Joint Oceanographic Institutions (JOI)
Request for Proposal
OOI Network Coastal and Global Scale Nodes

SECTION A – GENERAL INFORMATION

The Joint Oceanographic Institutions (JOI) is requesting proposals to establish an Implementing Organization (IO) to support the development and operation of the Ocean Observatories Initiative (OOI) Network. The resultant Subaward will continue the evolution of the design, procurement and operation of the Global and Coastal Scale Nodes, critical components of the OOI Network. These were formerly known as the Global Scaled Observatory and the Coastal Scaled Observatory. Although documentation may continue to carry these names, this RFP begins the process of envisioning the OOI Network as a single entity comprised of a number of Scientific and Gateway Nodes.

The effort to prepare, release and conduct this procurement is funded by a cooperative agreement between JOI and the National Science Foundation which requires compliance with OMB Circular A-110, Uniform Administrative Requirements for Grants and Agreements with Institutions of Higher Education, Hospitals and Other Nonprofit Organizations.

A.1 IMPORTANT NOTES

1) Because the OOI Network is a research and education facility and will involve researchers and students in all aspects, proposals will only be accepted from academic institutions, academically-led academic/industry partnerships or nonprofit oceanographic research centers currently conducting graduate level research programs in oceanographic and the broader geosciences.

2) JOI has not received funding for this procurement. This solicitation does not commit JOI to pay any cost incurred in the preparation or submission of the Offeror's proposal or in making necessary studies or designs for the preparation thereof. It also does not commit JOI to contract for the services.

3) JOI as the Program Manager for the OOI Program, will review, provide comments and approve all deliverables in Section F.2. This right of review and approval is not subject to negotiation or deletion at time of award; therefore, Offerors are advised to consider this in their deliberation of whether to compete for this award.

A.2 ISSUING OFFICE/PROPOSAL DUE DATE

JOI is the only point of contact for this procurement. Any questions related to this procurement should be emailed to scavros@joiscience.org by 4 PM, Friday, March 30, 2007. JOI will consolidate all questions and provide answers on the JOI website within 14 days thereafter.

JOI requests potential Offerors to provide a non-binding Notice of Intent to submit a proposal after all assembled questions have been answered and posted on the JOI website. This Notice must be submitted to JOI no later than Friday, April 20, 2007.

Hard copy proposals are due by 4PM EST on Thursday, June 14, 2007 to the following address:

Strat Cavros, Contracts Administrator
Joint Oceanographic Institutions
1201 New York Ave, NW
Suite 400,
Washington, DC 20005

(End of Section A)

SECTION B - SUPPLIES OR SERVICES AND PRICES/COSTS

B.1 SCOPE OF Subaward

Subrecipient shall provide all necessary labor and material to support the activities delineated in Section C. Performance shall be in accordance with all terms, conditions and specifications as stipulated herein.

B.2 TYPE OF Subaward

JOI anticipates the award of a Cost Reimbursement, No Fee type Subaward. This type establishes an estimate of total cost for the purpose of obligating funds and establishing a cost ceiling that the Subrecipient may not exceed (except at its own risk) without the advance approval of JOI. The Subrecipient must have an accounting system adequate for determining costs applicable to the Subaward established in advance of award.

B.3 TOTAL ESTIMATED COSTS

CONTRACT LINE ITEM NUMBER	TERM	ESTIMATED COST
Task 1, 2, 3, 4, 5, 6, 7, 8	August 2007+60 months covers Tasks 1-8	**To be completed at award**
OPTION 1 Tasks 1, 7, 8	August 2013-July, 2014	***To be completed at award***
OPTION 2 Tasks 1, 7, 8	August 2014-July, 2015	***To be completed at award***
OPTION 3 Tasks 1, 7, 8	August 2015-July, 2016	***To be completed at award***
OPTION 4 Tasks 1, 7, 8	August 2016-July, 2017	***To be completed at award***
OPTION 5 Tasks 1, 7, 8	August 2017-July, 2018	***To be completed at award***
Total Estimated Cost of Subaward		$_____ ***To be completed at award***

(End of Section B)

SECTION C – STATEMENT OF WORK

1. Introduction

Joint Oceanographic Institutions, Inc. (JOI) is a not-for-profit organization classified as a 501(c)(3) tax-exempt organization by the IRS. JOI was incorporated in April 1976.

JOI is a consortium of 31 premier oceanographic research institutions that serves the U.S. scientific community through management of large-scale, global research programs in the fields of marine geology and geophysics and oceanography. Known for leadership of U.S. scientific ocean drilling initiatives and growing involvement in ocean observing, JOI facilitates science advisory committees, coordinates with funding agencies and policy makers, sponsors meetings that enable scientific planning and exchange, and publicizes the opportunities and outcomes of its programs. For more than 25 years, JOI has helped facilitate discovery and advance global understanding of the Earth and its oceans through excellence in program management.

The Ocean Observatories Initiative (OOI) Network will facilitate research across a broad cross section of ocean sciences and is part of a broader international effort to establish a global ocean-observing system. The OOI Network is an outgrowth of scientific planning efforts by the national and international ocean research communities over the past decade and is motivated in part by rapidly expanding development of computational, robotic, communications, and sensor capabilities. The OOI Network is envisioned to be in operation for 25 to 30 years and consist of a number of Nodes located at areas of high scientific interest which are operated and controlled through the OOI Network Cyberinfrastructure (CI).

The Joint Oceanographic Institutions invites proposals from Implementing Organizations (IOs) for the design, development, construction and operation of the Coastal and Global Scale Nodes of the OOI Network. Proposals will be accepted from U.S. academic research institutions, academically-led academic/industry partnerships, or nonprofit oceanographic research centers who are currently conducting graduate level research programs in oceanographic and broader geosciences. One award will be made. IOs for the Regional Scale Nodes (formerly the Regional Cabled Obervatory (RCO)) and the CI systems have been solicited under separate RFPs.

Contingent upon federal funding, the anticipated duration of the initial IO award is approximately 10 years, consisting of a base design and construction period of 5 years and a subsequent initial operation and maintenance period option of an additional 5 years. Design and construction of the OOI Network will be funded through the Major Research Equipment and Facilities Construction (MREFC) award to JOI from the National Science Foundation (NSF) which is expected to provide a $331.11M investment in ocean observing infrastructure and technologies over a five year period (six U.S. fiscal years). Operation, administration, and maintenance of the OOI Network will be funded through annual requests by JOI to the NSF. The OOI Network infrastructure, as designed, constructed, and operated by the IOs, will be managed by the JOI Ocean Observing Program Office.

The initial phase for the Coastal and Global Scale Nodes is a design and development phase culminating in a project plan, a traceable set of performance requirements, interface agreements, preparation for and participation in a Preliminary Design Review (PDR) in December 2007, and additional reviews as required. Applications for critical long-term permits will also be made during the initial phase.

The second phase is the implementation of the project, including construction contracts, construction permitting, testing, installation, and commissioning and acceptance of the nodes.

The third phase covers the initial operations of the components installed during Phase 2.

The fourth phase provides for on-going operations, administration and maintenance for the network. Additional operational funding will be forthcoming for Phase 4, but operational planning as well as minimizing the total life cycle cost is an objective for Phases 1 and 2.

This SOW addresses the work tasks in phases 1, 2, 3 and 4 of the OOI Network. Phase 3 represents the initial operation and maintenance period, followed by full operations in the five option years of Phase 4.

2. Background

Our view of the ocean is rapidly shifting from static, descriptive accounts to highly dynamic representations and models of processes, phenomena and systems that interact and feedback in complex ways that remain incompletely understood. These emerging interactions and feedbacks occur at time and space scales, intensities and frequencies that are difficult to capture with traditional discrete expeditionary sampling. Expeditionary sampling, most traditionally using ships, is also an ineffective way of recording aperiodic events that are a critical component of our understanding of ocean processes. Such events are recognized to play an important role in many long-term environmental changes, including large changes in marine ecosystems, now being observed on interannual and decadal time scales. To characterize the range of temporal processes occurring across varying spatial scales of the ocean, new infrastructure approaches are needed that are capable of providing long-term, in-situ, high-resolution observations of critical physical, chemical, biological, and geological parameters and phenomena. Such infrastructure will provide novel platforms for continued oceanographic discovery and facilitate continued investigation of oceanographic phenomena. Emerging technological capabilities are enabling the investigation of complex atmospheric, ocean, and earth system processes and the inter-linkages among these, along with a new intellectual approach: adaptive "observatory" science. This approach will allow the study of multiple inter-related properties, variables, and processes over a range of time and space scales.

NSF's ocean observing efforts seek to direct the science, technology, education and outreach of an emerging network of research-driven ocean observatory nodes under the OOI Network. The global scale nodes will consist of buoys that will provide near-real-time data transmission from on or near the buoy (including extensions on the seafloor) via satellite. The regional scale nodes, off the coast of the northwestern United States, will provide power and data transmission to sensors on the Juan de Fuca tectonic plate using an undersea cable. The coastal scale nodes will be fixed and movable observing platforms that will be installed at select locations on the U.S. continental shelf.

Scientific planning for the OOI Network is well underway, supported by numerous workshop reports and documents. Documentation of the present status of the effort, as well as ongoing planning and workshop activities can be found at the JOI website. Many individual aspects of the OOI Network involve leading-edge developments, and the ultimate scale and integration will be novel to the ocean science community. It is thus critical that all network components and subsystems, as well as the overall integration and installation plan, be carefully considered and reviewed prior to their installation.

To take full advantage of the expertise and skills of the wider U.S. oceanographic research community, who are the eventual end-users of the OOI Network, it is essential that the fullest participation and

cooperation of this group be engaged and consulted during proposal preparation. At the same time, relevant expertise lies in federal agencies and in the private sector, including the offshore technology industry and private marine science and engineering sectors. **Academic institutions are strongly encouraged to seek partnerships with industry during the preparation of the proposal.**

One focus of global scale nodes is to contribute to studies of the ocean's role in climate change by providing long term, four dimensional views of variations in oceanographic properties and air-sea interactions. This network of fixed ocean observing nodes also seeks to improve understanding of the structure and dynamics of the Earth's interior by collecting hydro-acoustic and seismic data in areas of the ocean which are otherwise lacking coverage.

The focus of coastal scale nodes is to provide new opportunities for research in areas such as the variability of large-scale coastal ocean circulation, material mass balances (nutrient and carbon balances), ecosystem studies, and coastal morphology and beach erosion. These observatory nodes are particularly important because they facilitate basic research on episodic and extreme events in the coastal ocean. Such research will improve predictions of harmful algal blooms or storm-related coastal erosion, improve the accuracy of regional coastal models and forecasts, and assess the magnitude and quality of anthropogenic effects on the coastal ocean. Coastal scale nodes will employ a variety of facilities to gather data in the coastal region, including moored buoys, cables, , AUVs, airborne sensors, and ships.

An updated conceptual design for the global and coastal infrastructure of the OOI Network has been posted on the JOI website (March 8, 2007). The coastal and global scale nodes will be procured by award to a single Implementing Organization.

3. Science Plan and Conceptual Network Designs

The Science Plan and the updated Conceptual Network Design for the OOI Network can be found on the JOI website. The Science Plan and the Conceptual Network Design serve as a focal point for determining the fixed and mobile infrastructure and the sensors and instruments that will be installed as part of the initial construction using MREFC funding. Science User Requirements are in the process of being developed and will be posted on the JOI website when available.

4. Scope of Work

The primary responsibility of the IO will be to provide for the design, development, construction, and operation of the Coastal and Global Scale Nodes. The IO program shall include, but not be limited to:

- Project Management**,** including Permitting
- Systems Engineering including requirements and performance definition and system testing
- Hardware Development
- Software Development
- Shore Facilities
- Implementation, including installation, commissioning, and acceptance
- Operation and Maintenance of the coastal and global scale nodes, including operation of science investigations and data
- Science Outreach and Education

The infrastructure includes, but is not limited to:

- Hardware, consisting of

  - Acoustically-linked discus buoys, including mechanical mooring, redundant buoy-based acoustic modems, buoy-based power, buoy-based control, data acquisition and communication electronics, sub-surface mechanical mooring, deep and shallow profilers, acoustic modems for seafloor instrumentation, and redundant omni-directional satellite-telemetry systems.
  - Medium latitude spar buoy, benthic nodes, seafloor EOM cable, satellite telemetry systems, diesel generator and fuel bladders, solar panels, batteries, power-control, data acquisition, and communication electronics, sub-surface electro-mechanical mooring, deep and shallow profilers
  - One subsurface electromechanical mooring with acoustic source for Aloha Site
  - West Coast Endurance Arrays, including surface moorings with power and communication capability, medium voltage benthic nodes, deep and shallow profilers, profiler hardware and cables, EOM moorings with power and communication, low voltage benthic nodes, and seafloor cables with connectors.
  - Coastal Pioneer Array, including EOM surface moorings with local power generation and satellite communication,, benthic nodes, cabled and acoustically-linked subsurface profiling moorings, acoustic repeater moorings, long range AUVs with instrumentation, AUV docking stations, and gliders.
  - Gliders and Glider Support
  - Shore Facilities to connect satellite transmissions into the OOI Network
  - Initial Science Investigation Equipment and Sensors
- Software, consisting of
  - Science Data Management for integration with CI
  - Software Programs for Interpretation of Data, including modeling programs
- Shore Facilities, consisting of
  - System Level Facilities, including test beds, calibration facilities, and spare part depot(s).
- Implementation, consisting of procurement, installation, commissioning, and acceptance of the coastal and global scale nodes.

It is expected that the three planned IOs will form a close partnership with each other and with JOI. This is critical since the OOI Network is an integrated observatory, brought together through the CI facilities. Infrastructure that is common to more than one node (e.g., sensors) may be assigned to only one IO for design and/or construction in order to avoid duplication of work and non-recurring engineering costs and to achieve economies of scale. Collaboration and assignments will be accomplished via interface agreements, interface schedules, and an integrated project management team coordinated through JOI.

Specific tasks to be addressed are described below. Tasks 1 and 8 are to be performed during all phases of the project although the use of MREFC funds for Task 8 may be limited. Tasks 2, 3, 4, and 5 are Phase 1 of the project. Task 6 represents Phase 2. The initial Operations under Task 7 are Phase 3. Task 7, once all of the observatory nodes are accepted, is Phase 4.

The OOI Project must be scheduled to match the MREFC funding profile, initially as shown in the following table.

MREFC Funding Profile ($ in Millions)							
Fiscal Year	2007	2008	2009	2010	2011	2012	Total
OOI Network (then year $)	5.12	30.99	80.0	90.0	95.0	30.0	331.11
OOI Network (2007 $)	4.77	27.04	65.55	69.31	68.89	20.48	256.04
Coastal and Global Nodes (2007 $)	1.40	7.92	19.19	20.29	20.17	6.00	74.97

The coastal and global scale node funding profile is given in 2007 budget year dollars. The JOI project office will hold the total budget for contingency which has not yet been removed from the funding profile. The bidder will include contingency in their cost estimate in accordance with the OOI Network Cost Estimating Plan. (See Section L, Instructions to Offerors.) Please note that the total cost estimate, including contingency, should not exceed the coastal and global funding profile.

Due to the potential for changes to the planned funding profile caused by the Federal budget process, the IO should understand that tasks may shift in time as a result. Under Task 1, the IO will develop an Annual Work Plan (AWP) which will become the baseline plan for the IO tasks. Re-planning required due to funding shifts will be accomplished by the IO and approved by JOI through the AWP.

4.1. Task 1 – Project Management

The IO shall be responsible for a wide array of project management activities during the period of contract performance. Business management activities apply to all tasks included in this statement of work. Project Execution Plan development will address the planned approach for the design, development, construction, testing, and operation of the coastal and global scale nodes.

4.1.1. Business Management

The IO shall supervise and control the business functions of the program, comprised of schedule and budget development and control, reporting, accountability, and strategic planning. This effort includes:

a. Establishing and managing an organizational structure to effectively perform the activities required by the tasks identified herein, including design, development, construction, testing, maintenance, and operations of the applicable nodes.
b. Assuring that qualified personnel resources are available for performing contract tasks.
c. Identifying and procuring materials, equipment and services required to accomplish program objectives.
d. Developing and implementing suitable management procedures for selecting, monitoring and controlling subcontracted efforts to meet the scientific and technical objectives of the program.
e. Developing an Annual Work Plan (AWP), to be approved by JOI and to be submitted on a schedule to be determined by JOI, which shall address but not be limited to:
    (1) Programmatic goals, schedules and activities

    (2) Schedules for the coastal and global scale node design, development, construction, commissioning, and operations

    (3) Major planning and review activities

    (4) Required Budgets; and

    (5) Recent scientific results/accomplishments and lessons learned in the context of the preceding Annual Work Plan.

f. Procuring and maintaining (or otherwise providing) all required insurance.
g. Procuring and maintaining permits and legal coverage required for any and all activities under the contract, including owner-obtained permits.
h. Providing all necessary inputs toward developing appropriate environmental documentation for all aspects of the applicable observatory.
i. Managing budget and financial control procedures, including implementing an approved Earned Value Management System (EVMS) that will work seamlessly with the overarching EVMS established by JOI.
j. Developing a cost book in accordance with the OOI Network Cost Estimating Plan.
k. Establishing and managing the use of contingency funds through allocation to lower levels of the WBS.
l. Providing an Annual Report summarizing performance during the preceding year. The report shall address IO performance with respect to success in all aspects of the applicable observatory program and in complying with established NSF Facilities Performance Targets (e.g., GPRA).
m. Providing monthly and quarterly reports to summarize the design, development, construction, commissioning, operations, management and financial activity to JOI. The content of these reports is to be mutually agreed between the IO, JOI, and NSF and shall include critical path analysis of the project schedule.
n. Providing other technical, administrative and financial documentation as described herein, or as requested by JOI.

4.1.2. Project Execution Plan

The IO shall develop a comprehensive Project Execution Plan for the contract effort. The Project Execution Plan shall address the planned approach for all of the tasks of the program. The Project Execution Plan shall include, but not be limited to, the following items:

a. The project organization and management structure for the IO's project team including a Principal Investigator/Project Director with overall authority and responsibility for the project and interactions with the JOI representative.
b. Definition of the project baseline in terms of cost, schedule and technical performance.
c. Identification of alternative strategies for the node infrastructure and trade-off studies and recommendations relative to the various alternatives. Examples include:
    - Alternate System Configurations
    - Cost Reductions
    - Future Upgrade Capability
    - Flexibility
    - Lease-purchase analysis for acquisition of the nodes with emphasis on shore facilities and test equipment.
    - Trade-offs between Capital and Operating Costs
d. Identification and mitigation strategies for project risks.
e. Business operations and financial controls used to ensure project compliance, including subcontractors, with NSF flowdown contract provisions, Federal regulations, and associated reporting requirements.
f. Plans for system integration and interface controls, configuration management, commissioning, and transitioning from the acquisition activity in Phase 2 to operations in Phases 3 and 4.
g. A Commissioning and Acceptance Plan (and Report) for the completed nodes, identifying the expected condition and performance attributes, and the tests and trials to be satisfactorily performed prior to final acceptance.

h. A Transition to Operations Plan.
i. An Operation, Administration, and Maintenance (OA&M) Plan which minimizes life cycle costs.

Relevant technical information developed during Task 1, Project Management, including but not limited to specifications, drawings and studies shall be incorporated and updated with the Project Execution Plan. The plan and accompanying technical information shall be updated after major Milestone reviews, major task changes, or major task completions. These updates shall show task completions and changes to the approach moving forward and shall be subject to JOI, NSF and scientific community input and review and to JOI approval. Reviews and site visits shall be scheduled as required by JOI and the IO during performance of this task.

4.1.3. Permit Requirements and Design Requirement Permits

The IO shall provide all necessary inputs toward developing appropriate environmental documentation for the coastal and global scale nodes.

The IO shall investigate and prepare a complete listing of all permits that will be required to implement and operate the project, including name and contact information for the permitting authority, the expected length of time to obtain the permit following application, and what the permit allows to be done. The permit list shall be grouped appropriately by type and use. Permits that are used solely for the construction process shall be identified, but shall be segregated and obtained as part of Task 6.

The IO shall be responsible for obtaining all permits in a timely manner to accommodate other activities. Permitting dates shall be incorporated in Interface documents as Interface Milestones. The IO shall review the permit status as part of the monthly report. Permit dates in jeopardy shall be brought to the immediate attention of JOI.

At any time in this process, the IO may recommend that certain permits be undertaken by JOI or the project owner. JOI, at its sole discretion, may assume the responsibility for any or all of these permits.

4.2. Task 2 – Systems Engineering

The IO shall define the requirements for the coastal and global scale nodes. Such requirements shall be coordinated with JOI and shall flow from the Science Plan to Science User Requirements to the Preliminary and Final designs that define the Technical, Manufacturing, Quality, Installation, Maintenance, Repair, Operational, and Reliability Requirements for each component of the coastal and global scale nodes. All requirements shall be traced to the Science User Requirements and shall be approved by JOI.

This task has been subdivided by various infrastructure envisioned by the ocean science community and included in the OOI Conceptual Network Design, descriptions of which are included below. The IO may reasonably decide to change the allocation of equipment and facilities between the descriptions, for example, profilers that are the same for two different types of buoys need only be specified once. However, the IO shall ensure that all elements necessary for a robust, functional observatory are included in the design and implementation.

An important part of this task will be in the establishment of interface requirements between the coastal and global scale nodes and the other nodes in the OOI Network as well as with the OOI Network cyberinfrastructure. Interfaces within the global and coastal scale nodes shall also be specified. **Please note that this latter effort will be significantly increased by the number of partner groups within the IO. For that reason, proposals using small teams with subawards to garner necessary expertise are encouraged.**

Part of this task will be participating in design reviews, including the Preliminary Design Review scheduled for 2007. The IO shall conduct additional design reviews as needed and requested by JOI during the development of the system. These reviews will include, but not be limited to, relevant reviewers from JOI, NSF, industry, and the science community.

Another part of this task will be preparing test plans to verify that the each infrastructure component and each node meets its performance requirements. Testing is to be done at various times in the project schedule, as necessary, to confirm that the requirements are met, including but not limited to component requirements, integrated system requirements, installation requirements, commissioning and acceptance requirements.

4.2.1. System Level Requirements and Facilities

4.2.1.1. System Level Requirements

The OOI Network is comprised of a number of Observatory Nodes. Some requirements, for example, reliability, must be established for the entire system and allocated between the nodes. This area of requirements definition results in a number of regularly updated documents, including, but not limited to:

- Quality Plans
- Reliability Plans and Allocations
- Configuration Management Plans
- Maintainability Plans, including calibration and repair timing and durations
- Sparing Philosophy and Quantities
- Interoperability Plans
- Integrated Logistics Support Plans

The IO shall establish system level performance requirements and documentation for the coastal and global scale nodes. In addition, the IO shall support JOI in its development of documents and allocation of requirements at the OOI Network level.

4.2.1.2. System Level Facilities

During the development of the coastal and global infrastructure, the need for supporting facilities may emerge. Examples of a support facility are a test bed, a depot for spare parts, or a calibration facility. These facilities may potentially be used across all the systems of the OOI Network.

