) and (2) of this section, Alternate I of the clause at 52.246-24, and identify clearly in the contract schedule the line items designated as high-value items.

52.247-63, Preference for U. S. Flag Air Carrier.

52.247-64, Preference for Privately Owned U. S. Flag Commercial Vessels.

252.247-7023, Transportation of Supplies by Sea.

252.247-7024, Notification of Transportation of Supplies by Sea, in all contracts for which the offeror made a negative response to the inquiry in the provision at 252.247-7022, Representation of Extent of Transportation by Sea.

Insert the clause at 52.249-5, Termination for the Convenience of the Government (Educational and Other Nonprofit Institutions), in solicitations and contracts when either a fixed-price or cost-reimbursement contract is contemplated for research and development work with an educational or nonprofit institution on a nonprofit or no-fee basis.

Insert the clause at 52.249-6, Termination (Cost Reimbursement), in solicitations and contracts when a cost-reimbursement contract is contemplated, except in contracts for research and development with an educational or nonprofit institution on a no-fee basis.

Insert the clause at 52.249-14, Excusable Delays, in solicitations and contracts for supplies, services, construction, and research and development on a fee basis, when a cost-reimbursement contract is contemplated.

Insert the clause at 52.251-1, Government Supply Sources, in solicitations and contracts when the contracting officer may authorize the contractor to acquire supplies or services from a Government supply source.

252.251-7000, Ordering From Government Supply Sources, in solicitations and contracts which include the clause at FAR 52.251-1, Government Supply Sources.

Insert the clause at 52.253-1, Computer Generated Forms, in solicitations and contracts that require the contractor to submit data on Standard or Optional Forms prescribed by this regulation and forms prescribed by agency supplements.

ATTACHMENTC
ADDITIONAL
REPRESENTATIONS AND CERTIFICATIONS
FROM OFFERORS
FAR/DFARS

CERTIFICATION, SIGNATURE

(If the person signing this contract/offer is other than the secretary/treasurer, vice-president, or president of the organization, and the amount of the contract/offer is in excess of $100,000, the following certificate must be completed.)

I, _____, certify that I am secretary to the organization named as Contractor herein; that _____, who signed this contract on behalf of the Contractor, was then _____ of said organization; that said contract was duly signed for on behalf of said organization by authority of its governing body and is within scope of its power.

_____
SECRETARY

FAR52.203-2 CERTIFICATE OF INDEPENDENT PRICE DETERMINATION (Apr 1985)
(Applicable to firm-fixed price contracts expected to exceed $100,000.)

(a) The Offeror certifies that --

(1) The prices in this offer have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other Offeror or competitor relating to (i) those prices, (ii) the intention to submit an offer, or (iii) the methods or factors used to calculate the prices offered;

(2) The prices in this offer have not been and will not be knowingly disclosed by the Offeror, directly or indirectly, to any other Offeror or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a negotiated solicitation) unless otherwise required by law; and

(3) No attempt has been made or will be made by the Offeror to induce any other concern to submit or not to submit an offer for the purpose of restricting competition.

(b) Each signature on the offer is considered to be a certification by the signatory that the signatory --

(1) Is the person in the Offeror's organization responsible for determining the

prices being offered in this bid or proposal, and that the signatory has not participated and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above; or

(2) (i) Has been authorized, in writing, to act as agent for the following principals in certifying that those principals have not participated, and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above

_____

(insert full name of person(s) in the Offeror's organization responsible for determining the prices offered in this bid or proposal, and the title of his or her position in the Offeror's organization);

(ii) As an authorized agent, does certify that the principals named in subdivision (b)(2)(1) above have not participated and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) above; and

(iii) As an agent, has not personally participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) above.

(c) If the Offeror deletes or modifies subparagraph (a)(2) above, the Offeror must furnish with its offer a signed statement setting forth in detail the circumstances of the disclosure.

(End of Provision)

FAR 52.203-11 CERTIFICATION AND DISCLOSURE REGARDING PAYMENTS TO INFLUENCE CERTAIN FEDERAL TRANSACTIONS (Apr 1991)
(Applicable if the contract is expected to exceed $100,000.)

(a) The definitions and prohibitions contained in the clause, at FAR 52.203-12, Limitation on Payments to Influence Certain Federal Transactions, included in this solicitation, are hereby incorporated by reference in paragraph (b) of this certification.

(b) The Offeror, by signing its offer, hereby certifies to the best of his or her knowledge and belief that on or after December 23, 1989,

(1) No Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment or modification of any Federal contract, grant, loan, or cooperative agreement;

(2) If any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person

for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with this solicitation, the Offeror shall complete and submit, with its offer, OMB Standard Form LLL, Disclosure of Lobbying Activities, to the Contracting Officer; and

(3) He or she will include the language of this certification in all subcontract awards at any tier and require that all recipients of subcontract awards in excess of $100,000 shall certify and disclose accordingly.

