# Scientific Services

Provide scientific services and expertise in meteorology, hydrology, climatology, weather, space and atmospheric sciences to the NOAA enterprise as supported by line offices such as the NWS and the Office of Oceanic and Atmospheric Research (OAR). This includes science-based organizations, such as, but not limited to, the NWS National Centers for Environmental Prediction (NCEP), Meteorological Development Laboratory (MDL), Office of Water Predictions (OWP) and regional centers, OAR laboratories such the Earth System Research Laboratory (ESRL), OAR program offices such as the Climate Program Office (CPO) and Office of Weather and Air Quality (OWAQ). This furthermore includes programs such as, but not limited to, the Hurricane Forecasting Improvement Project (HFIP), Advanced Weather Interactive Processing System (AWIPS), Automated Surface Observing Systems (ASOS), Next Generation Weather Radar (NEXRAD) and the Joint Technology Transfer Initiative (JTTI).

Contractor shall identify and apply appropriate methodologies and research designs needed to test particular technologies or answer a specific research question. In addition, the Contractor shall provide services for social science, atmospheric science, weather and environmental observation and forecasting, on scales ranging from near real time to climate projections. The Contractor shall provide scientific support services to include, but not be limited to the following:

* + - 1. Develop and support numerical prediction models for environmental components, including but not limited to models for the atmosphere, ocean (including coastal processes), ocean surface waves (including wind waves, tides, and tsunamis), cryosphere, aerosols (ozone, carbon dioxide, particulates, trace gases, etc., addressing both incident response and situational and systematic assessments), land processes (including hydrology), space weather and ecosystems (including marine).
      2. Develop and support the testing and evaluation of observation systems gathering environmental data for operations and for research using National and

International standards. Support holistic planning and prioritization of observing systems.

* + - 1. Develop, validate and maintain state-of-the-art Data Assimilation (DA) techniques to initialize the environmental models.
      2. Provide services to move the present suite of operational forecast systems to a unified approach across scales that consists of an ensemble based coupled physical modeling system covering the component models as outlined in C.3.1.1. This approach is currently known as the Unified Forecast System (UFS). These services may include augmenting the UFS with other methods as appropriate (e.g., statistical methods for outlooks at longer time scales).
      3. Develop and maintain scientific techniques (including post-processing and visualization) that cover time scales from nowcasting to climate time scales, with appropriate spatial scales and domains (global, regional). Development will focus on high-impact events, including but not limited to severe weather (e.g., tornadoes, tropical cyclones, thunderstorms, fire weather, extreme precipitation, winter weather), droughts and floods, coastal processes (e.g., salt and freshwater inundation, waves, rip currents), water and air quality with health impacts.
      4. Develop appropriate ensemble techniques at all space and time scales as outlined in C.3.1.4 to address and improve forecast accuracy and assess forecast uncertainty.
      5. Perform fundamental research to support items C.3.1.1 through C.3.1.5, using alternative approaches as needed. This research includes but is not limited to fundamental model and DA development, predictability studies, process studies, Observation Systems (Simulation) Experiments (OSE and OSSE), field studies, social science impact, and infrastructure.
      6. Design, develop and perform re-analyses and re-forecasts for all applications to provide calibration of real-time forecast model runs, and to maintain and improve IDSS.
      7. Develop, operate and maintain pre-processing activities needed for physical environmental modeling. These activities include but are not limited to ingest and storage and access to observational data, quality control of observations, retrieval algorithms for remotely-sensed data and ingest of externally produced data (e.g., ensemble data generated by partners and to be used in Multi Model Ensembles (MMEs)).
      8. Develop, operate and maintain post processing (e.g., statistical, artificial intelligence) of numerical environmental predictions (i.e., weather, ocean, ice, waves, land, aerosols, etc.) including developing, generating, and disseminating objective guidance products for a wide variety of environmental elements based

on model outputs, and in support of IDSS. This includes downscaling of existing products, and providing products for assessments (in contrast to traditional forecast products).

* + - 1. Research, develop and maintain analysis products that provide the most accurate description of the physical environment possible, in support of nowcasting and short-term forecasting and verification of model output and products.
      2. Develop, operate and maintain Validation and Verification (V&V) tools to objectively assess quality of existing and new forecast tools and products, and to monitor the real-time quality of all weather, climate, and operational forecast systems. Develop and support requirement-based and process-based metrics to support objective evidence-based decision making. V&V tools include “health assessments” of observational systems.
      3. Develop, operate and maintain IDSS capabilities for all service areas of NOAA, in support of, e.g., Department of Homeland Security (DHS), Federal Emergency Management Agency (FEMA), and Federal Aviation Administration (FAA). Service elements can include, but are not limited to, products, collaboration, communication techniques and outreach.
      4. Develop and maintain processes to foster collaborative operational-research and public-private (including international) partnerships. This includes, but is not limited to, observation systems, Operations to Research (O2R) and Research to Operations (R2O) activities, codes and standards management, and documentation, training, outreach/community building, and data access, integrating social science and societal impacts in IDSS communication elements.

