BROAD AGENCY ANNOUNCEMENT
W912HZ-14-BAA-01

U.S. ARMY ENGINEER
RESEARCH AND DEVELOPMENT CENTER
(ERDC)

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For technical questions, contact the technical personnel listed at the end of each topic area. PREPARATION INSTRUCTIONS AND ADDRESSES SHOWN IN PART III.

For more information about ERDC visit our website at: http://www.erdc.usace.army.mil/

INTRODUCTION

The U.S. Army Engineer Research and Development Center (ERDC) includes the Coastal and Hydraulics Lab (CHL), the Geotechnical and Structures Lab (GSL), the Environmental Lab (EL) and the Information Technology Lab (ITL) in Vicksburg, Mississippi, the Cold Regions Research and Engineering Lab (CRREL) in Hanover, New Hampshire, the Construction Engineering Research Lab (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 **(FAR 35.016)** 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. To be eligible for consideration and possible contract award, the

technology or methodology shall be either basic research, applied research, advanced technology development not for a specific system/hardware, or demonstration and validation. 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. Resulting agreements may be in the form of purchase orders, contracts, grants, or cooperative agreements depending upon the specifics of the effort, such as extent of Government involvement, actual scope of work, and cost.

This guide constitutes the BAA of this Command and conforms to 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. This guide is also posted on www.Grants.gov.

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. 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. These contracts will be written in accordance with the Contract Student Regulation as regards pay, GPA requirements, place of performance and every other requirement or statement within the regulation.

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 submit 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.

Proposals submitted under the BAA should clearly identify within the proposal any research that is expected to be fundamental in nature as defined in National Security Defense Directive 189. Fundamental research means basic and applied research in science and engineering, the results of which ordinarily are published and shared broadly within the scientific community, as distinguished from proprietary research and from industrial development, design, production, and product utilization, the results of which ordinarily are restricted for proprietary or national security reasons.

Federally Funded Research and Development Centers (FFRDCs) and Government entities (Government/National laboratories, military educational institutions, etc.) are subject to applicable direct competition limitations and cannot propose to this BAA in any capacity unless they meet the following conditions. FFRDCs must clearly demonstrate that the work is not otherwise available from the private sector AND they also provide a letter on letterhead from their sponsoring organization citing the specific authority establishing their eligibility to propose to government solicitations and compete with industry, and compliance with the associated FFRDC sponsor agreement and terms and conditions. This information is required for FFRDCs proposing to be prime or subcontractors. Government entities must clearly demonstrate that the work is not otherwise available from the private sector and provide written documentation citing the specific statutory authority (as well as, where relevant, contractual authority) establishing their ability to propose to Government solicitations. At the present time, DARPA does not consider 15 U.S.C. 3710a to be sufficient legal authority to show eligibility.

While 10U.S.C. 2539b may be the appropriate statutory starting point for some entities, specific supporting regulatory guidance, together with evidence of agency approval, will still be required to fully establish eligibility. DARPA will consider eligibility submissions on a case-by-case basis; however, the burden to prove eligibility for all team members rests solely with the Proposer.

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 ordnance (UXO). Conservation deals with sustaining the natural 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) conducts research, development, and studies and provides technical assistance and operational support in information technology (IT) and closely related fields, with particular emphasis on the areas of computer-aided interdisciplinary engineering, computer-aided design and drafting, building information modeling, computer-aided facilities management, computer science, high performance computing, advanced computer security, general-purpose computing, and sensor and instrumentation systems. These activities are conducted to support and enable execution of missions of USACE, the Army, and DoD.

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 mission of the COLD REGIONS RESEARCH AND ENGINEERING LABORATORY (CRREL) is to solve interdisciplinary, strategically important problems of the US Army Corps of Engineers, Army, Department of Defense, and the Nation by advancing and applying science and engineering to complex environments, materials, and processes in all seasons and climates, with unique core competencies related to the Earth's cold regions. CRREL provides innovative products and solutions in support of the warfighter, homeland security, environment, infrastructure, and civil works water resources requirements. CRREL's research staff utilizes a multi-disciplinary approach to solve difficult environmental physics and cold regions engineering problems. Technical areas of research include Signature Physics, Terrain Properties and Processes, Biogeochemical Processes in Earth Materials, Environmental Fate and Transport Geochemistry, Maneuver Support and Sustainment, Cold Regions Infrastructure, Water Resources and Geospatial Applications, and Hydrology and Hydraulics.

The TOPOGRAPHIC ENGINEERING CENTER's (TEC) mission is to provide the Warfighter with a superior knowledge of the battlefield. 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. 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 battle space.
- The development of geographic information software that enables reliable, efficient, and secure information management, interoperability and accessibility for various user communities operating globally, each with different needs.
- 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 low echelon combat units with information in near-real-time, enabling rapid response to developing situations in any battle space.
- The development of new and innovative techniques to understand and visualize terrain and battle space 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: Rob McAdory, 601-634-3057; Email: Robert.T.McAdory@usace.army.mil)

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, including wave forces/loads on gates (tainter, miter, etc).

(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: Jackie Pettway, 601-634-2288; Email: Jackie.S.Pettway@usace.army.mil)

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 stream bank 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: Loren Wehmeyer, 601-634-2923; Email: Loren.L.Wehmeyer@usace.army.mil)

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 near shore 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: Eddie Wiggins, 601-634-2471; Email: Charles.E.Wiggins@usace.army.mil)

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 re suspension 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: Richard Styles, 601-634-4065; Email: Richard.Styles@usace.army.mil)

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, structures, and sediment transport analysis and modeling. (Contact: Gary Brown, 601-634-4417; Email: Gary.L.Brown@usace.army.mil)

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: Stacy Howington, 601-634-2939; Email: Stacy.E.Howington@usace.army.mil)

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: Aaron Byrd, 601-634-2473; Email: Aaron.R.Byrd@usace.army.mil))

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: Jeff Lillycrop, 202-761-4229; Email: Jeff.Lillycrop@SAM.usace.army.mil)

J. Coastal Hydrodynamics, Coastal Processes (CHL-10)

Research in shallow water wave estimation; forecasting and hind casting of wind generated waves for oceanic to local regions; wave theory; statistical distribution of wave parameters; simulation of spectral conditions in wave basins; near shore 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: Ty Wamsley, 601-634-2099; Email: Ty.V.Wamsley@usace.army.mil and/or Jackie Pettway, 601-634-2288; Email: Jackie.S.Pettway@usace.army.mil)

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

Sediment shoaling in coastal inlet channels; stability and performance of inlet channels; scour at structures; sediment transport modeling; influence of structures such as jetties and breakwaters on wave, current, and sedimentation processes. Numerical modeling of inlet hydrodynamics and sediment-transport processes. Shoreline evolution modeling and storm erosion of beaches, particularly concerning over wash and breaching near inlets; wind and wave generated sediment transport; sediment budget analysis; coastal and inlet geomorphology; and PC-, workstation-, and mainframe-based automated coastal engineering software (including relational and GIS data bases). (Contact: Julie Rosati, 251-694-3719; Email: Julie.D.Rosati@usace.army.mil)

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 run-up, 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 run-up gage for rough and porous slopes; investigation of attenuation/mooring force models of floating breakwaters; development of materials and techniques to produce high quality breakwater model armor units; analysis of wave run-up 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: Jackie Pettway, 601-634-2288; Email: Jackie.S.Pettway@usace.army.mil)

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

Technologies, instrumentation, and monitoring systems in coastal and riverine settings for collecting, analyzing, and disseminating data related to measurements of coastal waves, surface currents, water levels, water quality, sediment, and wind, primarily in the field, but also in a sediment laboratory; advanced data analysis (spectral and non-spectral) techniques; remote sensing techniques; bed load and suspended sediment transport; monitoring and evaluating technical and structural stability of coastal projects; advanced hydrographic survey

techniques, field measurement of coastal processes; bathymetric survey systems. (Contact: James “Pat” McKinney, 601-634-3754, Email: James.P.McKinney@usace.army.mil)

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: Jackie Pettway, 601-634-2288; Email: Jackie.S.Pettway@usace.army.mil)

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

Sand bypassing systems and equipment; beach fill 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: Tanya Beck, 601-634-2603; Email: Tanya.M.Beck@usace.army.mil)

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: Linda Lillycrop, 202-761-1837; Email: Linda.S.Lillycrop@usace.army.mil)

Q. Marine Transportation Technologies (CHL-17)

1. OBJECTIVE: The USACE has as one of its primary missions to provide safe, reliable, efficient, effective, and environmentally sustainable waterborne transportation

systems for movement of commerce, national security needs, and recreation. To accomplish this mission, the USACE requires R&D to facilitate tracking of vessels on inland waterways (shallow draft) and coastal ports (deep draft). Knowing what vessels are arriving, when, the commodities being carried, etc., will provide lock operators and operations project managers valuable tools to improve safety, efficiency, asset management, and help to make decisions on performance based funding for navigation project maintenance and improvements.

2. DESCRIPTION:

a. Focus. This topic focuses on software that uses the United States Coast Guard's (USCG) Automated Identification Systems (AIS) vessel mounted transmitters which broadcasts a radio signal with the vessels name, position, heading, velocity, and a wide range of other information. Proposals are sought for developing the following:

i. Capability that will take the full suite of standard CG AIS messages and provide them in near real time to the Corps facilities in the immediate area of the vessel.

ii. Capability to allow collection of the full suite of standard AIS messages simultaneously at all pertinent Corps Inland and Deep Draft facilities.

iii. Capability to customize user interface to allow the Corps operations staff to view vessels in the vicinity of the Corps facilities to make decisions on the order in which to allow commercial tows to pass through lock.

iv. Provide the capability for Corps facilities to transmit pertinent information to the vessels in the immediate vicinity of the Corps facilities via AIS.

b. Special Considerations. The level of understanding of AIS technology and signal processing, the number of successful installations of similar AIS software processing capabilities; experience with USCG staff, facilities, regulations and procedures.

(Contract: Jeff Lillycrop, 601-634-2693 or 202-761-4229; Email Jeff.Lillycrop@usace.army.mil)

GEOTECHNICAL AND STRUCTURES LABORATORY

I. Introduction

Research performed by the Geotechnical and Structures Laboratory's (GSL) eight branches consists of investigations in the areas of soil mechanics, engineering geology, geophysics and seismology, earthquake engineering, pavements (both expedient and permanent), mobility and traffic ability 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 ordnance) and to characterize earth media. Research on concrete and cement is predominantly 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: Mr. Chad Gartrell, 601-634-2313, Chad.A.Gartrell@usace.army.mil)

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, detection and monitoring of seepage, nondestructive investigation of archeological sites, location of groundwater, and detection of buried objects; analytical and data-processing techniques, borehole surveys, cross hole seismic imaging, electromagnetic detection of anomalies, seismic surveys, sub bottom profiling, and acoustic impedance surveys; and uses of microgravity. (Contact: Mr. Chad Gartrell, 601-634-2313, Chad.A.Gartrell@usace.army.mil))

C. Mobility of Vehicles (GSL-3)

The Mobility Systems Branch addresses engineering research on the performance of vehicles operating cross country and on-road, and/or 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 counter mobility for battlefield operations and operations other than war. (Contact: Mr. Randolph A. Jones, 601-634-4145; Randolph.A.Jones@usace.army.mil)

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 geo textiles and geo membranes, grid-confining systems, stabilization, dust-control materials and techniques, and advanced binder systems. (Contact: Dr. Gary Anderton, 601-634-2955; Email: Gary.L.Anderton@usace.army.mil)

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 conduits through or beneath levees and other structures; (d) develop improved methods, including risk-based methods for analyzing earth and rock fill 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, and clay shales; earth-rock mixtures, granular filters, cohesive and non cohesive 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 data 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 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, and intersections); (q) predictions of rock mass dredgability; (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 riprap; (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: Mr. Chad Gartrell, 601-634-2313, Chad.A.Gartrell@usace.army.mil)

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; geo hydrology in military and civil applications; including water quality and supply issues; geologic mapping; geologic applications of mathematical techniques and geo statistics; 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 hydro geologic models. (Contact: Mr. Chad Gartrell, 601-634-2313, Chad.A.Gartrell@usace.army.mil)

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, anti-tank ditching, bridge and tunnel demolition, and the breaching of walls, bunkers, levees, and dams.

(Contact: Dr. Larry Lynch, 601-634-2230, Larry.N.Lynch@usace.army.mil and/or Mr. James L. Davis, 601-634-2750; Email: James.L.Davis@usace.army.mil)

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 air blast 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: Dr. Larry Lynch, 601-634-2230, Larry.N.Lynch@usace.army.mil and/or Dr. Gordon McMahon, 601-634-2183; Email: Gordon.W.McMahon@usace.army.mil)

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

The mechanical effects induced by 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: Dr. Larry Lynch, 601-634-2230, Larry.N.Lynch@usace.army.mil and/or Dr. Gordon McMahon, 601-634-2183; Email: Gordon.W.McMahon@usace.army.mil)

J. Geophysical Phenomenology - Multi-Modal Geophysical Phenomenology, Modeling, Data Processing, and Data Management (GSL-10)

The objectives include detecting, classifying, and locating airborne and ground military targets and buried objects using geophysical methods for homeland defense and homeland security applications. Also included are invasive and non-invasive approaches for measuring and quantifying the geophysical/geologic signatures of diverse geo-environments. This can include the development of new and/or improved analytical and numerical models, rapid data-processing techniques, and new subsurface imaging techniques that include active and passive sensor modalities in a variety of rural and urban terrains.

Of particular interest is the broadband propagation of energy including, but not limited to: seismic/acoustic/infrasonic/electromagnetic/ thermal/chemical, under variable conditions using a variety of sensing platforms (fixed, mobile, airborne, space). The development of new tactics, techniques, and procedures for the employment of novel sensing methods as well as the development and/or verification of empirical testing and evaluation techniques is also desirable. Data management and multi-mode integration techniques and platforms are also of interest. (Contact: Mr. Terry Stanton, 601-634-3408, Terry.R.Stanton@usace.army.mil)

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 are the development of dynamic test equipment and techniques and the experimental evaluation of geological and structural material response to high-pressure transient loadings. (Contact: Dr. Larry Lynch, 601-634-2230, Larry.N.Lynch@usace.army.mil)

L. Projectile Penetration (GSL-12)

Theoretical and experimental studies of projectile stresses and trajectories due to impact and penetration into geologic and man-made targets and development of design criteria for shield systems include development of equipment and diagnostic techniques to examine the response of targets to low- and high-velocity impact of penetrators, rods, etc. (Contact: Dr. Larry Lynch, 601-634-2230, Larry.N.Lynch@usace.army.mil)

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, multi-scale, multi-physics and interdisciplinary flow-thermal-structural interactions. This 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: Mr. James L. Davis, 601-634-2750; Email: James.L.Davis@usace.army.mil)

N. Concrete Materials (GSL-14)

Research in this area includes improving the performance of concrete materials and systems. Performance could include very high tensile or compressive strength, high ductility, high fracture toughness, low shrinkage, rapid hardening, very low permeability, resistance to abrasion and erosion durability, chemical resistance, shock-attenuating properties, ultra-low density, thermal insulation properties, workability, and other unique attributes. This includes improvements in the materials typically used in a concrete mixture such as aggregate, cement, and chemical admixtures. Aggregates could include waste and/or manmade materials such as fly ash, silica fume, ground granulated blast-furnace slag, recycled concrete, lightweight aggregates other potentially low cost and/or green materials. Micro- and Nanoscale aggregates, inclusions, pozzolans, cements and reinforcements such as microspheres, nanosilicates, microfibers and low cost nanotubes or nanofibers would also be included in this research area. Chemical admixtures such as water reducers, set retarders, set accelerators, air-entraining admixtures, and foaming and defoaming agents that lend

unique properties would also be considered in this research area. Since reinforcement is a critical element to the ductility and durability of concrete materials, advanced reinforcement materials that enhance these properties fall under this research area. Additionally, this topic area would include research involving nontraditional cement binders including polymer-impregnated concrete, polymer or resin concrete, polymer Portland-cement concrete and geopolymer concretes. (Contact: Christopher Moore, 601-634-3271; Email: Christopher.Moore@usace.army.mil)

O. Concrete Properties and Analysis (GSL-15)

Research in this area if focused on the development of new nondestructive and destructive test methods and analysis techniques to better characterize the properties and performance of concretes and the constituents that they are composed of at scales ranging from the nano-level to the macro-level. There are a vast number of topics in testing and analysis that could be included in this area as related to the physical and chemical properties of aggregates, cements, pozzolans, admixtures, fibers and their interaction during the mixing, placing, curing, and service phases of a concrete. This could include but is not limited to:

1. Developing test methods and analysis techniques to better quantify material properties at aggregate-paste and fiber-paste transition zones.
2. Developing tools, test methods and analysis techniques to non-destructively define the spatial distribution of components in a concrete specimen.
3. Developing better assessment tools and criteria for predicting durability and longevity of concrete and grout.
4. Developing better methods to define and classify chemical admixtures by chemical composition and mechanism of performance.
5. Developing innovative systems to construct concrete materials and structures more economically.
6. Developing theoretical, computational, and experimental methods for effectively characterizing stress, strain, progressive damage, and fracture of engineering materials subjected to static and dynamic loads. (Contact: Mr. Christopher Moore, 601-634-3271; Email: Christopher.Moore@usace.army.mil)

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: Christopher Moore, 601-634-3271; Email: Christopher.Moore@usace.army.mil)

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; water stop 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 of 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: Mr. Christopher Moore, 601-634-3271; Email: Christopher.Moore@usace.army.mil)

R. Bridge Research (GSL-18)

Research is conducted in support of the Army's Bridge Safety and Waterfront Facilities Evaluation Programs. These programs require the design, construction, maintenance, repair and inspection of bridges and ports worldwide as well as other engineering functions as they relate to transportation structures. This involves the formulation of engineering criteria for the design, construction, evaluation, maintenance, and rehabilitation of permanent and expedient bridge and port facilities. Research areas of interest include improved design procedures, material characterization and evaluation, nondestructive testing, rapid repair, scour, unknown material properties, unknown foundations, traffic safety, underwater inspection, fracture critical and fatigue evaluations, load capacity and load ratings. (Contact: Mr. Terry R. Stanton, 601-634-3408; Email: Terry.R.Stanton@usace.army.mil)

S. Structures Research (Civil Works) (GSL-19)

Research is conducted in assessing the performance of critical structures to extreme loads, such as those resulting from seismic, terrorist attack, and storm events, as well as the effects of flow-induced vibrations. Efforts include assessing sensitivity of structural design and analysis procedures, vulnerability of structures, and critical design parameters to develop appropriate load-resistance factors. Techniques for retrofit, including use of new and innovative materials, of structures to resist extreme loads is of interest. Also, a better understanding of long-term behavior and deterioration of civil structures is needed, including factors such as material interactions, thermal stresses, and any issues affecting design of new structures and operation and maintenance of existing structures.

Nonlinear and linear system identification research includes 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 pseudo static loads. (Contact: Dr. Gordon McMahon, 601-634-2183; Email: Gordon.W.McMahon@usace.army.mil)

T. Structures Research (Military) (GSL-20)

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 aboveground 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 semihardened and protected facilities.

c. Analysis of structural loading and damage resulting from internal or external detonations.

d. Development of fast-running models for PC based applications to predict the response of structures, both hardened and unhardened, to single and multiple explosive detonations. (Contact: Mr. James L. Davis, 601-634-2750, Email: James.L.Davis@usace.army.mil and/or Dr. Gordon McMahon, 601-634-2183; Email: Gordon.W.McMahon@usace.army.mil)

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 air blast-induced and direct-induced ground shock from surface and shallow earth-penetrating high-energy sources.

b. Formulation of computer models for SSI and pre- and post-test analysis of structural response to include correlation and comparison with experimental data. (Contact: Mr. James L. Davis, 601-634-2750, James.L.Davis@usace.army.mil)

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 phenomenology’s 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: Mr. James L. Davis, 601-634-2750; Email: James.L.Davis@usace.army.mil)

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 microprocessor-based software/hardware and supporting documentation to aid in the assessment of structural survivability to the effects of conventional and advanced weapons 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 microprocessor-based survivability and structural assessment software/hardware. (Contact: Mr. James L. Davis, 601-634-2750; Email: James.L.Davis@usace.army.mil; and/or Dr. Gordon McMahon, 601-634-2183; Email: Gordon.W.McMahon@usace.army.mil)

5. Composite Materials for Force Protection-Research in this area includes developing, characterizing, modeling, and testing of layered composite materials for protection against airblast and penetration/fragmentation. These materials are intended for use in lightweight expedient protective systems to protect against improvised explosive devices and conventional weapons such as small arms, standoff weapons, fragmenting weapons, and shape charges. It is envisioned that panels of these materials could be incorporated into protective structure designs to increase survivability of personnel or to protect mission-critical assets. Performance measures include such attributes as build

time, low mass, cost, penetration resistance, ductility, and environmental durability. Additionally, this topic area includes methods to develop appropriate material anisotropic and or non-homogeneous material models for incorporation into advanced computational models such as Abaqus, LS-DYNA, and EPIC. Protocols for evaluation and performance testing of composite materials subjected to energetic, high-strain rate events are desired. (Contact: Mr. James L. Davis, 601-634-2750; Email: James.L.Davis@usace.army.mil)

6. Worldwide Construction Practices- This research includes capturing typical construction practices and construction material properties worldwide. Information of interest is material properties of structural components, building types and construction techniques, building footprints, construction timeframe/era of buildings, and location of the building (country, world region, urban terrain zone). (Contact: Mr. James L. Davis, 601-634-2750; Email: James.L.Davis@usace.army.mil)

U. Multispectral Camouflage Research (GSL-21)

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 allied counter-CCD capability against adversaries. Multispectral refers to those areas of the electromagnetic spectrum used by the United States 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 conducting target/background signature measurements; assessing the United States 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 the RDT&E 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. (Contact: Mr. James L. Davis, 601-634-2750; Email: James.L.Davis@usace.army.mil)

V. USACE Reachback Operations Center (GSL-22)

USACE Reachback Operations Center 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; Email: Rhonda.D.Taylor@usace.army.mil)

W. Countermine/Counter Improvised Explosive Device Phenomenology (GSL-23)

This research addresses methods and procedures to develop and demonstrate advanced technologies that support the Army's requirements for improved detection of mines, minefields and improvised explosive devices (IEDs). 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 and surfaced placed 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/target conditions are also of interest. (Contact: Mr. Randolph A. Jones, 601-634-4145; Randolph.A.Jones@usace.army.mil)

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

A. 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: Mr. John Ballard, 601-634-2246; Email: John.H.Ballard@usace.army.mil)

B. Environmental and Military Sensing (EL-2)

1) Research in this area includes basic and applied research to develop environmental sensing, characterization, and monitoring capabilities necessary to quantify environmental site conditions and trends at local and regional scales. In the military area, research is conducted on basic signature research, to better understand target and environmental background signature characteristics.