(c) Submission of this certification and disclosure is a prerequisite for making or entering into this contract imposed by Section 1352, Title 31, United States Code. Any person who makes an expenditure prohibited under this provision or who fails to file or amend the disclosure form to be filed or amended by this provision shall be subject to a civil penalty of not less than $10,000, and not more than $100,000, for each such failure.

(End of Provision)

FAR52.204-3 TAXPAYER IDENTIFICATION (Oct 1998)

(a) Definitions.

“Common parent,” as used in this provision, means that corporate entity that owns or controls an affiliated group of corporations that files its Federal income tax returns on a consolidated basis, and of which the Offeror is a member.

“Taxpayer Identification Number (TIN),” as used in this provision, means the number required by the Internal Revenue Service (IRS) to be used by the Offeror in reporting income tax and other returns. The TIN may be either a Social Security Number or an Employee Identification Number.

(b) All offerors must submit the information required in paragraphs (d) through (f) of this provision to comply with debt collection requirements of 31 U.S.C. 7701(c) and 3325(d), reporting requirements if 26 U.S.C. 6041, 6041A and 6050M, and implementing regulations issued by the IRS. If the resulting contract is subject to the payment reporting requirements described in Federal Acquisition Regulation (FAR) 4.904, the failure or refusal by the Offeror to furnish the information may result in a 31 percent reduction of payments otherwise due under the contract.

(c) The TIN may be used by the Government to collect and report on any delinquent amounts arising out of the offeror’s relationship with the Government (31 U.S.C. 7701(c)(3)). If the resulting contract is subject to the payment reporting requirements described in FAR 4.904, the TIN provided hereunder may be matched with IRS records to verify the accuracy of the offeror’s TIN.

(d) Taxpayer Identification Number (TIN).

[ ] TIN: _____
[ ] TIN has been applied for.
[ ] TIN is not required because:
[ ] Offeror is a nonresident alien, foreign corporation, or foreign partnership that does not have income effectively connected with the conduct of a trade in the United States and does not have an office or place business or a fiscal paying agent in the United States;
[ ] Offeror is an agency or instrumentality of a foreign government.

[ ] Offeror is an agency or instrumentality of a foreign government; [ ] Offeror is an agency or instrumentality of Federal Government.

(e) Type of organization.

[ ] Sole proprietorship;
[ ] Partnership;
[ ] Corporate entity (not tax-exempt)
[ ] Corporate entity (tax-exempt)
[ ] Government entity (Federal, State, or local);
[ ] Foreign government
[ ] International organization per 26 CFR 1.6049-4;
[ ] Other _____.

(f) Common Parent.

[ ] Offeror is not owned or controlled by a common parent as defined in paragraph (a) of this provision.

[ ] Name and TIN of common parent:

Name: _____

TIN: _____

(End of Provision)

FAR52.204-5 WOMEN-OWNED BUSINESS Other than Small Business (May 1999)
(Applicable if the contract is expected to exceed $100,000.00)

(a) Definition. "Women-owned business concern," as used in this provision, means a concern that is at least 51 percent owned by one or more women; or in the case of any publicly owned business, at least 51 percent of its stock is owned by one or more women; and whose management and daily business operations are controlled by one or more women.

(b) Representation. [Complete only if the offeror is a women-owned business concern

and has not represented itself as a small business concern in paragraph (b)(1) of FAR 52.219-1, Small Business Program Representations, of this solicitation.] The offeror represents that it * is a women-owned business concern.

(End of provision)

DFARS 252.204-7001 COMMERCIAL AND GOVERNMENT ENTITY (CAGE) CODE REPORTING (Aug 1999)

(a) The offeror is requested to enter its CAGE code on its offer in the block with its name and address. The CAGE code entered must be for that name and address. Enter "CAGE" before the number.

(b) If the offeror does not have a CAGE code, it may ask the Contracting Officer to request one from the Defense Logistics information Service (DLIS). The Contracting Officer will—

(1) Ask the Contractor to complete section B of a DD Form 2051, Request for Assignment of a Commercial and Government Entity (CAGE) Code;

(2) Complete section A and forward the form to DLIS; and

(3) Notify the Contractor of its assigned CAGE code.

(c) Do not delay submission of the offer pending receipt of a CAGE code.

(End of Provision)

FAR52.209-5 CERTIFICATION REGARDING DEBARMENT, SUSPENSION, PROPOSED DEBARMENT, AND OTHER RESPONSIBILITY MATTERS (Mar 1996)
(Applicable if contract is expected to exceed the Simplified Acquisition Threshold (SAT).)

(a) (1) The Offeror certifies, to the best of its knowledge and belief, that --

(i) The Offeror and /or any of its principals --

(A) Have [ ] are not [ ] presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any Federal agency;

(B) Have [ ] have not [ ], within a three-year period preceding this offer, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, state, or local) contract or subcontract; violation of Federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, or receiving stolen property; and

(C) Are [ ] are not [ ] presently indicted for, or otherwise criminally or civilly charged by a governmental entity with, commission of any of the offenses enumerated in subdivision (a)(1)(i)(B) of this provision.

