

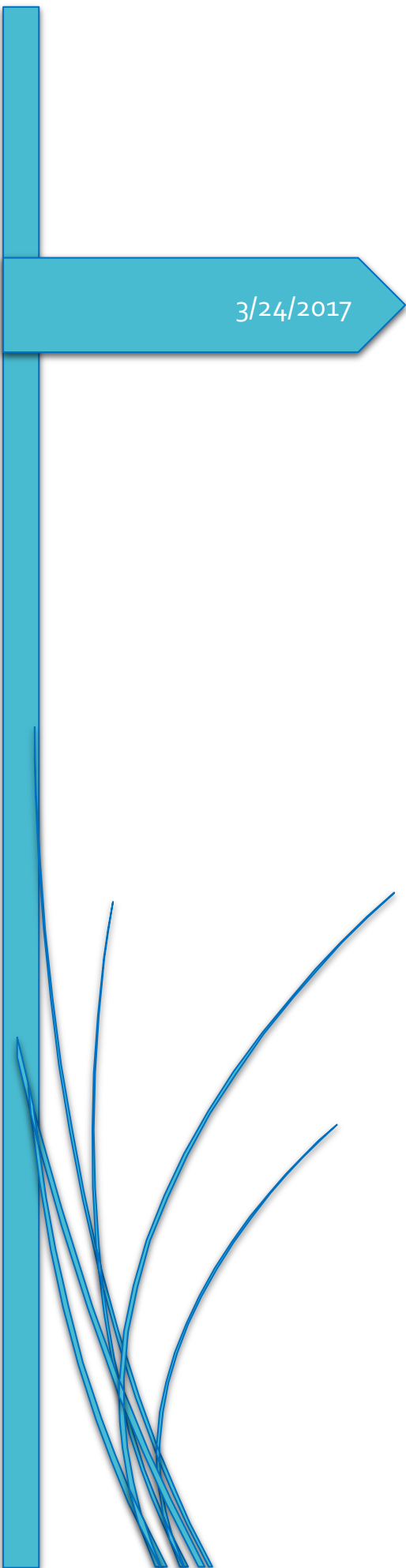
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# QUALITY MANAGEMENT PLAN

Version 2.1



**great lakes**  
**observing system**



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## A. MANAGEMENT AND ORGANIZATION

### A1. INTRODUCTION

The Great Lakes Observing System (GLOS) is charged with coordinating and integrating data and information relative to the needs of multiple user communities in the Great Lakes basin. These users can be broadly categorized as decision-makers with responsibility for coastal and natural resources, maritime operations, human health and water security, and the overarching issues associated with adapting to climate change and attendant hazard mitigation. The following document outlines the process GLOS has developed for determining regional data and information needs and the quality management systems used to ensure that the GLOS sponsored solutions to address these needs satisfy expectations for accuracy, reliability, and efficiency.

Established as a private non-profit in 2006, GLOS is identified by the National Oceanographic and Atmospheric Administration (NOAA) and the Integrated Ocean Observing System (IOOS) as the Regional Association responsible for developing the framework for a coordinated observing system for the Great Lakes that enhances and improves existing observing activities by leading the integration and development of interoperable, easy to access data, products, and related services. The mission of GLOS is to *advance the coordination of the extensive Great Lakes regional observing network of people, processes and technology that work together to maximize access to critical, real-time and historical information for use in managing, safeguarding and understanding the Great Lakes and St. Lawrence River system.*

GLOS coordinates Great Lakes observations, information technology, data delivery products, and related services by developing a broad network of members and providing a forum for collaboration and communication. These members and partners include governmental, academic, and non-governmental organizations, as well as private industry and individuals with expertise and interest in Great Lakes water resources. GLOS facilitates the cooperation of US federal agencies with US and Canadian federal, state, and local government, academic, non-profit, and commercial organizations. This consortium of partners represents the interests of Great Lakes observing stakeholders including data collectors, researchers, educators, and various data user groups.