2) Specific areas of required research include:

a. Development, integration, and application of remote sensing technologies and the use of these data in geospatial models to characterize site conditions over large areas.

b. Development of innovative data fusion approaches, particularly the combined use of hyperspectral and bathymetric and/or topographic LIDAR data for the extraction of environmental information.

c. Research to identify, model, and mitigate the effects of the environment on novel sensing techniques that address environmental and military requirements.

d. Development of ground-based and airborne remote sensing approaches, and associated modeling, for unexploded ordnance detection, minefield detection, military targets and vehicles, and smart weapons development.

e. Rapid collection, analysis, and visualization of sensor data for environmental quality and military applications. (Contact: Mr. Mark R. Graves, 601-634-2557; Email: Mark.R.Graves@usace.army.mil)

CONTAMINATED SITE CHARACTERIZATION, ASSESSMENT & REMEDIATION

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 Technology for Environmental Sensors and Tools. (EL-3)

The EL has an ongoing research program to develop advanced technologies for environmental sensing, characterization, and monitoring in order to quantify environmental conditions at sites of interest. The program is actively developing field-based tools and sensors to conduct rapid site characterization/screening for environmental contaminants. Additional research is needed in the areas of novel sensing technologies for detection of chemical and biological contaminants allowing for rapid field-based data acquisition. Also, research is needed to develop technologies and platforms allowing for rapid data analysis/interpretation/reporting. Fundamental measurements and models that define/predict the performance of new sensing methods in soil, water and air are also of interest. (Contact: Dr. Brandon J. Lafferty, 601-634-3589; Email: Brandon.Lafferty@usace.army.mil)

B. Innovative Technologies for Treating Hazardous Waste and Contaminated Surface and Ground Waters (EL-4)

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); Mr. Chris McGrath or Dr. David Gent (physical-chemical organics), 601-634-4822 or 601-634-4846, respectively; Dr. Heather Smith (bioremediation), 601-634-4216; David Morrow, 601-634-2737, (analytical chemistry methods) Email: David.W.Morrow@usace.army.mil; Mr. Warren Lorentz (environmental risk assessment), 601-634-3750; Email: Warren.P.Lorentz@usace.army.mil)

C. Design, Evaluation, Verification and Modeling of Solid and Hazardous Wastes and Contaminated Sediments (EL-5)

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: Andy Martin, 601-634-3710, Email: Andy.Martin@usace.army.mil

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-6)

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; Email: Todd.S.Bridges@usace.army.mil)

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; Email: Todd.S.Bridges@usace.army.mil))

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. Jeffery Steevens, 601-634-4199, Email: Jeffery.A.Steevens@usace.army.mil)

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: Mr. Warren Lorentz, 601-634-3750; Email: Warren.P.Lorentz@usace.army.mil)

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; Email: Janean.C.Shirley@usace.army.mil)

B. Sediment Water Interactions (EL-7)

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. Mark Chappell, 601-634-2802; Email: mark.A.Chappell@usace.army.mil)

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. (Contact: Dr. Karl Indest, 601-634-2366; Email: Karl J.

Indest@usace.army.mil)

C. Techniques for Contaminated Dredged Material Disposal and Treatment (EL-8)

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: Ms. Trudy Estes, 601-634-2125; Email: Trudy.Estes@usace.army.mil)

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: Ms. Trudy Estes, 601-634- 2125; Email: Trudy.Estes@usace.army.mil)

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; Email: Paul.R.Schroeder@usace.army.mil)

4. Development and/or application of new or improved environmental chemistry methodologies to assess contaminant concentrations of dredged material focusing on costeffectiveness, quality assurance, and lower detection limits. (Contact: Mr. Warren Lorentz, 601-634-3750; Email: Warren.P.Lorentz@usace.army.mil)

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. Trudy Estes, 601-634-2125; Email: Trudy.J.Estes@usace.army.mil)

ENVIRONMENTAL AND 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 (TMDLs), 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

A. Numerical Water Quality and Contaminant Modeling (EL-9)

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; Email: Barry.W.Bunch@usace.army.mil)

*CONSERVATION

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-10)

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. Craig Fischenich, 601-634-3449; Email: Craig.J.Fischenich@usace.army.mil).

B. Freshwater Fishery Investigations (EL-11)

Primary areas of research are predicting environmental impacts of navigation and flood control projects on fishes, freshwater mussels, and other aquatic fauna; benefits of restoring aquatic habitat; conservation of endangered fish and mussel species; evaluating wetland fish communities; management of invasive species movement and colonization; 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 and data analysis capabilities. Demographic and landscape habitat models are anticipated products of this research (Contact: Dr. Jack Killgore, 601-634-3397)

C. Freshwater Macro invertebrate Investigations (EL-12)

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: Tim Lewis, 601-634-2141; Email: Timothy.Lewis@usace.army.mil)

D. Mitigation (EL-13)

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: Jacob Berkowitz, 601-634-5218; Email: Jacob.Berkowitz@usace.army.mil)

E. In Stream Flow Requirements for Aquatic Biota (EL-14)

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. Dave Smith, 601-634-4267; Email: David.L.Smith@usace.army.mil)

F. Behavioral and Structural Fish Barriers (EL-15)

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. David Smith, 601-634-4267; Email: David.L.Smith@usace.army.mil)

G. Fish Guidance and Bypass Systems (EL-16)

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. David Smith, 601-634-4267; Email: David.L.Smith@usace.army.mil)

H. Coastal Ecology (EL-17)

Research topics in coastal ecology include multidisciplinary investigations of the environmental impacts of engineering activities in the coastal zone, such as dredging, redged 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: Deb Shafer, 601-634-3650; Email: Deborah.Shafer@usace.army.mil)

I. Techniques for Designing, Operating and Managing Dredged Material Disposal Facilities and Beneficial Use Projects (EL-18)

1. Refinement and verification of techniques for designing, operating, and managing dredged material disposal areas.
2. 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.
3. 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; Email: Paul.R.Schroeder@usace.army.mil)

ENVIRONMENTAL CRITERA 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 In Stream Habitat Restoration (EL-19)

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. Craig Fischenich, 601-634-3449; Email: Craig.J.Fischenich@usace.army.mil)

B. Assessing Benefits of Channel Modifications (EL-20)

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, lowhead 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. David Smith, 601-634-4267; Email: David.L.Smith@usace.army.mi)

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-21)

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: Ms. Antisa Webb, 601-634-4259; Email: Antisa.C.Webb@usace.army.mil)

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: Dr. Richard Fischer, 502-315-6707;Email: Richard.A.Fischer@usace.army.mil)

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: Ms. Antisa Webb, 601-634-4259; Email: Antisa.C.Webb@usace.army.mil))

A1. Natural Resources Inventories (EL 21-1)

1. OBJECTIVE: Natural Resources Inventories. The USACE has the requirement to conduct research and development for Level I and Level II Inventories and this research includes literature searches, field investigations, data analysis, and development of reports Natural Resources Inventories and Analysis for Fort Peck, Oahe, Garrison, Big Bend, Fort Randall, Gavins Point, Coldbrook, Cottonwood Projects, all on the main-stem of the Missouri River. The study area consists of all lands presently owned by the Corps that is contained within the Projects. This excludes all lands transferred to date to the Cheyenne River Sioux Tribe, Lower Brule Sioux Tribe, and State of South Dakota under Title VI.

2. DESCRIPTION:

a. Focus. This topic focuses on advanced research and development for Level I and Level II Inventories. Proposals are sought for the research, development and execution of any or any combination of the following:

(1) Research and development of Level I Inventories in sufficient detail to determine general plant and animal composition, acreage of dominant vegetative types (such as grasslands, woodlands, and wetlands among others), soil types, land use capabilities, and the presence of "special status species" and/or their critical habitat occurring on project lands and waters. "Special status species" include any species which is listed, or proposed for listing, as threatened or endangered by the U.S. Fish and Wildlife Service (FWS) or National Marine Fisheries Service (NMFS), under the provisions of the Endangered Species Act; any species covered by the Migratory Bird Treaty; any species designated by the FWS as a “candidate” or “listing” species or "sensitive” species; and any species which is listed and protected by State statute in a category implying potential endangerment or extinction. Research and Development for Level I Inventory shall be conducted using available existing information which is eadily available from a variety of sources (e.g., U.S. Geological Survey maps, county soil surveys, U.S. Fish and Wildlife Service, aerial photography, Corps real estate maps, Corps project feasibility documents, State Heritage Offices, etc.).

(2) Research and development of Level II Inventories that are required for the effective development, execution and evaluation of specific natural resources management prescriptions. Detailed inventories for "special status species" are contained in Level II Inventories. Research and development for Level II Inventories shall be conducted at frequencies necessary to determine the existence of any new populations of "special status species" occurring on project lands, or to determine significant changes in the existing population levels of these species. Proposals are encouraged to include:

(A) vegetation acreage classification and quantification, in accordance with the Federal Geographic Data Committee (FGDC) National Vegetation Classification System (NVCS) within the Projects boundary. Development of vegetation classification and quantification:

i. Use 2006 NAIP-USDA imagery for the Projects
ii. Use a 1:24,000 scale for the Projects
iii. Use Spatial Data Standards for Facilities Infrastructure and Environment (SDSFIE) format
iv. Perform Field Verification

(B) wetland acreage classification and quantification, in accordance with the U.S. Fish and Wildlife Service Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979) within the Projects boundary. Development of wetland classification and quantification:

i. Use appropriate scale as determined by source data
ii. Use SDSFIE format

(C) land (soils) capability classification and quantification, as defined by the Natural Resources Conservation Service (NRCS) – land capability classes within the Projects boundary. Development of land classification and quantification:

i. Use appropriate scale as determined by source data
ii. Use Soil Survey Geographic database (SSURGO) structure

(D) special Status Species (Federally listed threatened and endangered species and state protected species) – potential occurrence on project lands within the Projects boundary. Use SDSFIE format.

3. (Contact: Dr. David Price, 601-634-4874; Email: David L. Price@usace.army.mil)

B. Wildlife Resource Management (EL-22)

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: Dr. Richard Fischer, 502-315-6707; Email: Richard.A.Fischer@usace.army.mil)

C. Endangered Species (EL-23)

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: Dr. Richard Fischer, 502-315-6707; Email: Richard.A.Fischer@usace.army.mil)

C.1. Manatee Protection Systems (EL-23-1)

1. OBJECTIVE:
Current techniques for protecting manatees as they swim in and around Corps operational structures, locks, spillways and culverts contain a fundamental flaw which has resulted in a level of manatee taking which is unacceptable. Current protection methods include electronic systems used to detect manatees and prevent mechanical equipment from closing on them as well as physical barriers used to prevent manatees from entering spillways and lock sector gates. While current methods are effective when operational, the status of these systems can’t be determined remotely. Operational readiness can only be determined by visual observation. This results in an inefficient system that is not guaranteed to be operational 100% of the time. Seeking new methods of providing manatee protection is of great importance. By taking advantage of new technology, current methods could be modified to be more cost effective, operationally friendly, and easier to maintain, repair, and upgrade.

2. DESCRIPTION:

Focus: New ways to improve manatee protection and system reliability.

1. Improved physical or electronic systems for culverts
a. Maintenance and operational readiness obtainable without the dewatering of the culvert.
b. Repairs and upgrades cost and time efficient.
2. Advanced methods of monitoring local manatee movement as well as automated critical proximity alerts.
3. Safe and cost effective methods for manatee movement relocation.
4. Update and repair current systems.

5. Constant remote system status monitoring equipped with automated system failure alerts. (Contact: Ms. Dena Dickerson, 601-634-3772; email: Dena.D.Dickerson@usace.army.mil)

D. Waterfowl Resources (EL-24)

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, 502-315-6707; Email: Richard.A.Fischer@usace.army.mil)

E. Wetlands (EL-25)

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. Jacob Berkowitz, 601-634-5218; Email: Jackob.Berkowitz@usace.army.mil)

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.

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 explosives as well as development of unique analytical techniques to identify metals speciation in complex environmental media. These unique capabilities are applied to biological investigations of
toxicity as well as support computational predictions of contaminant behavior. Contact: Mr.

Jacob Berkowitz, 601-634-5218; Email: Jackob.Berkowitz@usace.army.mil)

ENVIRONMENTAL CHEMISTRY

I. Introduction

Environmental chemistry at the EL provides Chemical expertise in the areas of experimental geochemistry, computational, organic, inorganic, materials, and analytical chemistry for the other ERDC researchers and laboratories, for USACE district, Army, and other Department of Defense customers (Contact: Mr. David Morrow, 601-634-2737; Email: David.W.Morrow@usace.army.mil)

II. Research Areas

A. Experimental Chemistry (EL-26)

This team seeks to understand the fate of metals and explosives in the environment by measuring relevant physical properties, and environmental fate and degradation reactions. Ongoing work includes the identification of intermediates in degradation pathways for explosives as well as development of unique analytical techniques to identify metals speciation in complex environmental media. These unique capabilities are applied to behavior. (Contact Dr. Anthony J. Bednar, 601-634-3652; Email: Anthony.J.Bednar@usace.army.mil)

B. Computational Chemistry (EL-27)

This team seeks to understand the fate of contaminants and explosives in the environment by predicting relevant physical properties and by delineating degradation pathways. Ongoing work includes the prediction of rates of reactions for contaminants and explosives and for all intermediates in degradation pathways, and the prediction of vibrational spectra using ab initio quantum chemical and molecular dynamics formalism. QSAR methods are also developed to aid in the prediction of physical properties and in relating the chemical structures of explosives and contaminants to their toxicity. (Contact: Dr. Frances C. Hill, 601-634-4661; Email: Frances.C.Hill@usace.army.mil).

C. Characterization of Emerging Contaminants (EL-28)

This team seeks to investigate interactions of emerging contaminants, including nanomaterials, with environmental matrices. Ongoing projects include synthesis of novel materials and determination of analytical methodologies for adequately characterizing them. Degradation reactions of the materials themselves, but also reactions facilitated by the material surfaces are also of interest. (Contact: Ms. Aimee Poda, 601-634-4003; Email: Aimee.R.Poda@usace.army.mil)

NONINDIGENOUS AQUATIC NUISANCE

Species Management

I. Introduction
In a 1993 report, the U.S. Congress, Office of Technology Assessment estimated that nonindigenous pest species have resulted in U.S. losses of millions to perhaps billions of dollars annually. They reported documented losses of $97 billion between1906-1991. 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) as reauthorized and amended by the National Invasive Species Act of 1996 (PL 104-332) 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-29)

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. 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. Linda Nelson, 601-634-2656; Email:Linda.S.Nelson@usace.army.mil)

1. Aquatic Plant Ecology. Current ecological research on both nonindigenous nuisanceforming 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; Email: Mike.Smart@usace.army.mil)

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: Mr. Bruce M. Sabol, 601-634-2297; Email:Bruce.M.Sabol@usace.army.mil)

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. Michael Grodowitz, 601-634-3182; Email:Michael.J.Grodowitz@usace.army.mil)

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; Email:Kurt.D.Getsinger@usace.army.mil)

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; Email:Mike.Smart@usace.army.mil)

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; Email: Jack.Killgore@usace.army.mil)

1. OBJECTIVE:

The Clark Fork/Pend Oreille River system (Montana, Washington, and Idaho) is infested with Eurasian watermilfoil (Myriophyllum spicatum), curlyleaf pondweed (Potamogeton crispus) and flowering rush (Butomous umbellatus). These species are displacing native plant communities, destroying natural resources and degrading water quality, fish/wildlife habitat, threatened and endangered species habitat, and reducing biodiversity. Prolific growth of these plants is also interfering with water flows, irrigation, potable water intakes, power generation and recreational opportunities. Site-specific and environmentally compatible technologies (e.g. chemical, biological, and mechanical/physical) that can be used to selectively control these invasive plants, protect native vegetation, and improve the ecological and hydrological functions of this system need to be evaluated.

II. DESCRIPTION:

a. Focus. This topic focuses on demonstration and evaluation of environmentally compatible techniques for selective control of the invasive aquatic plants, Eurasian watermilfoil, curly leaf pondweed, and flowering rush in the Clark Fork/Pend Oreille River system. Proposals are sought for development and execution of any or any combination of the following:

(1) Demonstrate and evaluate strategies for selective control of the subject aquatic invasive plants using herbicides and/or plant growth regulators.

a. Chemical formulations considered must be registered by the US Environmental Protection Agency and approved by appropriate state agency for use in aquatic sites (i.e. an aquatic label). All use rates, restrictions, and application guidelines must conform to the language provided on these labels.

b. Pre and post-treatment (6 to 8 wk and 52 wk) assessments of product efficacy on the treated vegetative community (target and non-target plants) should be conducted using a scientifically recognized quantitative method. These assessments should be conducted in treated areas and in untreated (reference) areas situated to preclude contamination from treated areas.

c. Quantification of water-exchange processes should be determined prior to product applications, and must justify herbicide treatment rates. This should ultimately be linked to herbicide efficacy at post-treatment assessment periods, and to potential dissipation of aqueous herbicide residues from treated sites.

d. Real-time monitoring of water quality parameters (e.g. temperature, dissolved oxygen, pH, and turbidity) should be conducted within, and outside of, treated and untreated areas, prior to and after treatments.

e. Projects must be fully coordinated with Federal agencies, tribes, state and local agencies, and other organizations (public or private) that have management jurisdiction over water bodies selected for these demonstrations/evaluations. In addition, aquatic plant control permits must be issued by appropriate agencies for this work.

(2) Demonstrate and evaluate strategies for selective control of the subject aquatic invasive plants using biological control agents.

a. Biological control agents considered must be host-specific to the subject target plants, and approved by Federal, state and local agencies for use in aquatic sites. All agents must adhere to rules and use policies of subject agencies.

b. Pre and post-treatment (6 to 8 wk and 52 wk) assessments of agent efficacy on the vegetative community (target and non-target plants) should be conducted using a scientifically recognized quantitative method. These assessments should be conducted in treated areas and in untreated (reference) areas situated to preclude contamination from treated areas. Also evaluation of populations of agents/organisms (various life stages) should be conducted.
c. Quantification of water-exchange processes should be determined prior to insertion of organisms into treatment areas. This should ultimately be linked to agent efficacy at post-treatment assessment periods, and to potential dispersion of agents from treated sites.

d. Real-time monitoring of water quality parameters (e.g. temperature, dissolved oxygen, pH, and turbidity) should be conducted within, and outside of, treated and untreated areas, prior to and after treatments.

e. Projects must be fully coordinated with Federal agencies, tribes, state and local agencies, and other organizations (public or private) that have management jurisdiction over water bodies selected for these demonstrations/evaluations. In addition, aquatic plant control permits must be issued by appropriate agencies for this work.