(ii) The Offeror has [ ] has not [ ], within a three-year period preceding this offer, had one or more contracts terminated for default by any Federal agency.

(2) "Principals," for the purposes of this certification, means officers; directors; owners; partners; and, persons having primary management or supervisory responsibilities within a business entity (e.g., general manager; plant manager; head of a subsidiary, division, or business segment, and similar positions).

THIS CERTIFICATION CONCERNS A MATTER WITHIN THE JURISDICTION OF AN AGENCY OF THE UNITED STATES AND THE MAKING OF A FALSE, FICTITIOUS, OR FRAUDULENT CERTIFICATION MAY RENDER THE MAKER SUBJECT TO PROSECUTION UNDER SECTION 1001, TITLE 18, UNITED STATES CODE.

(b) The Offeror shall provide immediate written notice to the Contracting Officer if, at any time prior to contract award, the Offeror learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

(c) A certification that any of the items in paragraph (a) of this provision exists will not necessarily result in withholding of an award under this solicitation. However, the certification will be considered in connection with a determination of the Offeror's responsibility. Failure of the Offeror to furnish a certification or provide such additional information as requested by the Contracting Officer may render the Offeror nonresponsive.

(d) Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by paragraph (a) of this provision. The knowledge and information of an Offeror is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

(e) The certification in paragraph (a) of this provision is a material representation of fact upon which reliance was placed when making award. If it is later determined that the Offeror knowingly rendered an erroneous certification, in addition to other remedies available to the Government, the Contracting officer may terminate the contract resulting from this solicitation for default.

(End of Provision)

DFARS 252.209-7001 DISCLOSURE OF OWNERSHIP OR CONTROL BY THE GOVERNMENT OF A TERRORIST COUNTRY (Mar 1998)
(Applicable if contract is expected to exceed $100,000.)

a) Definitions. As used in this provision-

(1) "Government of a terrorist country" includes the state and the government of

a terrorist country, as well as any political subdivision, agency, or instrumentality thereof.

(2) "Terrorist country" means a country determined by the Secretary of State, under section 6(j)(1)(A) of the Export Administration Act of 1979 (50 U.S.C. App. 2405(j)(i)(A)), to be a country the government of which has repeatedly provided support for acts of international terrorism. As of the date of this provision, terrorist countries include: Cuba, Iran, Iraq, Libya, North Korea, Sudan, and Syria.

(3) "Significant interest" means-

(i) Ownership of or beneficial interest in 5 percent or more of the firm's or subsidiary's securities. Beneficial interest includes holding 5 percent or more of any class of the firm's securities in "nominee shares," "street names," or some other method of holding securities that does not disclose the beneficial owner;

(ii) Holding a management position in the firm, such as a director or officer;

(iii) Ability to control or influence the election, appointment, or tenure of directors or officers in the firm;

(iv) Ownership of 10 percent or more of the assets of a firm such as equipment, buildings, real estate, or other tangible assets of the firm; or

(v) Holding 50 percent or more of the indebtedness of a firm.

(b) Prohibition on award. In accordance with 10 U.S.C. 2327, no contract may be awarded to a firm or a subsidiary of a firm if the government of a terrorist country has a significant interest in the firm or subsidiary or, in the case of a subsidiary, the firm that owns the subsidiary, unless a waiver is granted by the Secretary of Defense.

(c) Disclosure. If the government of a terrorist country has a significant interest in the Offeror or a subsidiary of the Offeror, the Offeror shall disclose such interest in an attachment to its offer. If the Offeror is a subsidiary, it shall also disclose any significant interest the government of a terrorist country has in any firm that owns or controls the subsidiary. The disclosure shall include-

(1) Identification of each government holding a significant interest; and

(2) A description of the significant interest held by each government.

(End of provision)

DFARS 252.209-7002 DISCLOSURE OF OWNERSHIP OR CONTROL BY A FOREIGN GOVERNMENT (Sep 1994)

(Applicable if access to proscribed information is necessary for contract performance.)

(a) Definitions. As used in this provision --

(1) "Effectively owned or controlled" means that a foreign government or any entity controlled by a foreign government has the power, either directly or indirectly, whether exercised or exercisable, to control the election, appointment, or tenure of the Offeror's officers or a majority of the Offeror's board of directors by any means, e.g., ownership, contract, or operation of law (or equivalent power for unincorporated organizations).

(2) "Entity controlled by a foreign government" --

(i) Means --

(A) Any domestic or foreign organization or corporation that is effectively owned or controlled by a foreign government; or

(B) Any individual acting on behalf of a foreign government.

(ii) Does not include an organization or corporation that is owned, but is not controlled, either directly or indirectly, by a foreign government if the ownership of that organization or corporation by that foreign government was effective before October 23, 1992.

(3) "Foreign government" includes the state and the government of any country (other than the United States and its possessions and trust territories) as well as any political subdivision agency, or instrumentality thereof.