The IO shall identify and document common facilities that are required for the operating and maintaining the coastal and global nodes, including any performance requirements for those facilities. The IO shall make recommendations to JOI for how these facilities might be accommodated within the overall OOI Network.

4.2.2. High Level Interface Requirements and Control

The IO shall support and establish Interface Agreements (IAs) and Interface Control Drawings (ICDs) among the IOs and with JOI. Such documents shall include all relevant hand-offs, constraints, and performance requirements between the OOI Network elements. The documents shall include Interface Milestones to facilitate schedule coordination, where relevant. The IO shall attend interface meetings, conference calls, or other activities to ensure that effective and complete interfaces are established. All interface documents shall be agreed and approved by the interfacing parties and by JOI.

4.2.2.1. Regional Scale Nodes

The IO shall establish interface requirements in the form of jointly-signed IAs and ICDs with the Regional IO and shall ensure that all interface requirements are reflected in the appropriate global and costal infrastructure requirements.

4.2.2.2. Cyberinfrastructure

The IO shall establish interface requirements in the form of jointly-signed IAs and ICDs with the Cyberinfrastructure IO and shall ensure that all interface requirements are reflected in the appropriate coastal and global infrastructure requirements.

4.2.3. Acoustically Linked Discus Buoy

An acoustically-linked discus buoy is a global infrastructure component comprised of the discus buoy along with all of the equipment that is necessary to send/receive scientific data to/from the buoy to the data management system and to provide power, control, interactive sensor management, and monitoring of the buoy. Dry instruments are also present in order to assess the air-sea interface. This includes, but is not limited to:

- Acoustically-linked discus buoy
- Mechanical mooring
- Redundant buoy-based acoustic modems
- Buoy-based power
- Buoy-based control, data acquisition and communication electronics
- Sub-surface mechanical mooring
- Deep and shallow profilers
- Acoustic modems for seafloor instrumentation
- Redundant omni-directional satellite-telemetry systems.

The IO shall provide detailed performance requirements for this equipment. The IO shall conduct site surveys and work with the scientific community to identify the location(s) of the Acoustically-linked discus buoys and the optimum placement. IAs and ICDs shall be incorporated by reference.

Because the proposed location of scientific nodes in the Conceptual Design is driven by differing scientific areas of interest, it may be necessary to customize each buoy. If so, the requirements for each location shall be specified separately.

4.2.4. Spar Buoy (or alternative technology)

The large spar buoy is the most technically challenging global infrastructure element and will deliver 500 watts of power to a seafloor junction box and about 500 Mbytes of data to shore each day. This element is comprised of the spar buoy along with all of the equipment that is necessary to send/receive scientific data to/from the buoy to the data management system and to provide power, control, interactive sensor management, and monitoring of the buoy. Dry instruments are also present in order to assess the air-sea interface. This includes, but is not limited to:

- Spar buoys, including 3-point moorings
- EOM cable
- Benthic node
- Seafloor EOM cable
- Satellite telemetry systems
- Diesel generator and fuel bladders
- Solar panels
- Batteries
- Power-control, data acquisition, and communication electronics
- Sub-surface electro-mechanical mooring
- Deep and shallow profilers

The IO shall provide detailed performance requirements for this equipment. The IO shall conduct site surveys to identify the location(s) of the spar buoys and the optimum placement. IAs and ICDs shall be incorporated by reference.

Because the proposed location of scientific nodes in the Conceptual Design is driven by differing scientific areas of interest, it may be necessary to customize each buoy. If so, the requirements for each location shall be specified separately.

4.2.5. Coastal Endurance Arrays

Endurance Arrays are long-term arrays of instruments in coastal waters. The arrays are cabled, buoyed, or moored along with all of the equipment that is necessary to send/receive scientific data to/from the array to the data management system and to provide power, control, interactive sensor management, and monitoring of the array. Dry instruments are also present on coastal endurance arrays in order to assess the air-sea interface. An array may be viewed as a series of observatory nodes. An endurance array includes, but is not limited to:

- surface moorings with power and communication capability
- medium voltage benthic nodes
- deep and shallow profilers
- profiler hardware and cables
- EOM moorings with power and communication
- low voltage benthic nodes
- seafloor cables with connectors

The IO shall provide detailed performance requirements for this equipment. The IO shall conduct site surveys and work with the scientific community to identify the location(s) of the arrays and the optimum placement. IAs and ICDs shall be incorporated by reference.

Because the proposed location of the arrays in the Conceptual Design is driven by differing scientific areas of interest, it may be necessary to customize each location. If so, the requirements for each location shall be specified separately.

4.2.6. Coastal Pioneer Arrays

Pioneer Arrays are relocatable arrays of instruments in coastal waters. The arrays are cabled moorings and mobile assets along with all of the equipment that is necessary to send/receive scientific data to/from the array to the data management system and to provide power, control, interactive sensor management, and monitoring of the array. An array may be viewed as a series of observatory nodes. Dry instruments are also present in order to assess the air-sea interface. A pioneer array includes, but is not limited to:

- EOM surface moorings with power and communication capability
- subsurface profiling moorings
- acoustic repeater moorings
- long range AUVs with instrumentation
- AUV docking stations
- gliders

The IO shall provide detailed performance requirements for this equipment. The IO shall conduct site surveys and work with the scientific community to identify the initial location of the arrays and the optimum placement. IAs and ICDs shall be incorporated by reference.

Because the coastal pioneer array is intended to be relocated several times during the OOI Network lifetime, requirements for configuration, retrieval, refurbishment, and reinstallation shall be developed, including components that may NOT be required for the initial installation site. Requirements for the initial location shall be specified separately.

4.2.7. Shore Facilities

The Shore Facilities for the coastal and global scale nodes are those facilities needed to receive the long distance communication signals and incorporate them into the OOI Network. These include, but are not limited to:

- facilities to connect satellite transmission into the OOI Network
- facilities to provide local support to maintain nodes

The IO shall provide detailed performance requirements for these facilities. IAs and ICDs shall be incorporated by reference.

4.2.8. Science Systems

The Science Systems are the suite of sensors and instruments that will be installed and funded as part of the initial, basic network infrastructure, not only to test system functionality, but also to provide the essential scientific context for the observatory's effective use in basic research. These have been defined as Core Science Nodes. These nodes include proven and reliable Commercial Off-the-Shelf (COTS) instruments that make basic physical, chemical, biological, or geological measurements needed by a broad cross section of the observatory community. Such sensors and instruments might include but are not limited to:

- Acoustic Doppler Current Profilers (ADCPs)
- Conductivity Temperature and Depth (CTD) sensors
- Oxygen sensors
- Optical Backscatter meters
- Fluorescence sensors
- Meteorological Packages
- Broadband seismometers and hydrophones
- High resolution bottom pressure transducers
- Active and passive acoustics

The IO shall develop detailed performance requirements for those sensors and instruments determined by the science community in concert with the JOI Program Office as the Core Science Nodes. IAs and ICDs shall be incorporated by reference. Specification of a specific Manufacturer's model number and its associated commercial specification shall be an acceptable approach for these items, provided that equivalent performance parameters are listed so that competition is accommodated.

4.2.9. Scientific Data Management and Interpretation

4.2.9.1. Data Management

Management of the data that are brought back from the Science Systems and from sensors and instruments from subsequent community and principal investigator experiments will be processed for transmission to the OOI Network.

The IO shall provide detailed performance requirements for data facilities for which the IO is assigned responsibility by Interface Agreement. IAs and ICDs shall be incorporated by reference.

4.2.9.2. Data Interpretation

To the extent that the IO, with help from the ocean science community, determines that certain Science System's data needs software tools to make the data generally useable for science purposes, the software tools will be developed and implemented as part of the OOI Network funding. For clarity and example, a sensor may return a signal in volts from which temperature can be determined by a formula. The IO would want temperature to be the parameter that is passed to the CI and user community.

The IO shall provide detailed performance requirements for this software. IAs and ICDs shall be incorporated by reference.

4.2.10. Interface Requirements within the IO

The IO shall support and establish Interface Agreements (IAs) and Interface Control Documents (ICDs) among the various infrastructure elements and external work groups of the IO. Such documents shall include all relevant hand-offs, constraints, and requirements between the coastal and global infrastructure and institutions. The documents shall include Interface Milestones to facilitate schedule coordination, where relevant. The IO shall establish interface meetings, conference calls, or other activities to ensure that effective and complete interfaces are established. All interface documents shall be agreed and approved by the interfacing parties.

4.2.11. Test Planning, Testing, and Reporting

4.2.11.1. Component Testing

The IO shall develop and perform a test program, including test plan and report, for any infrastructure components that are developed, programmed, or engineered for the coastal and global scale nodes to demonstrate that the component meets its performance requirements.

The IO may propose alternate methods for accomplishing this objective. However, such changes must be reviewed and approved by JOI, who may decline approval at its sole discretion.

The IO shall permit JOI, NSF, and representatives of the scientific community access to witness and participate in this activity. The IO may initiate reasonable written guidelines and processes, to be approved by JOI, to limit the attendance, duration, and extent of this participation.

4.2.11.2. Pre-installation Integration Testing

The IO shall develop and perform a test program, including test plan and report, for pre-installation integration testing of the components of the applicable observatory node and the CI. This test shall confirm that the node and CI work together as an integrated system, that the sensors can be controlled, and that the data can be transmitted and processed in accordance with the requirements and as envisioned by the scientific community.

The IO may propose alternate methods for accomplishing this objective. However, such changes must be reviewed and approved by JOI, who may decline approval at its sole discretion.

The IO shall permit JOI, NSF, and representatives of the scientific community access to witness and participate in this activity. The IO may initiate reasonable written guidelines and processes, to be approved by JOI, to limit the attendance, duration, and extent of this participation.

4.2.11.3. Installation Testing

The IO shall develop and perform a test program, including test plan and report, for installation testing of the components. This testing shall confirm that the nodes maintain the operation parameters established during pre-installation testing.

The IO may propose alternate methods for accomplishing this objective. However, such changes must be reviewed and approved by JOI, who may decline approval at its sole discretion.

The IO shall permit JOI, NSF, and representatives of the scientific community access to witness and participate in this activity. The IO may initiate reasonable written guidelines and processes, to be approved by JOI, to limit the attendance, duration, and extent of this participation.

4.2.11.4. Commissioning and Acceptance

The IO shall develop a Commissioning and Acceptance Plan for the coastal and global scale nodes, which shall be approved by JOI. The IO shall conduct the commissioning and acceptance in accordance with the test plan. The IO shall permit JOI, NSF, and the scientific community access to witness and participate in this activity. The IO may initiate reasonable written guidelines and processes, to be approved by JOI, to limit the attendance, duration, and extent of this participation. The IO shall document the results of the commissioning and acceptance tests in a Commissioning and Acceptance Report.

The IO shall compile detailed lists of deficiencies that may remain at system provisional acceptance and develop a timeline for correction. The IO shall ensure that final payments to subcontractors are not released until all the deficiencies are corrected and approved by JOI. The IO may negotiate for reasonable commercial settlement of deficiencies related to non-essential components of the work; e.g., painting or landscaping.

4.3. Task 3 – Hardware Development

The IO shall undertake the non-recurring engineering and documentation for each component of its observatory elements. The IO shall test these components in accordance with the component test plans developed in Task 2 and verify that each component meets its performance and interface requirements. The IO shall report on any hardware testing activities to JOI, NSF, and representatives of the science community.

4.4. Task 4: Software Development

The IO shall undertake the software development and documentation for the data that is associated with its observatory elements. Software development and documentation is necessary to make data from each node generally usable to the scientific community and to control the sensing systems. The IO shall test this software in accordance with the component test plans developed in Task 2 and verify that the software meets its performance and interface requirements. The IO shall report on any software testing activities to JOI, NSF, and representatives of the science community. The IO shall work with the CI IO to determine the boundaries of the cyberinfrastructure and document that in an interface agreement.

4.5. Task 5: Shore Facilities

The IO shall conduct trade-off studies to examine the benefits of constructing versus leasing shore facilities for its observatory element. The IO shall plan, construct or lease, refurbish, and fit-out any required shore facilities, including system-level facilities and communication facilities. The IO shall conduct testing or inspection to confirm that each facility meets its performance and interface requirements. The IO shall report on the results of any facility testing or inspection activities to JOI, NSF, and representatives of the science community.

4.6. Task 6: Implementation, including Installation

The IO shall undertake and document the site-specific engineering for each node in its purview. The IO shall acquire the applicable hardware including sufficient quantities of spare parts. The IO shall provide a price list for each component of its observatory element, showing the unit price and the quantity for the observatory and for spares. Omissions in this list are the responsibility of the IO.

The IO shall identify critical suppliers and subcontractors and conduct an initial audit of their Quality systems. All critical suppliers shall be ISO 9001 compliant. Software suppliers, if any, shall be qualified to a formally-recognized software quality system. The IO shall meet regularly with suppliers and subcontractors to review status, issues, action items, payment forecasts, and schedules. The IO shall coordinate and control its internal interfaces and actively participate in cross-scale interface activities, including interoperability testing, if required.

Prior to each node installation, the IO shall perform a test program in accordance with the Pre-installation test plan developed in Task 2 and verify that the node satisfies the objectives of the test plan. The IO shall report on any pre-installation testing activities to JOI, NSF, and the Science community.

The IO shall develop a marine installation plan that shows how the marine operations will be managed, conducted, and confirmed. This plan should address how the IO will comply with any installation requirements from Task 2. If the permitting authorities have imposed restrictions on the marine installation process, the IO shall have incorporated those conditions into the requirements of Task 2.

The IO shall acquire any necessary permits for the installation of its nodes. The IO shall install each node in accordance with the marine installation plan. The IO shall correct any deficiencies identified by JOI, JOI's representative, or a permitting authority during the installation. The IO shall conduct installation testing of the nodes to confirm that they maintain the operational parameters established during pre-installation testing, allowing for environmental corrections. The IO shall report on any installation testing activities to JOI, NSF, and representatives of the science community.

Following successful installation, the IO's system engineering team shall conduct commissioning and acceptance of each node in accordance with the commissioning and acceptance plan developed in Task 2. The IO shall report on any commissioning and acceptance testing to JOI, NSF, and representatives of the science community.

Following acceptance, the IO shall transition each node into the operation of the OOI Network in accordance with a network-wide transition to operations plan and process.

4.7. Task 7: Operations and Maintenance, including Operation of Science Investigations and Data

The IO shall develop an operational strategy as part of this task (during the performance of the contract, not for the proposal). In addition, the IO shall estimate the annual cost of operations for this strategy. This strategy shall cover the initial operation of components brought on line during the construction phase of the OOI Network.

The IO shall develop an Operation, Administration, and Maintenance (OA&M) Plan for its observatory nodes. The IO shall support and document Operational Readiness Tests that may be required as part of the OOI Network's OA&M Plan. JOI will be developing a Concept of Operations for the OOI Network; the coastal and global plan must be consistent with this.

The IO shall develop formal processes and procedures to implement the OA&M plan, including but not limited to executing contracts with qualified suppliers for marine maintenance, facility maintenance, and sensor and test equipment maintenance and

calibration. The IO shall provide adequate staffing and security to monitor the health and status of the applicable observatory element. The IO shall provide training, as required, to maintain the technical and process competency of the operating staff.

The IO shall manage, coordinate, perform, and make available its observatory facilities to support the on-going scientific research operations envisioned for the OOI Network. The JOI Program Office, in conjunction with the NSF, will have responsibility for determining which scientific experiments will be funded and approved for the OOI Network.

The IO shall develop a set of procedures that a Principal Investigator (PI) will need to follow in order to qualify his/her set of instruments before placing it in use on the IO's node. The IO shall maintain staffing to aid PIs in their qualification efforts. Depending upon the maturity level of the sensors and connectors, the IO may reasonably tailor the qualification requirements for a particular experiment. In addition, the IO will ensure that the PI's data will interface appropriately with the other key components of the OOI Network, particularly the Cyberinfrastructure.

The IO shall schedule the installation of approved PIs' experimental sensors on its observatory nodes and will plan, manage, and carry-out the installation. The IO shall allow the PI and a reasonably-sized team to participate in the planning and installation.

4.8. Task 8: Science Outreach and Education

Effective communication of the OOI Network activities and scientific results to the public is strongly encouraged. Examples of possible activities include:

a. Developing interactive, computer-based teaching modules that allow high school or undergraduate students to study changes in the oceans and ocean/earth interface.
b. Developing distance learning initiatives for high school science curricula in which teachers are assigned to scientific PI teams as part of the research program.
c. Working with museums, such as the Smithsonian Institution to display pictures and videos of the coastal and global scale nodes and their installation and of displays, which depict major breakthroughs in science as a result of long term in-situ measurements.
d. Increasing involvement with Internet and other distance learning technologies.
e. Participating in programs to establish digital education libraries.
f. Providing web-based reports and curricula material based on recent results
g. Encouraging first hand research experiences at sea and participation in subsequent laboratory analysis projects.

This task will require direct and indirect interface with the news media, the science community, industry, educators and students at all curriculum levels.

5. Liaison

The IO understands that JOI and/or NSF may use the consultative services of individuals or groups in regard to scientific, technical, or other aspects of the work, and the IO agrees to cooperate in furnishing information or facility access to such individuals or groups.

The IO shall confer with JOI and/or NSF to the extent requested. JOI and the NSF shall have the right to have representatives attend all major meetings of the IO and its subcontractors, as applicable, where the OOI Network Program is discussed.

6. Public Information and Publications

All news releases and other similar items prepared by the IO and/or its employees describing the IO activities or the results of OOI Network research shall be submitted for JOI and NSF review at least five (5) business days prior to publication and shall acknowledge the sponsorship of the NSF. The text of any planned Congressional testimony related to the observatory infrastructure or the OOI Network shall be submitted to JOI and NSF for approval prior to its presentation.

Public information brochures and other similar material that relates to the IO activities or OOI Network and prepared by the IO shall be sent to JOI and NSF before being made available to the public.

The IO shall acknowledge the support of the NSF on any signs identifying an OOI Network facility at its various locations.

An acknowledgement of NSF support and disclaimer must appear in any publication of any material based upon or developed under this contract in substantially the following terms:

> "The Ocean Observatories Initiative is sponsored by the National Science Foundation. Any opinions, findings and conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the National Science Foundation."

(The preceding sentence may be omitted from scientific articles or papers published in scientific journals.)

Also, support of other agencies or international contributors shall be acknowledged as appropriate.

(End of Section C)

SECTION D – PACKAGING AND MARKING

D.1 PACKAGING AND MARKING

Unless otherwise specified, all items shall be packaged and packed in accordance with best commercial practices.

(End of Section D)

SECTION E – INSPECTION AND ACCEPTANCE

E.1 EVALUATION AND ACCEPTANCE

Evaluation and acceptance of services delivered under this subcontract shall be performed by the JOI Technical Representative in Section G.3 or such other person as may be designated elsewhere in this contract or in writing by the JOI Director of Operations.

(End of Section E)

SECTION F – DELIVERIES OR PERFORMANCE

F.1 PERIOD OF PERFORMANCE

Tasks 1 through 8 of this subaward shall commence when formally executed by both parties and shall expire sixty (60) months thereafter unless extended by JOI in writing.

The contract incorporates options for five (5) twelve (12) month periods of operation and maintenance support. If funding is provided to JOI, JOI will activate the repricing of these option estimates by requesting a formal quote from the Subrecipient 180 days in advance of the Option start date.

F.2 REPORTING REQUIREMENTS

The following list identifies most, but not necessarily all, deliverable and/or reporting Requirements List for the OOI Network Coastal and Global Scale Nodes IO Subaward:

Contract Deliverable Requirements List for Coastal and Global Scale Node IO Contract

CDRL Number	Item
001	Annual Work Plan (Initial, Yearly Updates)
002	Annual Report (Yearly)
003	Monthly Status Reports (Monthly)
004	Quarterly Status Reports (4 times per year)
005	Earned Value Baseline Schedule and Budget (Initial, Updates)
006	Commissioning and Acceptance Test Plan
007	Commissioning and Acceptance Test Report
008	Project Execution Plan (Initial, Updates)
009	Performance Requirements (may be cascaded documents)
010	Requirements Traceability Matrix (to Science User Requirements)
011	Signed Interface Agreements (ICDs) with Regional Scale Nodes
012	Signed Interface Agreements (ICDs) with CI
013	Permit List
014	All Permits
015	Requirements Verification Compliance Matrix
016	Component Qualification Plans
017	Component Qualification Reports
018	Component Unit Price List, Base Quantity, Spare Quantity
019	Pre-installation Integrated Test Plan
020	Pre-installation Integrated Test Report
021	Marine Survey(s)
022	Site Survey(s)
023	Marine Installation and Burial Plan
024	Installation Test Plan
025	Installation Test Report
026	Hardware and Installation (may be subdivided)

027	Deficiency List
028	OA&M Plan
029	PI Instrument Qualification Plan
030	PI Instrument Qualification Report(s)
031	OA&M Procedures
032	Requirements for Facility Use
033	Integrated Logistic Support Plan
034	Configuration Management Plan
035	Quality Plan
036	Reliability Plan
037	Interoperability Plan
038	Govt Performance Results Act Report(s)
039	Cost Book in accordance with OOI Network Cost Estimating Plan

F.3 PUBLIC ACCESS TO DELIVERABLE REPORTS

Deliverables and/or reports are intended, at JOI's discretion, to be made publicly available.

(End of Section F)

SECTION G – SUBAWARD ADMINISTRATION DATA

G.1 Invoice and Payment Information

Invoices shall be submitted on a monthly basis to JOI, ATTN: Contracts Dept.

The following minimum detail shall be submitted:

- A monthly financial statement (in the same format as the Subrecipient's quarterly financial reporting) highlighting the major work breakdown categories according to the amounts billed; and
- The time period when billing charges were incurred;

From time to time JOI may require additional supporting documentation from the Subrecipient to assist in its transaction analysis. Refer to Section I Article 13 for reimbursement of allowable costs.

Upon completion of the required work, the Subrecipient shall submit a completion invoice in compliance with the Section I Article 13. This completion invoice shall be submitted promptly upon completion of the work, but no later than one year from the contractual completion date.

G.2 Contracting Authority

The following individuals are the only personnel authorized to contractually bind the parties of this Subaward or change any terms and conditions:

FOR JOI:
Carol A. Kokinda, Director of Operations Joint Oceanographic Institutions

FOR (VENDOR):

TO BE DETERMINED AT AWARD

G.3 JOI Technical representative (TR)

The following individual is authorized to guide Subaward performance within the Statement of Work and provide programmatic approval for the deliverables under this Subaward:

TO BE COMPLETED AT AWARD

The Technical Representative is responsible for administering the performance of work under this Subaward. **IN NO EVENT**, however, will any understanding, agreement, modification, change order, or other matter deviating from the terms of this Subaward be effective or binding upon the Parties unless formalized by Subaward modification executed by the JOI Contracting Authority in G.2.

The TR may give technical direction to Subrecipient that fills in details, requires pursuit of certain lines of inquiry, or otherwise serves to facilitate Subrecipient's compliance with this Subaward.

To be valid, technical direction by the TR:

- must be consistent with the general scope of work set forth in this Subaward;
- may not constitute new assignment of work nor change the expressed terms, conditions or specifications of this Subaward; and
- shall not constitute a basis for any increase in the Subaward estimated cost, or extension to the Subaward delivery schedule or period of performance.