(3) Demonstrate and evaluate strategies for selective control of the subject aquatic invasive plants using mechanical or physical methods.

a. Mechanical and physical methods considered must be approved by Federal, state and local agencies for use in aquatic sites. All devices/techniques must adhere to rules and use policies of subject agencies.

b. Pre and post-treatment (6 to 8 wk and 52 wk) assessments of efficacy on the treated vegetative community (target and non-target plants) should be conducted using a scientifically recognized quantitative method. These assessments should be conducted in treated areas and in untreated (reference) areas situated to preclude contamination from treated areas.

c. Quantification of water-exchange processes should be determined prior to product applications, and must justify treatment strategies. This should ultimately be linked to efficacy at post-treatment assessment periods, and to potential dispersion of plant fragments or

propagules from treated sites.

d. Real-time monitoring of water quality parameters (e.g. temperature, dissolved oxygen, pH, and turbidity) should be conducted within, and outside of, treated and untreated areas, prior to and after treatments.

e. Projects must be fully coordinated with Federal agencies, tribes, state and local agencies, and other organizations (public or private) that have management jurisdiction over water bodies selected for these demonstrations/evaluations. In addition, aquatic plant control permits must be issued for this work.

(4) Special Considerations. Evaluation of these methods should provide guidance for operational-scale invasive plant management practices in the Clark Fork/Pend Oreille River system, and similar river systems of the Pacific Northwest Region. Guidance factors should include seasonal timing of management techniques, expected efficacy (within and adjacent to treatment areas) on target vegetation, impacts on desirable non-target vegetation, potential impacts on water quality and threatened and endangered species, and cost effectiveness. (Contact: Dr. Kurt Getsinger, 601-634-2498; email: Kurt.D.Getsinger@usace.army.mil)

B. Aquatic Nuisance Species (EL-30)

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. Timothy Lewis, 601-634-2141; Email: Timothy.E.Lewis@usace.army.mil)

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. Ecological Modeling (EL-32)

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, structuredpopulation 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. Patrick Deliman, 601-634-3623; Email: Patrick.N.Deliman@usace.army.mil)

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 an 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-33)

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; Email:Scott.Jackson@usace.army.mil).

B. User Fees (EL-34)

Investigate and develop automated systems for registration of users, collection and analysis of trends data, and special feature capabilities including differential pricing, reservations, and credit card use in support of camping and day-use recreation fees at Corps of Engineers' recreation sites. Automated systems are designed for on site use of personal computers (Contact: Mr. Scott Jackson, 601-634-2105;Email:Scott.Jackson@usace.army.mil).

C. Economic Impacts of Recreation Management (EL-35)

Advance techniques to assess economic impacts of recreation-resource management and for estimation of use in and beyond developed parks. Investigate and develop regional recreation demand models for application to water resource system studies. (Contact: Mr. Scott Jackson, 601-634-2105; Email: Scott.Jackson@usace.army.mil).

D. Customer Trends and Satisfaction (EL-36)

Improve methods for identification of needs and demands of the using public and for monitoring recreation management to meet expectations of the public. (Contact: Mr. Scott Jackson, 601-634-2105; Email: scott.Jackson@usace.army.mil).

E. Insect Pest Management (EL-37)

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; Email: Al.F.Cofrancesco@usace.army.mil).

INFORMATION TECHNOLOGY LABORATORY

Research Areas

A. Computational Science and Engineering (ITL-1)

Research in computer-aided interdisciplinary engineering; scientific and engineering (S&E) software development and interoperability; and numerical analysis is conceived, planned, managed, conducted, coordinated, and applied to support ERDC R&D programs and related reimbursable projects. ITL collaborates with researchers in the DoD High Performance Computing Center and the other ERDC laboratories to advance the state of practice in numerical modeling and assessment applied to civil engineering, military engineering, and environmental quality challenges. In support of this research area, ITL performs the following:

1. Researches, develops, refines, validates, and applies advanced computational methods to model physical, biological, and sociological systems. Works to make these advanced computational systems more practical, meaningful, useful, and available to address problems of the Corps, Army, and Nation. Interacts with high performance computing centers to achieve optimum synergy between computational machine architecture and operating systems and computational techniques.

2. Researches, develops, refines, validates, and applies advanced nano-scale and macro-scale transduction and communication methods to observe, measure, and document the physical world, and to serve as components of servo-feedback systems to control structures and systems constructed to influence and leverage elements of the physical world. Works to transition these methods to address problems of the Corps, Army, and Nation.

3. Investigates a wide range of high-end data systems solutions in response to technical requirements. Researches and develops capabilities that address data display, data analysis, data visualization, data archiving, and mass storage. Provides support for algorithm development, scientific data analysis programming, data mining, data retrieval, fusion, and dissemination, scientific mission proposal development, and support for large- and small-scale software system configuration, sizing, and development methodologies utilizing recognized techniques and scientific data format standards. (Contact: Mr. David R. Richards, 601-634-2126; Email: David.R.Richards@usace.army.mil)

B. Software Engineering and Informatics (ITL-2)

Best practices in software engineering and informatics are applied to the research and development of new uses of IT to solve multidisciplinary problems in military engineering, civil and environmental engineering, basic sciences, and geospatial and business applications. Integrated systems are developed for USACE and its customers; prototyping is performed in collaboration with other USACE and government organizations, universities, and commercial partners; and testbeds are developed to prove concepts in an operational environment. Unique software, hardware, commercial off-the-shelf software, and data systems solutions are analyzed, designed, tested, developed, and integrated to meet customers' requirements. ITL performs the following in support of this research area:

1. Investigates software engineering methodologies; conducts research, development, and studies of information systems and applications; and develops, tests, operates, and maintains decision support systems for ERDC, USACE, and other federal agencies. Plans and develops systems and modules to provide for interoperability and reuse and to conform with applicable information assurance requirements; and provides technical assistance to internal and external customers in these areas.

2. Coordinates capabilities, requirements, and deployment for computer-aided design (CAD), building information modeling (BIM), and computer-aided facilities management (CAFM) technologies throughout the tri-services with an emphasis on maintaining the life-cycle use of facilities data through planning, design, construction, operation, maintenance, and disposal. Develops and maintains acquisition vehicles in support of the USACE, Army, DoD, and other partners and customers. Performs research, development, and technology transfer on a wide range of geospatial, geographic information system, CAD, BIM, CAFM, and related technologies in support of DoD and other federal agencies and customers across a wide range of activities. Conducts research and deployment on relevant hardware and software systems. Performs technology transfer to deliver improvements and new techniques to the user community.

3. Provides services and supports ERDC research and development projects through categorization, archiving, management, optimization and retrieval of information and knowledge to include library and information systems science services.

4. Technology transfer services include creation of technology transfer products, such as videos, Web sites, pamphlets, brochures, articles, bulletins, technical notes, pamphlets, brochures; and technical editing and document production management. Technology Transfer Specialists work with program managers of major Corps R&D programs and research laboratories to transfer technology that emerges from R&D work units to the appropriate audiences and assist the ERDC researchers in establishing a program identity for the Corps and its research programs.(Contact: Dr. Cary D. Butler, 601-634-4410; Email: Cary.D.Butler@usace.army.mil)

C. High Performance Computing (HPC) and Networking (ITL-3)

The Scientific Computing Research Center (SCRC), located in ITL, maintains large-scale, parallel computer systems for the DoD Science and Technology (S&T) community in addition to maintaining similar systems and computer networks for ERDC-specific use. In addition to providing computer access, the SCRC conducts research related to the efficient use of high performance computing (HPC) systems and networking technologies by this geographically dispersed community. An area of interest is heterogeneous computing clusters. These clusters include nodes containing non-traditional computational elements such as field programmable gate arrays (FPGAs), general-purpose computing on graphics processing units (GPGPUs), cell broadband engines (BE), ClearSpeed Advance, and stream processors. The principal issues with these heterogeneous platforms include application partitioning, programming models, and tools. Of special interest are technologies, services, and techniques for innovative access to workflow management on HPC resources by a distributed user community, for example, remote visualization tools and techniques for content-based management and analysis of terabyte-scale data. Also of interest are the development of parallel data-compression algorithms; the application of scalable parallel

algorithms to DoD S&T applications, especially those supporting the computational design of novel materials; and exploration of technologies and techniques for managing operational resource utilization and modeling future requirements. Research is also planned in advancing collaborative capabilities combining evolving communications technology in support of distributed R&D teams. This may involve automation/integration of media presentation considering such areas as documents, graphic arts, audio, video, and interactive presentations. Electronic flow of R&D data including management, searching, routing, tracking, and simultaneous review is also of interest. Additional research is planned in other information technology areas such as advanced topics in data, voice, and video transmission using evolving communication systems and their integrations with other information systems as they apply to supporting distributed R&D efforts. (Contact: Mr. David R. Richards, 601-634-3629; Email: David.R.Richards@usace.army.mil)

D. Coastal Modeling System Development (MORPHOS) (ITL-4)

1. OBJECTIVE:

USACE has the mission of managing inland and coastal waterways for the purposes of navigation, flood control, and environmental sustainability. This requires computational and information technology tools that enable scientists and engineers to make predictions of the impacts of Corps projects on the environment. In order to advance that purpose, R&D is needed in the field of hydro informatics. Hydro informatics combines computational hydrodynamics with information technology (informatics) to create a new generation of user friendly, highly productive water resource management tools. Hydroinformatics has the fundamental components of data management, computational frameworks, modeling and assessment, decision support, and knowledge management. R&D is needed in these component areas to support the development of MORPHOS and its purpose of addressing physics-based coastal modeling problems of a size and complexity not possible before.

2. DESCRIPTION:

a. Focus. This effort involves the use of Department of Defense supercomputers and highly evolved scientific visualization technologies. A central focus is advancing computational modeling technologies in graphically driven decision support environments. All proposed R&D must be consistent with hydroinformatic architectures in use within ERDC. Much of that ERDC architecture uses the Surface Water Modeling System (SMS), the Computational Model Builder (CMB), and ERDC's Google Earth decision support system frameworks to interact with wind, wave, and circulation models. Proposals are sought for developing the following:

i. Graphical user environments that can generate extremely large finite element meshes from high fidelity digital terrain and bathymetric databases that extend beyond the memory restrictions of desktop computers

ii. Graphical user environments that can assign boundary and initial conditions and model parameters on extremely large model meshes
iii. High performance computing methods that integrate hurricane surge models with near-shore wave and tidal circulation models
iv. Immersive decision support environments that reside on desktop computers but interact with input and output from high performance computers
v. Data and knowledge management tools that can access field data for model construction and publish model output for field use

b. Special Considerations. Requires a level of understanding and demonstrated proficiency in developing high performance computing numerical modeling technologies and associated graphical user interfaces and scientific visualization environments.

(Contact: David R. Richards, 601-634-2126; email: David.R.Richards@usace.army.mil)

CONSTRUCTION ENGINEERING RESEARCH LABORATORY

I. Research Areas

A. Innovative CBRN Protection for Facilities (CERL-1)

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 and 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 methods of optimizing the effectiveness of CBRN systems while minimizing life cycle costs and improving reliability and confidence in the system's required level of protection as well as cost effective means of certifying and recertifying protection levels of CBRN protection systems. (Contact: Andy Nelson, 217-373-7268; Email: andrew.j.nelson@usace.army.mil.

B. Using Indigenous Materials Resources for Construction Innovative semi-Permanent Military Construction in Austere Environment (CERL-2)

In recent U.S. contingency operations, the greatest vulnerability of a contingency base is its supply line. As a result ASA (AL&T) has stated that the "Army needs improved capability to enable sustainment independence (self-sufficiency) and to reduce sustainment demands at expeditionary basing levels." One path towards self-sufficiency must be done through the design of contingency bases. Adaptable military austere design is needed to help reduce reliance on convoy supply lines and increase the quality of immediate housing. It must be based on locally available or indigenous construction materials and techniques suited to the

environment, and it should be adaptable to multiple climate regions. It must meet material standards required for seismic stability and impact resistance for security standards. The design and methods of construction must facilitate construction for either soldiers or local nationals. The material needed for construction must also require minimal environmental disposal requirements. The design must be reconfigurable for multiple uses while requiring either less water for compound mixtures or lower quality of water for mixtures.

Proposals are sought which employ Engineering Sciences for comprehensive study on a selected structural system of semi-permanent military construction that mainly utilizes indigenous construction materials and process that can be adapted to standard military designs and remains suitable for several climate zones, including arid and tropical. (Contact: Dr. Ghassan Al-Chaar 217-373-4566; Email: Ghassan.k.al-chaar@usace.army.mil)

C. CERL 3 (RESERVED)

D. Innovative Energy Efficiency and Energy Security Initiatives (CERL-4)

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, 217-373-4566; Email: James.P.Miller@usace.army.mil)

E. Fuel Cell Technology Advancements (CERL-5)

Proposals are sought which address the following research areas for fuel cell, reformers and electrolyzer technology:

1. Development of an advanced technology base
2. Innovative and/or lower-cost manufacturing, packaging, and assembly processes
3. Balance-of-plant (BOP) components
4. Advanced field demonstrations of pre-commercial systems.

(Contact: Nicholas Josefik, 217-373-4436; Email: Nicholas.M.Josefik@usace.army.mil)

F. Contingency Basecamp Operational Energy (CERL-6)

Definition of Operational Energy: The energy and associated systems, information and processes required to train, move, and sustain forces and systems for military operations.

This research would identify new opportunities for contingency basecamp operational energy reduction (demand-side management) achieved through new and innovative technologies, improved system or operational modifications. This research would also identify new and innovative opportunities for improved power generation, to include renewables and energy storage (supply-side management) with the focus on; (1) Reducing reliance on vulnerable resupply operations (both fuel and water) -- this enables greater operational freedom of action and reduces the Soldier and system burden at the tactical edge, (2) Reducing the Soldier's individual carry load, and (3) Conserving resources. In addition, technologies considered should be able to withstand the harsh, demanding, and austere conditions of an operational environment. The research would provide results on the latest basecamp operational energy technologies or operational changes, and quantify the associated cost/benefits for any proposed change. (Contact: Charles Decker, 217-373-7611; Email: charles.t.decker@usace.army.mil and John Vavrin, 217-373-5856; Email: john.vavrin@usace.army.mil)

G. CERL 7 (RESERVED)

H. CERL 8 (RESERVED)

I. Fiber Reinforced Polymer (FRP) Composites for Infrastructure Applications (CERL-9)

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, design criteria for composites, durability and aging of composites, quality assurance of composites, smart composites, repair techniques for composites, and other appropriate phenomena and the ability to develop constitutive and other models of these phenomena for this application. The above considerations pertain to both thermoset and thermoplastic type composites. 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 the rapid repair and rehabilitation of existing navigation structures and the components that make up an operational navigation system. These components include, but are not limited to: gates, values, guide walls and bumpers, wall armor and fenders, and sheet pilings. (Contacts: Jonathan Trovillion, 217-373-4551; Email: Jonathan.C.Trovillion@usace.army.mil and Richard Lampo, 217-373-6765; Email: Richard.G.Lampo@usace.army.mil)

J. CERL 10 (RESERVED)

K. Innovative Corrosion Control (CERL-11)

This area focuses on research, development and field tests to reduce corrosion of electrical-mechanical systems and structural systems at military and civil works 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, sewage treatment plants, and navigation and dam structures. The general areas to be researched for corrosion reduction include corrosion control technologies using:

1. Coatings,

2. Cathodic Protection,

3. Advanced (Corrosion Resistant) Materials Selection and Design, Water Treatment, and

4. Remote Corrosion Assessment and Management.

(Contact: Mike McInerney, 217-373-6759; Email: michael.k.mcinerney@usace.army.mil or Vicki VanBlaricum, 217-373-6774; Email: vicki.l.vanblaricum@usace.army.mil)

L. Innovative Electrical-Mechanical Systems to Increase Efficiency, Reliability, Safety, and Security (CERL-12)

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. (Contact: Steve Sweeney, 217-373-6793; Email: Steven.C.Sweeney@usace.army.mil).

M. Electro-osmotic Technology for Water and Chemical Containment (CERL-13)

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: Mike McInerney, 217-373-6759; Email: michael.k.mcInerney@usace.army.mil)

N. Integrated Water Security for DOD Installations (CERL-14)

Proposals are desired which address the need for an enhanced capability to protect facility/mission critical water supplies and infrastructure (i.e. fire hydrants) from chemical and/or biological attacks, as well as accidental contamination incidents. In particular, innovative and non-developmental methodologies and systems are sought. Ideally, the processes/equipment would have the capability to expeditiously retrofit/commission/operate and maintain technologies intended and designed to prevent, detect, treat, decontaminate and rehabilitate DOD water systems that have been accidentally and/or deliberately contaminated by acts of vandalism or terrorism. These enhancements would therefore protect and result in rapid rehabilitation of CONUS/OCONUS DOD installation and/or Forward Area Base Camp water supplies and water distribution networks.

The technologies should be integrated into the installation water infrastructure in such a way that systems and functions on the DOD base are not negatively impacted. We are also interested in ways to optimize the effectiveness of such prevention, detection, treatment, decontamination and rehabilitation systems while minimizing life cycle costs and improving reliability and confidence in the system's required levels of protection. In addition, we are interested cost effective methods of certifying and recertifying water supply/infrastructure protection enhancements. (Contacts: Mark Ginsberg, 217-373-6754; Email: Mark.D.Ginsberg@usace.army.mil.

O. CERL 15 (RESERVED)

P. Critical Infrastructure Protection for Utility Systems (CERL-16)

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: Mark Ginsberg, 217-373-6754; Email: mark.d.ginsberg@usace.army.mil)

Q. Infrastructure Management, Facilities Maintenance (CERL-17)

This research calls for Army infrastructure condition assessment, engineering analysis, planning and prioritization, maintenance, repair and modernization (SRM) technologies that will facilitate limited budgets and mission emphasis for the Future Force and Civil Works. Specifics include planning and budgeting for SRM and O&M activities based upon mission priorities, computerized maintenance management support Reliability Centered Maintenance (RCM), risk analysis, and deconstruction. (Contact: Don Hicks 217-373-6712; Email: Donald.K.Hicks@usace.army.mil)

R. Modeling and Simulation/Analysis tools for Infrastructure Applications (CERL-18)

This research supports decision support tools for infrastructure at military installations. The tools include the capability to generate Infrastructure requirements from the mission and the ability to handle complex changes in mission requirements with an analysis that can examine multiple scenarios and assist decision-makers determine the optimum choice given system constraints. Tools provide the capability for modeling and simulation as well as analysis in engineering (including risk and reliability), architectural, environmental and economic domains. The tools encompass modeling for individual facilities or projects, an entire installation or watershed, or a region of the country. (Contact: Don Hicks 217-373-6712; Email: Donald.K.Hicks@usace.army.mil)

S. Innovative Coating Systems and Applications (CERL-19)

This area focuses on research, development, and field validation tests for all aspects of protective paints and coatings for military and civil works infrastructure, including building surfaces and structural components, utility systems, industrial structures and systems, and navigation, hydropower, and flood protection structures. Required research includes, but is not limited to: (a) innovative methods for the preparation of surfaces for painting, including the removal of coatings containing lead and other hazardous materials and the assessment of prepared surfaces; (b) innovative approaches to paint application and curing; (c) reducing the cost or environmental impact of surface preparation and painting, (d) coating systems for the protection of steel immersed in abrasive, turbulent water, (e) specialty coating applications, such as fire protection, mold control, thermal insulating coatings or heat transfer coatings, and high durability coatings for severe environments; (f) methods for assessing and managing the performance of coatings; (g) the development of coatings performance and service life models, and (h) standard serviceability tests and performance criteria for coating systems. (Contact: Susan Drozdz, 217-373-6767; Email: Susan.A.Drozdz@usace.army.mil)

T. Precision Material Design and Fabrication/Surface Modification and Testing (CERL-20)

Proposals are sought to support research in the area of non-standard materials fabrication, including methods at the macroscopic and microscopic scale. Materials of interest include complex alloys, pure metals, ceramics, optical materials, polymers, plastics, semiconductors, metamaterials and nanomaterials. A variety of projects require tailor-made materials and components unavailable commercially or otherwise not economically feasible for small quantities. Existing projects have a high demand for organizations and entities capable of rapid precision design and manufacture of multiple custom components as well as prototypes. In addition, proposals are sought to support surface modification and characterization at the atomic-molecular level. This need includes thin-film deposition, etching, implantation, functionalization of surfaces. Surfaces will require characterization to verify modification techniques and methods as well as to determine process repeatability, accuracy and quality. Characterization techniques may include but are not limited to: chemical composition, crystal structure, microscopic imaging techniques, radar cross sections, molecular bond strengths, electrical impedance, optical properties, surface roughness and structure, material degradation and others. (Contact: Melixa Rivera-Sustache, 217-373-7673, Email: melixa.rivera-sustache@usace.army.mil)

U. Improve Indoor Air Quality in Buildings (CERL-21)

Proposals are sought that address the need for improved indoor air quality (IAQ) in buildings through the use of active and passive technologies to reduce contamination levels, and to detect and warn of the presence of contaminants, so that corrective action may be taken. Contaminants of particular interest are pathogens, such as Legionella pneumophilia, H1N1 virus, mold spores, and submicron particulates, as well as airborne chemical compounds that can cause health problems, e.g., metabolic volatile organic compounds from Group 1 molds. Research and development is needed for advanced sensors to warn of the presence of chemical and biological contaminants, beyond safe levels. Research and development on advanced passive and active devices and methodologies should focus on in-duct filtration and neutralization of airborne contaminants in heating ventilation, and air conditioning (HVAC) systems, and decontaminating materials and coatings on HVAC duct interior surfaces and building interior surfaces, including walls and ceilings. Proposals may also address research, development and application of alternate building materials that emit extremely low levels of airborne contaminants and/or those that mitigate airborne contaminants, such as materials that are not conducive to mold growth. We are interested in improving the performance and reliability of these systems and reducing their life cycle cost. (Contact: James Hay, 217-373-3485, E-mail: Kent.J.Hay@usace.army.mil)

I. Research Areas

A. Inventory, Assessment, and Monitoring (CERL-22)

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. 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.(Contact: Dr. Christopher White, 217-373-7239; Email: Christopher.M.White@usace.army.mil)

B. Land Management (CERL-23)

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. 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.(Contact: William Meyer, 217-373-45637; Email: william.d.meyer@usace.army.mil)

C. Waste to Energy Conversion Systems (CERL-24)

Proposals are sought for the development, evaluation or demonstration of Waste to Energy conversion systems applicable to DoD installations. These technologies can vary in size, to serve small and large contingency bases or permanent installations, CONUS and overseas. The materials that could be processed include, but, are not limited to the entirety of

the solid waste stream, portion thereof, including food, vegetative materials, light construction materials, or plastics. Integrated technology solutions that provide electric power rather than liquid fuels or other intermediaries are preferred. (Contact: Stephen D. Cosper, 217-398-5569; email: stephen.cosper@us.army.mil or Giselle Rodriguez, 217-373-3434, email: Giselle.rodriguez@usace.army.mil)

D. Compliance at Troop Installations (CERL-25)

This research calls for basic and applied research to meet environmental regulation as it applies to installation activities. Research under this BAA includes technologies that enable continued operation of compliance sites, meeting regulatory requirements without negative impact on mission for CONUS installations. This includes, but is not limited to technologies that address compliance issues associated with noise, solid waste, hazardous waste/hazardous materials, water quality, wastewater, stormwater, air emissions. This also includes integrated monitoring networks, sensors, and reporting systems to provide consistence environmental assessment data critical for successful integration of pollution prevention standard solutions.