Through its role as a data management facilitator, GLOS primarily provides Data Management and Communications (DMAC) services to its partners utilizing the Data Integration Framework (DIF) adopted by IOOS to make a broader suite of data available to scientists, resource managers, decision-makers and other data users, allowing them to develop a more complete, long-term characterization of our Great Lakes by collecting and bringing information together to be used with other data sets, in models, and in data visualization products. GLOS also sponsors the development of solutions that are identified as meeting a specific data or information need. The outcome or end product of these solutions may result in the development of a model, web-based data mapping viewer, or data visualization tool. In many cases, the solution may be that observation gaps need to be identified and filled, data standards need to be agreed upon, or existing models, data, and tools simply need refinement, enhancement, or better promotion. The goal of DMAC activities is to maximize the utility of the solutions, whatever they may be, ensuring they are reliable, efficient, and informative. More information on DMAC activities can be found in the GLOS Business Plan.

This Quality Management Plan (QMP) is intended to establish a quality management system that ensures that various GLOS projects related to the collection, management, and delivery of environmental data are of the quality needed to meet the intended project objectives and to support environmental decisions. This document provides the blueprint for establishing and maintaining a quality management system and will support GLOS programmatic and business planning, and will at the same time ensure that GLOS projects meet quality planning goals required by the U.S. Environmental Protection Agency (EPA).

### A2. QA POLICY STATEMENT

As a data management facilitator for the Great Lakes region, GLOS considers quality assurance (QA) and quality control (QC) key to the organization's measures of success and credibility. To adequately manage the Great Lakes,

managers and decision makers require the best data available provided in a reliable and accessible manner. The GLOS quality management system is designed to protect the integrity and provenance of each GLOS project's data through adherence to the following goals:

- ❖ Project results are accurate, reliable, and practical;
- ❖ Project results are obtained in a timely manner;
- ❖ Projects are designed in a practical way for ease of QA/QC implementation; and,
- ❖ Problems/issues that may arise throughout the project are addressed in accordance with the GLOS QMP process.

This QMP presents the management policies, roles, responsibilities, and procedures to be followed by GLOS to ensure that all work performed under GLOS programming includes the following:

- ❖ Identification and understanding of project needs and expectations in terms of strategic, technical and quality goals.
- ❖ Translation and/or documentation of the needs into specifications and performance measures to produce the desired products or results.
- ❖ Planning and conducting management assessments and implementing adaptive actions

This QMP pertains to the projects for which GLOS directly implements and/or directly contracts to have implemented. Other components of the Great Lakes Observing System may be implemented by partners utilizing the same or different funding sources, but without contract through GLOS. In these instances, partners will be responsible for fulfilling quality systems requirements directly with the EPA or other government agencies as appropriate.