In the event any JOI technical direction is interpreted by Subrecipient to fall outside the scope of Section C, Subrecipient shall not implement such direction, but shall notify JOI Director of Operations in writing of such interpretation. Such notice shall:

- include the reasons upon which Subrecipient bases its belief that the technical direction falls outside the scope of the contract;
- include Subrecipient's best estimate as to the revision needed to the current estimated cost, performance time, delivery schedules or any other provision that would result from implementing the TR's direction.

If, after reviewing the information presented, JOI considers that such direction is technical direction authorized by this clause, Subrecipient will be directed to proceed with the implementation of such technical direction.

In the event a determination is made that it is necessary to avoid a delay in performance of the Subaward, JOI Director of Operations may direct Subrecipient to proceed with the implementation of the technical direction pending receipt of the above information to be submitted by Subrecipient.

(End of Section G)

SECTION H – SPECIAL SUBAWARD REQUIREMENTS

H.1 INDEMNIFICATION

The Subrecipient shall indemnify JOI against any claims for loss or damage to any property or injury or death to any person, during the course of the work, attributable to the negligence of the Subrecipient or its employees.

JOI shall similarly hold the Subrecipient harmless for any such claims attributable to the negligence of JOI or its employees.

H.2 LIMITED USE OF PROPRIETARY DATA AND INFORMATION

Performance of this Subaward may require the Subrecipient to access proprietary data and information proprietary to a government agency or government contractor and/or such a nature that its dissemination or use, other than in performance of this Subaward, would be adverse to the interest of the government and/or others.

Subrecipient personnel shall not divulge or release proprietary data or information developed or obtained in performance of this Subaward, until made public by JOI or the government, except to authorized personnel or upon written approval by the JOI Technical Representative. The Subrecipient shall not use, disclose or reproduce proprietary data that bears a restrictive legend, other than as required in the performance of this Subaward. Nothing herein shall preclude the use of any proprietary data independently acquired by the Subrecipient without such limitations or prohibit an agreement at no cost to JOI between the Subrecipient and the data owner which provides for greater rights to the Subrecipient.

H.3 CLEARANCE AND CONSTRAINTS

Notwithstanding any other provision of this Subaward, at any point in the conduct of this project where JOI approval is required, JOI will endeavor to notify the Subrecipient within ten (10) working days of receipt of a Subrecipient's request as to its approval or disapproval. Failure of JOI to respond within the ten (10) working day period shall **NOT** constitute approval.

H.4 SUBAWARD MONITORING

In monitoring the Subrecipient's performance, JOI is primarily interested in progress toward successful completion of each task along with the financial status of the Subaward. During the course of performance of the resulting Subaward, JOI (and authorized government representatives) shall have the right, at all reasonable times, to make site visits to inspect or review the progress of work or the management control systems of the Subrecipient or its lower-tier Subrecipients. The Subrecipient shall provide and shall require its lower-tier Subrecipients to provide all reasonable facilities and assistance for the safety and convenience of the representatives in the performance

of their duties. Such access shall include the right to inspect the Subrecipient's financial accounts or records that pertain to this Subaward.

H.5 KEY PERSONNEL

The personnel positions listed below are considered essential to the work being performed hereunder. Prior to removing, replacing, or diverting any of the specified individuals in these positions, the Subrecipient shall notify the Contracting Officer reasonably in advance and shall submit justification (including proposed substitutions) in sufficient detail to permit evaluation of the impact of such substitution upon the successful performance of the contract. No diversion shall be made by the Subrecipient without the written consent of the Contracting Officer; provided, the Contracting Officer may ratify the change in writing, and such ratification shall constitute the consent of the Contracting Officer required by this clause. Positions may be added or deleted from this clause during performance of the contract by mutual agreement of both parties.

Key Personnel Positions	Name
Project Manager	
Systems Engineer	
Principal Investigator	
*****	

***** Offeror to provide information in proposal – refer to Section L.

(End of Section H)

SECTION I - SUBAWARD CLAUSES

I.1 National Science Foundation (NSF) Cooperative Agreement FLOW-DOWN Terms and conditions

This effort is funded under a cooperative agreement between JOI and the National Science Foundation. JOI is responsible for complying with the conditions below and ensuring that our Subrecipients also comply with them. The resultant Subaward will incorporate the following articles:

NSF Financial & Administrative Terms and Conditions, November, 2003
(Applies to **ALL** Contract Line Items and Phases)

In reading/following these terms and conditions, substitute:

- *Subaward for award*
- *Subrecipient for Awardee*
- *JOI for NSF, where appropriate*

8. Participant Support Costs

a. Participant support costs are direct costs for items such as stipends or subsistence allowances, travel allowances and registration fees paid to or on behalf of participants or trainees (but not employees) in connection with meetings, conferences, symposia or training projects. (See also GPM Section 618.) Awardee organizations must account for participant support costs separately. Note: No indirect costs may be charged against participant support costs (See GPM Section 633.2).

b. Funds provided for participant support may not be used by awardees for other categories of expense without the specific prior written approval of JOI.

9. . Significant Project Changes

JOI is required to obtain prior written approval from the NSF Grants and Agreement Officer whenever there are significant changes in the Ocean Observing project or its direction as stipulated below.

a. Transfer of the Project Effort.

JOI authorization to contract or otherwise transfer a significant part of the research or substantive effort to another organization that has been disclosed in your IO proposal is not needed unless approval has been specifically withheld in the award. (See GPM Section 313.

If it becomes necessary to transfer, by contract or other means, a significant part of the research or substantive effort after an award has been made, notification of this intent should be submitted to JOI, ATTN: ckokinda@joiscience.org. At a minimum, the request shall include a clear description of the work to be performed and the basis for selection

of the subawardee (except for collaborative/joint arrangements; see GPM Section 313 for a definition.) JOI approval of such changes will be by an amendment to the award signed by JOI.

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IO subwardee remains responsible for maintaining the necessary documentation on all subawards and making it available to JOI upon request. The IO subawardee shall include subaward activities in the annual progress and final project reports that are submitted to JOI.

IO subwardees shall ensure that the following articles, if applicable, flow down to all subawardees, or are appropriately addressed in the subaward instrument: Articles 8, 9, 10, 11, 12, 13, 18, 19, 20, 21, 22, 24, 25, 28, 29, 32, 35, 39, 40, 41, 42, 43, and 44. If the IO subawardee issues subawards exceeding $2,000 for construction, alteration or repair that are within the scope of the Acts found in OMB Circular A-110, Appendix A, "Contract Provisions," the appropriate clauses applicable to construction activities also will be included in applicable subawards.

b. Change in Objectives or Scope. A proposed change in the phenomenon or phenomena under study or the objectives of the project stated in the proposal or agreed modifications thereto should be communicated to JOI, ATTN: ckokinda@joiscience.org. JOI approval of such changes will be by an amendment to the award signed by JOI.

c. Absence or Change of Principal Investigator. If a named Principal Investigator or Project Director plans to or becomes aware that he or she will: (1) devote substantially less effort to the work than anticipated in the approved proposal (defined as a reduction of 25% or more in time);
(2) sever his or her connection with the awardee organization; or (3) be absent for a continuous period of three months or more, or otherwise relinquish active direction of the project, he or she shall advise both the JOI Program Officer and shall make a request to JOI Director of Operations. SEE ALSO SECTION H – KEY PERSONNEL CLAUSE.

10. Procurement Standards

Whether or not approval of a procurement is required under Article 9.a., where appropriate, the awardee (including commercial organizations) is responsible for compliance with the procurement standards identified in Sections .40 through .48 of OMB Circular A-110. The awardee also is responsible for ensuring that the appropriate NSF conditions from this award (including Article 24, Audit and Records) are made a part of any contract or other arrangement whose award amount exceeds the simplified acquisition threshold (currently $100,000).

11. Travel

a. *Allowability of Travel Expenses.*

1. Expenses for transportation, lodging, subsistence and related items incurred by project personnel and by outside consultants employed on the project who are in travel status on business related to an NSF-supported project are allowable as prescribed in

the governing cost principles. The requirements for prior approval detailed in the governing cost principles are waived.

2. Except as provided in the governing cost principles, the difference between economy airfare and a higher-class airfare are unallowable. A train, bus or other surface carrier may be used in lieu of or as a supplement to air travel at the lowest first-class rate by the transportation facility used. However, if such travel could have been performed by air, the allowance will not normally exceed that for jet economy airfare.

b. Travel support for dependents of key project personnel. Travel support for dependents of key project personnel is allowable only under the following conditions:

1. the individual is a key person who is essential to the project on a full-time basis;

2. the individual's residence away from home and in a foreign country is for a continuous period of six months or more and is essential to the effective performance of the project; and

3. the dependents' travel allowance is consistent with the policies of the organization administering the award.

c. *Use of U.S.-Flag Air Carriers.*

1. The General Services Administration issued an amendment to the Federal Travel Regulations in the November 13, 1998 edition of the Federal Register Vol. 63, No. 219. The amendment relates to the use of U.S. flag air carriers under the provisions of 49 U.S.C. 40118, which is commonly referred to as the Fly America Act.

2. Any air transportation to, from, between, or within a country other than the U.S. of persons or property, the expense of which will be assisted by NSF funding, must be performed by or under a code-sharing arrangement with a U.S.-flag air carrier if service provided by such a carrier is available (see Comp Gen. Decision B-240956, dated September 25, 1991). Tickets (or documentation for electronic tickets) must identify the U.S. flag air carrier's designator code and flight number.

3. For the purposes of this requirement, U.S.-flag air carrier service is considered available even though:

(a) comparable or a different kind of service can be provided at less cost by a foreign-flag air carrier;

(b) foreign-flag air carrier service is preferred by, or is more convenient for, NSF or traveler; or

(c) service by a foreign-flag air carrier can be paid for in excess foreign currency.

4. The following rules apply unless their application would result in the first or last leg of travel from or to the U.S. being performed by a foreign-flag air carrier:

(a) a U.S.-flag air carrier shall be used to destination or, in the absence of direct or through service, to the farthest interchange point on a usually traveled route.

(b) if a U.S.-flag air carrier does not serve an origin or interchange point, a foreign-flag air carrier shall be used only to the nearest interchange point on a usually traveled route to connect with a U.S. flag air carrier.

(c) a U.S.-flag air carrier involuntarily reroutes the traveler via a foreign-flag air carrier, the foreign-flag air carrier may be used notwithstanding the availability of alternative U.S.-flag air carrier service.

d. *Use of Foreign-Flag Air Carriers.*

1. Travel To and From the U.S.

Use of a foreign-flag air carrier is permissible if:

(a) the airport abroad is the traveler's origin or destination airport, and use of U.S.-flag air carrier service would extend the time in a travel status by at least 24 hours more than travel by a foreign-flag air carrier; or

(b) the airport abroad is an interchange point, and use of U.S.-flag air carrier service would increase the number of aircraft changes the traveler must make outside of the U.S. by 2 or more, would require the traveler to wait four hours or more to make connections at that point, or would extend the time in a travel status by at least six hours more than travel by a foreign-flag air carrier.

2. Travel Between Points Outside the U.S.

Use of a foreign-flag air carrier is permissible if:

(a) travel by a foreign-flag air carrier would eliminate two or more aircraft changes en route;

(b) travel by a U.S.-flag air carrier would require a connecting time of four hours or more at an overseas interchange point; or

(c) the travel is not part of the trip to or from the U.S., and use of a U.S.-flag air carrier would extend the time in a travel status by at least six hours more than travel by a foreign-flag air carrier.

3. Short Distance Travel. For all short distance travel, regardless of origin and destination, use of a foreign-flag air carrier is permissible if the elapsed travel time on a scheduled flight from origin to destination airport by a foreign-flag air carrier is three hours or less and service by a U.S.-flag air carrier would double the travel time.

12. Rearrangements and Alterations

a. Rearrangement and alteration costs that do not constitute construction (i.e., rearrangements and alterations aggregating less than $25,000) to adapt space or utilities within a completed structure to accomplish the objectives of the award, are allowable and approved, provided the:

1. building has a usable life consistent with project purposes and is architecturally suitable for conversion;

2. rearrangements and alterations are essential to the project; and

3. space involved will be occupied by the project.

b. Rearrangements and alterations (construction) aggregating $25,000 or over require the prior written approval of the NSF Grants and Agreements Officer.

13. Allowable Costs

a. The allowability of costs and cost allocation methods for work performed under this award, up to the amount specified in the award, shall be determined in accordance with the applicable Federal cost principles in effect on the effective date of the award and the terms of the award.

b. The Federal cost principles applicable to specific types of awardees are contained in:

1. OMB Circular A-21 for both public and private institutions of higher education;

2. OMB Circular A-122 for other non-profit organizations, except those organizations specifically exempted by the Circular;

3. OMB Circular A-87 for State and Local Governments;

4. Federal Acquisition Regulation 31.2 [48 CFR 31.2] for commercial firms and those non-profit organizations specifically exempted from the provisions of OMB Circular A-122; and

5. 45 CFR Part 74, Appendix E, "*Principles for Determining Costs Applicable to Research and Development Under Grants and Contracts with Hospitals*," for hospitals.

c. Certain prior approval requirements contained in these Federal cost principles have been modified by Article 3.

18. Information Collection

Information collection activities performed under this award are the responsibility of the awardee, and NSF support of the project does not constitute NSF approval of the survey design, questionnaire content or information collection procedures. The awardee shall not represent to respondents that such information is being collected for or in association with the National Science Foundation or any other Government agency without the specific written approval of such information collection plan or device by JOI

This requirement, however, is not intended to preclude mention of NSF support of the project in response to an inquiry or acknowledgment of such support in any publication of this information.

19. Copyrightable Material

a. Subject writing means any material that:

1. is or may be copyrightable under Title 17 of the U.S.C.; and

2. is produced by the awardee or its employees in the performance of work under this award.

Subject writings include such items as reports, books, journal articles, software, databases, sound recordings, videotapes, and videodiscs.

b. *Copyright Ownership, Government License.* Except as otherwise specified in the award or by this paragraph, the awardee may own or permit others to own copyright in all subject writings. The awardee agrees that if it or anyone else does own copyright in a subject writing, the Federal government will have a nonexclusive, nontransferable, irrevocable, royalty-free license to exercise or have exercised for or on behalf of the U.S. throughout the world all the exclusive rights provided by copyright. Such license, however, will not include the right to sell copies or phonorecords of the copyrighted works to the public.

c. *Awards Affected by International Agreements.* If the award indicates it is subject to an identified international agreement or treaty, NSF can direct the awardee to convey to any foreign participant or otherwise dispose of such rights to subject writings as are required to comply with that agreement or treaty.

d. *Awardee Action to Protect Government Interests.* The awardee agrees to acquire, through written agreement or an employment relationship, the ability to comply with the requirements of the preceding paragraphs and, in particular, to acquire the ability to convey rights in a subject writing to a foreign participant if directed by NSF under the previous paragraph. The awardee further agrees that any transfer of copyright or any other rights to a subject writing, by it or anyone whom it has allowed to own such rights, will be made subject to the requirements of this article.

20. Program Income

a. *Definition.* Program income means gross income earned by the awardee that is directly generated by a supported activity or earned as a result of the award. Program income includes, but is not limited to, income from fees for services performed, the use or rental of real or personal property acquired under the award, the sale of commodities or items fabricated under the award, license fees and royalties on patents and copyrights, and interest on loans made with award funds. Interest earned on advances of Federal funds is not program income. Program income does not include the receipt of principal on loans, rebates, credits, discounts, etc., or interest earned on any of them.

b. *Standard Treatment.* Unless otherwise specified in the award, program income (except as noted in (1) below) received or accrued to the awardee during the period of this award shall be retained and added to the funds committed to the project by NSF and used to further project objectives. Also, unless otherwise specified, the awardee shall have no obligation to NSF with respect to: (1) license fees and royalties for copyrighted

material, patents, patent applications, trademarks, and inventions received or accrued at any time; or (2) program income received beyond the period of this award.

c. *Records Retention.* The awardee is required to retain appropriate financial and other records relating to project income earned during the award period and for three years beyond the end of the award period.

21. Publications

a. *Acknowledgment of Support.* The awardee is responsible for assuring that an acknowledgment of NSF support is made:

1. in any publication (including World Wide Web sites) of any material based on or developed under this project, in the following terms:

"This material is based upon work supported by the National Science Foundation under Grant No. (NSF grant number)."

2. NSF support also must be orally acknowledged during all news media interviews, including popular media such as radio, television and news magazines.

b. *News Releases.* The awardee is strongly encouraged to consult with and notify the NSF Program Officer or his/her designee prior to issuing news releases concerning NSF-supported activities.

c. *Disclaimer.* The awardee is responsible for assuring that every publication of material (including World Wide Web pages) based on or developed under this award, except scientific articles or papers appearing in scientific, technical or professional journals, contains the following disclaimer:

"Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation."

d. *Copies for NSF.* The awardee is responsible for assuring that copies of every publication of material based on or developed under this award, clearly labeled with the award number and other appropriate identifying information, are made available to the cognizant NSF Program Officer promptly after publication, unless other arrangements have been made by the Program Officer with the awardee.

e. *Metric System.* All reports and publications resulting from this NSF award are encouraged to use the metric system of weights and measures.

22. Patent Rights

Unless otherwise provided in the award, if this award is for experimental, developmental, or research work, the following clause (implementing the Bayh-Dole Act, [35 U.S.C. 200 et seq.]) shall apply. The awardee shall include this clause in all subawards for experimental, developmental, or research activities.

a. *Definitions.*

1. INVENTION means any invention or discovery which is or may be patentable or otherwise protectable under Title 35 of the USC, to any novel variety of plant which is or may be protected under the Plant Variety Protection Act (7 USC §§2321 et seq.).

2. SUBJECT INVENTION means any invention of the awardee conceived or first actually reduced to practice in the performance of work under this award, provided that in the case of a variety of plant, the date of determination (as defined in section 41(d)) must also occur during the period of performance.

3. PRACTICAL APPLICATION means to manufacture in the case of a composition or product, to practice in the case of a process or method, or to operate in the case of a machine or system; and, in each case, under such conditions as to establish that the invention is being utilized and that its benefits are to the extent permitted by law or Government regulations available to the public on reasonable terms.

4. MADE when used in relation to any invention means the conception or first actual reduction to practice of such invention.

5. NON-PROFIT ORGANIZATION means a domestic university or other institution of higher education or an organization of the type described in Section 501(c)(3) of the Internal Revenue Code of 1954 (26 USC §501(c)) and exempt from taxation under Section 501(a) of the Internal Revenue Code (26 USC §501(a)) or any domestic non-profit scientific or educational organization qualified under a State non-profit organization statute.

b. *Allocation of Principal Rights.* The awardee may retain the entire right, title, and interest throughout the world to each subject invention subject to the provisions of this Patent Rights clause and 35 USC §203. With respect to any subject invention in which the awardee retains title, the Federal Government shall have a non-exclusive, nontransferable, irrevocable, paid-up license to practice or have practiced for or on behalf of the U.S. the subject invention throughout the world. If the award indicates it is subject to an identified international agreement or treaty, the National Science Foundation (NSF) also has the right to direct the awardee to convey to any foreign participant such patent rights to subject inventions as are required to comply with that agreement or treaty.

c. *Invention Disclosure, Election of Title and Filing of Patent Applications by Awardee.*

1. The awardee will disclose each subject invention to NSF within two months after the inventor discloses it in writing to awardee personnel responsible for the administration of patent matters. The disclosure to NSF shall be in the form of a written report and shall identify the award under which the invention was made and the inventor(s). It shall be sufficiently complete in technical detail to convey a clear understanding of the nature, purpose, operation, and, to the extent known, the physical, chemical, biological or electrical characteristics of the invention. The disclosure shall also identify any publication, on sale or public use of the invention and whether a manuscript describing the invention has been submitted for publication and, if so, whether it has been accepted for publication at the time of disclosure. In addition, after disclosure to NSF, the awardee will promptly notify NSF of the acceptance of any manuscript describing the invention for publication or of any on sale or public use planned by the awardee.

2. The awardee will elect in writing whether or not to retain title to any such invention by notifying NSF within two years of disclosure to NSF. However, in any case where publication, on sale, or public use has initiated the one-year statutory period wherein valid patent protection can still be obtained in the U.S., the period for election of title may be shortened by NSF to a date that is no more than 60 days prior to the end of the statutory period.

3. The awardee will file its initial patent application on an invention to which it elects to retain title within one year after election of title or, if earlier, prior to the end of any statutory period wherein valid patent protection can be obtained in the U.S. after a publication, on sale, or public use. The awardee will file patent applications in additional countries or international patent offices within either ten months of the corresponding initial patent application, or six months from the date when permission is awarded by the Commissioner of Patents and Trademarks to file foreign patent applications when such filing has been prohibited by a Secrecy Order.

4. Requests for extension of the time for disclosure to NSF, election, and filing under subparagraphs 1., 2., and 3. may, at the discretion of NSF, be awarded.

d. *Conditions When the Government May Obtain Title.* The awardee will convey to NSF, upon written request, title to any subject invention:

1. if the awardee fails to disclose or elect the subject invention within the times specified in paragraph c. above, or elects not to retain title; provided that NSF may only request title within 60 days after learning of the failure of the awardee to disclose or elect within the specified times;

2. in those countries in which the awardee fails to file patent applications within the times specified in paragraph c. above, but prior to its receipt of the written request of NSF, the awardee shall continue to retain title in that country; or

3. in any country in which the awardee decides not to continue the prosecution of any application for, to pay the maintenance fees on, or defend in a reexamination or opposition proceeding on, a patent on a subject invention.

e. *Minimum Rights to Awardee.*

1. The awardee will retain a non-exclusive royalty-free license throughout the world in each subject invention to which the Government obtains title, except if the awardee fails to disclose the subject invention within the times specified in paragraph c. above. The awardee's license extends to its domestic subsidiaries and affiliates, if any, within the corporate structure of which the awardee is a party and includes the right to award sublicenses of the same scope to the extent the awardee was legally obligated to do so at the time the award was made. The license is transferable only with the approval of NSF except when transferred to the successor of that part of the awardee's business to which the invention pertains.

2. The awardee's domestic license may be revoked or modified by NSF to the extent necessary to achieve expeditious practical application of the subject invention pursuant to an application for an exclusive license submitted in accordance with applicable

provisions at 37 CFR §404. This license will not be revoked in that field of use or the geographical areas in which the awardee has achieved practical application and continues to make the benefits of the invention reasonably accessible to the public. The license in any foreign country may be revoked or modified at discretion of NSF to the extent the awardee, its licensees, or its domestic subsidiaries or affiliates have failed to achieve practical application in that foreign country.

3. Before revocation or modification of the license, NSF will furnish the awardee a written notice of its intention to revoke or modify the license, and the awardee will be allowed thirty days (or such other time as may be authorized by NSF for good cause shown by the awardee) after the notice to show cause why the license should not be revoked or modified. The awardee has the right to appeal, in accordance with applicable regulations in 37 CFR §404 concerning the licensing of Government-owned inventions, any decision concerning the revocation or modification of its license.

f. *Awardee Action to Protect Government's Interest.*

1. The awardee agrees to execute or to have executed and promptly deliver to NSF all instruments necessary to: (i) establish or confirm the rights the Government has throughout the world in those subject inventions for which the awardee retains title; and (ii) convey title to NSF when requested under paragraph d. above, and to enable the Government to obtain patent protection throughout the world in that subject invention.