Another target area under this BAA topic is to develop/update Environmental Governing Standards for OCONUS installations and provide the technologies to effectively comply with the standards. (Contact: Debbie Curtin, 217-398-5567; Email: Deborah.R.Curtin@usace.army.mil)

E. Pollution Prevention (CERL-26)

Proposals are sought that use pollution prevention technologies, methodologies, processes that support or eliminate environmental compliance issues. In particular methodologies and technologies that provide alternative surface cleaning technologies for eliminating or minimization of solvent use at Army installations and alternatives to hazardous materials/waste, contaminant treatment and degradation, contaminant reduction, and improved pollution control across all media areas in CONUS and OCONUS operations. (Contact: Debbie Curtin, 217-398-5567; Email: Deborah.R.Curtin@usace.army.mil)

F. Business Process Reinvention (CERL-27)

This research calls for new business processes and supporting technologies that will enable the DoD and civilian Federal agencies to efficiently and effectively exchange information, evaluate performance, and ensure regulatory compliance. Specific emphases include (1) Support of Environment, Safety and Occupational Health (ESOH) regulatory compliance research and program development, including the application of audit business processes and Environmental Management System program development; (2) Knowledge and information management; (3) Army Performance Improvement Criteria (APIC) processes; (4) Base Realignment and Closure (BRAC) analysis; (5) Change and transition management; and (6) Organizational development (teaming, facilitation, focus groups, and business process re-engineering). (Contact: Michelle Hanson, 217-373-3389; Email: Michelle.J.Hanson@usace.army.mil)

G. Socio-Cultural Analysis (CERL-28)

Understanding urban and social environments requires the ability to model complex interactions between 1) infrastructure systems and services, 2) human populations and society, and 3) natural and man-made environments and their impact on military operations. Proposals are sought for the development of new and improved concepts, methods, and tools for acquiring and representing spatial-temporal information that can be combined with cognitive and behavioral processes to advance the fundamental understanding of the spatial-temporal, socio-cultural dimensions of human social dynamics. Specific research efforts are requested in the following areas:

1. Understanding human military theater phenomena including but not limited to: aggregate behavior, nonlinear phenomena, networks with distributed or local control, and combinations of continuous and discrete behavior;

2. Development of computation techniques that enable discovery of new information and relationships that cut across disciplines (spatial and behavioral);

3. Development of abstract models or ontologies to represent fundamental understanding of the complex urban environments;

4. Development of technology transfer methods to take theory/concepts to operational environments through use of novel computation and simulation techniques;

5. Develop improved methods to characterize non-trivial spatial and temporal patterns and define relationships between physical environment (i.e., soils, vegetation, climate, surface geology) and human/cultural aspects (i.e., population/ethnic group movement, human patterns and behaviors). (Contact: Dr. Christopher White, 217-373-7239; Email: Christopher.M.White@usace.army.mil)

H. Photosynthesis at the Microscale (CERL-29)

The Environmental Chemistry Laboratory (ECL) at CERL is currently interested in addressing the need for supplying energy at the microscale for powering portable or remote fieldable devices. Production of hydrogen for use in fuel cells at the microscale would be instrumental in solving power generation for the new soldier, enhancing capabilities at lower weight requirements. Biomimetic photosynthetic constructs may address these energy requirement issues as a component of hybrid power systems, while decreasing fuel requirements and waste streams. The ECL is interested in new avenues of synthetic biology, biochemistry, and material science that can build and investigate artificial photosynthetic systems for hydrogen production as well as the concomitant benefit of carbon dioxide conversion to liquid fuels. The photosynthesis process requires an intimate cooperative effort among several biochemical functions, including photon capture, electron shuttling, water splitting, and H2 production from protons. Each of these steps will provide new insight into solid phase chemistry and surface chemistry at interfaces. Proposals are sought to address

each step in the photosynthetic process. This includes but is not limited to the following: 1) self assembled constructs that mimic one or more parts of photosystem II: photon capture, electron transfer, charge separation and water oxidation steps, 2) membrane systems with selective passive transport of protons, and 3) immobilized hydrogenase mimic for reduction of protons to hydrogen or enzymes for CO2 conversion to biofuel. (Contact: Dr. Donald Cropek, 217 373-6737; Email: Donald.M.Cropek@usace.army.mil)

I. Adaptive Intelligence Systems Architecture (CERL-30)

The following capabilities requirements regarding virtual capabilities to simulate base camps (either a model or modeling capability or a test bed capability) were identified in the TRADOC Pamphlet 525-7-7, "The United States Army Concept Capability Plan for Army Base Camps in Full Spectrum Operation for the Future Modular Force 2015-2024", 07 December 2009:

•Commanders at all levels require the capability for rapid, adaptive, and continuous analysis and planning of the life cycle of base camp operations in a JIIM environment throughout full spectrum operations.

•Those planning base camps need to be linked with base camp operations and management leadership to ensure operational needs are being met by the base camps being planned, designed, and constructed.

•Mission planning should incorporate base camp operations planning at the earliest possible opportunity, to include wargaming and operational training. This will allow and encourage the development of the capabilities to analyze 2nd and 3rd order effects to the three focus areas of planning/design, construction/deconstruction, and operations/management of base camps on the operational mission, which in turn, increases overall mission planning effectiveness.

•Those planning (as well as operators and managers of) base camps should analyze, assess, and evaluate operational conditions in both real and virtual environments. An automated planning/design decision tool similar to a "SimCity-like" simulator that could allow the planner to develop and assess scenarios associated with base camp planning/design. It should incorporate costing parameters for construction/ deconstruction and operations/management by varying parameters associated with the operational environment, resource and sustainment requirements, resource consumption, component system relationships, energy management, waste management, etc. Design of the decision tool/model should be based upon data available. Data obtained from existing base camp operations should be thoroughly reviewed and analyzed.

•The ability to simulate the impact the operational environment has on construction actions is critical to understanding the limiting factors that base camp construction/deconstruction and facility maintenance have on mission dynamics.

•Base camp commanders in a JIIM environment supporting full spectrum operations require the capability and authority to command and control base camp operations, enabling the operational commander(s) and staff to focus on the operational mission with increased flexibility and less distractions. The future base camp operational staff (both personnel and staff structure) must be flexible, scalable, and tailorable to address changes in mission (type, surge/size, support to smaller outposts, closure actions, etc.). To accomplish this, it will be necessary to outline the skill sets, rank structure, functions, and tasks associated with base camp operations and establish the resourcing requirements to provide the requisite personnel to do the mission. This will require operational testing and wargaming to accomplish.

•Trained personnel will be required to manage and operate base camps in a JIIM environment. The capability to provide both institutional and mobile on-site operating/managing training will be essential to support the mission. Onsite training may be necessary should institutionally trained personnel be unavailable or if augmentation to base camp operations is required.

The virtual capabilities to be provided include; but, are not limited to the following component systems:

•Power system management and analysis capabilities that are integrated with the component system dynamics and the system effects with other component systems. The interrelationships of micro grids – systems management and controls; alternative energy – solar (passive, PV), geothermal, wind, water, nuclear, waste to energy; energy storage – batteries, pressure, hydrocarbon liquids; and load, transformation, distribution, storage, and generation requirements for base camp component systems will be addressed.

•Water systems management analysis that are focused on use/demand requirements, collection/generation, distribution, storage, and reuse/recycle.

•Waste component systems management that is used to address solid waste, hazardous waste, and sanitary waste. To be included in this area is the ability to simulate waste to energy systems and the impacts on base camp operations.

•Natural dynamics systems simulation to determine the relative impacts they have on the base camps component systems and what impacts the component systems have on the natural systems.

•Human dynamics system simulations used to address the interrelationships that exist between the camp component systems and the ’tenants” of the camp. The means to predict the impact the base camp has on the human dynamics of the local population.

•Simulation of economics systems that relate the impacts of costs (operational, maintenance, and development), availability of material systems, labor (specialized and non skilled), and availability of funding as it pertains to operating base camp systems.

•Other, as yet to be indentified systems, that will be identified as having impacts on base camp component systems and their operations.

This effort will provide and understanding of the relationship dynamics of the operational base camps component systems as well as the dynamics between the component systems and the human, natural, and economic environments in which the base camp operated. (Contact: Kurt J. Kinnevan, P.E. 217-373-3437, Email: kurt.kinnevan@us.army.mil)

J. Environmental Health and Soldier Protection (CERL-31)

Proposals are sought for novel, basic and applied solutions in the areas of environmental health and soldier protection utilizing molecular and cellular biotechnology. In particular, technologies that enable rapid or real-time monitoring, detection of biomarkers, or biological recognition of membrane proteins or antigens are sought. Examples include but are not limited to technologies in the areas of cell based biosensors, nano- or micro-scale systems, biocompatible materials, protein and tissue engineering, and proteomics. (Contact: Stephen Grimme, 217-373-7345, Email: Stephen.J.Grimme@usace.army.mil)

K. Miniaturized Sensors (CERL-32)

Proposals are sought for basic and applied research for the detection and/or quantitation of chemical and biological analytes of Army interest in air, water, or other complex matrices using miniaturized, robust, portable sensor formats. Research and development of hardware to support such sensing schemes in non-laboratory environments is also desired. In particular, novel sensing methods, modalities, and constructs that provide rapid and accurate chemically or biologically-based sensing of environmental pollutants, animal or human toxicants, pathogens, toxins, or associated biomarkers are sought. Examples include, but are not limited to micro- and nanofluidic technologies, lab-on-a-chip systems, and miniaturized biosensors. (Contact: Travis King, 217-373-7442, Email: Travis.L.King@usace.army.mil)

L. Regional and Ecological Planning and Simulation (CERL-33)

Research in this domain involves the design, development, and application of ecological, economic, social, climate change, and urban growth models to help forecast the direct, indirect, and cumulative consequences of proposed management plans. Research is intended to support military installation long-term planning and sustainability by finding local and regional plans over time and space that support current and future military missions. (Contact: William Meyer, 217-373-45637; Email: william.d.meyer@usace.army.mil)

M. CERL 34- RESERVED

N. Biological Decontamination of DoD Equipment and Infrastructure (CERL-35)

Proposals are desired which address the need for an enhanced capability to protect and rehabilitate DoD equipment and infrastructure after a biological contamination event. Research proposals for the development, application, production, and validation of innovative materials and systems for self-decontaminating surfaces and decontamination sprays are of interest. Candidate decontaminant material systems should be potent, safe, and practical for the target DoD application. Target applications include building protection and remediation, wide area decontamination, and decontamination of corrosion-sensitive equipment and infrastructure.
(Contact: Dr. Martin Page, 217-373-4541, Email: Martin.A.Page@usace.army.mil ; Alternate Contact: Mark Ginsberg, 217-373-6754, Email: Mark.D.Ginsberg@usace.army.mil)

O. Innovative Materials for Water Sustainability Applications (CERL-36)

Proposals are desired which address the need for an enhanced capability to produce and preserve water for use at DoD installations and bases. Research proposals for the development, production, and integration of novel materials for water production and reuse are of particular interest. Candidate materials and systems should be energy-efficient, environmentally-friendly, and capable of producing water at the desired quantity and quality for the given application. Target applications include water harvesting, desalination, gray water reuse, and water/wastewater treatment. Proposals relating to water production and reuse in austere environments, including forward operations, disaster relief, and international settings are also of interest (Contact: Dr. Martin Page, 217-373-4541, Email: Martin.A.Page@usace.army.mil)

P. Innovative Water Efficiency and Water Resilience Initiatives (CERL-37)

Proposals are sought for evaluations and demonstrations of innovative technologies that will improve water efficiency, conserve water resources, and improve resilience of water delivery systems. Federal agencies are required to meet stringent water conservation targets mandated by Executive Order. In addition, the Army has set challenging goals for Net Zero Water attainment at installations. Products/methods/techniques that will improve overall water efficiency or reduce reliance on potable water sources are of interest. These include but are not limited to: water conservation and ultra-efficient plumbing fixtures and controls, smart landscaping, smart irrigation controls, rainwater and stormwater collection and reuse systems, condensate capture and reuse systems, water efficient energy technologies, graywater reuse systems, wastewater recycling, decentralized wastewater systems, the living building concept, distribution system leak detection, drain line transport issues, and net zero water. In addition, proposals are sought for products/methods/techniques that will improve the resilience of water delivery systems and reduce the risk of loss of water services due to economic dislocations, depletion of natural resources, and natural or man-made disasters. Proposals are also sought for products/methods/techniques which will facilitate cost effective, reliable, and sustainable water support to deployed forces in underdeveloped regions of the world. (Contact: Elisabeth Jenicek, 217-373-7238; E-mail: Elisabeth.M.Jenicek@usace.army.mil)

Q. Bioelectrochemical Systems (CERL-38)

Proposals are sought to evaluate, optimize, demonstrate and validate state-of-the-art bioelectrochemical systems (BES), such as microbial fuel cells (MFC) and microbial electrolysis cells (MEC), for applications to Army probles. BES utilize the natural biodegrading capacity of microbes to oxidize the organic matter content of an input water stream (e.g., waste water), thereby treating the water, while simultaneously generating electrical current. In this regard, BES have potential to be enabling components of effective wastewater treatment systems that do not require, or at least minimize, input of external energy at resource limited and remote military sites. Proposals can study key aspects of wastewater treatment or clean water production by BES including the type and design of BES used, the source of microbe inoculate used, the effectiveness of treatment, material performance, modes of operation that balance electrical current output with rate of organic matter oxidation, management of generated electrical current to power system components, scalability of BES volume to wastewater loading rate, and cost vs. benefit. Other possible topic areas include requirements, design, and standardization of BES, system fabrication, anaerobic digestion as a pretreatment step, the microbiology occurring within BES, materials research on BES components, process analysis and modeling, power management and self-powered autonomous diagnostics , scale-up designs, and demonstration . (Contact: Donald Cropek, 217 373 6737; Email: Donald.m.cropek@usace.army.mil)

R. Applications of Nanotechnology to Army Challenges (CERL-39)

This area focuses on research and applications of nanoscale solutions to Army problems in ecosystem protection and remediation, delivery and assurance of water quality, chemical sensing, and purification and separations of chemical products. Nanotechnology is the study and use of the novel properties of chemistry, materials, and structures that have dimensions in the sub-micron regime. It has been recognized that designing and constructing features in either a tailored bottom-up fashion from the molecular components or a controlled top-down direction from bulk materials result in materials that have properties substantially different from bulk properties. This enables revolutionary advances in numerous fields. Other specific areas include, but are not limited to, the application of nanotechnology toward the in-depth understanding of biological systems, energy production and harvesting, therapeutics, biomimetics and novel surfaces. (Contact: Donald Cropek, 217 373 6737; Email: Donald.m.cropek@usace.army.mil)

COLD REGIONS RESEARCH AND ENGINEERING LABORATORY (CRREL)

I. Research Areas:

A. Signature Physics Technical Area (CRREL-1)

The Signature Physics technical area focuses on research to increase knowledge and understanding of the variability in electromagnetic, acoustic, and seismic signatures of personnel, vehicles, aircraft and other military as well as non-military sources in response to weather, changing terrain state and complex terrain features and geometry. The understanding gained serves to improve our ability to predict signature behavior in support of materiel development, algorithm science and technology, sensor performance templates for tactical decision-making, force protection, and visualization for mission planning and rehearsal.

Military broadband wireless communication networks will operate in radio frequencies ranging from hundreds of MHz to several GHz. Terrain and environmental variability will significantly influence network performance. Research is focused on innovative approaches to gain fundamental understanding of geo-environmental influences, including terrain and terrain condition, on propagation at millimeter to meter wavelengths,. Basic experimentation, theoretical formulation, and simulation activities in this technical area include: the description of propagation along the surface of the earth; novel techniques for characterizing impacts of large and small-scale topographic features; the electrical properties of surficial materials, including vegetation; and the effects of near-surface and sub-ionospheric atmospheric disturbances.

Seismic and acoustic spectrum research focuses on the development of fundamental understanding of the propagation processes in different terrestrial materials and in the lower atmosphere, and algorithm development for improved target detection and classification. Of particular interest, this technical area seeks to develop theory and validation for full three-dimensional expression of 1) the character of seismic surface waves under strongly heterogeneous near-surface geological conditions and complex surface geometry at multiple scales; 2) the character of acoustic waves as affected by meter-scale turbulent boundary layer meteorology, heterogeneous ground impedance and topographic and terrain feature controls; and 3) the phenomenology of seismic-acoustic coupling. Other research focuses on the variation in personnel signatures (seismic, infrared, visual) due to weather, terrain, and cultural activity.

Products of this technical area support information superiority critical to military operations through improving terrain analysis support to command, control, communication, computer, information, surveillance, and reconnaissance (C4ISR) and tactical communications, thereby achieving Army and joint concepts for “see first”, “understand first”, “act first”, and “finish decisively”. By increasing our understanding of geo-environmental enablers and constraints to sensing (C4ISR) and radio frequency propagation, this research will lead to improved terrain analysis and mission planning tools. Seismic-acoustic interest extends to applications in the Biogeochemical Processes in Earth Materials technical area (CRREL-3), such as reducing military generated noise or mitigating its nuisance impact on local population densities (increasing problem due to encroachment of urban development around military lands) and wildlife. The research area operates in a unique niche that combines experimentation with physics based modeling and simulation, with an emphasis on the implications of the dynamics of the environment on systems performance. The Signature

Physics technical area is highly complementary to CRREL's Terrain Properties and Processes technical area (CRREL-2).(Contact: Dr. Lindamae Peck, 603-646-4261; Email: Lindamae.Peck@usace.army.mil).

Specific research efforts are requested in the following areas:

1. Environmental effects on seismic and acoustic wave propagation and sensors.
2. Innovative and/or integrative research in geospatial research and engineering.
3. Seismic-acoustic target localization or anomalous activity detection in urban and other complex environments.
4. Acoustic/seismic sensor performance modeling.
5. Seismic signal modeling for battlefield sensors.
6. Site characterization for seismic-acoustic signal modeling.
7. Surface radio wave propagation.
8. Weather and terrain effects on intrusion detection sensor performance.
9. Seismic, acoustic, and infrasound propagation in complex environments.
10. Electromagnetic remote sensing and sub-surface detection of buried metal objects including UXOs.
11. Electromagnetic modeling and numerical methods.
12. Signature phenomena and other exploitation techniques for remote sensing of kinetic hazards.
13. Near-surface electromagnetic wave propagation over rough terrain.