# Program and Project Management, Consulting, and Training

The Contractor shall provide program and project management, consulting, and training services to assist in program execution, improvements and measurements for scientific support services, in areas such as strategic planning and grant management. This includes providing programmatic and systems objectives for new applications, functionality, and inter-connectivity based on government project priorities and system needs. Services shall include but not limited to designing, redesigning and improving the quality of the performance measurement process, performance data, and the system and method by which the data are collected, strategic and tactical planning, budget formulation and execution. The program and project management, consulting and training services shall include, but are not limited to, the following:

* + - 1. Plan, implement and track schedule and costs of projects and programs, assess and evaluate project/program performance, risk and interdependencies to meet the program/project goals and objectives throughout the program and project life cycles.
      2. Provide program management office (PMO) functions for the development of strategic overview and reporting on all programs to senior management and stakeholders; provide in-house consultancy and/or programmatic support to projects and programs for proper management of schedule, risks, cost and performance; providing training to projects and programs management teams; conduct auditing and health checks on projects and programs.
      3. Provide assistance for the formulation and management of multi-year budgets, development of budget strategies, collection and analysis of financial data, cost collection and estimating, and the development of detailed spending plans, cost tracking and reporting systems/databases that can produce tracking and variance reports.
      4. Plan, develop, implement and maintain quality assurance programs and quality management systems in support of weather and climate operational and data systems.
      5. Provide assistance for the development, implementation, analysis, coordination, assessment, reporting, and execution of policies to meet federal and organizational goals and/or requirements.
      6. Provide services for human capital/workforce management, including but not limited to organizational design and staffing studies, cost analyses for current and future mission needs, position management and staff orientation activities, and organizational development and training support.
      7. Develop and execute training and seminars on new and updated operational weather and climate systems and architecture changes. Other training topics include but are not limited to project management, earned value for performance management, and performance measurement.
      8. Collaborate with internal, domestic and international partners to develop training in areas of operational weather and climate forecasting, including educating users of climate information, application of operational numerical prediction guidance, mesoscale meteorology, and global climate regimes and processes.
      9. Provide marketing and outreach coordination of public and commercial exhibit venues including large public trade shows. The support shall include, but is not limited to communication of technical information relating to weather and climate systems and NOAA line office operational systems, public exhibits, and legislative affairs communication.
      10. Provide administrative program management services to include but not limited to researching, maintaining, and preparing materials for inclusion and documentation (i.e. briefing packages, brochures, handouts and other information materials in various mediums) for NOAA public-private (including international)

partnerships for federal research, development and operational observing forecast systems.

# Engineering Services for Systems and Facilities

Provide engineering services for the NOAA enterprise as supported by line offices such as the NWS and the Office of Oceanic and Atmospheric Research (OAR). This includes services such as overall systems engineering or for its various components, facilities engineering, and engineering for a specific weather and climate system or collection of weather and climate systems, etc. These services are required for all phases of the program, project and system acquisition, development, and maintenance lifecycle for both existing and future mission systems and facilities. Furthermore, engineering services are required for deployment and logistics support to maintain and improve operational management in support of mission-oriented weather and climate systems. Tasks may pertain (but are not limited) to structural, electrical, electronic, mechanical, or building components, weather and climate systems or scientific equipment.

* + - 1. Provide overarching systems engineering, general engineering, and technical services in support of mission-oriented weather and climate systems. These services shall include, but are not limited to: systems engineering, policy development support, enterprise architecture support, configuration management, risk management, engineering assessment, validation and verification to include assisting various engineering offices with documentation needs throughout the full life cycle of a system.
      2. Provide engineering and operational services for the collection, validation and verification of information, and for the definition of geographic information system (GIS) integration requirements for meteorological systems, hydrological systems and geospatial-based applications.
      3. Provide specialized subject matter systems expertise and general engineering services to augment support for weather and climate programs. These services include program management, project planning and management, industry research, business process improvement, capacity projections, facilities management, and logistical support management specific to weather, water, and climate scientific applications.
      4. Provide engineering research and development to evaluate current and future state-of-the-art technological methodologies and automated tools. Contractor research shall include assessing and documenting current and potential uses of technology to meet system needs. This includes preparation for sustainment involving engineering changes due to obsolescence of operational weather and climate systems and associated documentation, or new system/equipment requirements for developmental systems.
      5. Provide complete lifecycle system and general engineering services (i.e. cradle to grave discipline) for acquisition planning, budgeting, risk management, and

program execution for new and evolving weather and climate systems, and services that meet performance, availability, affordability, and life cycle cost requirements.

* + - 1. Provide system engineering services supporting radio-frequency (RF) management (e.g., the NOAA/NWS RF spectrum initiative and operational systems support). These services shall include, but are not limited to the following: supporting NOAA line offices and their internal and external partners and stakeholders participating in domestic and international meeting forums, conferences, and working groups; and technical analysis and studies needed to develop recommendations, specification and requirements for the full life-cycle.
      2. Provide technical facilities engineering services for office/facility space planning and design and related facilities management including ergonomic and economic analyses; identification and analysis of current facility space usage; recommendations for more efficient use of facility spaces in accordance with federal policies and standards, drawings, studies and associated documentation and reports. This includes but is not limited to space planning, analysis and design, logistical management, land and building acquisition, lease management, real property disposal, construction planning and monitoring (i.e. builds, take down).
      3. Provide engineering and technical services for facilities engineering and architectural design; construction monitoring; installation test, and operation of facilities equipment and performance monitoring systems; facilities management including inspections for structural integrity, power loads and requirements, grounding, lightning protection, and grounds upkeep; safety, environmental, Industrial Hygiene (IH), and sustainability management and compliance; and other facilities related functions located within the Continental United States (CONUS) and Outside Continental United States (OCONUS), and site housing mission oriented systems and equipment.
      4. Provide engineering and technical services for safety and environmental compliance and sustainment including assistance with development and interpretation of national/federal policies, procedures, and technical reports.