(4) "Proscribed information" means --

(i) Top Secret information;

(ii) Communications Security (COMSEC) information, except classified keys used to operate secure telephone units (STU IIIs);

(iii) Restricted Data as defined in the U.S. Atomic Energy Act of 1954, as amended;

(iv) Special Access Program (SAP) information; or

(v) Sensitive Compartmented Information (SCI).

(b) Prohibition on award. No contract under a national security program may be awarded to an entity controlled by a foreign government if that entity requires access to proscribed information to perform the contract, unless the Secretary of Defense or a designee has waived application of 10 U.S.C. 2536(a).

(c) Disclosure. The Offeror shall disclose any interest a foreign government has in

the Offeror when that interest constitutes control by a foreign government as defined in this provisions. If the Offeror is a subsidiary, it shall also disclose any reportable interest a foreign government has in any entity that owns or controls the subsidiary, including reportable parents, and the ultimate parent. Use separate paper as needed, and provide the information in the following format:

- Offeror's Point of Contact for questions about Disclosure (Name and Phone Number with Country Code, City Code and Area Code, as applicable)
- Name and Address of Offeror
- Name and Address of Entity Controlled by a Foreign Government
- Description of Interest, Ownership Percentage, and Identification of Foreign Government

(End of Provision)

FAR 52.215-6 PLACE OF PERFORMANCE (Oct 1997)

As prescribed in 15.209(f), insert the following provision:

(a) The offeror or respondent, in the performance of any contract resulting from this solicitation, intends, does not intend [check applicable block] to use one or more plants or facilities located at a different address from the address of the offeror or respondent as indicated in this proposal or response to request for information.

(b) If the offeror or respondent checks "intends" in paragraph (a) of this provision, it shall insert in the following spaces the required information:

Place of Performance (Street Address, City, State, County, Zip Code)	Name and Address of Owner and Operator of the Plant or Facility if Other Than Offeror or Respondent

(End of Provision)

FAR 52.219-I SMALL BUSINESS PROGRAM REPRESENTATIONS (Apr 2002)

(a) (1) The North American Industry Classification System (NAICS) code for this acquisition is _____ [insert NAICS code].

(2) The small business size standard is _____ [insert size standard].

(3) The small business size standard for a concern which submits an offer in its own name, other than on a construction or service contract, but which proposes to furnish a product which it did not itself manufacture, is 500 employees.

(b) Representations.

(1) The offeror represents as part of its offer that it * is, * is not a small business concern.

(2) [Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.] The offeror represents, for general statistical purposes, that it * is, * is not, a small disadvantaged business concern as defined in 13 CFR 124.1002.

(3) [Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.] The offeror represents as part of its offer that it * is, * is not a women-owned small business concern.

(4) [Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.] The offferor represents as part of its offer that it * is, * is not a veteran-owned small business concern.

(5) [Complete only if the offeror represented itself as a veteran-owned small business concern in paragraph (b)(4) of this provision.] The offeror represents as part of its offer that is * is, * is not a service-disabled veteran-owned small business concern.

(6) [Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.] The offeror represents, as part of its offer, that -

(i) It * is, * is not a HUBZone small business concern listed, on the date of this representation, on the List of Qualified HUBZone Small Business Concerns maintained by the Small Business Administration, and no material change in ownership and control, principal office, or HUBZone employee percentage has occurred since it was certified by the Small Business Administration in accordance with 13 CFR part 126; and

(ii) It * is, * is not a joint venture that complies with the requirements of 13 CFR part 126, and the representation in paragraph (b)(6)(i) of this provision is accurate of the HUBZone small business concern or concerns that are participating in the joint venture. [The offeror shall enter the name or names of the HUBZone small business concern or concerns that are participating in the joint venture: _____.] Each HUBZone small business concern participating in the joint venture shall submit a separate signed copy of the HUBZone representation.

(7) [Complete if offeror represented itself as disadvantaged in paragraph (b)(2) of this provision.] The offeror shall check the category in which its ownership falls:

___ Black American.

___ Hispanic American.

___ Native American (American Indians, Eskimos, Aleuts, or Native Hawaiians).

___ Asian-Pacific American (persons with origins from Burma, Thailand, Malaysia, Indonesia, Singapore, Brunei, Japan, China, Taiwan, Laos, Cambodia (Kampuchea), Vietnam, Korea, The Philippines, U.S. Trust Territory of the Pacific Islands (Republic of Palau), Republic of the Marshall Islands, Federated States of Micronesia, the Commonwealth of the Northern Mariana Islands, Guam, Samoa, Macao, Hong Kong, Fiji, Tonga, Kiribati, Tuvalu, or Nauru).

___ Subcontinent Asian (Asian-Indian) American (persons with origins from India, Pakistan, Bangladesh, Sri Lanka, Bhutan, the Maldives Islands, or Nepal).

___ Individual/concern, other than one of the preceding.

(c) Definitions. As used in this provision--

"Service-disabled veteran-owned small business concern"-

(1) Means a small business concern-

(i) Not less than 51 percent of which is owned by one or more service-disabled veterans or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more service-disabled veterans; and

(ii) The management and daily business operations of which are controlled by one or more service-disabled veterans or, in the case of a veteran with permanent and severe disability, the spouse or permanent caregiver of such veteran.