2. The awardee agrees to require, by written agreement, its employees, other than clerical and non-technical employees, to disclose promptly in writing to personnel identified as responsible for the administration of patent matters and in a format suggested by the awardee each subject invention made under this award in order that the awardee can comply with the disclosure provisions of paragraph c. above, and to execute all papers necessary to file patent applications on subject inventions and to establish the Government's rights in the subject inventions. The disclosure format should require, as a minimum, the information requested by paragraph c.1. above. The awardee shall instruct such employees through the employee agreements or other suitable educational programs on the importance of reporting inventions in sufficient time to permit the filing of patent applications prior to U.S. or foreign statutory bars.

3. The awardee will notify NSF of any decision not to continue prosecution of a patent application, pay maintenance fees, or defend in a reexamination or opposition proceeding on a patent, in any country, not less than 30 days before the expiration of the response period required by the relevant patent office.

4. The awardee agrees to include, within the specification of any U.S. patent application and any patent issuing thereon covering a subject invention, the following statement:

"This invention was made with Government support under (identify the award) awarded by the National Science Foundation. The Government has certain rights in this invention."

5. The awardee or its representative will complete, execute and forward to NSF a confirmation of a License to the U.S. Government and the page of a United States patent application that contains the Federal support clause within two months of filing any domestic or foreign patent application.

g. *Subcontracts.*

1. The awardee will include this Patent Rights clause, suitably modified to identify the parties, in all Subawards, regardless of tier, for experimental, developmental or research work. The Subrecipient will retain all rights provided for the awardee in this Patent Rights clause, and the awardee will not, as part of the consideration for awarding the Subaward, obtain rights in the Subrecipients' subject inventions.

2. In the case of Subawards, at any tier, when the prime award by NSF was a contract (but not a cooperative agreement), NSF, Subrecipient, and contractor agree that the mutual obligations of the parties created by this Patent Rights clause constitute a contract between the Subrecipient and the Foundation with respect to those matters covered by this Patent Rights clause.

h. *Reporting on Utilization of Subject Inventions.* The awardee agrees to submit on request periodic reports no more frequently than annually on the utilization of a subject invention or on efforts at obtaining such utilization that are being made by the awardee or its licensees or assignees. Such reports shall include information regarding the status of development, date of first commercial sale or use, gross royalties received by the awardee and such other data and information as NSF may reasonably specify. The awardee also agrees to provide additional reports in connection with any march-in proceeding undertaken by NSF in accordance with paragraph j. of this Patent Rights clause. As required by 35 USC §202(c)(5), NSF agrees it will not disclose such information to persons outside the Government without the permission of the awardee.

i. *Preference for United States Industry.* Notwithstanding any other provision of this Patent Rights clause, the awardee agrees that neither it nor any assignee will grant to any person the exclusive right to use or sell any subject invention in the U.S. unless such person agrees that any products embodying the subject invention or produced through the use of the subject invention will be manufactured substantially in the U.S. However, in individual cases, the requirement for such an agreement may be waived by NSF upon a showing by the awardee or its assignee that reasonable but unsuccessful efforts have been made to award licenses on similar terms to potential licensees that would be likely to manufacture substantially in the U.S. or that under the circumstances domestic manufacture is not commercially feasible.

j. *March-in Rights.* The awardee agrees that with respect to any subject invention in which it has acquired title, NSF has the right in accordance with procedures at 37 CFR §401.6 and NSF regulations at 45 CFR §650.13 to require the awardee, an assignee or exclusive licensee of a subject invention to grant a non-exclusive, partially exclusive, or exclusive license in any field of use to a responsible applicant or applicants, upon terms that are reasonable under the circumstances and if the awardee, assignee, or exclusive licensee refuses such a request, NSF has the right to grant such a license itself if NSF determines that:

1. such action is necessary because the awardee or assignee has not taken or is not expected to take within a reasonable time, effective steps to achieve practical application of the subject invention in such field of use;

2. such action is necessary to alleviate health or safety needs which are not reasonably satisfied by the awardee, assignee, or their licensees;

3. such action is necessary to meet requirements for public use specified by Federal regulations and such requirements are not reasonably satisfied by the awardee, assignee, or licensee; or

4. such action is necessary because the agreement required by paragraph i. of this Patent Rights clause has not been obtained or waived or because a licensee of the exclusive right to use or sell any subject invention in the U.S. is in breach of such agreement.

k. *Special Provisions for Awards with Non-profit Organizations*. If the awardee is a nonprofit organization, it agrees that:

1. rights to a subject invention in the U.S. may not be assigned without the approval of NSF, except where such assignment is made to an organization which has as one of its primary functions the management of inventions, provided that such assignee will be subject to the same provisions as the awardee;

2. the awardee will share royalties collected on a subject invention with the inventor, including Federal employee co-inventors (when NSF deems it appropriate) when the subject invention is assigned in accordance with 35 USC §202(e) and 37 CFR §401.10;

3. the balance of any royalties or income earned by the awardee with respect to subject inventions, after payment of expenses (including payments to inventors) incidental to the administration of subject inventions, will be utilized for the support of scientific or engineering research or education; and

4. it will make efforts that are reasonable under the circumstances to attract licensees of subject inventions that are small business firms and that it will give preference to a small business firm if the awardee determines that the small business firm has a plan or proposal for marketing the invention which, if executed, is equally likely to bring the invention to practical application as any plans or proposals from applicants that are not small business firms; provided that the awardee is also satisfied that the small business firm has the capability and resources to carry out its plan or proposal. The decision whether to give a preference in any specific case will be at the discretion of the awardee. However, the awardee agrees that the Secretary of Commerce may review the awardee's licensing program and decisions regarding small business applicants, and the awardee will negotiate changes to its licensing policies, procedures or practices with the Secretary when the Secretary's review discloses that the awardee could take reasonable steps to implement more effectively the requirements of this paragraph k.4.

l. *Communications.* All communications required by this Patent Rights clause should be sent to:

Patent Assistant
Office of the General Counsel
National Science Foundation
4201 Wilson Boulevard
Arlington, VA 22230

24. Audit and Records

a. Financial records, supporting documents, statistical records, and other records pertinent to this award shall be retained by the awardee for a period of three years from submission of the final reports specified in Articles 17a and 18.

1. Records that relate to audits, appeals, litigation or the settlement of claims arising out of the performance of the project shall be retained until such audits, appeals, litigation or claims have been disposed of.

2. Records relating to projects subject to special project income provisions shall be retained until three years from the end of the awardee's fiscal year in which the award requirement for reporting income expires.

b. Unless court action or audit proceedings have been initiated, the awardee may substitute microfilm copies of original records.

c. The Director of the National Science Foundation and the Comptroller General of the U.S., or any of their duly authorized representatives, shall have access to any pertinent books, documents, papers and records of the awardee organization and of the performing organization, if different, to make audits, examinations, excerpts and transcripts. Further, any negotiated contract in excess of the simplified acquisition threshold (currently $100,000) made by the awardee shall include a provision to the effect that the awardee, the Director of the National Science Foundation, the Comptroller General of the U.S., or any of their duly authorized representatives, shall have access to pertinent records for similar purposes.

d. In order to avoid duplicate record keeping, NSF may make special arrangements with the awardee to retain any records that are needed for joint use. NSF may request transfer to its custody of records not needed by the awardee when it determines that the records possess long-term retention value. When the records are transferred to, or maintained by NSF, the three-year retention requirement is not applicable to the awardee. In the rare event that this provision is exercised, NSF will negotiate a mutually agreeable arrangement with the awardee regarding reimbursement of costs.

e. Awardees that are States, Local Governments or Non-Profit Organizations, shall arrange for the conduct of audits as required by OMB Circular A-133 "*Audits of States, Local Governments, and Non-Profit Organizations*" (including colleges and universities.) They shall provide copies of the reports of these audits to the cognizant Federal audit agency. Any Federal Audit of this project deemed necessary by NSF shall build upon the results of such audit(s).

25. Site Visits

NSF, through authorized representatives, has the right, at all reasonable times, to make site visits to review project accomplishments and management control systems and to provide such technical assistance as may be required. If any site visit is made by NSF on the premises of the awardee or a Subrecipient under an award, the awardee shall provide and shall require its contractors to provide all reasonable facilities and assistance for the safety and convenience of the Government representatives in the

performance of their duties. All site visits and evaluations shall be performed in such a manner that will not unduly delay the work.

28. Nondiscrimination

a. The award and any program assisted thereby are subject to the provisions of Title VI of the Civil Rights Act of 1964 [42 U.S.C. 2000d], the regulations issued pursuant thereto by NSF [45 CFR 611], and the Assurance of Compliance which the awardee has filed with NSF. No person on the basis of race, color, national origin, or handicap shall be excluded from participation in, be denied benefits of, or otherwise be subjected to discrimination under the award. In addition, if the project involves an education activity or program, as defined by Title IX of the Education Amendments of 1972 [20 U.S.C. 1681, 1682, 1683, 1684, 1685, 1686], no person on the basis of sex shall be excluded from participation in the project. Further, by acceptance of the award, the awardee assures NSF that it will comply with Section 504 of the Rehabilitation Act of 1973 [29 U.S.C. 794] and NSF's implementing regulations [45 CFR 605].

b. The awardee shall obtain from each organization that applies to be or serves as a subrecipient, or subawardee under the award (for other than the provision of commercially available supplies, materials, equipment or general support services) an Assurance of Compliance with Title VI of the Civil Rights Act of 1964. Civil Rights Act assurances may be filed with the awardee in one of two ways:

1. by written notification that the appropriate Assurance of Compliance form has been executed and filed either with NSF or the U.S. Department of Health and Human Services; or

2. by executing and filing with the awardee an NSF Assurance of Compliance Form. The awardee shall obtain assurances pursuant to Section 504 of the Rehabilitation Act of 1973, as amended, from subrecipients by incorporating into the subagreement a provision that acceptance of the subagreement constitutes assurance.

c. The awardee agrees to comply with the Age Discrimination Act of 1975 [42 U.S.C. 6101 et seq] as implemented by the Department of Health and Human Service regulations at 45 CFR 90 and the regulations of NSF at 45 CFR 617. In the event the awardee passes on NSF financial assistance to subrecipients, this provision shall apply to the subrecipients, and the instrument under which the Federal financial assistance is passed to the subrecipient shall contain a provision identical to this provision.

29. National Security: Classifiable Results Originating Under NSF Awards

a. NSF does not have original classification authority and does not normally support classified projects. It therefore does not expect that results of NSF-supported research projects will be classifiable, except in very rare instances.

b. E.O. 12958, as amended http://www.whitehouse.gov/news/releases/2003/03/20030325-11.html states that basic research information not clearly related to the national security may not be classified. Nevertheless, some information concerning, among other things, scientific, technological

or economic matters relating to the national security or cryptology may require classification.

c. There may be cases when an NSF awardee originates information during the course of an NSF-supported project that the awardee believes requires classification under E.O. 12958.

d. In such a case, the awardee has the responsibility to promptly:

1. submit the information directly to the government agency with appropriate subject matter interest and classification authority or, if uncertain as to which agency should receive the information, to the Director of the Information Security Oversight Office, GSA;

2. protect the information as though it were classified until the awardee is informed that the information does not require classification, but not longer than 30 days after receipt by the agency with subject matter interest or by the GSA; and

3. notify the cognizant NSF Program Officer.

e. The Executive Order requires the agency with appropriate subject matter interest and classification authority to decide within 30 days whether to classify the material. If it determines the information will require classification, the awardee shall cooperate with that agency, NSF or other appropriate agencies in securing all related project notes and papers.

f. If the information is determined to require classification, the awardee may wish or need to discontinue the project. (See Article 26 and GPM 913, “Termination by Mutual Agreement.”) .

32. Clean Air and Water

(Applicable only if the award exceeds $100,000, or a facility to be used has been the subject of a conviction under the Clean Air Act [42 U.S.C. 7413(c)(1)] or the Clean Water Act [33 U.S.C. 1319(c)] and is listed by EPA, or the award is not otherwise exempt.) The awardee agrees as follows:

a. To comply with all the requirements of Section 114 of the Clean Air Act [42 U.S.C. 7414] and Section 308 of the Clean Water Act [33 U.S.C. 1318], respectively, relating to inspection, monitoring, entry, reports and information, as well as other requirements specified in Section 114 and Section 308 of the Clean Air Act and the Clean Water Act, respectively, and all regulations and guidelines issued thereunder before the award of the cooperative agreement.

b. That no portion of the work required by the award will be performed in a facility listed on the Environmental Protection Agency List of Violating Facilities on the date that the award was awarded unless and until EPA eliminates the name of such facility or facilities from such listing.

c. To use its best efforts to comply with clean air standards and clean water standards at the facility in which the award is being performed.

d. To insert the substance of the provisions of this article into any nonexempt Subaward.

35. State Sales and Use Taxes

Awardees are reminded that each set of cost principles cited in Article 13b. limits the allowability of taxes to those the organization is required to pay. Awardees must avail themselves of any tax exemptions for which any activities supported by Federal funds may qualify, including any applicable exemptions from state or local sales and use taxes on the purchase of goods and services made with NSF award funds.

OTHER CONSIDERATIONS

39. Liability

NSF cannot assume any liability for accidents, illnesses, injuries, or claims arising out of, or related to, any activities supported by an award or for unauthorized use of patented or copyrighted materials. The awardee organization is advised to take such steps as may be deemed necessary to insure or protect itself, its employees and its property.

40. Sharing of Findings, Data, and Other Research Products

a. NSF expects significant findings from research and education activities it supports to be promptly submitted for publication, with authorship that accurately reflects the contributions of those involved. It expects investigators to share with other researchers, at no more than incremental cost and within a reasonable time, the data, samples, physical collections and other supporting materials created or gathered in the course of the work. It also encourages awardees to share software and inventions or otherwise act to make the innovations they embody widely useful and usable.

b. Adjustments and, where essential, exceptions may be allowed to safeguard the rights of individuals and subjects, the validity of results, or the integrity of collections or to accommodate legitimate interests of investigators.

41. Partnerships with Foreign Collaborators

a. The awardee shall provide written notification to the JOI prior to entering into formal arrangements with foreign collaborators. In the notification, the awardee should specify: the projects and individuals involved; the purpose of the cooperative program; the proposed duration; location; and, the magnitude of the proposed activity.

b. This provision is not intended to require notifications to the NSF of the routine use of awardee services and facilities by foreign investigators or foreign students, or the routine use of foreign facilities by project staff in accordance with the awardee’s standard policies and procedures.

42. Government Permits and Activities Abroad

a. For awards that include activities requiring permits from appropriate Federal, state, or local government authorities, the awardee should obtain any required permits prior to undertaking the proposed activities.

b. The awardee should assure that activities carried on outside the U.S. are coordinated as necessary with appropriate U.S. and foreign government authorities and that necessary licenses, permits or approvals are obtained prior to undertaking proposed activities. NSF does not assume responsibility for awardee compliance with the laws and regulations of the country in which the work is to be conducted.

43. Sense of the Congress on Use of Funds

Recent Acts making appropriations to NSF provide "It is the sense of the Congress that, to the greatest extent practicable, all equipment and products purchased with funds made available in this Act should be American-made" and require the Foundation to notify awardees of that statement.

44. Increasing Seat Belt Use in the United States

In accordance with Executive Order 13043, *Increasing Seat Belt Use in the United States*, dated April 16, 1997, "grantees are encouraged to adopt and enforce on-the-job seat belt policies and programs for their employees when operating company-owned, rented, or personally owned vehicles."

SUPPLEMENTAL FINANCIAL/ADMINISTRATIVE TERMS AND CONDITIONS – LARGE FACILITIES

For PHASE 2 of this Subaward, the following additional terms and conditions apply:

(NSF) Cooperative Agreement
Supplemental Financial/Administrative Terms and Conditions--Large Facilities
August 2003

Unless otherwise specified in a special award condition, or as modified below, the Cooperative Agreement Financial & Administrative Terms and Conditions (CA-FATC) dated, 8/03, are applicable to this cooperative agreement.

A. Intentionally blank.

B. Supplemental Financial/Administrative Terms and Conditions--Large Facilities -- The CA-FATC are supplemented with the following additional terms and conditions:

Article Subject
1 Master Site Plan
2 Lease or Purchase of Additional Space
3 Cooperative Support Agreements
4 Subaward Requirements
5 Government Performance and Results Act (GPRA)
6 Non-Renewal of the Cooperative Agreement

45. Master Site Plan
a. When required by the cognizant Program Officer, a Master Site Plan pertaining to the facility supported under the cooperative agreement must be provided as specified below:

1 The Master Site Plan will be provided to the cognizant NSF Program Officer by October 1 of each year.
2 No requests for approval of rent, lease, purchase, or renovation of lands, buildings, structures or facilities will be considered by the NSF Program Official or the NSF Grants and Agreements Official without a current Master Site Plan submitted for that fiscal year.

3. Each Master Site Plan will include:
(a) A map that identifies:
(1) the location, boundaries, and acreage of NSF-owned and/or leased lands;
(2) the location of existing buildings, structures, and facilities; and
(3) the location of proposed buildings, structures, and facilities.
(b) A Usage Chart that sets forth in table format:
(1) the identification of land (or segments thereof), buildings, structures, or facilities use;
(2) the placement within these of equipment types; and
(3) an explanation, if any of these is not being utilized with recommendations for retention or disposal.
(c) A Statement of Need for additional lands, buildings, structures, and facilities in addition to those above must be supported by a new space needs assessment and an updated Master Site Plan that must be submitted to NSF at least two fiscal years in advance of any specific need and that includes:
(1) the statement of specific needs, including why existent space is not adequate to meet that need;
(2) any geographic restrictions;
(3) a supported request that justifies rent, lease, acquisition, construction or renovation activities with associated cost estimates from qualified individuals; and
(4) an accompanying Temporary Science Project Relocation Plan with actual projected Time Line and Costs for any of the above requests that will affect projects underway.

46. Lease or Purchase of Additional Space
a. Requests for NSF approval to lease or purchase additional space must include documentation, as applicable, specified in the lease/purchase analysis, “Documentation Required for Request to Lease/Purchase Space” (Attachment 1). Approval by the cognizant Program Officer and the Grants and Agreement Officer is required prior to
1 Acquiring real property or interest therein with direct or indirect Federal funds provided under this Agreement;
2 Issuing, refinancing or altering bonds used to finance the acquisition of real property;
3 Establishing new facilities; or
4 Establishing a Lease/Purchase Space arrangement.

47. Cooperative Support Agreements
a. Cooperative Support Agreements (CSAs). CSAs will be issued by the NSF for support of specific projects and/or programs for work to be done under the general “Statement of Work” of each CSA. Amendments will be issued to modify specific terms and conditions of the CSA, including funding amendments that might be funded by the NSF Division that issued the award, other NSF Divisions, or other Federal agencies. Each CSA issued after the effective date of the Cooperative Agreement will normally include the following:

1, A Statement of Work, that incorporates by reference the Awardee's proposal;
2. The period of performance of the CSA;
3. The estimated cost of the program/project and the amount of funds obligated under the CSA;
4. The name of the cognizant NSF Program Officer designated under each CSA; and
5. The signature of both the Authorized Organizational Representative and the cognizant NSF Grants Officer.

Amendments to CSAs issued under this Agreement may be unilateral or bilateral, depending on their nature. Incremental funding amendments will normally be unilateral.

b. Conditions for Interagency Transfer of Funds. If funding from other Federal agencies is to be provided to Awardee via interagency fund transfer, the process will begin with an interagency agreement that effects the transfer of funds from the other funding agency to NSF and will conclude with the issuance of an amendment to a CSA by NSF transferring the funds to the Awardee pursuant to the interagency agreement. It is NSF's responsibility to provide to the Awardee copies of all interagency agreements that transfer funds in support of the Awardee's proposals. It is the Awardee's responsibility to notify the prospective sponsor that, as a condition of NSF's entering into an interagency agreement of fund transfer, other Federal agencies must agree to the following conditions:
1 NSF will implement the agreement by an amendment issued under this Cooperative Agreement, or any successor agreement, and NSF will not itself be directly responsible for the provision of goods or services contemplated under the Awardee's proposal to the other Federal Agency.
2 It is the Awardee's responsibility to provide the necessary fiscal and technical reports to the sponsoring agency in accordance with the terms and conditions of the sponsoring agency's agreement.
3 NSF assumes no liability for any costs above the funds obligated against the CSA.
4 In accordance with NSF policy, a portion of the incoming fund transfer will be set aside to recover costs that NSF incurs in the management, administration and oversight of the funded activities at a rate predetermined by the NSF.
5 All fund transfers and work performed will be accepted under the terms and conditions of this Agreement.

c. Proposals Not Involving the Large Facility Supported Under This Cooperative Agreement. It is recognized that the Awardee is free to submit proposals that do not involve the use of the facilities supported under this cooperative agreement (including personnel) to other Federal agencies. If such a proposal is to be funded by another Federal agency, NSF will normally be willing to enter into an interagency agreement with that agency. NSF reserves the right to assure itself before entering into any such interagency agreement that the project does not involve the use of the facility.
d. Format for Submission of Requests for Funding under Cooperative Support Agreements and Supplements. In submitting proposals requesting NSF funding, the Awardee shall use the standard NSF Budget format to provide budget information. The Authorized Organizational Representative must sign this form. Written justification for all funding requests is required.

48. Subaward Requirements

a. JOI authorizes the subawardee to enter into proposed contractual arrangements and to fund such arrangements with award funds up to the amount indicated in the approved MREFC budget. Such contractual arrangements should contain appropriate provisions consistent with the applicable Grant General Conditions, Cooperative Agreement Financial and Administrative Terms and Conditions (CA FATC) Cooperative Agreement General Conditions and any special conditions included in the subaward.

b. The subawardee shall notify JOI prior to awarding any new subaward/subcontract not already indicated in the approved budget, if it exceeds $250,000. Any proposed new subaward, identified by subaward type, shall be submitted to JOI for review by the JOI Program Supervisor.

c. Upon submission of a subaward request to JOI, the subawardee will certify that the subaward:

1. is appropriate, reasonable and legitimate
2. brings substantial programmatic benefits to the science
3. is issued to an organization that has the fiscal authority and responsibility to account for and handle Federal funds; and
4. is in compliance with all Federal requirements and the Awardee's policies and procedures.

d. After review, JOI will provide written notification to proceed to the subawardee, this notification shall not be construed as a determination by JOI or NSF of the allowability of any cost under this Agreement.

e. The subawardee shall make all consultant agreements, subawards, or other commitments in its own name and shall not bind JOI or the National Science Foundation; and hereby agrees to administer/monitor all subawards/subcontracts it enters into and supports with NSF funds in accordance with the applicable federal cost principles and the applicable Federal administrative requirements; remain responsible for maintaining the necessary documentation on all subawards, making them available to JOI or NSF upon request; and shall include subaward activities in the annual and final progress and final project reports that are submitted to JOI.