B. Terrain Properties and Processes Technical Area (CRREL-2)

The Terrain Properties and Processes technical area investigates fundamental processes and properties of terrain and terrestrial materials as affected by the atmosphere and applies this knowledge to solving a broad range of military and civil problems. The range of research topics is broad and involves laboratory experiments, field expeditions, and numerical modeling. Research focuses on environmental physics in such topic areas as electromagnetics, boundary layer processes, fluid flow in porous media, and thermodynamics. These topics include energy exchange with the terrain, transport of gas, water, and vapor in soils and snow, weather effects on sensor performance, ice accumulation, snow and ice mass balance, permafrost degradation, snow metamorphism, and snow, soil, and micrometeorological modeling. Terrestrial surfaces extend to permafrost, glaciers, as well as river, lake and sea ice covers. At the microscale, this technical area focuses on improving the understanding of the physical processes associated with mass, momentum, and thermal transport in the atmosphere and at the terrain surface. This includes measurements and theoretical developments to improve prediction of processes and integrates our understanding into larger-scale models. Efforts to predict atmosphere-terrain interactions are focused on the

impact of short vegetation on thermal and spectral signatures, developing computationally efficient models for very high spatial resolution, identifying terrain features and soil strength with spectral imagery, understanding and modeling impacts of pressure-driven flow on atmosphere-terrain exchange, and modeling freezing rain in complex terrain. Military research on terrain state aims to extend understanding of weather-driven terrain material property changes at tactical-relevant scales. This technical area also investigates, models, and predicts viewable gap fraction in complex terrain with vegetation, slope, and aspect and conducting area-wide assessments of target infrared contrast.

The Terrain Properties and Processes technical area contributes to Army, DoD, and national capabilities by defining the natural environment and the terrestrial-climate impacts on plans and operations as well as critical infrastructure. A key interest for the Army is the development of tactical decision aids for terrain reasoning and situational awareness. The relevance of the work relies on ability to predict the state of the environment for any weather, any time of day, and any season. This allows the military to exploit the dynamics of the environment rather than conquer it, allowing the military commander to exercise terrain advantage. This technical area also contributes to the body of knowledge supporting long range Corps programs in water resources planning and management and assistance to other Federal agencies responsible for understanding changes in climate dynamics and its impacts on civilization. The Terrain Properties and Processes technical area is strongly synergetic with CRREL's Signature Physics Technical Area (CRREL-1).(Contact: Ms Janet P. Hardy, 603-646-4306; Email: Janet.P.Hardy@usace.army.mil).

Specific research efforts are requested in the following areas:

1. Signature and scene prediction and synthesis for the millimeter-wave spectral region
2. Algorithms to recover geophysical products from remote sensing measurements to drive models of surface energy balance and signature prediction
3. Methods to spatially distribute models of snow cover, soil, and vegetation energy and mass interactions in the boundary layer
4. Penetration of energy transfer components into snow
5. Characterization and modeling of weather, obscurants, and terrain conditions related to the spatial winter boundary layer
6. Environmental and atmospheric effects on winter battlefields
7. Physically accurate modeling to produce synthetic scenes and data for a global range of environmental conditions
8. In-flight aircraft icing prediction/detection systems
9. Geophysics of snow, ice, and frozen ground
10. Spatial distribution of snow properties
11. Geological and geophysical processes of permafrost, glaciers, and ice sheets
12. Lunar and planetary site characterization

13. Vapor-driven snow metamorphosis coupling Lattice-Boltzmann air flow with discrete element model of snow
14. Air-sea surface energy exchange and sea ice mass redistribution in the Arctic
15. High resolution sea ice modeling
16. Infrared and millimeter wave signatures in urban and other complex terrain
17. Terrain and cultural factors effecting deterrence planning and operations

C. Biogeochemical Processes in Earth Materials Technical Area (CRREL-3)

The Biogeochemical Processes in Earth Materials technical area focuses on understanding the interaction of biological systems, in particular the establishment, growth, and dynamics of plant and microbial communities, with a variety of earth materials such as soil, rocks, sediment, dust, and with engineered materials that mimic properties of these natural materials (i.e., geomimetics), such as high surface area and reactivity. The properties of these materials are studied both *in situ* in the field, and via laboratory experimentation. This technical area spans basic research to field demonstrations.

The goal of research in this technical area is to exploit understanding of biological, geological, and chemical interactions to further technology development in environmental remediation and ecosystem restoration, sustainable military training lands and ranges, biosensor development, and terrain reasoning and assessment. A further goal is to understand hierarchical or scalable relationships between the fundamental large-scale biogeochemical processes and smaller-scale “drivers” that constrain such processes, i.e., climate and physiography. Understanding the hierarchical linkage between fundamental processes and the drivers characterizing a particular biome or ecoregion can aid in the development of predictive capabilities at the landscape level such as plant material suitability for a military installation, persistence and fate of harmful chemicals or microorganisms in the environment, or response of biosensors in the battlespace environment.

Research under this technical area is being impacted and enhanced by the following emerging concepts and technological developments applied to biogeochemical systems and materials:

Omics. Spin-offs of genome characterization (genomics), protein and other biomolecule characterization (proteomics), and metabolomics, will continue to provide new, rapid, high throughput bioanalytical techniques and novel methodological approaches to research in this technical area. This could revolutionize study and assessment of interactions between biological systems and the environment and make feasible real-time analytical and assessment capabilities available to end users.

Nanomaterials development. Research in chemistry, materials science, and pharmacology on synthesis and properties of small particles (< 0.1μm) with highly reactive surface materials may make possible development of materials that mimic natural geologic and soil materials (geomimetics), but exhibit enhanced properties such

as mechanical strength, novel catalytic properties, or variable dielectric behavior, i.e., carbon nanotubes.

Informatics and knowledge management. Advances in informatics and emerging concepts of knowledge management will have a major impact on the ability to analyze large amounts of diverse biological, physical, and chemical data for biological and environmental systems. It will enable the extraction of new information from datasets using sophisticated statistical, ontological, and reasoning techniques. Such approaches were not feasible in the past due to the computational overhead and sheer processing power required. New paradigms for understanding biological and computational systems, i.e., cellular automata, finite-state machines, state and transition theory, etc., when merged with modern digital data processing power will make it possible to field complex, real-time assessment techniques and technologies.

Computational chemistry and computational biology refers to *in silico* techniques (i.e., performed on computer or via computer simulation) and attendant software that make it possible to virtually perform complex or numerous chemical and biological "experiments," or even experiments impossible or infeasible to carry out in the laboratory. These computational techniques promise a significant cost savings and increased productivity that will maximize knowledge gained from more costly laboratory experimentation, and will provide analytical input to future automated risk assessment and reduction applications for end users. Validation by *in vitro* experimentation will be conducted when appropriate.(Contact: Dr. Terry Sobecki, 603-646-4563; Email: Terry.M.Sobecki@usace.army.mil).

Specific research efforts are requested in the following areas:

1. Biological process affecting the nature and rate of transformation of natural constituents in environmental media (soil, water, air) or on anthropogenic surfaces under environmental conditions

2. Biological processes affecting the nature and rate of transformation of contaminants and other anthropogenic materials in environmental media or on anthropogenic surfaces under environmental conditions

3. Restoration of plant communities at site and landscape scales

4. Plant and plant community adaptation to extreme environmental conditions

5. Behavior of soil microbes or microbial communities under extreme natural or anthropogenic conditions

6. Impact of ecosystem disturbance regimes on spatiotemporal patterns of biogeochemical processes

7. Biogeochemical processes in natural and disturbed ecosystems and terrain

8. Biosensor development employing microbes, microbial physiology, or principles of microbiology for detection of chemical and biological threats or contaminants

9. Microbe and biomolecule behavior in soils and on anthropogenic surfaces

10. Application of advanced bioanalytical and genomics methods to assessing the nature and rate of biogeochemical processes in natural and artificial environments

11. Application of advanced concepts of complexity, computational biology, knowledge management, and related fields to studying and predicting the behavior of microbial and plant communities in a variety of environmental conditions

D. Environmental Fate and Transport Geochemistry Technical Area (CRREL-4)

Basic and applied research is aimed at understanding site conditions and environmental characteristics affecting the fate and transport of existing and emerging contaminants, military and industrial compounds, and natural substances under earth surface conditions. The goal of the Environmental Fate and Transport Geochemistry technical area is to understand and characterize site conditions themselves and develop appropriate detection, assessment, and sampling technologies applicable to military installations, existing and formerly used training ranges, and civil projects aimed at remediation, restoration, or protection of the environment. Research in the technical area can be divided into four broad focus areas:

Characterization and sampling of energetic and munitions compounds. Research is ongoing on the distribution and fate of explosive residues, smokes, propellants, and spent projectiles from military munitions on training range soils, on transport of explosive residues, military-specific compounds, and their breakdown products via and into surface and groundwater and the air. Emphasis is on developing appropriate or innovative sampling methodologies and analytical methodologies for these difficult to characterize non-homogenously distributed compounds. Recently, research has begun on the distribution, fate, effect, and possible mobilization and transport of tungsten from munitions projectiles. This research produces field sampling and laboratory analytical methods for explosive residues that are widely accepted within and outside of DoD.

Contaminated site characterization using geophysical methods. Transport of contaminates is difficult to predict in complex geological settings and cold regions with discontinuous permafrost due to lateral and vertical heterogeneity in the soils and vadose zone. Research-based site investigations using innovative multiple-technique geophysical methods that include two- and three-dimensional resistivity, electromagnetic instruments, ground penetrating or other types of radar, or standoff spectroscopic methods provide a way to more effectively and rapidly characterize such variable site conditions and contaminants. It also provides the basis for better one, two, and three-dimensional conceptual site models to predict pathways for the movement of surface and groundwater and associated contaminants. These techniques are particularly useful in cold regions, such as military installations in Alaska, due to intermittently or continuously frozen ground and access or trafficability limitations.

Sub-surface investigations of anomaly discrimination using innovative geophysical methods. This research is directed at increasing the understanding of the nature and causes

of buried target responses to geophysical surveying methods and fostering better target discrimination for site characterization and clean-up. This is particularly important in cold regions where freeze-thaw cycling and the presence of frozen ground can impact soil moisture and other properties that some geophysical methods are particularly sensitive to. Improved numerical modeling that supports signal interpretation to determine size, location, orientation, magnetic permeability, and conductivity of a candidate target relative to known buried target signatures is an important facet of this work. Novel seismic and acoustic methods are also of potential application in this technical area.

Characterization and sampling of petroleum, organic solvent, and biological contaminants in groundwater and soils. This area focuses on applied research on the suitability of various materials and techniques for sampling and characterizing environmental media. Typical interests are suitability of various well-casing materials for groundwater monitoring wells or the ability of various groundwater-sampling devices to collect representative samples. It also includes research on appropriate and representative sampling for volatile and semi-volatile organic compounds in environmental media and on chemical and biological characterization of soil material dispersed and transported via aeolian dust.

Research under this technical area will be potentially be impacted and enhanced by the following emerging technologies that are shaping the expectations of how fate and transport data and information is collected, assessed, and conveyed to end users:

Recent advances in the study and manufacturing of micro-electromechanical systems (MEMS), photoreactive bandgap materials (PRBs) and biosensors suggest eventual development of technologies leading to dispersible, active chemical sensors responsive to various environmental conditions or states, and therefore a future capability for geospatially-distributed, remotely-queriable sensing systems for natural or built environments.

Continued advances in robotics will spur demand for development of a wide variety of on-board instrumental analysis techniques able to qualitatively and quantitatively analyze soils and other environmental media. Formerly relegated only to the laboratory, this portends that real-time, onsite analysis and assessment of munitions and energetics on training ranges and other hazardous environments may become routine.

Advances in application and analysis of hyperspectral and other EM-sensor imaging make conceivable real-time, spatially-distributed assessment capabilities for simultaneous determination of environmental parameters and contaminant distributions.

Evolution and development of new concepts of spatial organization and structure coupled with advances in informatics and knowledge management principles, practice, and technology is spurring the development of novel computational approaches to pattern recognition and change detection. This may lead to more holistic and sensitive approaches to environmental risk assessment and ecological status assessment of

complex natural and anthropogenic systems. Contact: Dr. Terry Sobecki, 603-646-4563; Email: Terry.M.Sobecki@usace.army.mil).

Specific research efforts are requested in the following areas:

1. Environmental investigation methods, techniques, and approaches adapted to extreme environmental conditions or inaccessible locations

2. Physics and chemistry of water and its behavior in cold-region soils and geological settings

3. Physics and chemistry of water and its behavior in extremely arid environments

4. Innovative detection and analysis methods for contaminants in soil, water, and air *in situ* or in the laboratory

5. Rates and magnitude of fundamental soil, water, and atmospheric processes in extreme environments as they affect the fate and transport of natural substances and contaminants

6. Development of computational approaches to evaluating the nature, reactivity, fate, and transport of trace metals and organic compounds in the environment

7. Development of innovative sampling methods and protocols for contaminants in environmental media (i.e. soil, water, air)

8. Application of informatics and knowledge management principles, practice, and techniques to natural product and contaminant fate and transport assessment and management in the environment

E. Maneuver Support and Sustainment Technical Area (CRREL-5)

This technical area encompasses a broad spectrum of technology development that combines engineering research and practice to develop innovative solutions for challenging problems in a wide variety of environments. These environments include temperate and extreme conditions and remote sites, such as the Polar Regions. Operations, logistics, and support in these challenging environments are expensive, highly complex, and extend beyond the state of current technology. This research area focuses on technologies to optimize vehicle mobility in a variety of developed and undeveloped terrains in all seasons. This includes manned and unmanned vehicle performance, all-season terrain mechanics, and characterizing and improving materials and engineered systems for all-season vehicle maneuver support. Other research in this technical area develops engineering principles for force projection airfields in remote-austere environments and the sustainment of operational capabilities in remote, extreme cold regions. Technological capabilities include neural networks, expert systems, and smart technologies. These advancements permit modeling complex terrain behavior and providing new methods for solving problems that involve the mechanics of engineering materials as well as overall improvement of support systems.

Current efforts include working with small unmanned vehicles and developing an understanding of complex vehicle-to-terrain interactions. In addition, the changing landscape

of future conflicts requires new maneuver support research in nonlinear theater and urban environments. Consideration of vertical envelopment, inter-modal logistics, and environmental impacts are critical to real-time military planning. Other applications include instrumentation for measurement of porous media strength and permeability, specialized heavy-vehicle mobility instrumentation, and extreme cold hardened instrumentation and analyses packages. Military opportunities include developing the capability to prepare our expeditionary military for operations in harsh environments, which necessitates understanding austere logistics and its relationship to overall maneuver support.

Other work requires the development of logistics and transport models to accurately represent the adaptation of vehicles to challenging terrain conditions or the adaptation of the terrain itself. These models should predict the impact of “next generation” mobility technologies, and illustrate the cost/benefit return-on-investment and payback schedules for implementation of said technologies. Transport requirements also include the interaction of equipment, vessels and aircraft with changing ice conditions in the Polar Regions.(Contact: Mr. Edel R. Cortez, 603-646-4301; Email: Edel.R.Cortez@usace.army.mil).

Specific research efforts are requested in the following areas:

1. All-season mobility modeling and field testing
2. All-season terramechanics modeling
3. All-season vehicle dynamics models
4. Vehicle simulation and visualization
5. Weather and vehicle interactions
6. Obscured environment (non-weather) and vehicle interactions
7. Cold Regions robotic vehicle performance
8. Cold Regions equipment design and engineering
9. Robust logistics analyses
10. Polar and austere environment engineering
11. Unpaved airfields
12. Implications of new vehicle technology
13. Environmental impact of vehicle operations
14. All-season air and ground vehicle operations

F. Cold Regions Infrastructure Technical Area (CRREL-6)

The Cold Regions Infrastructure technical area provides Cold Regions research and technology solutions for construction, operations, and maintenance of standard and strategic facilities worldwide. Key issues facing the DoD include 1) strategic national defense facilities will continue to be located in cold climate and remote locations; 2) critical defense facilities in

remote locations require highly reliable transportation infrastructure including airfields to sustain all-weather and year-round operations; 3) facilities are frequently one-off adaptations of standard designs and many facilities require unique/prototypical designs, thus, performance criteria must be adapted to provide high reliability; 4) severe climate and lack of local infrastructure add significant costs to design, construct and sustain facilities, airfields and other transportation infrastructure in Cold Regions; and 5) *in situ* testing of operational facilities is expensive and acceptance criteria difficult to define.

The Cold Regions Infrastructure technical area is largely a Center of Excellence type activity with a primary mission of transferring knowledge and capability directly to individual users through technical support. Current focus is on providing services, often in partnership with USACE elements including Alaska District and New York District to agencies planning, constructing or operating facilities in winter environments. Research opportunities are leveraged with funding from other Federal agencies. Recent efforts have focused on technical support of the design, construction and operation of missile defense facilities in Alaska and National Science Foundation facilities in the Antarctica and the Arctic. Significant operational issues are solved and value engineering impacts related to building envelopes and airfields/pavements are realized. Other key military facility design and construction efforts have benefited from CRREL's Cold Regions infrastructure support in recent years. This has included work on military hospitals, flight simulators and strategic communications and surveillance facilities in cold regions where high interior humidity is required by users, but presents substantial building operational challenges in cold regions.

New requirements will stem from the necessity to adapt to climate variability in the Polar Regions. Thawing frozen ground in the Earth's Arctic Regions will be a formidable infrastructure challenge in the coming decades. Most current infrastructure design requirements are dated and no longer produce serviceable design lives for foundations, transportation facilities, and structures in these dynamic environments. Much of the technology adapted for use in the oil and gas industry in the 1970's is outdated. Virtually all new infrastructure projects need development of new requirements documents and technically advanced designs that operate well above the current minimum standards.(Contact: Mr. Edel R. Cortez, 603-646-4301; Email: Edel.R.Cortez@usace.army.mil).

Specific research efforts are requested in the following areas:

1. All-season airfields and pavements models
2. All-season geomaterials modeling and stabilization
3. All-season pavement testing and evaluation
4. Building envelopes in Cold regions facilities
5. Environmental loads and design criteria for facilities
6. Utilities and heat storage in Cold regions facilities
7. Permafrost engineering

8. Polar engineering

9. Low temperature concrete admixtures and placement

10. Novel materials for Cold regions infrastructure

11. Energy efficient systems and conservation techniques for remote and cold regions facilities

12. Snow and ice (as construction materials) airfields and roads pavement design, testing, and evaluation

G. Water Resources Geospatial Applications Technical Area (CRREL-7)

The Water Resources Geospatial Applications technical area conducts research to improve data collection, analyses, and decision support through appropriate use of remote sensing and geographic information systems (GIS) technologies and applications. The direct and reimbursable support to the research in this technical area results in the development of software tools and methods to improve the use of geospatial technologies across all Corps business areas to effectively manage water resources, emergency situations, real estate, environmental restoration, regulatory, navigation and operations projects and programs.

These technologies are being used to support stability, reconstruction, and homeland security operations, develop sound water resources solutions, and enhance life-cycle infrastructure management. The dedicated, highly technical staff has multidisciplinary expertise, which has allowed them to develop advanced hardware and software resources to provide around-the-clock database and application support. These developments have led to geospatial tools for data management and decision support for USACE Enterprise GIS, the Corps Water Management System, the Formerly Used Defense Sites Program, the Iraq Reconstruction Tracking System, Emergency Management (EngLink), the Wetlands Regulatory Program, the National Levee Database and the Defense Installation Spatial Data Infrastructure Strategic Viewer. Customer breadth and satisfaction with these products is demonstrated by steadily increasing funding for this research area, projects of larger scope, and an expanding customer base (e.g., moving from primarily Civil Works Corps of Engineers applications to larger DoD and other nationwide projects). The approach of this technical area has led to a demonstrated unique capability to develop and deliver operational geospatial information systems, which are fully extensible and transferable across functional areas.(Contact: Mr. Timothy Pangburn, 603-646-4296; Email: Timothy.Pangburn@usace.army.mil).

Specific research efforts are requested in the following areas:

1. Geostatistical methods for accuracy assessment of derived geospatial information

2. Real-time precipitation and snowmelt runoff prediction through integration of remote sensing and GIS technologies

3. Remote sensing to collect and analyze airborne electromagnetic Arctic sea ice thickness data relevant to climatic change

4. GIS technologies for environmental and water resources applications
5. Geospatial decision support systems
6. Wetlands delineation

H. Hydrology and Hydraulics Technical Area (CRREL-8)

Research activities in the Hydrology and Hydraulics technical area address the fundamental aspects of Cold regions hydrology and hydraulics. Specifically, this area includes direct and reimbursable research characterizing winter impacts on operation and management of Corps structures; ice jam mitigation measures and emergency operations; geospatial distribution and water equivalent estimation of snow pack; volume and timing of snowmelt soil infiltration and runoff; water quality, ecosystem restoration and environmental remediation in Cold regions; and watershed and basin water management, hazard mitigation, and methodologies for regional watershed/water resources management systems in regions affected by seasonal dynamics.