(2) Service-disabled veteran means a veteran, as defined in 38 U.S.C. 101(2), with a disability that is service-connected, as defined in 38 U.S.C. 101(16).

"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 in 13 CFR Part 121 and the size standard in paragraph (a) of this provision.

"Veteran-owned small business concern" means a small business concern-

(1) Not less than 51 percent of which is owned by one or more veterans (as defined at 38 U.S.C. 101(2)) or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more veterans; and

(2) The management and daily business operations of which are controlled by one or more veterans.

"Women-owned small business concern," means a small business concern --

(1) That is at least 51 percent owned by one or more women; or, in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and

(2) Whose management and daily business operations are controlled by one or more women.

(d) Notice.

(1) If this solicitation is for supplies and has been set aside, in whole or in part, for small business concerns, then the clause in this solicitation providing notice of the set-aside contains restrictions on the source of the end items to be furnished.

(2) Under 15 U.S.C. 645(d), any person who misrepresents a firm's status as a small, HUBZone small, small disadvantaged, or women-owned small business concern in order to obtain a contract to be awarded under the preference programs established pursuant to section 8(a), 8(d), 9, or 15 of the Small Business Act or any other provision of Federal law that specifically references section 8(d) for a definition of program eligibility, shall --

(i) Be punished by imposition of fine, imprisonment, or both;

(ii) Be subject to administrative remedies, including suspension and debarment; and

(iii) Be ineligible for participation in programs conducted under the authority of the Act.

(End of Provision)

FAR 52.222-22 PREVIOUS CONTRACTS AND COMPLIANCE REPORTS (Feb 1999)

The offeror represents that--

(a) It [ ] has, [ ] has not participated in a previous contract or subcontract subject the Equal Opportunity clause of this solicitation;

(b) It [ ] has, [ ] has not filed all required compliance reports; and

(c) Representations indicating submission of required compliance reports, signed by proposed subcontractors, will be obtained before subcontract awards.

(End of provision)

FAR 52.222-25 AFFIRMATIVE ACTION COMPLIANCE (Apr 1984)

The offeror represents that --

(a) It * has developed and has on file, * has not developed and does not have on file, at each establishment, affirmative action programs required by the rules and regulations of the Secretary of Labor (41 CFR 60-1 and 60-2); or

(b) It * has not previously had contracts subject to the written affirmative action programs requirement of the rules and regulations of the Secretary of Labor.

(End of Provision)

FAR 52.222-38 COMPLIANCE WITH VETERANS' EMPLOYMENT REPORTING REQUIREMENTS (Dec 2001**) (Applicable when contract is expected to exceed SAT)**

By submission of its offer, the offeror represents that, if it is subject to the reporting requirements of 38 U.S.C. 4212(d) (*i.e.*, if it has any contract containing Federal Acquisition Regulation clause 52.222-37, Employment Reports on Special Disabled Veterans, Veterans of the Vietnam Era, and Other Eligible Veterans), it has submitted the most recent VETS-100 Report required by that clause.

(End of provision)

FAR 52.223-13 CERTIFICATION OF TOXIC CHEMICAL RELEASE REPORTING (Oct 2000) **(Applicable when contract is expected to exceed $100,000.00)**

(a) Submission of this certification is a prerequisite for making or entering into this contract imposed by Executive Order 12969, August 8, 1995.

(b) By signing this offer, the offeror certifies that --

(1) As the owner or operator of facilities that will be used in the performance of this contract that are subject to the filing and reporting requirements described in section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) (42 U.S.C. 11023) and section 6607 of the Pollution Prevention Act of 1990 (PPA) (42 U.S.C. 13106), the offeror will file and continue to file for such facilities for the life of the contract the Toxic Chemical Release Inventory Form (Form R) as described in sections 313(a) and (g) of EPCRA and section 6607 of PPA; or

(2) None of its owned or operated facilities to be used in the performance of this contract is subject to the Form R filing and reporting requirements because each such facility is exempt for at least one of the following reasons: [Check each block that is applicable.]

* (i) The facility does not manufacture, process, or otherwise use any toxic chemicals listed under section 313(c) of EPCRA, 42 U.S.C. 11023(c);

* (ii) The facility does not have 10 or more full-time employees as specified in

section 313(b)(1)(A) of EPCRA, 42 U.S.C. 11023(b)(1)(A);

* (iii) The facility does not meet the reporting thresholds of toxic chemicals established under section 313(f) of EPCRA, 42 U.S.C. 11023(f) (including the alternate thresholds at 40 CFR 372.27, provided an appropriate certification form has been filed with EPA);

* (iv) The facility does not fall within Standard Industrial Classification Code (SIC) major groups 20 through 39 or their corresponding North American Industry Classification System (NAICS) sectors 31 through 33; or

* (v) The facility is not located within any State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, Guam, American Samoa, the United States Virgin Islands, the Northern Mariana Islands, or any other territory or possession over which the United States has jurisdiction.