49. Government Performance and Results Act (GPRA)

Under the Government Performance and Results Act of 1993 (5 U.S.C. 306, 31 U.S.C. 11141119, "GPRA") the NSF is required to report on the Federal Performance Goals for Facilities. This may include the collection and submission of specific data related to the NSF GPRA requirements. The Awardee will be required to submit estimates by December 31 and actuals by October 31 for each fiscal year. Any and all facilities with an annual budget exceeding $1,000,000 must report on their operations activities; any and all construction / upgrade projects that exceed a total project cost of a specific threshold must report on their construction/upgrade activities. Therefore, the Awardee will be required, to submit reports related to the GPRA performance goals to the cognizant NSF Program Officer.
For further information on GPRA, see the NSF GPRA Home Page at:
http://www.nsf.gov/od/gpra/.

50. Non-Renewal of the Cooperative Agreement

In the event this agreement is not renewed, the Awardee agrees to provide for an orderly and efficient transition, should a successor Awardee be selected by NSF.

Attachment 1 Documentation Required for Request to Lease/Purchase Space NSF hereby provides additional information that may be useful to the awardee when preparing a lease/purchase analysis and a space analysis plan intended for review and approval by NSF. The awardee should provide the following information as applicable to its request for proposed lease/purchase space:

1 Why is additional space needed?

2 Was a lease/purchase analysis performed? If yes, the awardee should provide a copy of the analysis along with its request for NSF approval.

3 If this is a request for NSF approval of a renewal lease/purchase arrangement, were any advance agreements previously established? If yes, please explain.

4 If there is an existing lease/purchase arrangement, when does it expire?

Lease/Purchase Analysis: A lease/purchase analysis for proposed space must be conducted in accordance with the requirements of Office of Management and Budget (OMB) Circular A110, "Property Standards", Sec. .30-.37, and "Procurement Standards", Sec. .40-.44. The Circular may be accessed at:
http://www.whitehouse.gov/omb/circulars/a110/a110.html#40
The following information should be included:

1 What is the proposed term of the lease?

2 State timelines for buying/leasing/building additional space including start and end dates.

3 What other sources of space were considered? What were the results?

4 What is the cost per square foot for the proposed purchased space? What is the cost per square foot for the proposed lease space?

5 What are the incidental service costs such as maintenance, insurance and applicable taxes for the buy and lease space?

6 What is the condition and total value of the property?

7 Is lease or purchase space most advantageous (economical and practical) to the Federal Government? Why?

8 What amount of NSF funding is proposed for the proposed lease/purchase space? State any other sources and amounts of funding.

Space Analysis Plan: A multi-year plan for office and related space that establishes present and future science (project by project) and related administrative needs. This planning activity must be conducted by independent professionally experienced space planners and clearly engage all aspects of project activities. It should also include an assessment that clearly demonstrates the needs of the scientific staff that are carrying out the activities and mission established under the cooperative agreement.

Additional Documentation (provide as appropriate to the circumstances):

1 A copy of the current lease agreement, if applicable.

2 If estimates are used (e.g., anticipated rental increases, change in facility location), provide data from which these estimates were derived.

3 Any other information to support the awardee's request for NSF approval to lease/purchase space.

NSF Review Process

1 The awardee should provide a request for NSF approval, including lease/purchase analysis and a space analysis plan, to DGA with a copy to the cognizant NSF Program Officer.

2 DGA will ask the Program Officer to review the awardee's request for reasonableness of space and effect on science to be performed under the cooperative agreement.

3 The Program Officer will provide a review analysis and recommendation to DGA.

4 After receipt of the Program Officer's recommendation, DGA will conduct a business review of the awardee's request.

5 If deemed necessary to clarify concerns or obtain additional information, NSF will provide written questions / comments to the awardee. A teleconference between NSF and the awardee may be conducted if needed to resolve issues.

6 NSF expects to finalize the awardee's request within 30 days of receipt of complete information from the awardee. Additional time may be required to finalize the awardee's request if issues need resolution.

7 NSF approval (or disapproval) will be provided in writing to the awardee.

(End of Section I)

SECTION J – LIST OF ATTACHMENTS

J.1 LISTING OF ATTACHMENTS

These documents, including any subsequent updates, are made a part of this subaward:

Ocean Observatories Initiative (OOI), Cost Estimating Plan (CEP), Revision 0, March 9, 2007, on JOI website at: www.orionprogram.org/news/RFP.html

NSF Guidelines for Development of Project Execution Plans for Large Facilities, Draft, undated, on JOI website at: www.orionprogram.org/news/RFP.html

[Subrecipient's proposal will be attached here as a material part of the resulting Subaward]

(End of Section J)

SECTION K – REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS OF OFFERORS

K.1 OFFEROR REPRESENTATIONS AND CERTIFICATIONS

The Offeror certifies that (i) all Representations and Certifications contained in the solicitation and offer are complete, current, and accurate as required, (ii) the Offeror is aware that award of any Subaward shall be considered to have incorporated the applicable Representations and Certifications by reference.

K.2 TAXPAYER IDENTIFICATION (OCT 1998)

(a) Definitions

"Common parent," as used in this solicitation provision, means that corporate entity that owns or controls an affiliated group of corporations that files its Federal income tax returns on a consolidated basis, and of which the Offeror is a member.

"Taxpayer Identification Number (TIN)," as used in this provision, means the number required by the IRS to be used by the Offeror in reporting income tax and other returns. The TIN may be either a Social Security Number or an Employer Identification Number.

(b) All Offerors are required to submit the information required in paragraphs (d) through (f) of this provision in order to comply with debt collection requirements of 31 U.S.C. 7701(c) and 3325(d), reporting requirements of 26 U.S.C. 6041, and 6041A, and 6050M and implementing regulations issued by the IRS. If the resulting contract is subject to reporting requirements described in FAR 4.904, the failure or refusal by the Offeror to furnish the information may result in a 31 percent reduction otherwise due under the contract.

I The TIN may be used by the Government to collect and report on any delinquent amounts arising out of the Offeror's relationship with the Government (31 U.S.C. 7701I (3)). If the resulting contract is subject to the payment reporting requirements described in FAR 4.904, the TIN provided hereunder may be matched with IRS records to verify the accuracy of the Offeror's TIN.

(d) *Taxpayer Identification Number (TIN)*

☐ TIN: _____.

☐ TIN has been applied for.

☐ TIN is not required because:

☐ Offeror is a nonresident alien, foreign corporation, or foreign partnership that does not have income effectively connected with the conduct of a

trade or business in the U.S. and does not have an office or place of business or a fiscal paying agent in the U.S.

☐ Offeror is an agency or instrumentality of a foreign government.

☐ Offeror is an agency or instrumentality of the Federal Government.

(e) Type of organization

☐ Sole proprietorship

☐ Partnership

☐ Corporate Entity (not tax-exempt)

☐ Corporate Entity (tax-exempt)

☐ Government Entity (Federal, State or local)

☐ Foreign Government

☐ International Organization per 26 CFR 1.6049-4

☐ Other

(f) Common Parent

☐ Offeror is not owned or controlled by a common parent as defined in paragraph (a) of this provision.

Name and TIN of common parent:

Name: _____

TIN: _____

K. 3 CERTIFICATION REGARDING DEBARMENT, SUSPENSION, PROPOSED DEBARMENT, AND OTHER RESPONSIBILITY MATTERS

(a) (1) The Offeror certifies, to the best of its knowledge and belief, that –

(i) The Offeror and/or any of its Principals –

(A) Are ☐, Are not ☐ presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any Federal agency.

(B) Have ☐ Have not ☐, within a 3-year period preceding this offer, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, state, or local) contract or Subaward; violation of federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement,

theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, or receiving stolen property; and

(C) Are ☐, Are not ☐ presently indicted for, or otherwise criminally or civilly charged by a government entity with, commission of any of the offenses enumerated in subdivision (a)(1)(i)(B) of this provision.

(ii) The Offeror has ☐, has not ☐, within a 3-year period preceding this offer, had one or more contracts terminated for default by any Federal agency.

(2) "Principals," for the purposes of this certification, means officers; directors; owners; partners; and, persons having primary management or supervisory responsibilities within a business entity (e.g., general manager; plant manager; head of a subsidiary, division, or business segment, and similar positions).

This certification concerns a matter within the jurisdiction of an agency of the United States and the making of a false, fictitious, or fraudulent certification may render the maker subject to prosecution under section 1001, title 18, United States Code.

(b) The Offeror shall provide immediate written notice to the Contracting Officer if, at any time prior to contract award, the Offeror learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

(c) A certification that any of the items in paragraph (a) of this provision exists will not necessarily result in withholding of an award under this solicitation. However, the certification will be considered in connection with a determination of the Offeror's responsibility. Failure of the Offeror to furnish a certification or provide such additional information as requested by the Contracting Officer may render the Offeror non-responsible.

(d) Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by paragraph (a) of this provision. The knowledge and information of an Offeror is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

(e) The certification in paragraph (a) of this provision is a material representation of fact upon which reliance was placed when making award. If it is later determined that the Offeror knowingly rendered an erroneous certification, in addition to other remedies available to the Government, the Contracting Officer may terminate the contract resulting from this solicitation for default.

(End of Section K)

SECTION L – INSTRUCTIONS, CONDITIONS, AND NOTICES TO OFFERORS

This section contains important information concerning the preparation of proposals for this procurement. The Offeror is expected to examine this solicitation thoroughly and furnish all information required by this solicitation.

JOI recognizes that there can be significant liabilities and risks associated with the ownership of the components of the OOI. The NSF and JOI are working together to resolve liability and ownership concerns; therefore, Offerors should not be concerned about this aspect for purposes of preparing their response to this RFP.

Since the OOI infrastructure will be a research facility, the participation of faculty and graduate students, the training of systems engineers and other educational activities could contribute to the overall effectiveness of the observatory. Proposals should identify the commitment of institutional financial, administrative and/or logistical support and how participation as an implementing organization furthers institutional academic goals, educational initiatives and integration with institutional research and, enhances the facility and benefits the effectiveness of the institution as an IO.

L.1 PROPOSAL PREPARATION INSTRUCTIONS

1. PAYMENT OF PROPOSAL COSTS

This solicitation does not commit JOI to pay any cost incurred in the preparation or submission of the Offeror's proposal or in making necessary studies or designs for the preparation thereof. It does not commit JOI to contract for the services.

2. PROPOSAL PREPARATION INSTRUCTIONS

The following instructions are provided to assist the Offeror in understanding the information needed to make an objective selection of the contractor for this proposed procurement. Since this information constitutes the major basis for formal judgment, it will be advantageous to the Offeror to present a proposal in a clear, concise manner and in terms understandable to those who may be unfamiliar with the Offeror's intentions and reasoning process.

A. GENERAL INFORMATION

The proposal shall be submitted in two (2) separate volumes:

Volume I – TECHNICAL/MANAGEMENT PROPOSAL
Volume II – COST AND PAST PERFORMANCE

The Offeror shall provide to JOI one (1) original, four (4) copies and two (2) CD ROMs of each Volume, which must be in PDF format. If there are any discrepancies between the proposal volume hardcopies and the proposal volume CD ROMs, the hardcopy will govern.

Each proposal volume with its copies is to be packaged together and separated from the other volumes. They should be clearly marked to identify contents. Cost or pricing data shall **NOT** be included in Volume I. Proposal text shall be printed on 8-1/2" x 11" paper with size 10 font and all pages shall be three-hole punched and inserted in ring binders only.

Each volume shall be written on a stand-alone basis. Cross-referencing within a proposal volume is permitted where its use would conserve space without impairing clarity. Information required for each volume, which is not found in its designated volume, will be reviewed as omitted from the proposal and will affect the evaluation results.

B. TECHNICAL/MANAGEMENT PROPOSAL - VOLUME I

The Offeror shall prepare Volume 1 of the proposal in the form of a Project Execution Plan (PEP) under the draft guidelines developed by the Large Facilities Office of the NSF; the OOI PEP on the JOI website can serve as an example. There is no page limit for this document. This plan should include a Work Breakdown Structure aligned at a high level with the tasks in Section C. Volume 1 will include the PEP, including the WBS with estimated labor mix and hours and descriptions of direct cost but no dollar amounts associated with it. A WBS dictionary should be contained within the PEP.

In addition, Volume 1 shall include supplementary narrative to address subfactor items that are not appropriate for inclusion in the PEP. A matrix that cross-references the subfactors to the PEP will be helpful to identify what additional information is required. The supplementary narrative for Volume 1 shall be limited to 25 pages, exclusive of charts, exhibits, or spreadsheets.

Offerors shall compile the PEP and the supplemental narrative in sufficient detail to address all of the information requested below and to describe how they will manage all of the tasks in the Statement of Work (Section C). Upon review and evaluation of the proposal, JOI may require additional supporting information from the Offeror in order to clarify the proposal.

Offerors should note that technical proposals which merely offer to conduct a program in accordance with the requirements of Section C - Scope of Work, (for example, parroting back the Statement of Work) will be considered non-responsive to this solicitation and will not be considered further.

Subfactor 1: Understanding the Required Work

To achieve the Section C objectives, detailed knowledge and experience with numerous aspects of systems engineering, project management, and major oceanographic facility design, development, construction, and operations are required. Offerors shall describe their experience in these areas, including any experience with government contracts.

It is expected that each Offeror to this RFP will adopt a unique work strategy and offer the appropriate mix of labor talent for each task area defined in Section C.

Offerors shall:

- Demonstrate its understanding of each Section C task and tell how they would go about supporting the task.
- Identify the labor categories required for each task area.
- Address the logic for selecting those labor categories and the experience essential for success that your proposed labor mix offers.
- Identify for each task area which labor category is considered key to the successful completion of that task.
- Address the need for any subcontracting, clearly identify which labor categories or activities are being subcontracted.
- Describe how they intend to interface effectively with JOI.
- Describe how they intend to provide effective customer support to the tasks outlined in Section C.

NOTE: Do not insert any pricing in this section. Pricing of labor by task for each task will be provided in the Cost Volume.

Subfactor 2: Understanding the Project Phasing

The Offeror shall provide a Plan of Work (POW) (schedule) that demonstrates its understanding of the project schedule and its interdependencies. We expect that each Offeror to this RFP will adopt a unique work strategy and reflect that in the proposed schedule. Offerors shall identify work duration and interdependencies for each task area. The Offeror shall discuss anticipated risks and trade-offs associated with each task.

A Work Breakdown Structure (WBS) shall be developed that contains the framework for the organization of the project effort. The WBS will include ALL of the work required to complete the project: all physical deliverables, subsystems, R&D, design, prototyping, fabrication, assembly, installation, acceptance testing leading to a deliverable product, administration, system engineering, purchasing, and other categories as needed.

Because JOI is striving for consistency across all of the IOs, Offerors should review the WBS contained in the OOI PEP on the JOI website for further understanding of the vision of organizing the work. The coastal and global work will now roll into a single level 1 account, instead of two as previously envisioned in the OOI PEP. During the development of the proposal, JOI will provide assistance to Offerors to facilitate the development of the WBS in such a way as to accent the delivery of the science nodes to the OOI network. WBSs may contain as many levels as necessary to fully describe the work. Offerors may call JOI to arrange WBS support; a system level block diagram is required input for the WBS support sessions.

Since all of the work on the project is identified through the WBS, the POW will be tied to the WBS and will provide the cost phasing for Volume 2 and for JOI to use for applying escalation factors. The phasing should be shown here, and the costs in Volume 2.

JOI has proposed a definition for completion of the OOI Network for purposes of the MREFC construction funding. Specifically, the OOI Network will be deemed

complete when all of the Core Science Nodes have been commissioned and accepted.[1]

This definition for completion should be factored into the WBS creation so that a critical path can be determined for each Core Science Node and for the overall coastal and global scale node development and implementation. One powerful feature of a network with hundreds of Science Nodes is that each individual Science Node can be commissioned and accepted independently.

Subfactor 3: Task Area Experience

Offeror shall provide two (2) exhibits of work products of similar technical scope and size for each Task Area in Section C that were performed within the past 5 years of this solicitation. Please indicate which of your proposed key personnel have worked on these projects and how their prior experience is relevant to the work identified for this subaward.

Subfactor 4: Key Resources – Non-Labor

Offeror shall provide narrative descriptions of facilities that are or will be available to perform the Task Areas of this project.

Offerors shall:

- Describe their infrastructure and technical capabilities of relevance to the successful implementation and operation of the OOI.
- Outline planned space requirements and how those are to be supported, including office space, laboratories, test labs, work areas, landing stations, and Cyberinfrastructure.
- Discuss the role of the institution in Education and Outreach activities that enhance the overall OOI facility and its use.
- Identify how participation as an implementing organization furthers institutional academic goals, educational initiatives and integration with institutional research.

Subfactor 5: Management Team

The bidder shall describe the management team's experience in organizing, supporting, and managing large, interdisciplinary, and inter-entity organizations implementing large complex systems. Offerors shall describe experience in these areas including experience with integrating government and commercial requirements.

Offerors shall:

- Provide an organization chart.

[1] A Science Node is a distinct physical area where one or more measurements or experiments are required to be performed. In general, a Science Node will be connected to the OOI via a single connector. A rover or an AUV can be defined as a Science Node. A Core Science Node is a Science Node where core instruments will be installed during the MREFC process.

- Identify all positions considered key positions for each task by labor title.
- Include the rationale for identifying these positions as key.
- Provide resumes for all personnel designated as key in your proposal.
- Clearly state the responsibilities and authorities of each key person by describing such elements as his/her span of control, degree of autonomy, and lines of communication.
- Where Offeror plans on subcontracting parts of the work, give an explanation of each Subrecipient's responsibility as part of the Offeror's team.
- Explain the steps taken to insure the integration of multiple subcontractors into the management team.
- For those areas of experience in which the Offeror has no personnel with relevant experience, provide the Offeror's plans for recruiting experienced personnel and/or training existing personnel.

Note: The RFP terms and conditions contain a requirement relating to restrictions on reassignment and replacement of key personnel. A letter of commitment is required for each proposed key personnel not currently in the employ of the Offeror. The letter of commitment must include the date of availability, the salary accepted by the individual, how long the individual's commitment is binding, and be signed by the individual and an authorized officer of the Offeror. A resume for a key individual that is unaccompanied by a letter of commitment shall be explained.

Subfactor 6 – Management Techniques and Risk Mitigation

To achieve the management and reporting requirements of Section C, Offeror shall show proficiency in the use of the earned value management systems. Additionally, proficiency in Microsoft Project, the scheduling software used by JOI, is required. Offerors shall describe any experience in these areas, including any experience with government contracts.

Offerors shall:

- Include a detailed schedule of expected milestones that must be met to perform the Section C task requirements and manage inherent risks. The schedule shall be presented in Microsoft Project software which JOI uses to manage its projects.
- Assess the critical path(s) for this project and indicate which sub-task areas are considered key to the successful completion of that task.
- Address how any subcontracted tasks will be incorporated in the master schedule and how the Subcontractor will be asked to manage its schedules.
- Describe the process to be followed by your offered Project Manager in obtaining decisions beyond his/her authority and in resolving priority conflicts for resources/functions not under their direct control.
- Identify critical areas of management and technical risk and how that risk will be mitigated to ensure successful execution of the contract.
- Address how these risk areas could be mitigated during the contract life cycle, and discuss how such risk mitigation techniques have been previously employed by your organization.

The Offeror shall discuss the line of communication as well as the reporting relationships between and among the Offeror, JOI, and the Offeror's Subcontractors.

Subfactor 7 – Test and Acceptance Strategy

Because the components for the coastal and global scale nodes will likely be supplied from a number of academic and commercial partners, it is important to have a carefully thought out strategy for testing and acceptance. Such a strategy must also include ownership transfer points. The proposal should explain the bidder's approach to testing and acceptance, including the proposed qualification process components will be required to follow to certify they will interface successfully to the system thereby reducing integration/interoperability issues.

It is possible that decisions made during the formulation of the Test and Acceptance strategy will affect the way in which the bidder will organize the work during the construction phase.

Subfactor 8 – Preliminary Network Design:

Bidders shall provide an update to the Conceptual Network Design (Revised Infrastructure Plan, March 8, 2007) shown on the JOI website. The designs should reflect the bidder's unique approach to providing the required functionality at the various science nodes. The updated designs must meet the cost constraints contained in Section C of this solicitation.

Volume 1 is limited to 25 pages of supplemental narrative, the PEP, and the exhibits for Subfactor 3.

D. COST AND PAST PERFORMANCE – VOLUME II

Volume II cost data shall be organized into a cost book using the WBS from the PEP, but should not include the full text of the PEP. Offeror shall estimate contingency by WBS element and provide the basis of estimate for both the cost and the contingency estimates in accordance with the OOI Cost Estimating Plan. Narratives supporting pricing data shall be succinct, and shall not attempt to duplicate or supplement text that properly belongs in the Technical/Management Volume.

In addition, Volume 2 may include supplementary narrative to address items that are not appropriate for inclusion in the PEP. The supplementary narrative for Volume 2 shall be limited to 10 pages, exclusive of charts, exhibits, or spreadsheets.

MREFC funds are intended to support the construction of facilities to transform science and not to support other activities that will ultimately be important to the success of the science program. Institutional support in the form of matching funds or cost contributions is not mandatory, but may strengthen a proposal. Such activities may include planning workshops for science experiments, support for graduate students and post-doctoral fellowships, and education and public awareness activities.

The Volume II Past Performance and Cost shall propose costs for each fiscal year beginning with an expected award/start date of August, 2007. The Offeror shall include spreadsheets by fiscal year showing each WBS Element, breakout of headcount by proposed labor categories, associated Offeror direct labor rates, fringe and overhead applications/rates and a breakout of other direct costs for equipment, communication and proposed Subcontractors. A detailed budget is required for all proposed Subcontracts in excess of $100,000. Pricing spreadsheets shall be submitted in a single workbook in Excel 97 or higher version. All cells containing derived data shall be presented together with the formulas used to derive the data. The Offeror shall estimate contingency for each item based on the risk or uncertainty of the estimate in accordance with the OOI Cost Estimating Plan.

Proposals that fail to break down costs by WBS Element will be considered non-responsive to the RFP and will not be considered for evaluation.

The OOI Cost Estimating Plan (CEP) defines the guidelines and methodology that will be used to prepare and update the OOI cost estimate for the Construction Proposal and for the PDR. The OOI CEP will help to assure that the final product is complete, consistent, and well documented. The cost estimate will be assembled and maintained in an OOI Cost Book by JOI.

The WBS from Subfactor 2 of the Technical/Management Volume will form the framework for the organization of the coastal and global sections of the OOI Cost Book. The Cost Book will include the WBS Dictionary definitions and the detailed estimate of the cost to accomplish the work in each WBS element broken out by the normal NSF cost categories. All analysis, calculations, quotations, reports, and other substantiating documentation will be provided and maintained with the Cost Book. Finally, a detailed, bottom-up estimate of required contingency is required.

The Offeror shall submit pricing spreadsheets for Task 7 with the understanding that operations (both initial and post implementation) will employ a different funding mechanism.