Products in this technical area directly support USACE water resources, environment, homeland security, and warfighting missions through support of flood damage reduction, navigation, ecosystem restoration, water supply, recreation, hydroelectric power, shore protection, regulatory, and environmental stewardship. This technical area has demonstrated a unique ability to align snow and ice science and engineering with operational needs to develop effective tools for direct operational use in both civil and military applications. The Hydrology and Hydraulics technical area is a unique niche within DoD and includes national and international experts in snowmelt hydrology, ice engineering, combined with extensive experience in hydrologic analyses and regional watershed and basin management.Contact: Mr. Timothy Pangburn, 603-646-4296; Email: Timothy.Pangburn@usace.army.mil).

Specific research efforts are requested in the following areas:

1. Hydraulics, hydrology, and sediment transport in Cold Regions
2. Wetlands and winter ecology
3. Runoff and sediment yield of glacierized basins
4. Rapid flood control structure assessment
5. Ice scour around bridge piers
6. Cold regions coastal shoreline protection
7. Ice forces on riverine and coastal structures

I. Counter Improvised Explosive Device Special Program Area (CRREL-9)

Technical activities in the Counter Improvised Explosive Device special program area address research, development, and prototyping of new systems technology to defeat top-tier threats. These systems are being developed to counter employment of Improvised Explosive

Devices (IEDs) by a dynamic threat and must operate in environments with complex terrain and other technically challenging urban and geo-environmental features. Funding in this area includes direct and reimbursable sources. This area focuses on rapid maturation and field demonstration of promising research and development technologies by maturing and assessing systems that have high military utility through rigorous adherence to sound engineering and scientific principles. The Counter Improvised Explosive Device special program area is synergetic with and integrates technologies from CRREL's Signature Physics (CRREL-1) and Terrain Properties and Processes (CRREL-2) technical areas.Contact: Dr. Mark Moran, 603-646-4274; Email: Mark.L.Moran@usace.army.mil

Specific research efforts related to IEDs are requested in the following areas:

1. Threat Signature Analysis
2. Sensor Concept Development
3. Counter IED related materials
4. Analytical and field test evaluations

J. Strategic Weapons Proliferation Special Program Area (CRREL-10)

The Strategic Weapons Proliferation special program area has interest in research that investigates and studies the implications for strategic deterrence, assurance, and stability associated with the intended goal of reducing the number of strategic weapons and their roles in U.S. national security strategy. The research area emphasizes alternative analytic techniques and their applicability to assess the changing role of strategic weapons. Efforts do not seek to provide recommendations on the policy issues and associated implications. Rather, knowledge discovery will result in evaluation of analytical techniques useful to examine such issues. Contact: Dr. Justin Berman, 603-646-4794; Email: Justin.B.Berman@usace.army.mil

Specific research efforts related to Strategic Weapons Proliferation are requested in the following areas:

1. Preventing strategic weapons proliferation and terrorism
2. Reducing the role of U.S. strategic weapons in U.S. national security strategy
3. Maintaining strategic deterrence and stability at reduced strategic weapons force levels
4. Strengthening regional deterrence and reassuring U.S. allies and partners

TOPOGRAPHIC ENGINEERING CENTER (TEC)

TOPOGRAPHY, IMAGERY AND GEOSPATIAL (TIG) RESEARCH DIVISION

Geospatial Applications Branch

I. Introduction

Conducts research relating to the extraction of terrain data from remotely sensed sources. Other interests include methodologies for exploitation, integration, and compression of terrain data, and photogrammetry. Researches program efforts to explore technologies incorporating novel materials for tagging, tracking, and locating (TTL) and available and emerging LiDAR technologies (Linear and Geiger Mode). Researches program efforts to develop technologies to address real-time environmental sensing of the Operational Environment and Sensor Phenomenology and invent an open ended, common architecture for plug-and-play sensors communication, analysis, geospatial modeling, and integration.

II. Research Areas

A. Terrain/ Environmental Influences on Remote Sensor Data (TEC-1)

Explore/understand and solve problems associated with complex terrain and environmental issues that influence the collection and/or resulting data from remote sensing. Examples include bi-directional reflectance distribution function (BRDF) models in complex terrain, range errors in LiDAR data due to weather or atmospheric influences, vegetation obscuring ground returns for LiDAR, collection of GPS in complex terrain or multistory canopies. (Contact Michael Collins, 703-428-7424; Email: Michael.L.Collins@usace.army.mil).

B. Photogrammetry / Software Tools (TEC-2)

The object is to conduct research or develop techniques to perform automated/semi automated extraction of terrain data from remotely sensed imagery, maps, or direct measurement. Techniques can be based on single or multiple sources. If using multiple sources, fusion issues should be addressed. Contact Michael Collins, 703-428-7424; Email: Michael.L.Collins@usace.army.mil).

C. Integration and Exploitation (TEC-3)

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**.** (Contact Michael Collins, 703-428-7424, Michael.L.Collins@usace.army.mil).

D. Image Registration (TEC-4)

The objective is to conduct research and development into techniques to compare imagery and/or remotely sensed terrain data from multiple sources in order to improve spatial registration. (Contact Michael Collins, 703-428-7424, Michael.L.Collins@usace.army.mil).

E. Photogrammetric Processing Software Tools (TEC-5)

The objective is to conduct research and development into photogrammetric processing software tools and techniques for selected tactical sensors. (Contact Michael Collins, 703-428-7424, Michael.L.Collins@usace.army.mil).

F. Telemetry (TEC-6)

The objective is to conduct research and development of techniques and methodologies for representing, compressing, or decompressing terrain data. Input can be existing data products or remotely sensed data. (Contact Michael Collins, 703-428-7424, Michael.L.Collins@usace.army.mil).

Data Representation Branch

I. Introduction

Conducts research and development on innovative technologies for advanced geospatial analysis and processing capabilities supporting a wide-range of military operational processes across mission command war fighter mission areas, and humanitarian assistance and disaster response (HADR).

II. Research Areas

A. Terrain Evaluation and Reasoning (TEC-7)

The objective is to research and develop analytical geospatial models to support small units in mission planning through analysis and exploitation of high resolution terrain, weather forecasts, and socio-cultural data. Key aspects of research include advancing application of high resolution raster and vector data, graphics card accelerated analysis and development of analytical applications that run in a connected and disconnected environments for desktop, mobile, and handheld devices. The object is to develop new terrain evaluation and terrain reasoning capabilities to provide the war fighter with improved situation awareness. (Contact Michael Collins, 703-428-7424, Michael.L.Collins@usace.army.mil).

B. Geospatial Open Source Software and Standards (TEC-8)

The objective is to research and develop capabilities that allow for multiple data collector methods (ie mobile devices, excel spreadsheet, hand written) to ingest, update and distribute non-proprietary feature data. Feature data should be disseminated up, down, and across the multiple organizations, utilizing open source software and open standards. The overall goal is to plan, analyze, and collaborate using dynamic map data to support humanitarian assistance and disaster response (HADR).

C. Imaging/Spectral Research (TEC-9)

The objective 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. This activity may include (through synthesis chemistry) the development of optical labels or taggants to be used in active or passive systems for synoptic or integrated into distributed sensors arrays. These taggants may be organic or inorganic as driven by the need and target detection (e.g., quantum materials like semiconductors or organic fluorophores). (Contact Michael Collins, 703-428-7424, Michael.L.Collins@usace.army.mil).

D. Small Unit Mission Planning Modeling (TEC-10)

This research focuses on developing algorithms, tools, and methodologies to efficiently route U.S. dismounted troops and autonomous or unmanned ground vehicles. While geospatial tools are currently available that project dismounted routes based on physical terrain such as slope, water features, trails, and vegetation, there are no tools that fuse physical terrain costs with human performance factors or mechanical factors related to small deployable autonomous robotics. One of the important human performance factors of interest to the Army is energy expenditure (e.g. calories). Energy expenditure is an important element in estimating soldier risk when planning long or physically demanding dismounted missions. To meet this requirement, the US Army ERDC TEC has researched and developed GIS tools that model energy expenditure along a given route or predict a route along which the least amount of energy will be expended. Research is needed to further understand the effect of soldier weight, load burden, terrain, weather, and cognitive stress on dismounted route selection. This research should lead to the development of small unit dismounted mission planning tools that consider physical terrain, human performance factors, and available mechanical assistance (e.g. autonomous or semi-autonomous robots) to assist small units in dismounted route selection. (Contact Michael Collins, 703-428-7424, Michael.L.Collins@usace.army.mil).

Data and Signature Analysis Branch

I. Introduction

Examines the Military Decision Making Processes (MDMP) and commercial processes against varying force structure concepts, Corp through Squad, to determine the physical implementation(s) of the Army Geospatial Enterprise (AGE). Conduct additional research incorporating fusion sensing using real-time point-cloud processing and product downlink and LiDAR-derived terrain attribution. Explores research and development on emerging technologies to collect and analyze user-generated content by leveraging soldier as sensor and data mining techniques. Conducts research of techniques of maintaining spatial databases from automatic data processing and interpretation systems (e.g., geotext), and other environmental data resources (e.g., web). Develops techniques and methodologies for storing, retrieving, manipulating, analyzing, visualizing, 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. Develops new methods for displaying data; for graphical user interfaces; for controlling sensors or displaying sensor output. Monitors and evaluates government and industry developments in the areas of spatial databases generation technologies and geographic information processing.

II. Research Areas

A. Battlefield Terrain and Environment (TEC-11)

The object is to provide the Army/DoD with advanced techniques for merging, visualizing, and analyzing battlefield terrain and environment information. (Contact Michael Collins, 703-428-7424, Michael.L.Collins@usace.army.mil).

B. Decision Support Tools (TEC-12)

The object is the development of a comprehensive suite of Physical Combat Environment Decision Support Tools that exploits the geospatial context of battle space 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. (Contact Michael Collins, 703-428-7424, Michael.L.Collins@usace.army.mil).

C. Spatial Data Bases (TEC-13)

The object is to conduct research on techniques and equipment for the modeling, representation, and structuring of data in spatial data bases, including temporal properties. Input information can be derived from remotely sensed imagery, terrestrial sensors, or existing terrain/environmental data. Investigate tools for the generation and exploitation of metadata. Extend the capabilities of GIS data structures to more robustly accommodate 3-D and temporal data. Conduct research and develop tools to extend capabilities of wireless disconnected construction, update, and maintenance of geospatial data. (Contact Michael Collins, 703-428-7424, Michael.L.Collins@usace.army.mil).

D. Data Manipulation (TEC-14)

The object is to develop techniques and methodologies for storing, retrieving, manipulating, and disseminating terrain data for use in a broad range of military and civil applications. Techniques are needed for managing, comparing, and fusing data from multiple sources. Assess the contribution of data derived from variable sources and with differing levels of certainty. Investigate Extract/Load/Transform (ELT) technologies for data reformatting, as well as the use of Application Programmer Interfaces (API) and web services for data access and manipulation. Input data can be vector data, elevation data, intelligence data, imagery, or a combination of the above. (Contact Michael Collins, 703-428-7424, Michael.L.Collins@usace.army.mil).

E. Geospatial Information Exploitation (TEC-15)

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. Research includes the application of future smart sensors that process and interpret collected data onboard before providing end user data. (Contact Michael Collins, 703-428-7424, Michael.L.Collins@usace.army.mil).

F. Government and Industry Developments (TEC-16)

The object is to evaluate government and industry developments in the areas of spatial data base generation technologies and geographic information processing. (Contact Michael Collins, 703-428-7424, Michael.L.Collins@usace.army.mil).

G. Visualization (TEC-17)

The objective is to conduct research and development on techniques, equipment, and systems for visualizing geospatial information. Research will establish design principles and practices for the display of 2-dimensional, 3-dimensional, and special-temporal (4-dimensional) data in hardcopy and digital environments. Research will include the investigation of simulation and animation techniques. Physical modeling techniques, as well as digital visualizations, will be evaluated. (Contact Michael Collins, 703-428-7424, Michael.L.Collins@usace.army.mil).

H. Geoparsing (TEC-18)

The objective is to conduct research and development in the extraction and geotagging of place names in text documents. Research will develop geo-specific approaches to improve precision and recall measures for extracted names. Research will also include the development of innovative techniques for visualizing the linkage between the original text and the extracted names, correcting errors in extracted names, and utilizing geotagged place names in Geographic Information Systems (GIS). (Contact Michael Collins, 703-428-7424, Michael.L.Collins@usace.army.mil).

I. Imaging/Spectral Research (TEC-19)

The objective 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. This activity may include (through synthesis chemistry) the development of optical labels or taggants to be used in active or passive systems for synoptic or integrated into distributed sensors arrays.

These taggants may be organic or inorganic as driven by the need and target detection (e.g., quantum materials like semiconductors or organic fluorophores). (Contact Michael Collins, 703-428-7424, Michael.L.Collins@usace.army.mil).

Information Generation and Management Branch

I. Introduction

Increasingly, the war fighter is tasked to work across the entire spectrum of war - from full kinetic operations to stability, reconstruction and emergency response operations. The impact of the cultural environment on full spectrum operations is significant – especially in Counter Insurgency (COIN) and stability operations. The impact of the cultural environment needs to be factored into situational awareness and decision-making tools for the war fighter. However, techniques to collect, display, fuse, and exploit cultural information to support full spectrum operations is often lacking. The focus of this branch is the development of these techniques and tools to give the war fighter a better understanding of socio-cultural context of the battle space and the possible ramifications of their actions. The branch is interested in advanced computation and analysis used for prediction, decision-making, and anomaly detection. Additionally, we are focused on the analysis and retrieval of spatial and temporal data from many sources.

II. Research Areas

A. Spatial Data Mining and Spatial Analysis (TEC-20)

The object is to conduct research and develop tools to use the techniques of spatial data or of spatial analysis on information from a wide variety of terrain, intelligence, environmental, and cultural sources for the purpose of discovering, quantifying, and developing spatial relationships among terrain entities. These relationships can be used for prediction, error detection, and validation of terrain features and attributes. Map algebra techniques and measures for characterizing spatial phenomena are needed, as well as new/improved algorithms for determining suitability, proximity, connectivity, and visibility. Another objective is to utilize the spatio-temporal aspects of terrain, intelligence, environmental, and cultural information to help uncover relationships and patterns that can be used to characterize, analyze, and predict human activities. (Contact Michael Collins, 703-428-7424, Michael.L.Collins@usace.army.mil).

B. Spatial and Temporal Sensor Issues (TEC-21)

The objective is to conduct research and development into techniques and methodologies of sampling and transmitting remotely sensed data having a spatial and/or temporal component. Techniques are needed to analyze sensor signals at (x, y, z, t) and to infer additional information. Input can be from a single sensor or a network of sensors. (Contact Michael Collins, 703-428-7424, Michael.L.Collins@usace.army.mil).

C. Research Techniques to Display, Fuse, and Exploit Cultural Information for War- fighter Missions (TEC-22)

The object is to conduct research and development in the areas of cultural collection, visualization, fusion, and exploitation, with an emphasis on the geospatial. Of particular interest is the relationship between people, natural features, and the infrastructure. The derived methodologies are applied within a geographic information retrieval framework to enhance retrieval performance (e.g., precision and recall) and result in novel methods that integrate data retrieval and analysis to support the knowledge discovery process cycle. (Contact Michael Collins, 703-428-7424, Michael.L.Collins@usace.army.mil).

D. Terrain Characterization (TEC-23)

Terrain characterization includes research initiatives that lead to enhanced characterization of static (e.g., soil texture, land cover, elevation) or dynamic (e.g., dielectric permittivity, snowpack) terrain parameters. Information and knowledge obtained through the use of remotely sensed data is encouraged, though not necessary. Enhanced terrain characterization leads to improved battle space awareness for intelligence preparation of the battlefield, dismounted maneuver, and tactical situational awareness. (Contact Michael Collins, 703-428-7424, Michael.L.Collins@usace.army.mil)

E. Big Spatial Data (TEC-24)

The prevalence of new sensing technologies and extensive modalities of recording human generated content have caused a surge in the amount and growth of spatiotemporal data. The data can manifest under various forms: large repositories of static geographic data to fast arriving evolving data streams. The objective of this research is to investigate new techniques to process, manage, and analyze this massive set of spatiotemporal data. However, the research is not limited to structured geographic data but can include unstructured sources that may contain highly ambiguous geospatial information. Of particular interests are research that advance the state of the art distributed processing/management of spatial data, generalizable methods for online spatial data mining, and summarization approaches of spatiotemporal data. (Contact Michael Collins, 703-428-7424, Michael.L.Collins@usace.army.mil).

F. Semantic Analysis of Spatial Data (TEC-25)

The transition from data to information to knowledge requires a firm understanding of the environment and its components. Semantic analysis provides a foundation upon which entities, objects, and events can be measured in terms of their particular characteristics and determine how they help shape meaningful relationships across space. This area of research seeks extended techniques that can promote the resolution of spatial components, understand their levels of correlation, and determine ranges of influence among one another. Topics of interest include Natural Language Processing (NLP) extraction, entity graph mining, topic discovery, and ontological reasoning across disparate domains. (Contact Michael Collins, 703-428-7424, Michael.L.Collins@usace.army.mil).

G. Modeling social-environmental-conflict systems in support of tactical counterinsurgency or stability operations (TEC-26)

The US Army is increasingly involved in military operations in locations where the natural environment is a contributing factor to the conflict. For example, a degraded natural environment can introduce stress into an area of operations and in conjunction with other factors either initiate conflict or exacerbate existing conflict. Additionally, US Army operations can either directly or indirectly cause an environment to be degraded, thereby introducing undesirable 2nd and 3rd order effects as a result. To understand how military operations effect the natural environment and local populations and conversely how the natural environment and local populations effect military operations will require a systemic perspective that looks at the military operations, natural environment, and the local population together holistically.

In attempting to deal with these types of problems, the US Army has been increasingly looking at how to view the complex operational environment from a systemic perspective – especially when it comes to COIN (counterinsurgency) operations. PAM 525-5-500 discusses the "wicked problem" and the need to look at the battlespace from a systemic perspective. Numerous articles in Military Review and Parameters have cited the same need, especially in articles pertaining to the Army's new concepts on operational design. Operational design is reflected formally in new US Army doctrine – specifically FMs 3-0 and 5-0.

However, while the need for a systemic approach has been described in these documents, the difficulty comes in how to actually execute the approach in practice – especially when capturing and modeling the social, environmental, and conflict systems. Traditionally, social and environmental systems have been defined and modeled separately and attempts to couple them after the fact have proven difficult. In the academic literature, there have been attempts to build models that describe in a unified structure both the social and environmental systems so that their joint effects could be understood. These are commonly called social-environmental system (SES) models. However, the conflict component is generally not part of these models.

Research proposals are sought for research that takes into account all three components of a system – the social, environmental, and conflict components. A system model that accommodates all three components with their respective entities and relationships is a difficult proposition to build in the field. Some of the research questions include: Given that it will be impossible to model the entire system, how do we determine the minimal requirements for the system in order to effectively capture the primary entities and their relationships? How do we gather or capture the information in order to understand and build the system? How do we know when we are done? How can we help the commander look for changes in the system once it has been perturbed by his actions?

The proposal needs to accomplish multiple research goals. First, present a methodology that would facilitate the creation of a system model capturing the social, environmental, and conflict components. This methodology must allow the commander to build a system in order to understand the actors and their relationships. It should be able to create a system view of the inter-related social/environmental/conflict components – i.e. the entities and their

relationships. The methodology needs to provide ways for the system model to be visualized and contextualized to facilitate discussion and interrogation of the system. The approach needs to cover how the commander can assess the completeness of his system and provide guidance on how to improve understanding of the system. The methodology should also show the model may impact dynamically parts of the system that vary across time and space – especially as perturbations are inserted in the system.

Second, using this methodology, model a portion of a social / environmental / conflict system through a case study. (Contact Michael Collins, 703-428-7424, Michael.L.Collins@usace.army.mil).

H. Conflation/Fusion of Spatial Data (TEC-27)

There is an increasing amount of digital geospatial data of interest to the Army. Some of the geospatial data is created by established authorities following well established standards; however, some of the data is created by nonstandard producers, perhaps not following established standards, and often not containing any metadata whatsoever. The reality is that the geospatial data is approaching more of a quilt work of coverage – with varying degrees of spatial and thematic coverage over areas of interest. This trend will continue to grow – especially as the geospatial data collection is pushed every further down to the warfighter – i.e. the soldier as sensor paradigm. How do G-2s/S-2s, intelligence reach back centers, etc. make sense of all of this geospatial data? That is the need or problem - there is a need to *compare* and *fuse/conflate* geospatial data from a variety of digital sources.

Comparison of the multiple geospatial layers will allow analysts to do change detection, identify areas of congruence and disagreement (both spatially and thematically, facilitate spatial data mining across geospatial data layers, etc. The conflation or fusion of multiple data sets will hopefully allow the best combination of data to be created and then utilized in subsequent analyses – such as tactical decision aids. So the more traditional areas of "conflation" include vector-to-vector conflation, but increasingly mixed types of conflation or fusion are needed – for example vector-to-image conflation. Another type of conflation is the fusion of spatial information derived from digital text with traditional geospatial data sources, such as vector data.