(End of Provision)

FAR 52.226-2 HISTORICALLY BLACK COLLEGE OR UNIVERSITY AND MINORITY INSTITUTION REPRESENTATION (May 2001)

(a) Definitions. As used in this provision --

"Historically Black College or University" means an institution determined by the Secretary of Education to meet the requirements of 34 CFR 608.2. For the Department of Defense, the National Aeronautics and Space Administration, and the Coast Guard, the term also includes any nonprofit research institution that was an integral part of such a college or university before November 14, 1986.

"Minority Institution" means an institution of higher education meeting the requirements of Section 1046(3) of the Higher Education Act of 1965 (20 U.S.C. 1067k, including a Hispanic-serving institution of higher education, as defined in Section 316(b)(1) of the Act (20 U.S.C. 1101a)).

(b) Representation. The offeror represents that it --

* is * is not a historically black college or university;

* is * is not a minority institution.

(End of Provision)

FAR 52.227-6 ROYALTY INFORMATION (Apr 1984)

(a) Cost or charges for royalties. When the response to this solicitation contains costs or charges for royalties totaling more than $250, the following information shall be included in the response relating to each separate item of royalty or license fee:

(1) Name and address of licensor.

(2) Date of license agreement.

(3) Patent numbers, patent application serial numbers, or other basis on which the royalty is payable.

(4) Brief description, including any part or model numbers of each contract item or component on which the royalty is payable.

(5) Percentage or dollar rate of royalty per unit.

(6) Unit price of contract item.

(7) Number of units.

(8) Total dollar amount of royalties.

(b) Copies of current licenses. In addition, if specifically requested by the Contracting Officer before execution of the contract, the offeror shall furnish a copy of the current license agreement and an identification of applicable claims of specific patents.

(End of Provision)

FAR 52.227-7 PATENTS-NOTICE OF GOVERNMENT LICENSEE (Apr 1984)

The Government is obligated to pay a royalty applicable to the proposed acquisition because of a license agreement between the Government and the patent owner. The patent number is ____ [Contracting Officer fill in], and the royalty rate is ____ [Contracting Officer fill in]. If the offeror is the owner of, or a licensee under, the patent, indicate below:

* Owner

* Licensee

If an offeror does not indicate that it is the owner or a licensee of the patent, its offer will be evaluated by adding thereto an amount equal to the royalty.

(End of Provision)

FAR 52.227-15 REPRESENTATION OF LIMITED RIGHTS DATA AND RESTRICTED COMPUTER SOFTWARE (May 1999)

(a) This solicitation sets forth the work to be performed if a contract award results, and the Government's known delivery requirements for data (as defined in FAR 27.401). Any resulting contract may also provide the Government the option to order additional data under the Additional Data Requirements clause at 52.227-16 of the FAR, if included in the contract. Any data delivered under the resulting contract will be subject to the Rights in Data--General clause at 52.227-14 that is to be included in this contract. Under the latter clause, a Contractor may withhold from delivery data that qualify as limited rights data or restricted computer software, and deliver form, fit, and function data in lieu thereof. The latter clause also may be used with its Alternates II and/or III to obtain delivery of limited rights data or restricted

computer software, marked with limited rights or restricted rights notices, as appropriate. In addition, use of Alternate V with this latter clause provides the Government the right to inspect such data at the Contractor's facility.

(b) As an aid in determining the Government's need to include Alternate II or Alternate III in the clause at 52.227-14, Rights in Data--General, the offeror shall complete paragraph (c) of this provision to either state that none of the data qualify as limited rights data or restricted computer software, or identify, to the extent feasible, which of the data qualifies as limited rights data or restricted computer software. Any identification of limited rights data or restricted computer software in the offeror's response is not determinative of the status of such data should a contract be awarded to the offeror.

(c) The offeror has reviewed the requirements for the delivery of data or software and states [*offeror check appropriate block*]--

* None of the data proposed for fulfilling such requirements qualifies as limited rights data or restricted computer software.

* Data proposed for fulfilling such requirements qualify as limited rights data or restricted computer software and are identified as follows:

_____

_____

_____

Note: "Limited rights data" and "Restricted computer software" are defined in the contract clause entitled "Rights in Data--General."

(End of provision)

DFARS 252.227-7036 DECLARATION OF TECHNICAL DATA CONFORMITY (Jan 1997)

All technical data delivered under this contract shall be accompanied by the following written declaration:

The Contractor, _____, hereby declares that, to the best of its knowledge and belief, the technical data delivered herewith under Contract No. _____ is complete, accurate, and complies with all requirements of the contract.

Date: _____
Name and Title of Authorized Official: _____

(End of clause)

FAR52.230-1 (Jun 2000) COST ACCOUNTING STANDARDS NOTICES AND CERTIFICATION

(Applicable if proposed contract subject to CAS as specified in 48 CFR.)

Note: This notice does not apply to small businesses or foreign governments. This notice is in three parts, identified by Roman numerals I through III.

Offerors shall examine each part and provide the requested information in order to determine Cost Accounting Standards (CAS) requirements applicable to any resultant contract.