Past Performance

The information requested below is anticipated to be sufficient for the purposes of the evaluation of past performance. In Volume 2 supplemental narrative, the Offeror shall furnish the following information for any combination of two (2) relevant contracts, subcontracts, subawards, grants and/or cooperative agreements awarded to the Offeror in the past five years:

a. Customer's name, address, email address and current verified telephone number of both the lead contractual and technical personnel. (Customer personnel may not be connected to the governance of or be in the employ of the Offeror.)
b. Contract number, type, and original and final contract value.
c. Date of contract, place(s) of performance, and delivery dates or period of performance.
d. Brief description of contract work and comparability to the proposed effort. It is not sufficient to state that it is comparable in magnitude and scope. Rationale must be provided to demonstrate that it is comparable.

e. Discuss any major technical problems and how they were overcome. List any major deviations or waivers to technical requirements that were granted by the customer.
f. Whether delivery was on time and, if not, why; adherence to program schedules; incentive performance (e.g., schedule and technical) history, if applicable.
g. Cost/price management history; cost overruns and underruns, and cost incentive history, if applicable.
h. List any contracts terminated (partial or complete) within the past 5 years and basis for termination (convenience or default). Include the contract number, name, address, and telephone number of the terminating officer. Include contracts that were “descoped” by the customer because of performance or cost problems.

(End of Section L)

SECTION M -- BASIS FOR SELECTION

A single award will be made to the Offeror whose proposal is responsive to this solicitation and provides the best value to JOI based on an evaluation of technical and management approach, Offeror's past performance and proposed cost. Factors in Volume 1 are of equal importance.

Past Performance and Cost will not be scored or carry specific weighting. Cost will be assessed for cost realism and if a cost vs. technical/management tradeoff is warranted, the Source Selection Official will determine the best value by comparing the strengths, weaknesses and risks in Volume 1 with the difference in evaluated cost.
Past Performance will be considered in the tradeoff portion of the evaluation.

Offerors are placed on notice that any proposals which are unrealistic in terms of technical commitment or unreasonably low or high in cost will be deemed to be reflective of an inherent lack of technical competence or indicative of failure to comprehend the complexity and risk of the contract requirements.

(End of Section M)

(End of Solicitation)

Ocean Observatories Initiative (OOI)

Cost Estimating Plan (CEP)

Revision 0

March 9, 2007

Document Control

Revision	Date	Reason for Change	Approver
Revision 0	March 9, 2007	Initial Issue	R. Lunde

1.0 Overview

The Ocean Observatories Initiative (OOI) Cost Estimating Plan (CEP) defines the guidelines and methodology that will be used to prepare and update the OOI cost estimate. This guidance is provided to assure that the final product is complete, consistent, and well documented. The cost estimate will be assembled and maintained in an OOI Cost Book.

2.0 Objectives

The primary objective is to develop a comprehensive estimate of the total OOI project cost. This includes the costs for engineering, design, testing, analysis, procurement, fabrication, assembly, testing, installation, integrated system testing, commissioning, and management of the in-situ Ocean Observatory.

The cost estimates will be prepared by technical experts who are experienced in the fields of specialization required to accomplish the OOI. Vendor quotations, engineering calculations, drawings, and other pertinent data including similarities to the Monterey Accelerated Research System (MARS) and the NEPTUNE Canada program, which are used to support the cost estimate, will be collected and organized into a Basis-of- Estimate (BOE). A copy of the BOE will be maintained in the Cost Book with the cost estimate. The Cost Book will be organized according to the OOI Work Breakdown Structure (WBS). This Cost Book and BOE will furnish OOI management as well as reviewing organizations with the data required to substantiate all estimates. The documentation will include the basic configuration information and list all critical assumptions used during the estimating process. The BOE will be prepared according to the guidelines established in this plan.

Large, complex, and challenging projects entail uncertainty and cost risk. A contingency to cover anticipated costs resulting from this uncertainty will be developed using standardized risk analyses as established in this OOI CEP. Contingencies will be developed at the same level of the WBS used to prepare cost estimates.

OOI costs will be monitored and controlled over the life of the project by the Joint Oceanographic Institutions and the Implementing Organizations. The cost estimate will be used to establish budgets in a formal project management control system. The control system will compare actual costs with the budgets established for the work accomplished. Thus, it is vital that the guidelines established by this CEP be strictly followed to facilitate subsequent project monitoring activities.

3.0 Basis-of-Estimate (BOE)

The cost estimate developed according to this CEP shall be a detailed bottom-up estimate performed at the lowest reasonable or “activity” level. These estimates will be based on current (2007) year dollars. A Work Breakdown Structure (WBS) will be used to sum estimates to intermediate and upper levels. Escalation will be applied at the top level to adjust costs to the anticipated Funding Year basis.

Cost estimates shall be entered into a database (see Section 5.0) indexed to the project WBS. The WBS hierarchy will delineate all subsystems and divide those subsystems into successively lower levels. For each lowest level of the WBS, specific engineering, design, testing, analysis, procurement, fabrication, assembly, testing, installation, integrated system testing, commissioning, and management activities will be defined. Within each activity, items to be estimated include direct funded staff labor, contract labor, equipment, travel (foreign and domestic), materials and supplies, consultants, computer costs, publication costs, and subcontracts (subawards).

The cost estimator shall provide supporting information in the form of a BOE for each activity. The Basis-of-Estimate (BOE) shall contain supporting information substantiating each cost data item including vendor quotations, engineering calculations, graphs, figures, etc. This information shall be provided with the cost estimate to be included in the Cost Book. Any additional detailed backup will be retained by each WBS estimator in his/her own copy of the Cost Book and appropriately archived.

This information will be available and used during internal and external reviews of the OOI cost estimates.

Narrative information including memos describing critical assumptions or referencing other documentation shall also be integrated into the Cost Book and be available and used during internal and external reviews of the OOI cost estimates.

4.0 Work Breakdown Structure

The Work Breakdown Structure (WBS) is a product-oriented hierarchy that identifies all elements of the OOI Project and their parent/child relationships. Cost estimators, working with the JOI Project Office, will develop the subsystem WBS hierarchies. These will be collected and defined in a Work Breakdown Structure Dictionary. The scope of work for each WBS element will be delineated in the dictionary. Each lowest-level WBS element shall be further subdivided into specific research and development, engineering, design, testing, analysis, procurement, fabrication, assembly, testing, installation, integrated system testing, commissioning, and management activities or tasks. The cost estimate for each activity shall be based on the scope of work defined for the WBS element.

5.0 Costing Methodology

Each WBS estimator shall provide data for each activity. This data will be entered into a database established by the JOI Project Office for the purpose. The costs associated with each cost element shall be distributed by year and be categorized by labor category, equipment, travel, materials and supplies, consultants, publications/documentation costs, and subcontracts. This information will enable the generation of reports summarizing the cost estimate at various WBS levels and preparation of the summary budgets required for proposals submitted by the JOI Project Office to the NSF.

The method used to apply indirect rates should be clearly explained in the cost estimate. Uniformity in the estimation of travel costs is enhanced by the application of travel rate tables. Estimators are allowed the choice of using the rate tables or of making their own estimate for specific trips.

5.1 Cost Database

A database will be established by the JOI Project Office to collect and report the OOI cost estimate and supporting information. The reports generated in the database will include:

- the WBS Dictionary,
- WBS Summary Reports,
- rollup reports for parent level WBS elements, and
- detailed reports for lowest level WBS elements.

The cost estimate database will also be integrated with:

- the planning and scheduling software system used to establish and track schedules, and
- the performance measurement systems used to track cost and schedule status during execution of the OOI program.

5.2 Collection of Cost Information

Data is to be submitted by cost estimators using hardcopy or electronic versions of the forms provided by the JOI Project Office. Completed forms along with the BOE documentation are to be submitted to the JOI Project Office. Estimators may submit modified copies of the cost book sheets or subsystem cost estimator work sheets to the project management team for approved updates to the cost book. Reports will then be prepared for review by the estimator for validation and approval prior to a review by the Level 2 Leads and a subsequent review by Project Management.

Points of contact within the Project Management Office at the Joint Oceanographic Institutions (JOI) have been designated and will be available for questions or assistance in the preparation of cost estimates. Utilization of this point of contact will expedite the process and ensure that BOE

documentation and estimate preparation are of the highest quality and contains the essential information. Points of contact can be used on-site or by phone. Contact Stu Williams at JOI by either e-mail (swilliams@joiscience.org) or by phone 202-787-1620 and arrangements will be made to provide you with the assistance you require.

5.3 Confidence of Cost Estimate

Each item in the cost estimate shall be tagged with a confidence descriptor (BOE code) which characterizes the uncertainty associated with the estimate. The categories established for the project in decreasing order of confidence include:

- CP, catalog prices for off-the-shelf items;
- VQ, vendor quotations based on finished drawings, followed by vendor quotes on preliminary drawings;
- HD, historical data from previous ocean observatory experience with similar components and efforts; and
- EE, engineering estimates based on the estimator's judgment and experience.

For equipment, the cost basis refers to the unit price. For labor, the cost basis code refers to the estimate of labor hours. The basis of estimate code is used to guide the determination the level of contingency.

Estimators record the details of their estimates, including quantity, unit cost or rate, and basis of estimate code in a Basis of Estimate (BOE) form. The BOE form for each subsystem is a controlled document and is included in the OOI Cost Book information.

5.4 Cost Book

All detailed and summary reports as well as the supporting BOE will be collected and maintained in the OOI Cost Book maintained at JOI.

5.5 Cost Book to Schedule Integration

All cost estimate data is collected at the activity level to facilitate the integration of the estimate with the schedule. The one-to-one relationship between the cost estimate and the schedule will assist the project team when implementing the Earned Value Management System. Integration will also allow the project team to assess resource usage and determine by discipline what resources are needed to effectively execute the plan.

6.0 Labor Pricing

Material, labor, and subcontract costs will be based directly on information provided by the cost estimator. However, the estimator will provide labor estimates in hours which will be priced according to representative JOI or Implementing Organization direct salary experience for the labor resource identified. Indirect costs and Benefits will be computed and reported by the database for the rates established by respective organizations.

6.1 Direct Labor Rates

Average labor rates for each labor category will be used for pricing direct labor. A current list of rates by labor category should be provided by the financial organization of each Institution. Each individual is identified by a labor cost code consisting of four letters. The first two letters uniquely identify the Institution that is paying the individual; these two letters can be determined by the Institution with JOI arbitrating any conflicts. After a space, the second two letters identify the labor category of that resource. All labor resources for OOI are assigned to one of the following labor categories:

- KE Key Personnel
- PO Postdoctoral Scientist
- GR Graduate Student
- SC Scientist

- AE Associate Engineer
- CS Computer Science
- EN Engineer
- MA Management
- SE Senior Engineer
- SS Senior Scientist
- TE Technician
- UG Undergraduate Student
- AD Administrator
- CL Clerical/Administrative
- Others? (Call the JOI Project Office for coding.)

As an example, a senior engineer at JOI would be coded as PO SE, where PO stands for Project Office. The JOI financial team would provide a representative annual salary for a senior engineer. The representative yearly salary would then be divided by an assumed 1800 hours of productive effort per year to obtain an hourly rate for productive work. Because there are 2080 hours paid during a normal full year, the productive work rates contain approximately a 15 percent inefficiency factor to cover holiday, vacation, and sick leave. Rates by institution are contained in Appendix A (to be completed after IO awards).

The rates used do not include Benefits or Indirect Costs. Benefits and Indirect Costs are added by the reporting system based on rates to be provided by each Institution. These benefit and indirect cost rates by institution are contained in Appendix B (to be completed after IO awards).

The estimator shall provided hour estimates for all labor resources. Full time equivalent (FTE) estimates should be converted to 1800 hour years. In other words, 1.0 FTE is equivalent to one person working full time with normal holidays, vacations, and sick time. No paid overtime is assumed.

6.2 Contract Labor

Staff benefits for sub-award and contracted employees are included in the loaded hourly rate and are not called out separately. Indirect charges are included for contracted staff augmentation labor for the first $100,000 of each contract. No additional overhead rates are applied to the contractor costs.

6.3 Travel

In accordance with the travel estimation model developed and shown in Appendix D, domestic travel shall be estimated at $1900 per trip and foreign travel shall be estimated at $2600 per trip.

6.4 Taxes

It is anticipated that all equipment purchased under this agreement will be purchased directly by JOI or by IOs acting as JOI's purchasing agent. JOI will take title to the equipment at the time of its acquisition. Therefore, the cost estimator should assume that there will be no sales tax cost with respect to the acquired equipment.

7.0 Risk Analysis, Contingency

Contingency established for the OOI Project shall be based on a standardized risk analysis as described below. The cost estimator is responsible for providing risk factors for each activity. The estimator is responsible for assuring that each and every WBS element has appropriate and defensible contingency applied.

7.1 Risk Analysis

A risk analysis is used to calculate contingency. The method is based on estimator evaluation of the technical, cost, and schedule risk for every activity. Technical, cost, and schedule risk factors are input fields on the forms used to enter data into the database. Standard ranges for these parameters are 1 to 15 for technical and cost risk and 2 to 8 for schedule risk.

7.2 Risk Assessment Methodology

Risk Factors are assigned as described in Table 1 on page 7. For technical risk, a value of 1 implies "normal industry supplied off the shelf items" and 15 is reserved for components significantly "beyond the current state-of-the-art." For cost risk, a value of 1 is used to indicate "vendor quote or catalog price for a specific item" and 15 is used for estimates where no data are available. Schedule risk factors range from 2 to 8.

The technical risk factor is multiplied by the risk percentage, which is categorized in Table 2 on page 7. The applied risk percentage depends on two factors. The first is whether the risk is associated with technical, cost, or schedule concerns. The second is whether these concerns relate to design, manufacturing, materials cost, or labor rate uncertainties. Acceptable values in the range of 1 percent to 4 percent are defined in Table 2 on page 7. These percentages are multiplied by the corresponding risk factor to determine the contingency to be applied. The resulting percentages are added together to establish the total contingency for the activity. The minimum contingency percentage using this approach is five percent and the maximum is 98 percent.

There may be special cases where the parameter limitations defined above are not appropriate. Some high-risk elements may deserve contingencies greater than 98 percent. In these cases, at the discretion of the estimator and Project Management, higher values may be used. Written justification must be provided in the supporting documentation and with the cost book.

Risk analyses shall be performed at the activity level. Results of this analysis will be summed to compute the contingency that will be reported at each level of the WBS.

While contingencies will be estimated at the same level as the bottom-up cost estimate, during execution of the project contingency will be held at the top level by the JOI Project Office and allocated as needed to address problems and items or activities that have been overlooked during the estimating process. A formal change control process will be used to allocate contingency to specific activities.

8.0 Escalation

The OOI estimate is to be based on fiscal year 2007 dollars. The project funding is slated to begin in FY 2008. Escalation will be computed using rates provided by the National Science Foundation and based on the time phasing provided by the estimator. Escalation will be applied at the top level of the WBS by JOI.

The following table gives the NSF escalation rates by Fiscal Year for construction projects:

2007	2008	2009	2010	2011	2012	2013	2014	2015
7.4	6.7	6.5	6.4	6.3	6.2	6.2	6.2	6.2

The following table gives the NSF escalation rates by Fiscal Year for operations and maintenance cost:

2007	2008	2009	2010	2011	2012	2013	2014	2015
2.1	2.6	2.6	2.5	2.4	2.3	2.3	2.3	2.3

9.0 Responsibility

Responsibility for the estimates lies within JOI and with each IO. Individuals responsible for the subsystem estimates will be designated by the subsystem leader appointed by the Institution.

Subsystem Leaders by institution are contained in Appendix C (to be completed after IO awards).

Table 1: Risk Factors

Risk Factor	Technical	Cost	Schedule
1	Existing design and off-the-shelf hardware	Off the shelf or catalog item	Not used
2	Minor modifications to an existing design	Vendor quote from established drawings	No schedule impact on any other item
3	Extensive modifications to an existing design	Vendor quote with some design sketches	Not used
4	New design within established product line	In-house estimate for item within current production line	Delays completion of noncritical path subsystem item
6	New design different from established product line. Existing technology	In-house estimate for item with minimal company experience but related to existing capabilities	Not used
8	New design. Requires some R&D development but does not advance the state-of-the-art	In-house estimate for item with minimal company experience and minimal in-house capability	Delays completion of critical path subsystem item
10	New design. Development of new technology which advances the state-of-the-art	Top down estimate from analogous programs	Not used
15	New design far beyond the current state-of-the-art	Engineering judgment	Not used

Table 2: Risk Percentage

	Condition	Risk Percentage
Technical	Design or manufacturing concerns only	2%
	Design and manufacturing concerns	4%
Cost	Material cost or labor rate concern	1%
	Material and labor rate concern	2%
Schedule		1%

Appendix A: Labor Rates by Institution

To be provided.

Appendix B: Benefit and Indirect Rates by Institution

To be provided.

Appendix C: Subsystem Leaders by Institution

To be provided.

Appendix D: Travel Estimation Model

Domestic Travel Model

Domestic travel is estimated to be 90% scheduled and structured activity to get the most benefit possible for the expense. Planned trip durations are generally 4 to 5 days at length with reduced airfare and weekly rental car rates are appropriate. The other 10% of domestic travel results from short notice needs to meet with oversight agencies or to support related meetings within other organizations. There is generally one full day bounded with travel on either side. The cost of these two travels are calculated separately below following the standard government travel voucher format, and, the resulting costs are prorated based on the percent of total travel they represent. Travel estimates are based on average regional pricing for Washington, DC and key points in California and Washington. The weighted average cost is rounded to the nearest $100 for cost estimate purposes, resulting in **$1,900**/domestic trip.

Domestic Travel Model Parameters

Per Diem	$64/day*
Lodging	$160/day* (average)
POV Mileage	$0.485/mile**
Airport Parking	$10/day
Distant to Airport	12.5 miles (average)
Airfare >2weeks	$410 (average)
Airfare <2weeks	$620 (average)
Duration	5 days if planned (90%)
	3 days if unplanned (10%)
Rental Car	$380/week (average)
	$55/day (average)

* Subject to GSA maximum per diems for specific locations
**IRS guidelines are subject to periodic changes

Domestic Travel Cost Model Estimate

	Days	Air Fare	POV Mileage & Parking	Car Rental	Meals	Lodging	Total	Weight	Weighted Average
Planned	5	$410	$56	$380	$320	$800	$1,966	90%	$1,769
Unplanned	3	$620	$36	$165	$192	$480	$1,493	10%	$149
									$1,919

Foreign Travel Model

Foreign travel is assumed to be preplanned 100%. Weekly car rates and reduced airfares are assumed. An extra day is added to the duration to accommodate time zone effects. Travel estimates are based on average regional GSA pricing in Victoria Canada. The computed cost is rounded to the nearest $100 for cost estimating purposes, resulting in **$2,600**/foreign trip.

Foreign Travel Model Parameters

Per Diem	$111/day*
Lodging	$151/day* (average)
POV Mileage	$0.485/mile**
Airport Parking	$10/day
Distant to Airport	12.5 miles (average)
Airfare >2weeks	$592 average
Airfare <2weeks	$ 822 average
Duration	6 days if planned (100%)
Rental Car	$380/week (average)
Rental Car	$55/day (average)

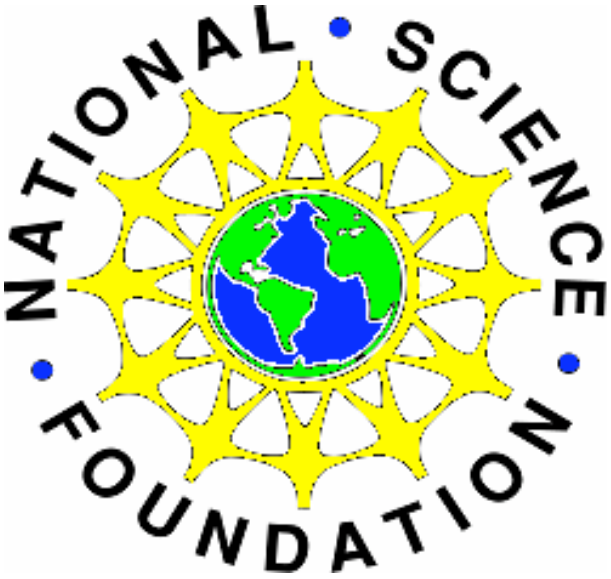
* Subject to GSA maximum per diems for specific locations
**IRS guidelines are subject to periodic changes

Foreign Travel Cost Model Estimate

	Days	Air Fare	POV Mileage & Parking	Rental	Meals	Lodging	Total	Weight	Weighted Average
Planned	6	$592	$66	$380	$666	$906	$2,610	100%	$2,610
									$2,610

COMMENTS AND SUGGESTIONS ARE WELCOME AND SHOULD BE TRANSMITTED TO THE DEPUTY DIRECTOR FOR LARGE FACILITY PROJECTS, OFFICE OF BUDGET, FINANCE, AND AWARD MANAGEMENT

GUIDELINES FOR DEVELOPMENT OF PROJECT EXECUTION PLANS FOR LARGE FACILITIES



Office of Budget, Finance, and Award Management

GUIDELINES FOR DEVELOPMENT OF PROJECT EXECUTION PLANS FOR LARGE FACILITIES

1 INTRODUCTION

The purpose of this document is to provide assistance to the Program Officer, Grants and Agreements Officer, and others involved in overseeing a large facility project in assessing the project management plans of an awardee. These plans are usually provided, in at least preliminary fashion, as part of the proposal for construction of a large project within a Project Execution Plan[1], describing how the Awardee will carry out the proposed project. This plan can be fine tuned, during the period following approval of the award and prior to undertaking making construction activities, through interactions between the Awardee and the NSF Program Officer and the Grants and Agreements Officer that define NSF's expectations of the awardee for project management. This document provides an overview of NSF expectations that specifically bear on project management practices.

The Project Execution Plan contains a system level Work Breakdown Structure (WBS) and associated cost estimates rather than detailed costs at the component level, gross contingency estimates scaled from experience on similar projects, a top level definition of the project scope, and general indications of the construction schedule. Plans for Safety, Environment, and Health, Financial and Business Operations, Systems Integration and Commissioning, Testing and Acceptance, Transitioning to Operations, Quality Assurance, Configuration Management, are likely to be only notional at the proposal stage. Following the award of construction funds, with the availability of far greater financial resources, the project can proceed to refine the Project Execution Plan elements described in the Facilities Management and Oversight Guide The refined plan should form the project baseline definition, and it should be validated through a project baseline review as early as practical following award (for example, 6 months). As described in the Roles and Responsibilities Module, the baseline should be validated by the Program Officer through an external review, using an external advisory panel capable of providing advice on the broad range of managerial, financial, technical, and programmatic aspects that will be addressed by the project.

This document provides the Program Officer with guidance regarding NSF's expectations regarding how the project will manage itself. It is important to establish effective initial expectations for NSF oversight of a large project so that the project is properly planned, and so that adequate budget can be provided to support the requisite efforts needed to create an effective project management control system. These expectations, when embraced by the project and implemented within the Project Execution Plan, empower the Program Officer to oversee the project in a manner that satisfies NSF, interagency, and international project commitments, and provide clear paths for dealing with problems that may arise in the future, enabling NSF to undertake mitigation as appropriate. A suite of possible options for consideration is presented, but it is understood that only a fraction of the options presented are relevant to the needs of any particular program. Many of

[1] See page 25 of the NSF's Facilities Management and Oversight Guide.

these options are reflective of practices that have been put to good use on previous NSF-supported projects.