Thus, research is needed in topic areas related to a) vector-to-vector conflation, b) vector-to-image conflation, and c) text to vector conflation. Other modes of conflation will be considered. (Contact Michael Collins, 703-428-7424, Michael.L.Collins@usace.army.mil).

I. On Demand Complex Spatio-Temporal Information Delivery (TEC-28)

With extensive amounts of information available, some spatial, some temporal, some spatial-temporal, some neither, decision makers are surrounded by an unprecedented amount of data inputs when making decisions. When applied to the domain of Humanitarian Assistance/Disaster Relief, information feeds shift even more rapidly. The object of this is to conduct research and development in the areas of foundational information pre-event, necessary information for decision making during and shortly after an event, and long-term

information requirements. Of particular interest is the ability to exploit different decision making paradigms, the relationship of the actors, the physical, social, natural environments, and the event. Additional work to create new spatial-temporal statistics that enhance decision making of social phenomena can be explored. Research is needed in topic areas related to a) spatial-temporal statistics and b) information retrieval for near real-time to real-time decision making; and c) visualization of static and dynamic 3/4/Nth dimension information. (Contact Michael Collins, 703-428-7424, Michael.L.Collins@usace.army.mil).

PART II

PRE-PROPOSAL AND PROPOSAL EVALUATION

A. All proposals initially submitted in response to this BAA will be considered pre-proposals. Should ERDC evaluation indicate a need for a full proposal, one will be requested from the offeror. Every pre-proposal and full proposal will include an Executive Summary prepared by the offeror. The Executive Summary will be no more than one page in length. The Executive Summary will not include any sensitive data or proprietary information. The purpose of the Executive Summary is to provide evaluators a comprehensive synopsis, an overview, of the pre-proposal/full proposal's key points. A pre-proposal will not exceed 5 pages. Upon receipt, the ERDC staff will perform an initial review of its scientific merit, its potential contribution to the Army/ERDC mission, and the current availability of funding. As prescribed in FAR 35.016(a), proposed efforts shall focus on supporting ERDC's 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. Offerors of pre-proposals receiving favorable initial review will be encouraged to submit a more detailed full proposal (in the format outlined in Part III), which 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, including how the proposal meets the FAR 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.

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. If a grant or cooperative agreement is contemplated by the offeror, they shall specifically describe in the proposal how the principal purpose of the research effort supports or stimulates a public purpose and, if applicable, the substantial involvement by the

government. See Part III, Pre-Proposal and Proposal Preparation, Section 3 - Type of Contract.

D. Pre-proposals and proposals not considered having 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.

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.

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, including the focus on scientific study and experimentation directed toward advancing the state-of-the-art or increasing knowledge or understanding. It should include all the information specified in this announcement in order to avoid delays in evaluation. Pre-proposals 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.

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).

Proposals submitted under the BAA should clearly identify within the proposal any research that is expected to be fundamental in nature as defined in National Security Defense Directive 189. Fundamental research means basic and applied research in science and engineering, the results of which ordinarily are published and shared broadly within the scientific community, as distinguished from proprietary research and from industrial development, design, production, and product utilization, the results of which ordinarily are restricted for proprietary or national security reasons.

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.

Note that there is a new requirement for contractor reporting if the contract is funded with military funds. The below info is provided for your assistance in complying. At the website listed, there are FAQs you may also find helpful.

"The Office of the Assistant Secretary of the Army (Manpower & Reserve Affairs) operates and maintains a secure Army data collection site where the contractor will report ALL contractor manpower (including subcontractor manpower) required for performance of this contract. The contractor is required to completely fill in all the information in the format using the following web address: https://cmra.army.mil/ The required information includes: (1) Contracting Office, Contracting Officer, Contracting Officer's Technical Representative; (2) Contract number, including task and delivery order number; (3) Beginning and ending dates covered by reporting period; (4) Contractor name, address, phone number, e-mail address, identity of contractor employee entering data; (5) Estimated direct labor hours (including sub-contractors); (6) Estimated direct labor dollars paid this reporting period (including sub-contractors); (7) Total payments (including sub-contractors); (8) Predominant Federal Service Code (FSC) reflecting services provided by contractor (and separate predominant FSC for each sub-contractor if different); (9) Estimated data collection cost; (10) Organizational title associated with the Unit Identification Code (UIC) for the Army Requiring Activity (the Army Requiring Activity is responsible for providing the contractor with its UIC for the purposes of reporting this information); (11) Locations where contractor and sub-contractors perform the work (specified by zip code in the United States and nearest city, country, when in an overseas location, using standardized nomenclature provided on website); (12) Presence of deployment or contingency contract language: and (13) Number of contractor and sub-contractor employees deployed in theater this reporting period (by country). As part of its submission, the contractor will also provide the estimated total cost (if any) incurred to comply with this reporting requirement. Reporting period will be the period of performance not to exceed 12 months ending 30 September of each government fiscal year and must be reported by 31 October of each calendar year. Contractors may use a direct XML data transfer to the database server or fill in the fields on the website. The XML direct transfer is a format for transferring files from a contractor's systems to the secure web site without the need for

separate data entries for each required data element at the web site. The specific formats for the XML direct transfer may be downloaded from the web site."

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 contract clauses are self-deleting; therefore, there is neither a requirement nor need for a modification to the award if any clause is found not applicable. Performance after the receipt of an award signed by the Contracting Officer indicates your full acceptance of all terms and conditions within the award.

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

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 this BAA solicitation

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

B. REPORT REQUIREMENTS:

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://www.gsa.gov/portal/forms/download/884DE4C90A9F054C85256A1F005ABDB1

For grants and cooperative agreements, use the SF-424 located at http://apply07.grants.gov/apply/forms/sample/SF424_2_1-V2.1.pdf

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-proposals 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, TEC and ITL regarding this BAA should be submitted either to email Derek.A.Howard@usace.army.mil or to:

U. S. Army Corps of Engineers
ERDC Contracting Office (ECO)
Attn: CEERD-CT
3909 Halls Ferry Road
Vicksburg, MS 39180-6199

For inquiries, please contact Derek Howard via email or via phone at 601-634-3310.

CRREL's pre-proposals and proposals regarding this BAA should be submitted either to email Wendy.A.Adams@usace.army.mil or to:

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

For inquiries, please contact Wendy Adams via email or via phone at 603-646-4323.

CERL prefers to receive pre-proposals and proposals electronically. The primary address for submission is wanda.l.huber@usace.army.mil, and the back-up address is andrea.j.krouse@usace.army.mil. If necessary, hard copies may be sent to:

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

For inquiries, please contact Jim Dowling via email or phone at 217-373-4479, or Andrea Krouse via email or phone at 217-373-6746.

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 suitability in supporting research is a cost-reimbursable type contract. It 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.

A grant or cooperative agreement will be used only when the principal purpose of a transaction is to accomplish a public purpose of support or stimulation authorized by Federal statute. Contracts will be used when the principal purpose is acquisition of property or services for the direct benefit or use of the Federal Government. The statutory criterion for choosing between grants and cooperative agreements is that for the latter, substantial involvement is expected between the agency and recipient when carrying out the activity contemplated in the agreement.

SECTION 4 - CONTENTS OF PRE-PROPOSAL

Pre-proposals will not exceed five pages and will 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 detailed estimated cost (i.e., labor costs, material costs, burdens, etc.).

6. Statements describing the objective(s) or goal(s) of the working hypothesis to be proved or disproved, if appropriate.

7. Statements describing 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. Statements describing 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.

10. If a cooperative agreement or grant is contemplated, a description of how the principal purpose of the research effort supports or stimulates a public purpose and, if applicable, the substantial involvement by the government. See Part III, Pre-Proposal and Proposal Preparation, Section 3 - Type of Contract.

11. A one page Executive Summary describing the background, scope of work, deliverables, and total proposed price (no cost breakdown is required in the executive summary). The executive summary shall not contain any sensitive data or proprietary information and is excluded from the pre-proposal page limitation of five pages.

SECTION 5 - CONTENTS OF FULL PROPOSALS

Proposals will 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 will contain the following and any other information the offeror considers necessary to address the evaluation criteria 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. A recommended Quality Assurance Surveillance Plan, which includes proposed methods for the Government to evaluate performance and determine that the deliverables (results/products/reports, etc) are properly executed.

3. 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.

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

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

6. 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.

7. If a cooperative agreement or grant is contemplated, a description of how the principal purpose of the research effort supports or stimulates a public purpose and, if applicable, the substantial involvement by the government. See Part III, Pre-Proposal and Proposal Preparation, Section 3 - Type of Contract.

8. A one page Executive Summary, revised as appropriate from the pre-proposal submission, describing the background, scope of work, deliverables, and total proposed price (no cost breakdown is required in the Executive Summary). The Executive Summary shall not contain any sensitive data or proprietary information.

COST

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

1. A complete detail of direct labor to include, by discipline, 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 will 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://farsite.hill.af.mil/vffara.htm

and the DFARS site (clauses beginning with “252.”) at

http://farsite.hill.af.mil/vffara.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.
This contract incorporates one or more clauses by reference.

252.201-7000, Contracting Officer's Representative

52.202-1 Definitions, in solicitations and contracts that exceed the simplified acquisition threshold. When a solicitation provision or contract clause uses a word or term that is defined in the Federal Acquisition Regulation (FAR), the word or term has the same meaning as the definition in FAR 2.101 in effect at the time the solicitation was issued, unless--

(a) The solicitation, or amended solicitation, provides a different definition;

(b) The contracting parties agree to a different definition;

(c) The part, subpart, or section of the FAR where the provision or clause is prescribed provides a different meaning; or

(d) The word or term is defined in FAR Part 31, for use in the cost principles and procedures.

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

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

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.

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

52.203-12, Limitation on Payments to Influence Certain Federal Transactions, shall be included in solicitations and contracts expected to exceed $150,000.

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

52.204-4 Printed or Copied Double-Sided on Postconsumer Fiber Content Paper, in solicitations and contracts that exceed the simplified acquisition threshold.

52.204-6 Data Universal Numbering System (DUNS) Number.

52.204-7 System for Award Management, plus 252.204-7004 Alternate A instructs to substitute the following paragraph (a) for paragraph (a) of the clause at FAR 52.204-7:

(a) Definitions. As used in this provision—

"Data Universal Numbering System (DUNS) number" means the 9-digit number assigned by Dun and Bradstreet, Inc. (D&B) to identify unique business entities.

"Data Universal Numbering System+4 (DUNS+4) number" means the DUNS number means the number assigned by D&B plus a 4-character suffix that may be assigned by a business concern. (D&B has no affiliation with this 4-character suffix.) This 4-character suffix may be assigned at the discretion of the business concern to establish additional System for Award Management records for identifying alternative Electronic Funds Transfer (EFT) accounts (see the FAR at Subpart 32.11) for the same concern.

"Registered in the System for Award Management (SAM) database" means that—

(1) The Offeror has entered all mandatory information, including the DUNS number or the DUNS+4 number, the Contractor and Government Entity (CAGE) code, as well as data required by the Federal Funding Accountability and Transparency Act of 2006 (see Subpart 4.14), into the SAM database; and

(2) The offeror has completed the Core, Assertions, and Representations and Certification, and Points of contact sections of the registration in the SAM database;

(3) The Government has validated all mandatory data fields, to include validation of the Taxpayer Identification Number (TIN) with the Internal Revenue Service (IRS). The Offeror will be required to provide consent for TIN validation to the Government as a part of the SAM registration process.

(4) The Government has marked the record "Active".

(b)

(1) By submission of an offer, the offeror acknowledges the requirement that a prospective awardee shall be registered in the SAM database prior to award, during performance, and through final payment of any contract, basic agreement, basic ordering agreement, or blanket purchasing agreement resulting from this solicitation.

(2) The offeror shall enter, in the block with its name and address on the cover page of its offer, the annotation "DUNS" or "DUNS+4" followed by the DUNS or DUNS+4 number that identifies the offeror's name and address exactly as stated in the offer. The DUNS number will be used by the Contracting Officer to verify that the offeror is registered in the SAM database.

(c) If the offeror does not have a DUNS number, it should contact Dun and Bradstreet directly to obtain one.

(1) An offeror may obtain a DUNS number—

(i) Via the internet at http://fedgov.dnb.com/webform or if the offeror does not have internet access, it may call Dun and Bradstreet at 1-866-705-5711 if located within the United States; or

(ii) If located outside the United States, by contacting the local Dun and Bradstreet office. The offeror should indicate that it is an offeror for a U.S. Government contract when contacting the local Dun and Bradstreet office.

(2) The offeror should be prepared to provide the following information:

(i) Company legal business name.

(ii) Tradestyle, doing business, or other name by which your entity is commonly recognized.

(iii) Company physical street address, city, state and Zip Code.

(iv) Company mailing address, city, state and Zip Code (if separate from physical).

(v) Company telephone number.

(vi) Date the company was started.

(vii) Number of employees at your location.

(viii) Chief executive officer/key manager.

(ix) Line of business (industry).

(x) Company Headquarters name and address (reporting relationship within your entity).

(d) If the Offeror does not become registered in the SAM database in the time prescribed by the Contracting Officer, the Contracting Officer will proceed to award to the next otherwise successful registered Offeror.

(e) Processing time, which normally takes 48 hours, should be taken into consideration when registering. Offerors who are not registered should consider applying for registration immediately upon receipt of this solicitation.

(f) Offerors may obtain information on registration at https://www.acquisition.gov.

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 (Alt A) Central Contractor Registration

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

252.205-7000 Provision of Information to Cooperative Agreement Holders, in solicitations and contracts expected to exceed $1,000,000.

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

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.

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 $30,000.

252.209-7001 Disclosure of Ownership or Control by the Government of a Terrorist Country, in all solicitations expected to result in contracts of $150,000 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 $150,000 or more.

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

52.211-14 Notice of Priority Rating for National Defense, Emergency Preparedness, and Energy Program Use in solicitations when the contract to be awarded will be a rated order.

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

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

52.214-34 Submission of Offers in the English Language.

52.214-35 Submission of Offers in U.S. Currency.

52.215-1, Instructions to Offerors -- Competitive Acquisition, in all competitive solicitations where the Government intends to award a contract without discussions.

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.

52.215-5 Facsimile Proposals.

52.215-8 Order of Precedence -- Uniform Contract Format.

52.215-10 Price Reduction for Defective Cost or Pricing Data.

52.215-11 Price Reduction for Defective Cost or Pricing Data – Modifications.

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

52.215-15 Pension Adjustments and Asset Reversions in solicitations and contracts for which any preaward or postaward cost determinations will be subject to Part 31.

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).

(a) Facilities capital cost of money will be an allowable cost under the contemplated contract, if the criteria for allowability in FAR 31.205-10(b) are met. One of the allowability criteria requires the prospective Contractor to propose facilities capital cost of money in its offer.

(b) If the prospective Contractor does not propose this cost, the resulting contract will include the clause Waiver of Facilities Capital Cost of Money.

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

252.219-7003 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 Business Subcontracting Plan (Test Program), instead of the clauses at 252.219-7003 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.

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 the United States and its outlying areas.

52.219-9 Small Business Subcontracting Plan, in solicitations and contracts that offer subcontracting possibilities, are expected to exceed $650,000 ($1,500,000 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.

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.

52.222-3 Convict Labor, in solicitations and contracts above the micro-purchase threshold, (a) Except as provided in paragraph (b) of this clause, the Contractor shall not employ in the performance of this contract any person undergoing a sentence of imprisonment imposed by any court of a State, the District of Columbia, Puerto Rico, the Northern Mariana Islands, American Samoa, Guam, or the U.S. Virgin Islands.

(b) The Contractor is not prohibited form employing persons--

(1) On parole or probation to work at paid employment during the term of their sentence;

(2) Who have been pardoned or who have served their terms; or

(3) Confined for violation of the laws of any of the States, the District of Columbia, Puerto Rico, the Northern Mariana Islands, American Samoa, Guam, or the U.S. Virgin Islands who are authorized to work at paid employment in the community under the laws of such jurisdiction, if--

(i) The worker is paid or is in an approved work training program on a voluntary basis;

(ii) Representatives of local union central bodies or similar labor union organizations have been consulted;

(iii) Such paid employment will not result in the displacement of employed workers, or be applied in skills, crafts, or trades in which there is a surplus of available gainful labor in the locality, or impair existing contracts for services;

(iv) The rates of pay and other conditions of employment will not be less than those paid or provided for work of a similar nature in the locality in which the work is being performed; and

(v) The Attorney General of the United States has certified that the work-release laws or regulations of the jurisdiction involved are in conformity with the requirements of Executive Order 11755, as amended by Executive Orders 12608 and 12943.

52.222-26 Equal Opportunity.

52.222-21 Prohibition of Segregated Facilities.

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.

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

52.222-35 Equal Opportunity for Veterans in solicitations and contracts if the expected value is $100,000 or more, except when work is performed outside the United States by employees recruited outside the United States.

52.222-36 Affirmative Action for Workers with Disabilities, in solicitations and contracts that exceed $15,000 or are expected to exceed $15,000, 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).

52.222-37 Employment Reports on Veterans, in solicitations and contracts containing the clause at 52.222-35, Equal Opportunity for Veterans.

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.

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. Use Alt II if the contract provides for Contractor activities on a Federal facility.

52.223-6 Drug-Free Workplace, (b) The Contractor, if other than an individual, shall -- within 30 days after award (unless a longer period is agreed to in writing for contracts of 30 days or more performance duration), or as soon as possible for contracts of less than 30 days performance duration --

(1) Publish a statement notifying its employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the Contractor’s workplace and specifying the actions that will be taken against employees for violations of such prohibition;

(2) Establish an ongoing drug-free awareness program to inform such employees about --

(i) The dangers of drug abuse in the workplace;

(ii) The Contractor's policy of maintaining a drug-free workplace;

(iii) Any available drug counseling, rehabilitation, and employee assistance programs; and

(iv) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;

(3) Provide all employees engaged in performance of the contract with a copy of the statement required by subparagraph (b)(1) of this clause;

(4) Notify such employees in writing in the statement required by subparagraph (b)(1) of this clause that, as a condition of continued employment on this contract, the employee will --

(i) Abide by the terms of the statement; and

(ii) Notify the employer in writing of the employee's conviction under a criminal drug statute for a violation occurring in the workplace no later than 5 days after such conviction;

(5) Notify the Contracting Officer in writing within 10 days after receiving notice under subdivision (b)(4)(ii) of this clause, from an employee or otherwise receiving actual notice of such conviction. The notice shall include the position title of the employee;

(6) Within 30 days after receiving notice under subdivision (b)(4)(ii) of this clause of a conviction, take one of the following actions with respect to any employee who is convicted of a drug abuse violation occurring in the workplace:

(i) Taking appropriate personnel action against such employee, up to and including termination; or

(ii) Require such employee to satisfactorily participate in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency; and

(7) Make a good faith effort to maintain a drug-free workplace through implementation of subparagraphs (b)(1) though (b)(6) of this clause.

(c) The Contractor, if an individual, agrees by award of the contract or acceptance of a purchase order, not to engage in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance while performing this contract.

(d) In addition to other remedies available to the Government, the Contractor's failure to comply with the requirements of paragraph (b) or (c) of this clause may, pursuant to FAR 23.506, render the Contractor subject to suspension of contract payments, termination of the contract or default, and suspension or debarment.

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.

252.225-7003 Report of Intended Performance Outside the U. S. and Canada – Submission with Offer in solicitations greater than $12.5 million.

252.225-7004 Report of Intended Contract Performance Outside the U. S. and Canada – Submission after award in solicitations greater than $12.5 million.

252.225-7006 Quarterly Reporting of Actual Contract Performance Outside the U.S., in contracts expected to exceed $650,000.

252.225.7012 Preference for Certain Domestic Commodities.

252.225-7031 Secondary Arab Boycott of Israel.

252.225-7040 Contractor Personnel Authorized to Accompany U.S. Armed Forces Deployed Outside the United States.

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

52.225-13 Restrictions on Certain Foreign Purchases, in solicitations and contracts, unless an exception applies.

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.

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.

52.227-1 Alternate 1, Authorization and Consent. 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.

52.227-6 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

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

252.227-7020 Rights in Special Works.

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.

252.227-7037 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--Ownership by the Contractor (Short Form). Report of Subject Inventions and Subcontracts is located at:

http://www.dtic.mil/whs/directives/infomgt/forms/eforms/dd0882.pdf

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.

52.227-11 Patent Rights -- Ownership by the Contractor, unless an alternative patent rights clause is used in accordance with paragraph (c), (d), or (e) of this section, insert the clause at 52.227-11, Patent Rights--Ownership by the Contractor. 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(e) or otherwise supplement the clause 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 the filing date, serial

number, title, patent number and issue date for any patent application filed on any subject invention in any country or, upon request, copies of any patent application so identified. (iv) Furnish the Government an irrevocable power to inspect and make copies of the patent application file when a Government employee is a co-inventor.