If the offeror is an educational institution, Part II does not apply unless the contemplated contract will be subject to full or modified CAS coverage pursuant to 48 CFR 9903.201-2(c)(5) or 9903.201-2(c)(6), respectively.

I. Disclosure Statement--Cost Accounting Practices and Certification

(a) Any contract in excess of $500,000 resulting from this solicitation will be subject to the requirements of the Cost Accounting Standards Board (48 CFR Chapter 99), except for those contracts which are exempt as specified in 48 CFR 9903.201-1.

(b) Any offeror submitting a proposal which, if accepted, will result in a contract subject to the requirements of 48 CFR Chapter 99 must, as a condition of contracting, submit a Disclosure Statement as required by 48 CFR 9903.202. When required, the Disclosure Statement must be submitted as a part of the offeror's proposal under this solicitation unless the offeror has already submitted a Disclosure Statement disclosing the practices used in connection with the pricing of this proposal. If an applicable Disclosure Statement has already been submitted, the offeror may satisfy the requirement for submission by providing the information requested in paragraph (c) of Part I of this provision.

Caution: In the absence of specific regulations or agreement, a practice disclosed in a Disclosure Statement shall not, by virtue of such disclosure, be deemed to be a proper, approved, or agreed-to practice for pricing proposals or accumulating and reporting contract performance cost data.

(c) Check the appropriate box below:

* (1) *Certificate of Concurrent Submission of Disclosure Statement*. The offeror hereby certifies that, as a part of the offer, copies of the Disclosure Statement have been submitted as follows:

(i) Original and one copy to the cognizant Administrative Contracting Officer (ACO) or cognizant Federal agency official authorized to act in that capacity (Federal official), as applicable; and

(ii) One copy to the cognizant Federal auditor.

(Disclosure must be on Form No. CASB DS-1 or CASB DS-2, as applicable. Forms may be obtained from the cognizant ACO or Federal official and/or from the loose-leaf version of the Federal Acquisition Regulation.)

Date of Disclosure Statement: _____ Name and Address of Cognizant ACO

or Federal Official Where Filed: _____

The offeror further certifies that the practices used in estimating costs in pricing this proposal are consistent with the cost accounting practices disclosed in the Disclosure Statement.

* (2) *Certificate of Previously Submitted Disclosure Statement*. The offeror hereby certifies that the required Disclosure Statement was filed as follows:

Date of Disclosure Statement: _____ Name and Address of Cognizant ACO or Federal Official Where Filed: _____

The offeror further certifies that the practices used in estimating costs in pricing this proposal are consistent with the cost accounting practices disclosed in the applicable Disclosure Statement.

* (3) *Certificate of Monetary Exemption*. The offeror hereby certifies that the offeror, together with all divisions, subsidiaries, and affiliates under common control, did not receive net awards of negotiated prime contracts and subcontracts subject to CAS totaling $50 million or more in the cost accounting period immediately preceding the period in which this proposal was submitted. The offeror further certifies that if such status changes before an award resulting from this proposal, the offeror will advise the Contracting Officer immediately.

* (4) *Certificate of Interim Exemption*. The offeror hereby certifies that (i) the offeror first exceeded the monetary exemption for disclosure, as defined in (3) of this subsection, in the cost accounting period immediately preceding the period in which this offer was submitted and (ii) in accordance with 48 CFR 9903.202-1, the offeror is not yet required to submit a Disclosure Statement. The offeror further certifies that if an award resulting from this proposal has not been made within 90 days after the end of that period, the offeror will immediately submit a revised certificate to the Contracting Officer, in the form specified under subparagraph (c)(1) or (c)(2) of Part I of this provision, as appropriate, to verify submission of a completed Disclosure Statement.

Caution: Offerors currently required to disclose because they were awarded a CAS-covered prime contract or subcontract of $50 million or more in the current cost accounting period may not claim this exemption (4). Further, the exemption applies only in connection with proposals submitted before expiration of the 90-day period following the cost accounting period in which the monetary exemption was exceeded.

II. Cost Accounting Standards--Eligibility for Modified Contract Coverage

If the offeror is eligible to use the modified provisions of 48 CFR 9903.201-2(b) and elects to do so, the offeror shall indicate by checking the box below. Checking the box below shall mean that the resultant contract is subject to the Disclosure and Consistency of Cost Accounting Practices clause in lieu of the Cost Accounting Standards clause.

* The offeror hereby claims an exemption from the Cost Accounting Standards clause under the provisions of 48 CFR 9903.201-2(b) and certifies that the offeror is eligible for use of the Disclosure and Consistency of Cost Accounting Practices clause because during the cost accounting period immediately preceding the period in which this proposal was submitted, the

offeror received less than $50 million in awards of CAS-covered prime contracts and subcontracts. The offeror further certifies that if such status changes before an award resulting from this proposal, the offeror will advise the Contracting Officer immediately.