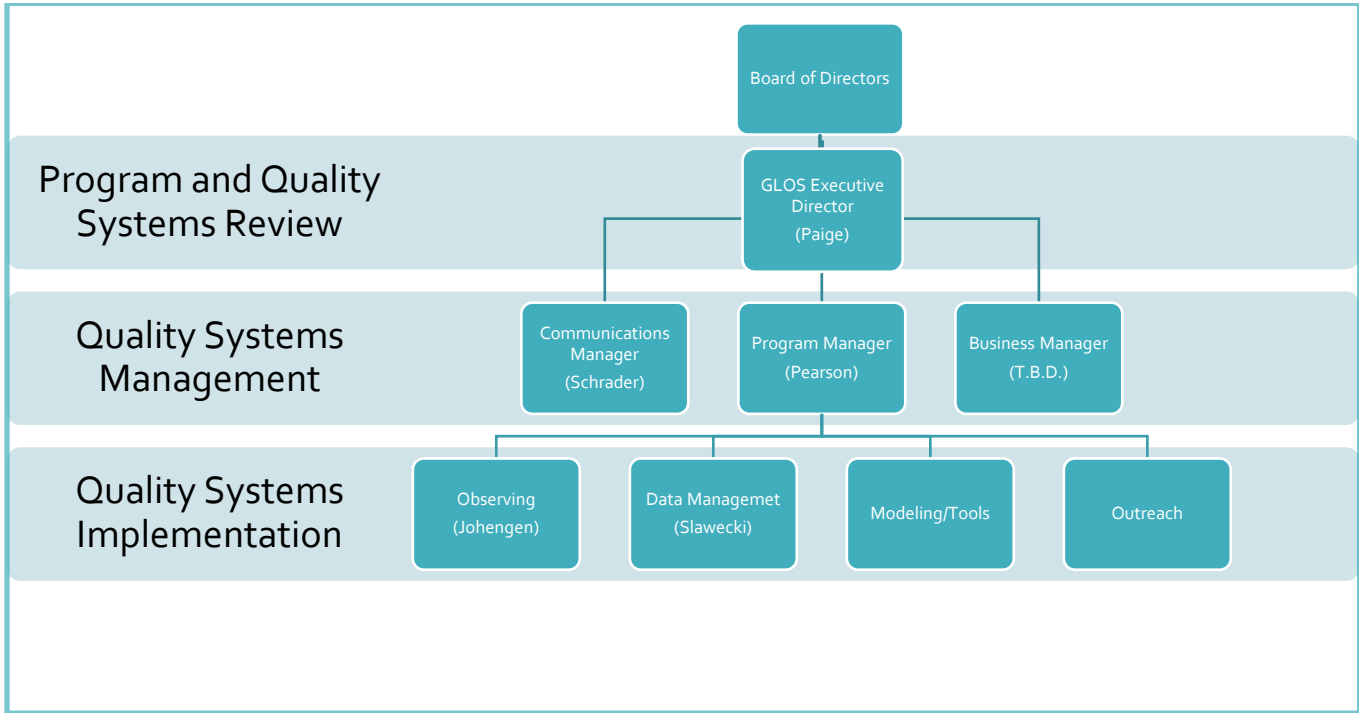
The GLOS QMP is provided to all staff, contractors, grantees, and other project partners and is available to all other interested parties via the GLOS website. Resources, guidelines, SOPs and/or documentation requirements for project adherence to the QMP are included in any/all contracts, cooperative agreements, MOUs, etc. as applicable on a project by project basis. Relevant project quality documentation is reviewed by GLOS QA/Program Manager and Executive Director prior to project implementation and evaluated during regular project reporting periods. All GLOS staff, but in particular, the QA/Program Manager, are responsible for ensuring all project partners are familiar with the GLOS QMP and have adequate support in adhering to it. GLOS staff will be supported by the GLOS Board of Directors in the development, implementation, and revision of the QMP as needed. As quality system implementation is an integrated part of GLOS program management, additional resources for the quality system are not needed.

### A3. ORGANIZATIONAL CHART

GLOS is a small organization, consisting of the Executive Director, two full-time staff positions (Program Manager and Communications Manager), and one part-time Business Manager. The QA reporting and communication structure follows directly from the GLOS organizational structure, which is further described in the GLOS Business Plan. This organizational structure can be characterized as being similar to a foundation or granting entity that solicits and manages projects as a distributed consortium through contracted services. Projects are selected and evaluated based on criteria, further described in the GLOS Business Plan, which assess the projects' ability to meet programmatic and functional goals for GLOS, including quality objectives.

Project partners are independently responsible for project scoping, developing performance metrics, adopting required standards and protocols, independently verifying or validating data quality, and documenting QA/QC procedures as part of contracting/service agreement process with GLOS. GLOS staff and team leads for Observations and Data Management are responsible for the management of these projects and partners including project reporting, evaluation and assurance that they are meeting contract requirements. Because of its small staff size, it is not possible for GLOS to create a position fully dedicated to QA management. However, GLOS has designated its Program Manager to also serve as the QA Manager to ensure appropriate independent review. It is also important to emphasize

that projects are implemented independently of GLOS and undergo various levels of review by team leads, GLOS Staff, an independent Technical Advisory Panel, and the GLOS Board of Directors.



**FIGURE 1 GLOS ORGANIZATIONAL CHART**

Program Team Leads and other project partners or contractors report to GLOS through the Program Manager. The Program Manager is also the Technical Coordinator and an independent QA Manager to provide review and evaluation of quality systems in addition to the other levels of project review provided by the team leads, GLOS staff, and Board of Directors.