52.227-14 Rights in Data -- Generally, a contract should contain only one data rights clause. However, where more than one is needed, the contract should distinguish the portion of contract performance to which each pertains. (b)(1) Insert the clause at 52.227-14, Rights in Data--General, 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 27.405-1, although in these cases insert the clause at 52.227-14, Rights in Data--General, and make it applicable to data other than special works, as appropriate (see paragraph (e) of this section); (ii) For the acquisition of existing data, commercial computer software, or other existing data, as described in 27.405-2 through 27.405-4 (see paragraphs (f) and (g) of this section); (iii) A small business innovation research contract (see paragraph (h) of this section); (iv) To be performed outside the United States (see paragraph (i)(1) of this section); (v) For architect-engineer services or construction work (see paragraph (i)(2) of this section); (vi) For the management, operation, design, or construction of a Government-owned facility to perform research, development, or production work (see paragraph (i)(3) of this section); or (vii) A contract involving cosponsored research and development in which a clause providing for less than unlimited right has been authorized (see 27.408).

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.

52.228-7 Insurance -- Liability to Third Persons.

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 territories, Puerto Rico, or the North Mariana Islands, when the contract is expected to exceed the simplified acquisition threshold.

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.

52.230-2 Cost Accounting Standards, in negotiated contracts, a) Unless the contract is exempt under 48 CFR 9903.201-1 and 9903.201-2, the provisions of 48 CFR Part 9903 are incorporated herein by reference and the Contractor, in connection with this contract, shall --

(1) (CAS-covered Contracts Only) By submission of a Disclosure Statement, disclose in writing the Contractor’s cost accounting practices as required by 48 CFR 9903.202-1 through 9903.202-5, including methods of distinguishing direct costs from indirect costs and the basis used for allocating indirect costs. The practices disclosed for this contract shall be the same

as the practices currently disclosed and applied on all other contracts and subcontracts being performed by the Contractor and which contain a Cost Accounting Standards (CAS) clause. If the Contractor has notified the Contracting Officer that the Disclosure Statement contains trade secrets and commercial or financial information which is privileged and confidential, the Disclosure Statement shall be protected and shall not be released outside of the Government.

(2) Follow consistently the Contractor's cost accounting practices in accumulating and reporting contract performance cost data concerning this contract. If any change in cost accounting practices is made for the purposes of any contract or subcontract subject to CAS requirements, the change must be applied prospectively to this contract and the Disclosure Statement must be amended accordingly. If the contract price or cost allowance of this contract is affected by such changes, adjustment shall be made in accordance with subparagraph (a)(4) or (a)(5) of this clause, as appropriate.

(3) Comply with all CAS, including any modifications and interpretations indicated thereto contained in 48 CFR Part 9904, in effect on the date of award of this contract or, if the Contractor has submitted certified cost or pricing data, on the date of final agreement on price as shown on the Contractor's signed certificate of current cost or pricing data. The Contractor shall also comply with any CAS (or modifications to CAS) which hereafter become applicable to a contract or subcontract of the Contractor. Such compliance shall be required prospectively from the date of applicability to such contract or subcontract.

(4) (i) Agree to an equitable adjustment as provided in the Changes clause of this contract if the contract cost is affected by a change which, pursuant to subparagraph (a)(3) of this clause, the Contractor is required to make to the Contractor's established cost accounting practices.

(ii) Negotiate with the Contracting Officer to determine the terms and conditions under which a change may be made to a cost accounting practice, other than a change made under other provisions of subparagraph (a)(4) of this clause; provided that no agreement may be made under this provision that will increase costs paid by the United States.

(iii) When the parties agree to a change to a cost accounting practice, other than a change under subdivision (a)(4)(i) of this clause, negotiate an equitable adjustment as provided in the Changes clause of this contract.

(5) Agree to an adjustment of the contract price or cost allowance, as appropriate, if the Contractor or a subcontractor fails to comply with an applicable Cost Accounting Standard, or to follow any cost accounting practice consistently and such failure results in any increased costs paid by the United States. Such adjustment shall provide for recovery of the increased costs to the United States, together with interest thereon computed at the annual rate established under section 6621(a)(2) of the Internal Revenue Code of 1986 (26 U.S.C.6621(a)(2)) for such period, from the time the payment by the United States was made to the time the adjustment is effected. In no case shall the Government recover costs greater than the increased cost to the Government, in the aggregate, on the relevant contracts subject to the price adjustment, unless the Contractor made a change in its cost accounting practices

of which it was aware or should have been aware at the time of price negotiations and which it failed to disclose to the Government.

(b) If the parties fail to agree whether the Contractor or a subcontractor has complied with an applicable CAS in 48 CFR 9904 or a CAS rule or regulation in 48 CFR 9903 and as to any cost adjustment demanded by the United States, such failure to agree will constitute a dispute under the Contract Disputes Act (41 U.S.C.601).

(c) The Contractor shall permit any authorized representatives of the Government to examine and make copies of any documents, papers, or records relating to compliance with the requirements of this clause.

(d) The Contractor shall include in all negotiated subcontracts which the Contractor enters into, the substance of this clause, except paragraph (b), and shall require such inclusion in all other subcontracts, of any tier, including the obligation to comply with all CAS in effect on the subcontractor's award date or if the subcontractor has submitted certified cost or pricing data, on the date of final agreement on price as shown on the subcontractor's signed Certificate of Current Cost or Pricing Data. If the subcontract is awarded to a business unit which pursuant to 48 CFR 9903.201-2 is subject to other types of CAS coverage, the substance of the applicable clause set forth in subsection 30.201-4 of the Federal Acquisition Regulation shall be inserted. This requirement shall apply only to negotiated subcontracts in excess of $650,000, except that the requirement shall not apply to negotiated subcontracts otherwise exempt from the requirement to include a CAS clause as specified in 48 CFR 9903.201-1.

52.230-7 Proposal Disclosure—Cost Accounting Practice Changes

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.

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

252.232-7003 Electronic Submission of Payment Requests and Receiving Reports.

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.

252.232-7010 Levies on Contractor Payments.

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.

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

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.

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.

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.

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. (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.

52.232-33 Payment by Electronic Funds Transfer—System for Award Management.

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.

52.233-2 Service of Protest, in solicitations for contracts expected to exceed the simplified acquisition threshold.

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.

52.233-4 – Applicable Law for Breach of Contract Claim.

252.233-7001 Choice of Law (Overseas).

252.235-7010 Acknowledgment of Support.

252.235-7011 Final Scientific or Technical Report.

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.

252.239-7000 Protection Against Compromising Emanations

52.242-13 Bankruptcy, in all solicitations and contracts exceeding the simplified acquisition threshold.

52.242-15 Stop-Work Order. If a cost-reimbursement contract is contemplated, the contracting officer shall use the clause with its Alternate I.

52.243-1 Changes -- Fixed-Price.

52.243-6 Change Order Accounting, in solicitations and contracts for research and development contracts of significant technical complexity, if numerous changes are anticipated.

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.

52.244-6 Subcontracts for Commercial Items.

52.245-1, Government Property, Except as provided in paragraph (d) of this section, the contracting officer shall insert the clause at 52.245-1, Government Property, in- (i) All cost reimbursement, time-and-material, and labor-hour type solicitations and contracts; and (ii) Fixed-price solicitations and contracts when the Government will provide Government property. (iii) Contracts or modifications awarded under FAR Part 12 procedures where Government property that exceeds the simplified acquisition threshold, as defined in FAR 2.101, is furnished or where the contractor is directed to acquire property for use under the contract that is titled in the Government.

52.245-9, Use and Charges, when Government will furnish property for performance of the contract.

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.

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.

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).

52.246-16 Responsibility for Supplies.

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.

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.

52.249-1 Termination for Convenience of the Government (Fixed-Price) (Short Form), as prescribed in 49.502(a) (1), in solicitations and contracts when a fixed-price contract is contemplated and the contract amount is expected to be $150,000 or less, except

(a) if use of the clause at 52.249-4, Termination for Convenience of the Government (Services) (Short Form) is appropriate

(b) in contracts for research and development work with an educational or nonprofit institution on a no-profit basis,

(c) or if one of the clauses prescribed or cited at 49.505(a), (b), or (e), is appropriate:

- Fixed-price contracts of $150,000 or less (short form).

(1) General use. 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 $150,000 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 $150,000.

(i) General use. 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 $150,000, except in contracts for Research and development work with an educational or nonprofit institution on a no-profit basis It shall not be used if the clause at 52.249-4, Termination for Convenience of the Government (Services)

(Short Form), is appropriate (see 49.502(c)), or one of the clauses prescribed or cited at 49.505(a), (b), or (e), is appropriate.

(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

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.

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.

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.

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 https://www.acquisition.gov/far/current/html/FARTOCP52.html#wp372482 and the DFARS site (clauses beginning with “252.”) at http://www.acq.osd.mil/dpap/dars/dfars/html/current/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.
This contract incorporates one or more clauses by reference.

252.201-7000, Contracting Officer's Representative.

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.

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

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

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.

52.203-12 Limitation on Payments to Influence Certain Federal Transactions, shall be included in solicitations and contracts expected to exceed $150,000.

52.203-14 Display of Hotline Posters, Unless the contract is for the acquisition of a commercial item under part 12 or will be performed entirely outside the United States--

...

(b) Insert the clause at FAR 52.203-14, Display of Hotline Poster(s), if--(i) The contract exceeds $5,000,000 or a lesser amount established by the agency; and(ii)(A) The agency has a fraud hotline poster; or(B) The contract is funded with disaster assistance funds.In

paragraph (b)(3) of the clause, the contracting officer shall--(i) Identify the applicable posters; and(ii) Insert the website link(s) or other contact information for obtaining the agency and/or Department of Homeland Security poster.In paragraph (d) of the clause, if the agency has established policies and procedures for display of the OIG fraud hotline poster at a lesser amount, the contracting officer shall replace ``$5,000,000'' with the lesser amount that the agency has established.

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

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

52.204-6 Data Universal Numbering System (DUNS) Number.

52.204-7 Central Contractor Registration, plus 252.204-7004 Alternate A instructs to substitute the following paragraph (a) for paragraph (a) of the clause at FAR 52.204-7:

(a) Definitions. As used in this clause--

“Central Contractor Registration (CCR) database” means the primary Government repository for contractor information required for the conduct of business with the Government.

“Commercial and Government Entity (CAGE) code” means—

(1) A code assigned by the Defense Logistics Information Service (DLIS) to identify a commercial or Government entity; or

(2) A code assigned by a member of the North Atlantic Treaty Organization that DLIS records and maintains in the CAGE master file. This type of code is known as an “NCAGE code.”

“Data Universal Numbering System (DUNS) number” means the 9-digit number assigned by Dun and Bradstreet, Inc. (D&B) to identify unique business entities.

“Data Universal Numbering System +4 (DUNS+4) number” means the DUNS number assigned by D&B plus a 4-character suffix that may be assigned by a business concern. (D&B has no affiliation with this 4-character suffix.) This 4-character suffix may be assigned at the discretion of the business concern to establish additional CCR records for identifying alternative Electronic Funds Transfer (EFT) accounts (see Subpart 32.11 of the Federal Acquisition Regulation) for the same parent concern.

“Registered in the CCR database” means that—

(1) The Contractor has entered all mandatory information, including the DUNS number or the DUNS+4 number, into the CCR database;

(2) The Contractor’s CAGE code is in the CCR database; and

(3) The Government has validated all mandatory data fields and has marked the records “Active.”

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 Central Contractor Registration, Alt A

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 $1,000,000.

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

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.

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 $30,000.

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.

52.211-14 Notice of Priority Rating for National Defense, Emergency Preparedness, and Energy Program Use, in solicitations when the contract to be awarded will be a rated order.

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

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

52.214-34 Submission of Offers in the English Language.

52.214-35 Submission of Offers in U.S. Currency.

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

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.

52.215-5 Facsimile Proposals.

52.215-8 Order of Precedence -- Uniform Contract Format.

52.215-10 Price Reduction for Defective Cost or Pricing Data.

52.215-11 Price Reduction for Defective Cost or Pricing Data – Modifications.

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

52.215-15 Pension Adjustment and Asset Reversions in solicitations and contracts for which any preaward or postaward cost determinations will be subject to Part 31.

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.

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

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."

52.216-8 Fixed Fee, in solicitations and contracts when a cost-plus-fixed-fee contract is contemplated.

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 Predetermined Indirect Cost Rates.

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.

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 the United States and its outlying areas.

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.

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.

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 $150,000.

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.

52.222-26 Equal Opportunity.

52.222-21 Prohibition of Segregated Facilities.

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.

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

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.

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).

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.

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.

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. Use Alt II if the contract provides for Contractor activities on a Federal Facility.

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.

52.223-14, Toxic Chemical Release Reporting, in the resulting contract, if the contract is expected to exceed $100,000.

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) 52.224-1, Privacy Act Notification. (b) 52.224-2, Privacy Act.

252.225-7003, Report of Intended Performance Outside the U. S., in solicitations greater than $500,000.

252.225-7004, Report of Intended Contract Performance Outside the U.S. and Canada in solicitations greater than $12.5 million.

252.225-7006, Quarterly Reporting of Actual Contract Performance Outside the U.S., in contracts expected to exceed $500,000.

252.225.7012, Preference for Certain Domestic Commodities.

252.225-7018, Notice of Prohibition of Certain Contracts with Foreign Entities for the Conduct of Ballistic Missile Defense Research, Development, Test, and Evaluation.

252.225-7031, Secondary Arab Boycott of Israel.

252.225-7040, Contractor Personnel Authorized to Accompany U.S. Armed Forces Deployed Outside the United States.

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

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.

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.

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.

52.227-1 Alternate 1, Authorization and Consent. 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.

52.227-6, 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) 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

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

252.227-7020 Rights in Special Works.

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.

252.227-7037, 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).Report of Subject Inventions and Subcontracts is located at:

http://www.dtic.mil/whs/directives/infomgt/forms/eforms/dd0882.pdf

252.227-7038, Patent Rights-Ownership by the Contractor (Large Business), Use the clause at 252.227-7038, Patent Rights--Ownership by the Contractor (Large Business), instead of the clause at FAR 52.227-11, in solicitations and contracts for experimental, developmental, or research work if--(A) The contractor is other than a small business concern or nonprofit organization; and(B) No alternative patent rights clause is used in accordance with FAR 27.303(c) or (e).

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.

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.

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.

52.227-11 Patent Rights -- Ownership by the Contractor, unless an alternative patent rights clause is used in accordance with paragraph (c), (d), or (e) of this section, insert the clause at 52.227-11, Patent Rights--Ownership by the Contractor. 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(e) or otherwise supplement the clause 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 the filing date, serial number, title, patent number and issue date for any patent application filed on any subject invention in any country or, upon request, copies of any patent application so identified. (iv) Furnish the Government an irrevocable power to inspect and make copies of the patent application file when a Government employee is a co-inventor.

52.227-13, Patent Rights -- Ownership by the Government, unless an alternative patent rights clause is used in accordance with paragraph (c), (d), or (e) of this section, insert the clause at 52.227-11, Patent Rights--Ownership by the Contractor. 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(e) or otherwise supplement the clause 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 the filing date, serial number, title, patent number and issue date for any patent application filed on any subject invention in any country or, upon request, copies of any patent application so identified.(iv) Furnish the Government an irrevocable power to inspect and make copies of the patent application file when a Government employee is a co-inventor.

52.227-14 Rights in Data -- Generally, a contract should contain only one data rights clause. However, where more than one is needed, the contract should distinguish the portion of contract performance to which each pertains. (b)(1) Insert the clause at 52.227-14, Rights in Data--General, 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 27.405-1, although in these cases insert the clause at 52.227-14, Rights in Data--General, and make it applicable to data other than special works, as appropriate (see paragraph (e) of this section); (ii) For the acquisition of existing data, commercial computer software, or other existing data, as described in 27.405-2 through 27.405-4 (see paragraphs (f) and (g) of this section); (iii) A small business innovation research contract (see paragraph (h) of this section); (iv) To be performed outside the United States (see paragraph (i)(1) of this section); (v) For architect-engineer services or construction work (see paragraph (i)(2) of this section); (vi) For the management, operation, design, or construction of a Government-owned facility to perform research, development, or production work (see paragraph (i)(3) of this section); or (vii) A contract involving cosponsored research and development in which a clause providing for less than unlimited right has been authorized (see 27.408).

52.228-7, Insurance -- Liability to Third Persons.

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.

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.

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) 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) 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 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 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 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 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 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.

52.230-7, Proposal Disclosure—Cost Accounting Practice Changes.

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.

252.232-7003, Electronic Submission of Payment Requests.

252.232-7010, Levies on Contractor Payments.

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.

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

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.

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.

52.232-22, Limitation of Funds, in solicitations and contracts if an incrementally funded cost-reimbursement contract is contemplated.

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.

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.

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, (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.

52.232-33, Payment by Electronic Funds Transfer--Central Contractor Registration.

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.

52.233-2, Service of Protest, in solicitations for contracts expected to exceed the simplified acquisition threshold.

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.

52.233-4 – Applicable Law for Breach of Contract Claim.

252.233-7001, Choice of Law (Overseas).

252.235-7010, Acknowledgment of Support and Disclaimer.

252.235-7011, Final Scientific or Technical Report

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.

252.239-7000, Protection Against Compromising Emanations

52.242-1, Notice of Intent to Disallow Costs.

52.242-3, Penalties for Unallowable Costs, in all solicitations and contracts, over $500,000.

52.242-4, Certification of Indirect Costs, into all solicitations and contracts which provide for establishment of final indirect cost rates.

52.242-13, Bankruptcy, in all solicitations and contracts exceeding the simplified acquisition threshold.

52.242-15, Stop-Work Order, Alternate I.

52.243-2, Changes -- Cost-Reimbursement, Alternate V.

52.243-6, Change Order Accounting, in solicitations and contracts for research and development contracts of significant technical complexity, if numerous changes are anticipated.

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.

52.244-2, Subcontracts, Alternate 1.

52.244-5, Competition in Subcontracting, when the contract amount is expected to exceed the simplified acquisition threshold.

52.244-6, Subcontracts for Commercial Items.

52.245-2, Government Property, Except as provided in paragraph (d) of this section, the contracting officer shall insert the clause at 52.245-1, Government Property, in-(i) All cost reimbursement, time-and-material, and labor-hour type solicitations and contracts; and(ii) Fixed-price solicitations and contracts when the Government will provide Government property.(iii) Contracts or modifications awarded under FAR Part 12 procedures where Government property that exceeds the simplified acquisition threshold, as defined in FAR 2.101, is furnished or where the contractor is directed to acquire property for use under the contract that is titled in the Government

52.245-9, Use and Charges.

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.

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.

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 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.

52.249-5, Termination for the Convenience of the Government (Educational and Other Nonprofit Institutions), in solicitations and contracts for research and development work with an educational or nonprofit institution on a nonprofit or no-fee basis.

52.249-6, Termination (Cost Reimbursement), in solicitations and contracts except in contracts for research and development with an educational or nonprofit institution on a no-fee basis.

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.

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.

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 C
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 $150,000, 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

52.204-8 – Annual Representations and Certifications

The offeror has completed the annual representations and certifications electronically via the Online Representations and Certifications Application (ORCA) website at http://orca.bpn.gov . After reviewing the ORCA database information, the offeror verifies by submission of the offer that the representations and certifications currently posted electronically have been entered or updated within the last 12 months, are current, accurate, complete, and applicable to this solicitation (including the business size standard applicable to the NAICS code referenced for this solicitation), as of the date of this offer and are incorporated in this offer by reference (see FAR 4.1201); except for the changes identified below [offeror to insert changes, identifying change by clause number, title, date]. These amended representation(s) and/or certification(s) are also incorporated in this offer and are current, accurate, and complete as of the date of this offer.

FAR Clause	Title	Date	Change

Any changes provided by the offeror are applicable to this solicitation only, and do not result in an update to the representations and certifications posted on ORCA.

(End of Provision)

DFARS 252.209-7001DISCLOSURE OF OWNERSHIP OR CONTROL BY THE GOVERNMENT OF A TERRORIST COUNTRY (Jan 2009)

(Applicable if contract is expected to be $100,000 or more.)

(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 subject to this provision include: Cuba, Iran, 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 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 252.209-7002DISCLOSURE OF OWNERSHIP OR CONTROL BY A FOREIGN GOVERNMENT
(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 outlying areas) as well as any political subdivision, agency, or instrumentality thereof.

(4) "Proscribed information" means—

(i) Top Secret information;

(ii) Communications security (COMSEC) material, excluding controlled cryptographic items when unkeyed or utilized with unclassified keys;

(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 provision. 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 interest concerning the Offeror's immediate parent, intermediate 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 52.227-7 PATENTS-NOTICE OF GOVERNMENT LICENSEE (use if Government is obligated to pay a royalty on a patent involved in the prospective contract)

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 52.230-1COST ACCOUNTING STANDARDS NOTICES AND CERTIFICATION

(Applicable if proposed contract subject to CAS as specified in 48 CFR 9903.201 (FAR Appendix)

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 $650,000 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 more than $50 million (of which at least one award exceeded $1 million) 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 $25 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

(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

(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 (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)