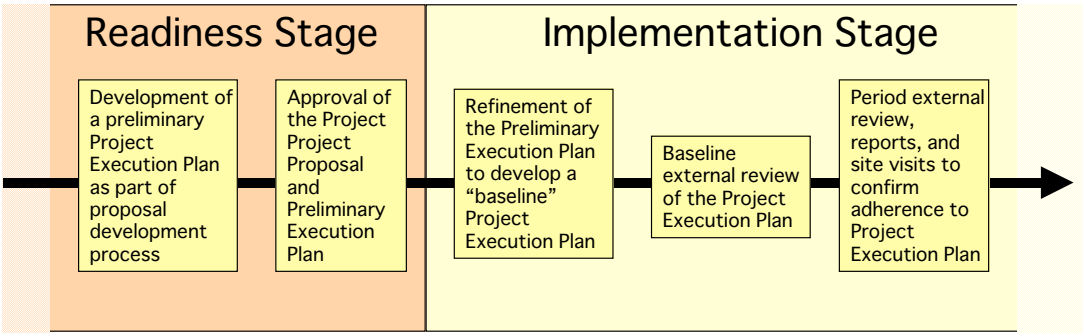


Figure 1: The timeline for development of a Project Execution Plan.

OMB Circular A-110 imposes limits on reporting requirements and on administrative terms and conditions that can be imposed on assistance awards such as Cooperative Agreements. However, by conveying NSF's expectations to an Awardee describing desirable features of a well-run project, the Awardee makes the commitment to NSF to conduct the project in this manner. The Program Officer is responsible for ascertaining that the Awardee adheres to these commitments. This is done through a combination of periodic post-award reviews, reports, and site visits, as described in the Roles and Responsibilities module.

The target audience for this document is the Program Officer and his or her management chain of command, the Grants and Agreements Officer, and other cognizant staff in BFA that may handle or participate in complex cooperative agreements.

REFERENCE DOCUMENTS:

The most general terms and conditions that provide a framework for cooperative agreements are found in OMB circular A-110, especially section 25 (f) – 25(j) covering awards for construction activities.

See also Chapter VIII of the Proposal and Award Manual for a general discussion of how cooperative agreements are developed and implemented, and especially exhibit VIII-2 which is a table of requirements that motivate use of cooperative agreements.

Cooperative Agreement-Financial/Administrative Terms and Conditions (CA-FATC) that are placed on all of the new Cooperative Agreements under the new business model are located at: http://www.nsf.gov/pubs/cafatc/cafa1103.pdf. Cooperative Agreement Supplemental Financial and Administrative Terms and Conditions written specifically for large facilities are at: http://www.nsf.gov/pubs/cafatc/cafalf1103.pdf.

The NSF Facilities Management and Oversight Guide is at: http://www.nsf.gov/pubs/2003/nsf03049/nsf03049.pdf.

The supplementary module on Roles and Responsibilities is located on the NSF internal web site at: http://www.inside-dev.nsf.gov/bfa/lfp/guide/roles.doc.

2 NSF EXPECTATIONS FOR PROJECT MANAGEMENT

2.1 Definition of Project Responsibility

The Project Execution Plan should define the single individual responsible for overall management of the project. It should also define the relationship between this person and other key individuals that are part of the project team. For example, a project may have a Principal Investigator, a Project Director, and/or a Project Manager. It may even have some significant management role for the institution's administrative management, such a Dean, Vice President, etc. The Project Execution Plan must define who is in charge and their scope of responsibility. If there are other individuals with significant roles and responsibilities, their subordinate interrelationships must be crisply defined. The Project Execution Plan should provide for the approval of NSF before any significant changes in project management can be implemented.

2.2 Restriction on Expenditure of Funds Prior to Baseline Review

Following award of construction funds, further definition and refinement of the PEP is usually required in order to define the management plan, technical scope, budget, and schedule of the project, and this usually requires significant funding to complete. Thus, the first efforts of a newly funded MREFC project are devoted to firming up the management and other aspects of the Project Execution Plan. Definition of the project baseline[2] should be the subject of the initial review of a new project, and any revisions to the baseline should take place only with the full concurrence of NSF[3]. Thus, it is prudent for the project to obtain NSF approval prior to the expenditure of significant construction resources other than for the purpose of refining the management plan and putting into place key staff, a project management control system, developing detailed costs, and generating a "bottoms-up" contingency estimate.

It may be prudent for the Awardee to refrain from making any significant sub-awards or subcontracts pending NSF approval of the Project Execution Plan (PEP). There may be exceptions that are appropriate under certain circumstances, but these circumstances should be mutually understood and approved by the Program Officer as part of the initial award negotiations. It is often the case that large projects that get into trouble do so at a very early stage, so the importance of thorough initial planning cannot be overemphasized. Adequate preparation of the Project Execution Plan, followed by NSF

[2] The project "baseline" is the reference management framework, technical scope, budget, and schedule which define what the project is, how it will be managed, how much it is projected to cost, and the duration of construction. The baseline defines and fixes the project's scientific requirements, technical scope necessary to satisfy the scientific requirements, project deliverables, subsystems, and interfaces, management structure, and the Work Breakdown Structure (including budgets, schedules, and contingency) that defines all of the work to be performed in the project including delivery of each subsystem and its integration into the overall project.

[3] See page 12 of the Roles and Responsibilities Module for a discussion of the role of the Program Officer, page 42 of the Roles and Responsibilities Module for a discussion of the Awardee responsibilities, and also hyperlinks within the document that elaborate on the roles of the Grants Officer and other NSF staff involved in project oversight. A forthcoming module will also address processes for conducting a baseline project review.

approval through a rigorous external review, is extremely important[4] to the success of the project.

The Program Officer should describe the validation process to the Awardee, since there are significant resources required of the awardee to prepare for a baseline review of project management, budget, risk, and schedule. In some cases an independent cost review or independent cost estimate may also be indicated. Signaling the intention to do this gives the awardee time to include preparation for this review in its overall schedule planning.

Important Note: The expectation that the project baseline will be formally defined and externally validated within 6-12 months following award is so important that any departures from this approach should be documented within the project's Internal Management Plan and approved by the Facilities Panel.

2.3 Project Management Control Systems

Projects should include the development of a project management control system within the scope of activities that the project will encompass, and allocate appropriate funds for development of special reporting tools that will be required to track and manage the project's status (typically 1-2% of the total project cost). Requirements for periodic reporting of project status (a separate specific condition) also set the scale for the scope of the Project Management Control System (PMCS) that is required. This reporting apparatus is part of the Project Execution Plan. The Project Management control system must integrate detailed schedules and tie schedules between subprojects, identify the project critical path, provide the resources to the project manager to test alternate project strategies ("what if" scenarios) and alternate strategies to the critical path, and develop "work arounds" for anticipated schedule risks

The Project Management Control System includes both software tools for development of project databases and the processes and procedures needed to organize and manage the project. The Project Management Control System will help management to:

- Determine and report the current project status.
- Make a comparison of project status to the baseline plan, report variances with respect to the baseline and assess the cause of the variances.
- Manage the change process for alterations to the project baseline budget, scope, and schedule, including the allocation of contingency funds.
- Track Earned Value status of the project.

2.4 Project Configuration Control

Along with the establishment of a project baseline definition, the project must also define a process for managing change, utilizing the Project Management Control System as a tool. The Project Execution Plan should define an orderly process by which the project will handle variations from the idealized plan to mitigate variances in cost, scope, and

[4] See page 13 of the Roles and Responsibilities module for a discussion of how the Program Officer might validate the project execution plan.

schedule that result from actual experience. The plan for configuration control should define the process for initiating a change request, evaluating the requested change, approving changes to the project baseline, and defining the level of involvement of NSF in approving these changes prior to implementation. Configuration control process also encompasses the procedure by which the project will revise the Baseline Cost of Work Scheduled "BCWS" to reflect the most realistic plan available to the project so that performance measurement is meaningful. Typically, the project should make reference to a Cost/Technical Review Board composed of key individuals within the project with responsibility for carrying out the overall project[5].

Important Note: Membership in the Cost/Technical Review Board should not be open to individuals outside the project, for example within the broader research community. While it is useful for there to be an avenue for the larger research community to convey its opinions to the project, the authority for defining the overall project scope must overlap with the responsibility and spending authority to construct and commission the project.

2.5 Adherence to the Project Execution Plan

All work must be carried out in accordance with the Project Execution Plan. NSF or the Awardee may recommend modifications to PEP to better facilitate project execution, but all substantive changes to the Project Execution Plan must require written approval of the cognizant NSF Grants Officer. The Awardee must consult with the cognizant NSF Grants Officer if the Awardee requires clarification regarding what constitutes substantive changes.

The Project Execution Plan should be placed under configuration control following approval, so that any significant changes to the document are implemented only following NSF approval, with NSF determining what constitutes a significant change.

2.6 Project-specific enhancements to the Project Execution Plan

While the Facilities Guide provides a list of the essential elements of the Project Execution Plan, it may be appropriate to include additional items germane to the needs of a specific project. These items should be conveyed to the Awardee by the Program Officer or the Grants and Agreements Officer if applicable. For example, the Project Execution Plan might additionally contain any of the following:

- A description of the design and development strategy, construction and installation strategy, and commissioning and initial operation strategy, including responsibilities within the project organization, subcontractors, and collaborative organizations;
- Detail the strategy for implementing design reviews, contract reviews, safety and Quality Assurance reviews, and operational readiness reviews;
- Describe plans for assembly and test of subsystems, systems integration test, and acceptance testing as part of an overall integrated test plan, and define who has responsibility for conduct and oversight of the various tests planned;

[5] See the Contingency Management Module, Section 3.3 "Managing the Change Control Process to Allocate Contingency", for a discussion of how managing the change control process applies to the use of project contingency resources.

- Define a plan for traceability of any secondary standards used in testing;
- Mandate unique aspects of a performance measurement baseline – for example, it could define assumptions that will be used in Earned Value[6] reporting that are unique to the needs of the project;
- Describe the processes which will be followed to ensure coordination of changes to the project management baseline and steps that will be taken to assure that the technical, cost, and schedule impact of changes are considered. For example, it could describe operation of the Change Control Board, method for modifying baseline cost and schedule, location of contingency funds and procedure for approval of allocation. As another example, it might be appropriate to request that for all subcontracted efforts greater than $100K, the requirements, specifications, interface drawings, and documentation will be under formal configuration management throughout the contracted period. The PEP should address other aspects of the overall project that are subject to interface constraints with the subcontracted work and to top level specifications. Interface control drawings and specifications will also be subject to configuration management control.
- Include a Project Staffing Plan within the Project Execution Plan. The PEP should describe the project's staffing plan. Relate the staffing plan to the various tasks to be performed and identify oversight and liaison responsibilities within the awardee organization. Identify key staff having cost and schedule responsibility and authority. Identify staff responsibilities for contract and procurement management, and for subcontract technical and managerial oversight.

[6] A future module will provide details of the Earned Value reporting of project status.

3 NSF EXPECTATION FOR MANAGEMENT OF CYBER INFRASTRUCTURE

3.1 Cyber infrastructure planning

Projects that invest heavily in cyber infrastructure will benefit from formalized planning to define their strategy for deciding on infrastructure requirements, scheduling acquisition, and bundling acquisitions with license agreements, service agreements, or other services in order to obtain the greatest benefit from the procurement. For example, it is frequently beneficial to purchase prototype IT hardware for a development platform early, but to procure production hardware as late as possible during the construction phase of a project. The project must also consider software licensing and hardware service costs and how to properly account for them within the context of what constitutes an allowable construction cost and what costs are properly associated with operational activities.

Projects that make a significant investment in cyber infrastructure should describe their strategy for maximizing the benefits obtained from IT infrastructure investments. For example, some network switches have very high annual maintenance costs. If the Awardee is able to receive a favorable price on a three-year maintenance and service agreement as part of the purchase price, this will reduce operating expenses, but perhaps at the consequence of higher, but justifiable, procurement costs. Another common example resulting in cost savings that should be considered is the strategy of extending campus software site licenses to remote sites, or obtaining site licenses for the project site, when applicable.

Software planning should be done by the Awardee in such a way that it doesn't impose on external collaborators or the research community the need to buy expensive software (or special purpose hardware) in order to interface and utilize the resources of the project, since this strategy transfers scope to the science operations budget.

Furthermore, consideration should be given to the installation and operations costs for leased data lines. It may be preferable to amortize these costs as part of an operations budget in those (typical) cases where the asset is not long lived, is likely to be replaced or upgraded during operation, or where the provider of the service may change. It many cases, it will be appropriate to devise a strategy for incrementally purchasing needed communications bandwidth as the project evolves and these needs increase.

The Program Officer may want to provide for the scheduling of a special purpose review prior to release of procurement funds for cyber infrastructure.

3.2 Cyber Infrastructure Acquisition Plan

Cyber infrastructure acquisition planning is a critical activity within many large projects. Distributed projects commonly have widely separated geographic locations, large numbers of sensors and distributed data acquisition systems, and they need to acquire or compile and broadly disseminate this data to the research community. Because they have these characteristics, they are especially reliant on this planning activity.

The Program Officer may wish to request that the project include details within the Project Execution Plan that specifically address processes for cyber infrastructure planning, coordination, and procurement activities to insure that they allow the project to maximize the performance return on investment. For example, because the capabilities of computers, mass storage, and networking systems are evolving rapidly, it may be helpful to require special planning or external review by NSF prior to permitting procurement of this equipment by the Awardee.

Furthermore, it can be particularly advantageous to a project to purchase quantities of cyber infrastructure as late as possible in the construction phase of a program, so the cooperative agreement should facilitate this. Care should be taken to avoid imposing an artificial financial deadline in the agreement that would preclude taking advantage of this obvious benefit, and the acquisition plan should provide the details of how this will be done. For example, the provide for the cyber infrastructure procurement to proceed once there is a mutual understanding, and approval by NSF, of the overall procurement strategy, and the schedule for approval should be defined to avoid imposing delays due to hierarchical approval at the last, time critical phase of the construction project.

Similarly, there may be coordination activities that are possible between a particular project and others underway or envisioned by NSF or other agencies or organizations. NSF may wish to formally involve others in the approval of designs and plans for the project prior to proceeding with procurement and deployment of this equipment.

3.3 Cyber Infrastructure Security

Most major facilities include significant investments in cyber infrastructure. Awardees are reminded of their responsibility for operating and maintaining cyber-infrastructure security as part of their overall responsibility for preserving the security of equipment and other facilities and ensuring that this equipment is not misused. In the case of cyber security, NSF may direct the Awardee to conduct a vulnerability assessment that includes the impact on others outside the facility as a consequence of misuse or a cyber break-in. The Program Officer may also want to consider the impact on the user community of steps taken to safeguard IT infrastructure, and coordinate the implementation of an approach that optimizes the needs of all parties to maintain the integrity of the facility while allow its utilization by the broader community of researchers.

The Awardee has the primary responsibility for insuring the safety of this equipment and for protecting it from misuse. The NSF should make sure those facilities, and the research communities they serve, assess their cyber-security needs and then define and implement appropriate cyber-security measures, recognizing cost/benefit tradeoffs. The Project Execution Plan is a convenient and highly visible place to describe any special security roles and responsibilities and respond to the expectations of NSF, as defined by federal laws, regulations, as well as project-specific guidance.

There should be a defined reporting mechanism for handling intrusion incidents, should they occur. The procedure should define the criteria that will be used to define reporting of incidents and the nature of the incidents, and for providing a managed release of information to the press, if necessary. It should also include a defined mechanism for involving law enforcement officials.

The Awardee should formally identify a procedure for informing the NSF program officer if a security incident occurs. This mechanism should identify the working relationship with the grantee's press office and incident response group so that any responses and public release of information are coordinated with NSF. (This might be directed thru the NSF CIO's office as a "neutral" but informed organization at NSF.)

Additionally, the Awardee should identify trained response personnel, security resources in place and needed, risk assessment, etc. At a minimum, each funded project should have an individual with computer/network security training on-call and associated with the project.

The Awardee should demonstrate to the Program Officer, and to any cyber-security advisors to the NSF, that "minimal best practices in IT security" are being implemented. Examples[7] of best practices that may be relevant to a particular project are:

- The project should have a defined, auditable procedure for ensuring that critical patches are installed quickly and completely.
- Each computing platform within the project should run some form of integrity monitor on at least a daily basis. One well-known exemplar is Tripwire.
- Access to highly connected or high-profile systems should be made only with one-time password systems. One well-known exemplar is the SecureID.
- Vulnerability scanning, using an up-to-date security scanner, should be performed periodically, and no less often than once a week.
- Firewalls should be put in place with rules set to deny services by default, with a defined procedure to review any changes (i.e., enabling access) for security considerations;
- Audit trails should be enabled and archived for a sufficient period of time so as to be useful in an investigation;
- All platforms will have anti-virus software with up-to-date databases (i.e., updated at least daily).

3.4 Data Archival

The project should establish a policy for curation of long lived data that is consistent with NSF policy. These policy issues and questions include:

- When, why, and for how long the NSF will fund each data collections that are or appear to be very long-lived?

[7] NSF's Chief Information Officer provided the examples listed here. It is recommended that Program Officers consult with the Chief Information Officer for advice on current best practices relevant to a particular project.

- Are their conditions under which it is appropriate for NSF to maintain a data collection intramurally, as most other agencies routinely do?
- What responsibility does NSF have to assure quality of the collections that it supports?
- Is there a community technical standard for the data, for example, or for the use and form of metadata with which the project should comply?
- What is the plan for assuring that data is accessible to a broad, diverse, and interdisciplinary community?
- Are there policies that should guide relationships with national, international, and private agencies and organizations to cooperatively support data curation from the project?

4 BASELINE PLANNING AND MANAGEMENT

4.1 Budget Planning

The following specific conditions require the development of an NSF-approved cost estimating plan, a formal Work Breakdown Structure (WBS) for the resulting estimate, time phasing of the WBS elements to create a resource-loaded schedule, and periodic reporting of financial status using that schedule. Example commitments that a project might make within the Project Execution Plan are:

- Develop a cost estimating plan to be submitted to NSF for approval. Following approval, utilize the estimating plan to create a project WBS and WBS dictionary. Estimate contingency by WBS element. Define the basis of estimate for each WBS element. Estimate mean contingency.
- Create resource loaded project schedule. Identify critical path, schedule contingency, and significant project milestones.
- Submit for NSF approval the performance measurement baseline to be used as the basis for project EV reporting.

4.2 Approval of Change Control Processes

NSF may wish to require that the Awardee develop a process for managing changes to the baseline plan, and that NSF approve this change control process prior to expenditure of construction funds. For example:

- Require the Awardee to notify NSF of any changes to the substantial changes to the baseline cost or schedule involving allocation of contingency for amounts in excess of some predetermined threshold, for example $1M millionor some percentage of the total project cost, such as 1%.
- Require the Awardee to notify NSF of *all* Change Control Board actions. Any adjustments having cost impacts exceeding $50K, schedule changes greater than one month, or substantive changes to subsystem or procurement specifications shall require a project CCB action with supporting documentation to be maintained by the awardee.

4.3 Amendments to authorize funding increments according to budget profile.

NSF should define a budget profile which is compatible with the plan for construction of the proposed project. Ideally, the budget profile should allow the project to proceed in a "technically limited" way, i.e. the proposed rate of progress is not limited by the availability of funds but rather by technical considerations in the execution of the project. However, the project must always be cognizant of its available spending authority to avoid incurring obligations for which it does not have the resources. Thus, the Cooperative Agreement should define the incremental funding available to the project and specify that the availability of further increments is based on satisfactory progress by the Awardee.

5 EXTERNAL REVIEWS

5.1 Project Baseline Review

The project baseline is the firm definition of a project's technical scope, budget requirements, anticipated schedule for execution, management plan, and risk assessment[8]. Formal validation and ratification of a project's baseline by the NSF establishes a mutually understanding with the Awardee of the project's scientific scope, consequent technical, budget, and schedule requirements. It also establishes a reference for any future changes that may arise as a result of experiences or events that occur during the course of the project. While these subjects may be addressed within the project proposal or accompanying Project Execution Plan, almost all projects require the much greater resources available during the construction stage to refine the baseline to an acceptably low level of uncertainty so that it can go forward. Thus, the project's initial activities in the first six to nine months following construction award should primarily focus on:

- Staffing the key management and technical positions for the project,
- Updating the Project Management Plan to include applicable recommendations from NSF for how the project should be conducted (including project-specific recommendations such as those contained within this module),
- Establishing a project management control system that can report progress against the project management baseline using Earned Value management methodology,
- Defining the master schedule along with various levels of milestones and a critical path,
- Refining cost estimates and associated risk factors to update the Risk Management Plan,
- Establishing a plan for Quality Assurance,
- Establishing a plan to fulfill project safety, environmental, and health requirements,
- Developing a Configuration Management Plan that defines a process for managing project change control activities, and
- Prioritizing deliverables to define scope contingency.

This baseline should be the subject of an external review, to be conducted by the NSF Program Officer in consultation with the Deputy Director for Large Facility Projects, whose purpose is to provide the NSF with an assessment that the baseline plan is matched to the needs and scope of the project.

Important note: All large facility projects should undergo a thorough baseline review as soon as possible following award of substantial construction funds, and no later than one year following award. The project should not obligate significant funds for procurements or construction activities until the project has completed a satisfactory baseline review. Exceptions to this policy should be identified prior to their award by the NSF Program Officer, documented in the Project's Internal Management Plan, and approved by the NSF Facilities Panel.

[8] See the Roles and Responsibilities Module for more information about baseline reviews. A forthcoming module on baseline reviews will provide additional background information.

5.2 Design and Development Reviews

Many projects require significant R&D early in their implementation phase. For example, the demonstration of enabling technology and its follow-on industrialization on the scale required by the project are significant efforts in themselves. Subsystems may go through various stages of design review, from conceptual design through operational readiness review. Similarly, the design of civil infrastructure requires adherence to a structured design process progressing from functional requirements through a conceptual design and sequential review as various levels of design detail are achieved. The Project Execution Plan should formalize the process and facilitate its transparency so that it is visible to NSF, representatives of NSF are invited to attend various reviews as appropriate, and proceedings of the reviews are available to NSF.

NSF may wish to identify specific reviews that must be held or that are criteria for future funding or some other phase of activity. For example, NSF may wish to mandate:

- A special design requirements review before undertaking the design of a facility or subsystem,
- The project describe plans for development of computer simulation and modeling of facility performance as an aid to conduct of the integrated test plan,
- Conduct a safety systems review prior to final design of a critical facility,
- Conduct an operational readiness review prior to allowing the facility to be used for its intended purposes, and/or
- Provide specific guidance on operational planning.

5.3 Periodic Post-award review

Oversight of Large Facility Projects during construction requires periodic on-sight review[9] by an external review committee organized and convened by the NSF Program Officer. The plan for these reviews will be detailed, for each project, within its NSF Internal Management Plan[10]. This plan should be conveyed to the Awardee so that the necessary resources to prepare preparation for periodic post-award reviews can be budgeted within the project scope. The Program Officer should provide the Awardee with the names of the review committee members and the charge to the committee well in advance of the review.