Caution: An offeror may not claim the above eligibility for modified contract coverage if this proposal is expected to result in the award of a CAS-covered contract of $50 million or more or if, during its current cost accounting period, the offeror has been awarded a single CAS-covered prime contract or subcontract of $50 million or more.

III. Additional Cost Accounting Standards Applicable to Existing Contracts

The offeror shall indicate below whether award of the contemplated contract would, in accordance with subparagraph (a)(3) of the Cost Accounting Standards clause, require a change in established cost accounting practices affecting existing contracts and subcontracts.

* yes * no

(End of provision)

FAR 52.242-4 CERTIFICATION OF FINAL INDIRECT COSTS (JAN 1997)

(a) The Contractor shall --

(1) Certify any proposal to establish or modify final indirect cost rates;

(2) Use the format in paragraph (c) of this clause to certify; and

(3) Have the certificate signed by an individual of the Contractor's organization at a level no lower than a vice president or chief financial officer of the business segment of the Contractor that submits the proposal.

(b) Failure by the Contractor to submit a signed certificate, as described in this clause, may result in final indirect costs at rates unilaterally established by the Contracting Officer.

(c) The certificate of final indirect costs shall read as follows:

CERTIFICATE OF INDIRECT COSTS

This is to certify that I have reviewed this proposal to establish final indirect cost rates and to the best of my knowledge and belief:

1. All costs included in this proposal _____ ***(identify proposal and date***) to establish final indirect cost rates for _____ ***(identify period covered by rate***) are allowable in accordance with the cost principles of the Federal Acquisition Regulation (FAR) and its supplements applicable to those contracts to which the final indirect cost rates will apply; and

2. This proposal does not include any costs, which are expressly unallowable under applicable cost principles of the FAR or its supplements.

FIRM: _____

SIGNATURE: _____

NAME OF CERTIFYING OFFICIAL: _____

TITLE: _____

DATE OF EXECUTION: _____

(End of Clause)

DFARS 252.204-7004 REQUIRED CENTRAL CONTRACTOR REGISTRATION --(Nov 2001)

(a) Definitions. As used in this clause-

(1) "Central Contractor Registration (CCR) database" means the primary DoD repository for contractor information required for the conduct of business with DoD.

(2) "Data Universal Number System (DUNS) number" means the 9-digit number assigned by Dun and Bradstreet Information Services to identify unique business entities.

(3) "Data Universal Numbering System +4 (DUNS+4) number" means the DUNS number assigned by Dun and Bradstreet plus a 4-digit suffix that may be assigned by a parent (controlling) business concern. This 4-digit suffix may be assigned at the discretion of the parent business concern for such purposes as identifying subunits or affiliates of the parent business concern.

(4) "Registered in the CCR database" means that all mandatory information, including the DUNS number or the DUNS+4 number, if applicable, and the corresponding Commercial and Government Entity (CAGE) code, is in the CCR database; the DUNS number and the CAGE code have been validated; and all edits have been successfully completed.

(b)(1) By submission of an offer, the offeror acknowledges the requirement that a prospective awardee must be registered in the CCR database prior to award, during

performance, and through final payment of any contract resulting from this solicitation, except for awards to foreign vendors for work to be performed outside the United States.

(2) The offeror shall provide its DUNS or, if applicable, its DUNS+4 number with its offer, which will be used by the Contracting Officer to verify that the offeror is registered in the CCR database.

(3) Lack of registration in the CCR database will make an offeror ineligible for award.

(4) DoD has established a goal of registering an applicant in the CCR database within 48 hours after receipt of a complete and accurate application via the Internet. However, registration of an applicant submitting an application through a method other than the Internet may take up to 30 days. Therefore, offerors that are not registered should consider applying for registration immediately upon receipt of this solicitation.

(c) The Contractor is responsible for the accuracy and completeness of the data within the CCR, and for any liability resulting from the Government's reliance on inaccurate or incomplete data. To remain registered in the CCR database after the initial registration, the Contractor is required to confirm on an annual basis that its information in the CCR database is accurate and complete.

(d) Offerors and contractors may obtain information on registration and annual confirmation requirements by calling 1-888-227-2423, or via the Internet at http://www.ccr.gov.

(End of clause)

252.247-7022 REPRESENTATION OF EXTENT OF TRANSPORTATION BY SEA (AUG 1992) **(Applicable if procurement greater than SAT).**

(a) The Offeror shall indicate by checking the appropriate blank in paragraph (b) of this provision whether transportation of supplies by sea is anticipated under the resultant contract. The term "supplies" is defined in the Transportation of Supplies by Sea clause of this solicitation.

(b) *Representation.* The Offeror represents that it-

_____ Does anticipate that supplies will be transported by sea in the

_____ Does not anticipate that supplies will be transported by sea in the performance of any contract or subcontract resulting from this solicitation.

(c) Any contract resulting from this solicitation will include the Transportation of Supplies by Sea clause. If the Offeror represents that it will not use ocean transportation, the resulting contract will also include the Defense FAR Supplement clause at 252.247-7024, Notification of Transportation of Supplies by Sea.

(End of provision)

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