Preparation for these reviews by the awardee is a responsibility of the awardee with guidance from the NSF. It is recommended that the intended course of reviews be discussed and agreed to by NSF and the awardee and incorporated into the Project Execution Plan, so that the budget and schedule take into account these reviews[11], covering technical and management issues. The NSF will provide the project with a copy of the charge to the review committee prior to the review, with adequate time to agree on the agenda and to prepare necessary presentation materials.

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[9] The plan for post-award oversight should be defined in the Internal Management Plan.
[10] See the forthcoming module on Internal Management Plans for more details.
[11] See page 16 of the Roles and Responsibilities Module for a description of the role of the Program Officer in conducting periodic post-award review.

It is recommended that the frequency of review be at the discretion of the Program Officer, and adapted to the needs of a particular project. Recommended practice is to conduct semi-annual reviews following the baseline review until the project is well into routine construction, at which point annual reviews should be sufficient unless motivated by some special consideration.

5.4 Construction management

Construction drawings should be made available to NSF in advance of the various review stages of development. Similarly, an Awardee's General Terms and Conditions for a proposed construction award should be transmitted to NSF for review prior as far in advance of procurement as possible to ensure that no unusual liabilities are incurred, construction is in accordance with property lease conditions, permit requirements, etc. The Project Execution Plan should specify the format for transmission of this information.

If design reviews of project subsystems are to be held by the project, the Project Execution Plan should commit to inviting NSF representatives to observe and participate, and to be informed of the proceedings of any such reviews that NSF staff members are not able to attend.

The Project Execution Plan should also provide that the Awardee hold, on behalf of NSF, the permits, certificates, and other license and the like which are required for construction and operation of the facility. Exceptions to this policy should be specified in writing and communicated to the Awardee by the NSF.

5.5 Special topic reviews

NSF may wish to convene external reviews on special topics specific to a particular project, or in association with key milestones that are part of the construction program. It might also be prudent, in certain circumstances, to make certain construction funding availability to the project contingent on successful outcome of the review. (These special topic reviews should also be documented within the project's Internal Management Plan.)

5.6 Periodic reviews during operations

Oversight of Large Facility projects during operation requires periodic on-sight review. In general, the frequency of periodic external reviews of large projects will be much less frequent that during the construction phase. For a newly constructed facility in initial operation, external reviews should be held more frequently than for an existing facility with a longer operational history. It is recommended that the cooperative agreement include language that defines NSF's expectations for conducting these reviews. Also, since the policy of NSF is to re-compete operational contracts for large facilities on a five-year basis (or sooner, if indicated by the performance of the Awardee in managing the facility), these awards should be structured in a way that provides the information to

NSF to make this assessment. Thus, the cooperative agreement may contain specific conditions that facilitate this determination, and inform the Awardee of any special evaluations that would aid NSF in making the decision whether it is in NSF's best interest to re-compete the award.

6 PERIODIC REPORTING

6.1 Define the methodology for reporting periodic technical and financial status

NSF requires that all financial reporting will use earned value methods to report cost and schedule variances. It is highly recommended[12] that these reports be provided on a monthly basis to NSF during the construction phase of the project. Reports will summarize cost and schedule status, and provide detailed explanations for cost variances of more than some significant amount, such as $1 million, or schedule variances exceeding some duration, such as 3 months. Reports will also describe any use of contingency greater than $100,000. Furthermore, it is highly recommended that this requirement flow down to major subcontracts awarded in support of the project, so that the monthly reports capture all of this information. NSF should define what is a major subcontract, since the apparatus to do this monthly reporting is expensive, and therefore it is not cost effective to impose this requirement on contracts where the overhead to do cost reporting adds appreciably to the contract cost. For example, NSF may want to impose this requirement only on contracts exceeding some predetermined threshold, such as $1 million, or that comprise more than some portion of the total effort, for example 2% of the total project cost.

6.2 Require that the Awardee report progress against significant milestones, with selection of milestones to be approved by NSF.

The PEP that is accepted by NSF should define a set of project milestones that have real consequence for the project. Thus, they should be selected carefully, since performance variances relative to these milestones will be reported to NSF. The reporting requirements should not be onerous; therefore there should be relatively few, but significant, milestones. Their selection should be dictated by the criteria that progress towards completing these milestones is indicative of the status of the project. They should be selected to preserve the flexibility of the Project Manager to adapt to events as they unfold, develop contingency work-around plans, and manage to a critical path defined by the technical needs of the project rather than to satisfy artificial reporting requirements. Identification of these milestones by the project and approval by the Program Officer are fundamental responsibilities of NSF Program Officer and the Program Manager, and the process for defining them should be defined within the Cooperative Agreement.

6.3 Monthly Status Reporting

During the construction phase of the project, the awardee should provide *brief* monthly reports electronically to NSF that detail:

- Financial status of the project (including activities of subawardees and major subcontractors) using earned value management.

[12] Exceptions to monthly status reporting should be explained in the Internal Management Plan.

- Technical status of the project (including activities of subawardees and major subcontractors)
- Significant accomplishments during the last month, notification of all uses of contingency funds or any adjustments to level 1 milestones, and a list of concerns.
- The monthly report is intended to be a form for quickly informing NSF of project developments. Reporting should be timely, with no more than a one month latency between the end of a monthly reporting period and receipt by NSF of that month's report.

Important note: Quarterly reporting, and the latency between the end of a reporting period and receipt by NSF of the report for that period, can be too slow a means of communication of project status. Large projects have the possibility to go very far off track in the four to five months between the start of a quarterly reporting period and receipt of a quarterly report. Brief monthly reporting of project status provides NSF with the opportunity to actively assist the project, when necessary, to address issues of concern.

6.4 Quarterly Reporting

The Awardee should prepare and submit to NSF three quarterly reports annually for the first three quarters of each fiscal period. The report shall consist of a summary of work accomplished during the reporting period including major scientific and technical accomplishments, an assessment of current status against scheduled status, a review of current or anticipated problem areas and corrective actions, and a status of action items affecting the awardee's and NSF's responsibilities. This report shall also include management information such as changes to personnel, financial status report and other financial information including actual or anticipated under-runs or over-runs, and any other action requiring NSF and other Federal Agency notification.

The financial information in the Quarterly Report will include a summary at the reporting level of the Work Breakdown Structure (WBS) level 3 for facilities construction and level 2 for the remainder of the WBS elements, of costs and obligations and a comparison with available funding. The forecast and actual completion of the Project Level milestones will be compared with the planned milestone completion dates presented in the plan. Performance data will include comparisons of Earned Value for work completed with a time-phased budget baseline and with actual costs accumulated to provide schedule and budget variances at each reporting level of the WBS. The data should be presented graphically at the top level of the WBS structure to indicate trends. A narrative variance report will discuss the causes and corrective actions to address significant variances from the plan. The report will also describe Change Requests approved by the Change Control Board during the reporting period and their affect on key milestones, contingency, or technical performance parameters.

6.5 Annual Reporting

An Annual Report will be prepared and submitted to NSF, in lieu of the fourth Quarterly Report for each fiscal year. Financial and schedule status information similar to that included in the Quarterly Reports should also be included in the Annual Report. In addition, the Annual Report should contain the following information:

- A summary of overall progress, including results to date, and a comparison of actual accomplishments with proposed goals fo the period.
- Indicate any current problems and favorable or unfavorable developments.
- Summarize work to be performed during the succeeding year, and any other pertinent information.

6.6 Annual Work Plans

The cooperative agreement should mandate the creation by the Awardee of an Annual Work Plan (AWP). The AWP must be approved by the NSF and shall be submitted in a format mutually agreed upon by NSF and the Awardee, and in accordance with schedules, funding levels, and other guidelines provided by NSF. In addition to the AWP, the Awardee should provide any supplemental information required by NSF. For example, it may be useful, in the case of projects with critical procurements requiring detailed review by NSF, to request periodic submission of a procurement plan for critical procurements, including the proposed date of submission to the NSF, the amount, and type of procurement, and for this plan to be reviewed by NSF prior to acceptance. This plan allows NSF to coordinate with the Awardee to establish a timely process for review and approval of major procurements and subcontracts.

In the event NSF requires modification to the AWP submitted, the Awardee should be allowed some minimum period of time, such as 30 days after receipt of the request, to respond. Example criteria that the Program Officer and Grants Officer may way to include with the definition of the AWP may include one of more of the following:

- Discuss scientific goals and program achievements and compare these achievements with projected goals in the currently approved AWP.
- Summarize proposed goals for construction, R&D, science, and collaborative arrangements, strategies, and priorities for the program year in which funds are sought. Compare efforts and goals with key milestones reflected in the PEP.
- Describe project staffing and compare with projected breakdown by labor category and work area as reflected in the project cost/schedule baseline.
- Summarize estimated costs and schedules by Level III WBS elements of the project and compare that with the cost/schedule baseline.
- Provide an organization chart and description of the project organization during the new program year together with any deviations from the Project Execution Plan.
- An annual calendar including dates for the project oversight committee meetings, project advisory committee meetings, scientific workshops, and reviews.
- Provide NSF with a description of any project reorganization and the effect it will have on project cost and schedule.

7 PROJECT INTERFACES

7.1 Definition of Interfaces Between Awardee and Sub-Awardees

It may be appropriate for NSF to manage the interfaces between the awardee and sub-awardees, particularly if there is the possibility of transference of project scope from the awardee to the sub-awardee. For example, a university may request that some of the originally proposed scope of the award be performed by another institution or subcontracted to a commercial organization. In this case, it would be important for NSF to assess the impact of this subcontract or subaward on the overall project and approve or deny the proposed action. Example language that might be committed to, within the Awardee's Project Execution Plan that addresses these issues is:

- NSF must approve any contracted effort to sub-awardees and may choose to make approval contingent on successful outcome of review of plans and capabilities of the sub-awardee.
- NSF approves annually the proposed funding and scope of work for sub-awardee institutions.

7.2 Definition of Interfaces Between Awardee and Scientific Partners

Cooperative agreements should allow the possibility for other scientific partners to join in the effort**.** However, care must be taken to preserve the baseline scope of work and budget funded by MREFC construction money. For example, if a university is awarded an MREFC construction project and a second university or entity desires to work collaboratively to contribute to the construction, this must be done through one of the following mechanisms:

- A subaward by the first university to the second university to undertake a portion of the baseline construction scope, accompanied by a change control action and concurrence by NSF;
- An augmentation of the baseline scope of work to clearly define the additional activities to be undertaken by the second university, if the second university has independent funds available to support this activity, irrespective of the source of funds. The augmentation of the baseline scope must done through the change control process defined in the Project Execution Plan and concurred to by NSF.

Similarly, the NSF should be informed of plans that involve the project in international scientific cooperative programs**.** Such programs often emerge during the construction phase of a project. The purpose of the specific condition is not to impede these developments, but rather to insure that NSF is fully informed in advance so that there is adequate opportunity for NSF to respond, if necessary.

The Awardee must submit to NSF advance notification of proposed plans for international scientific cooperative programs involving use of project personnel, facilities, or services. Notification should identify project and individuals involved, and should specify duration, location, and magnitude of proposed activity. Notifications are not required for routine use of project services and facilities by foreign investigators in accordance with standard awardee institution policies and procedures.

7.3 Interfaces and relationships to the scientific community utilizing the facility for research

The Project Execution Plan should include plans for commissioning and scientific operation that ensure that the facility enables the research community to conduct research activities as intended. Some projects may not have an organized user community prior to establishment of the facility, and NSF may choose to charge the Awardee PI with organizing the user community to utilize the facility, or it may define some other formal means for creating this relationship. The Project Execution Plan should detail how the facility operator will interact with the user community to promote scientific utilization. For example, it may define formal means of communication through meetings with user groups, input from the facility Awardee on proposals from the research community for utilization of the facility, and relationships with related international facilities and user organizations.

8 PROPERTY

8.1 Real Property

Large facility projects often involve use of real property leased by NSF from the property owner for use by the Awardee institution. Often, the Awardee is not a party to the lease agreement, but rather must abide by the terms of the lease that is negotiated between the owner and NSF. This simplifies the problem of transition of the operation of the facility to another awardee institution should that occur. When this leasing strategy is used, it is important to make sure that the Awardee abides by the terms of the lease.

The Project Execution Plan should commit the Awardee to fulfill conditions of leases or permits entered into between NSF and other parties for project land acquisition. The NSF Grants and Agreements officer should be the point of contact for any questions the Awardee may have on this issue.

In order to keep the Awardee cognizant of the conditions of the leases or permits associated with the property, the Project Execution Plan should specify that NSF will consult with the Awardee concerning any proposed amendments to any documents relating to land lease or land use, or access roads.

8.2 Security

Because NSF investments in major facilities are significant, NSF may choose to request that the Awardee conduct a vulnerability assessment and cost benefit analysis for implementing appropriate safeguard measures to protect the facility. If so, this commitment should be included within the Project Execution Plan.

8.3 Liability

The cooperative agreement should address liability risk issues associated with use of the facility. The Awardee is responsible for maintaining a safe environment, complying with all applicable laws, permits, and regulations. The Project Execution Plan should define NSF's responsibilities in relation to those of the awardee as the leaseholder and owner of the buildings and equipment on the property, ancillary equipment, vehicles, roadways, etc.

Agreements with states or others to limit activities in adjacent areas to minimize interference with site operations should be developed bilaterally between NSF and the surrounding jurisdictional authority, with the Awardee bound to operate by the terms of the agreement Where such agreements are necessary or desirable, they will be detailed within the Project Execution Plan.

9 ADVISORY COMMITTEES

9.1 Creation of an independent oversight committee by the Awardee institution.

It is recommended that the awardee institution set up an independent oversight committee to advise Awardee institution administration of the conduct of the project. It is the responsibility of the Awardee institution to select the membership of the committee. It is recommended that they meet at least once per year, and that their reports be shared with the NSF.

9.2 Internal advisory committee

The Awardee should establish an advisory committee to include external advisors on technical, managerial, and educational issues associated with conduct of the project. This committee, sometimes referred to as a Program Advisory Committee, or PAC, is intended to strengthen the relationship between the project and the user community by providing an avenue for members of the research community to communicate directly with the project and NSF. It also provides a mechanism for the awardee to obtain the talents and views of specialists who can offer timely advice on the conduct of the project as needed. Sample language:

The Awardee is to establish an advisory committee as soon as possible, and this committee should meet prior to the initial external review of the project by NSF. NSF should have full visibility, including attendance at PAC meetings as an observer, and access to any PAC reports. The Principal Investigator shall convene the PAC as necessary, but at least once each year. The PAC shall provide analysis and advice to the Principal Investigator and Project Manager. NSF shall be informed of all meetings, invited to attend, and shall receive copies of relevant reports. The charge and initial membership of the committee will require concurrence of the NSF program officer.

9.3 Interactions between the Awardee and the Research Facility Users Group

A user group may also be developed or exist that interacts with the project management. It is important that the NSF be made aware of concerns and interests expressed by the user group to the Awardee. The Project Execution Plan should provide the framework for the NSF Program Officer to be informed of all meetings between the user group and the Awardee and be invited to attend and observe the proceedings.

10 PROCUREMENTS AND CONTRACTS:

10.1 Critical Procurements:

Cooperative Agreements should define those critical procurements that have unusual impacts[13]. The Awardee should develop a Procurement Plan for those items deemed to be critical.

For example, for procurements that are identified as "critical", or alternatively procurements that exceed some significant threshold amount, such as $500,000, it may be advantageous to include, within the Project Execution Plan, the provisions that the Awardee will provide to NSF the following information:

- A procurement strategy.
- The relationship of the procurement to the project schedule.
- Steps to minimize contractor interference, tiering of subcontractors, and a list of all Government Furnished Equipment (GFE) items.
- Describe plans to minimize level-of-effort and time and materials contracts, and to utilize firm-fixed-price contracts with well-defined scope to the maximum extent possible.
- Describe plans to obtain and archive as-built drawings and specifications for project subsystems, whether build in-house or procured from vendors.
- Describe plans for involvement of subcontract labor, subcontracts to support organizations to supply specialized services, and subcontracts to other parts of the awardee institution.

10.2 Memoranda of Understanding

NSF should have full visibility into all collaborative MOU's, and approval of any MOU's with cost impacts exceeding some threshold, for example $500,000.

10.3 Subcontracting

Major project facilities design and construction should be performed using selected contracting methods (Firm-Fixed-Price or "FFP", Cost Reimbursable Contracts, etc.) appropriate for each contract based upon detailed, documented acquisition planning[14]. Subcontract terms should incorporate applicable flowdown requirements from the cooperative agreement or from commitments made within the Project Execution Plan, especially the requirement for Earned Value status reporting, preferably on a monthly basis. Subcontract terms should contain the following features:

- Provide for technical direction.
- Progress payments are to be based upon measurable performance milestones.
- Require delivery of programmatic data characteristic of cost-reimbursable contacts (detailed technical status, cost experience, and estimated cost to complete) which allow the detection of potential problems and the implementation of early corrective action through technical directives.

[13] See the Roles and Responsibilities Module discussion of critical procurement activities in the Awardee section of that document.
[14] Ibid.

- The cognizant Task Leader participates in regularly scheduled meetings at the subcontractor's facility to monitor technical progress and ensure that decisions are made in a timely manner.
- Technical specifications are identified up-front.
- Subcontractors are selected based upon their responsiveness to Request for Proposal (RFP) requirements, relevant technical expertise, and financial capabilities to accept the risk of the method of contracting.
- Technical and quality control, however, remain in the hands of the Project through requirements to review and approve subcontractor plans and procedures, contractually required formal design reviews, and provisions which permit Project inspection of work in progress.

10.4 Subcontract Oversight by Awardee

When cost or schedule problems arise, the Project Manager will investigate and work with the cognizant task leader and subcontractor to take steps necessary to correct the situation within the resources allocated to the task. If the problem cannot be satisfactorily resolved in this manner, it may be necessary to de-scope the task in question, de-scope an unrelated task in order to divert resources to the task in question, or apply contingency funds to solve the problem, or take any other available action deemed prudent under the circumstances. Any de-scoping constitutes change to the configuration and must be implemented according to the project's Configuration Management Plan. Should problems arise that cannot be resolved within available resources without impacting essential features of the project, the Principal Investigator and/or Project Manager, after consultation with the project oversight committee, shall propose alternative choices to the NSF which include an assessment of supplemental funds required to preserve the current project scope, and recommended descoping of one or more essential features needed to complete the project within current resources. NSF shall then decide upon the action(s) to be taken. In the event that NSF or the awardee offer direction which significantly alters the scope, cost, or schedule of planned activities, the Principal Investigator (or Project Manager) shall notify NSF, in writing, of the cost and schedule impact of such alterations. Any significant changes, including changes in scope require approval by the NSF Grants and Agreements Officer.

10.5 Performance Bonds

The NSF or the Awardee may specify performance bond requirements be included in key procurements by the awardee. Incentivization may also be appropriate, but NSF should reserve the right to approve any incentivized contracts by the awardee. In either case, the Project Execution Plan should identify those tasks for which performance bonds or Incentivization are planned, their justification for selection, and probable impacts if not implemented.

10.6 Bidder Qualification

The NSF may require the Awardee to take steps to ascertain the financial and operational history of firms that are candidates for critical sub-awards. For example, the NSF may

require that the Awardee obtain and review Dunn and Bradstreet reports on the business history of critical suppliers and include the information contained within the reports in the determining the winner of a competitive bid. The Awardee should also provide a justification for selection of a particular bidder if there are adverse items contained within the bidder's report. Another situation that arises is when a bidder firm is sold to another company. The NSF may require the Awardee to determine if the proposed procurement is central to the new owner's business interests, and to support this with substantiating documentation.

10.7 Indirect cost rates

Indirect cost rates and off campus overhead should be utilized where applicable. The Project Execution Plan should define specific locations where various indirect rates apply. This is especially important if it is the common practice of the awardee to apply an overhead rate at a particular location that is different than that to be applied to this agreement.

11 MISCELLANEOUS

11.1 Document Control Center

It is strongly recommended that the Project Execution Plan mandate creation, by the Awardee, of a project Document Control Center, having a web-accessible index of holdings, and web-accessible documents wherever possible. (Exceptions to this must be justified within the Internal Management Plan[15].) The DCC shall be the repository for all project documentation, including specifications, designs, drawings, configuration files, technical and management reports, schedules, presentations, etc. Personnel records, vendor confidential information, and other sensitive information may be protected from public accessibility.

11.2 NSF acknowledgment in publications

The Project Execution Plan should develop a written publication policy for dissemination of research results. Publications must acknowledge the NSF cooperative agreement number.

11.3 No cost extensions

Frequently, large facility construction projects have "punch list" items that must be resolved by vendors or subcontractors, and a retainage is held by Awardee until this work is completed. In such cases, the Awardee should be instructed to request a "no cost extension" to the cooperative agreement to complete this work. The Awardee should define what funds are needed, what procedures will be used to complete these items, and their expected completion date(s).

11.4 User fees

The appropriateness of such fees must be determined and approved by NSF. In circumstances where such fees are authorized by NSF, the Awardee should provide a detailed estimate of the source and amount of expected funds and how they will be used within the program. Note that they may not be used to augment construction funds to complete the scope of work approved and funded by NSF.

11.5 Local tax relief

Some projects have incentives from the state or local government to reduce or eliminate taxes on certain categories of activities on an NSF operated project. If this is the case, the cooperative agreement should direct the project management regarding the use of this reduction. Also, care should be taken in addressing the effect of a tax reduction on project cost. If tax reduction represents a savings to the project relative to the original project scope, the total project cost should be reduced by the amount of the tax relief.

[15] A forthcoming document will provide additional supporting detail on the development of Internal Management Plans.

11.6 Capital Reserve Fund

Allowance for the routine replacement of cyber infrastructure should also be included as part of the operations budget for a project. The Project Execution Plan may state that the project should develop a budget for maintenance of electronics, repair and replacement at some rate, such as every four years. In this case the Project Execution Plan should define the Awardee's strategy for obtaining approval by NSF, with NSF having the option to convene an *ad hoc* external review on this topic. (When this issue is relevant to a project, the Program Officer should address this as an element of the Internal Management Plan.)

Similarly, a long lived facility will require periodic replacement of major infrastructure (such as roofing, heating/cooling, etc.) The Project Execution Plan for Operations should define the strategy for accruing funds within a "Capital Reserve Fund" to address these infrequent, but essential, capital replacement expenses.

11.7 Termination liabilities

Some projects may accrue termination liabilities associated with shutdown, cleanup, and disposition of equipment, materials, or real property. In these cases, the Project Execution Plan should commit the project to providing a cumulative accounting of the accrued liabilities and report them on an annual basis to the NSF.

12 ABBREVIATIONS

AWP	Annual Work Plan
CA	Cooperative Agreement
DCC	Document Control Center
EV	Earned Value
FFP	Firm Fixed Price
GFE	Government Furnished Equipment
IMP	Internal Management Plan
PAC	Program Advisory Committee
PEP	Project Execution Plan
PI	Principal Investigator
PM	Project Manager
PO	Program Officer
REU	Research experiences for undergraduates
RFP	Request For Proposal
IT	Information Technology
WBS	Work Breakdown Structure