#### A4. QA MANAGER/STAFF AUTHORITIES

Rebecca Pearson, GLOS staff, serves as the QA/Program Manager. As GLOS staff, the QA/Program Manager works independently from those who generate, compile, or evaluate environmental data, because those activities are done through partner organizations or through contract with GLOS. Additionally, she coordinates project contract, and manages project documentation and reporting. Tom Johengen, Cooperative Institute for Limnology and Ecosystem Research, coordinates observing projects quality systems. Tad Slawewcki, LimnoTech, is the Data Management Lead responsible for data management and communications quality systems. Other project leads are responsible for coordinating and documenting project specific quality plans. Kelli Paige, GLOS Executive Director, coordinates review of project plans by the Board of Directors or Technical Advisory Panel. The Program Manager works with the Executive Director, Technical Advisory Panel and Board of Directors to plan, assess, and improve the organization’s quality system.

#### A5. TECHNICAL ACTIVITIES/PROGRAMS

The nature of GLOS’ mission and function requires that GLOS programs are managed through a well-documented quality system. Specifically, any observations, data management, modeling or tool development project is subject to compliance with the GLOS protocols and processes for quality assurance and quality control. With the exception of the Data Management and Communication (DMAC) services GLOS undertakes, projects and related technical activities will change in accordance the priorities identified in the GLOS Strategic Plan. However, these projects will always be implemented through contracts, MOUs, or cooperative agreements with members, partners, or private contractors. GLOS uses the contract process as a mechanism for enforcing, overseeing and evaluating data quality assurance. The QA/Program Manager (Pearson) will work with individual project leads, Observations (Johengen) and Data

Management (Slawewski) Leads to ensure that applicable projects meet quality systems requirements by reviewing project proposals and scope according to a QA/QC Reporting checklist as part of all GLOS contracts.

A Principal Investigator (PI) is defined as the individual who serves as the primary point of contact on a contract, sub-award, MOU, cooperative agreement, etc. entered into with GLOS. The individual will be responsible for documenting and directing all technical work performed in a manner that meets the QMP and related work plan specifications. Principal Investigators may be directing projects with observing, data analysis, modeling or other related activities. They will be responsible for developing the QA/QC Report with assistance from the Data Management and/or Observing Lead(s) as appropriate. The PI will:

- Determine the need for QA/QC for specific project tasks.
- Complete the QA/QC Report as required by the project contract, cooperative agreement, MOU, or other and develop other project-specific documents.
- Implement project-specific quality requirements.
- Complete all project objectives.
- Report results; monitor work quality; and identify, implement and document corrective actions.

The Data Management Lead is responsible for ensuring the project meets quality requirements for inclusion in the GLOS Data Integration Framework (DIF) and/or subsequent use in GLOS sponsored data analysis or visualization tools or applications. The duties for this position include:

- Review relevant QA/QC Reports and work with project leads to ensure project meets data management QA/QC requirements.
- Evaluate project compliance and identify any corrective actions needed.
- Assist in the resolution of data format and delivery issues as appropriate, with the help of a DMAC Committee consisting of technical experts.
- Report to the Program Manager about issues regarding the status of project compliance.
- Implement or manage Data Management and Communication (DMAC) activities in accordance with the IOOS DIF and other related protocols.

The Observations Lead is responsible for ensuring the project meets quality requirements for direct in-situ or remote sensing data collection. The duties for this position include:

- Review relevant QA/QC Reports and work with project leads to ensure project meets data collection QA/QC requirements.
- Evaluate project compliance and identify any corrective actions needed.
- Assist in the resolution of data format and delivery issues as appropriate.
- Report to the Program Manager about issues regarding the status of project compliance.
- Implement or manage other GLOS sponsored observing activities in accordance with adopted quality standards and protocols.

The QA/Program Manager is responsible for establishing and documenting guidelines, policies, and protocols at all levels to ensure that the work assignment data quality objectives are met and consistent with the GLOS QMP. In this capacity, the QA/Program Manager will ensure the following is done:

- Evaluate and review project QA/QC Reports, contracts, standard operating procedures, and other related documentation for compliance with EPA reference methods or other requirements.
- Assign all QA related tasks to appropriate team members to ensure that the QMP is followed and related project contract due dates are met.
- Ensure personnel are familiar with the QMP and related system policies and processes.
- Inform the appropriate personnel of QC failures and problems with data quality and assist in developing and implementing corrective actions for QC failures and other QA related problems.
- Develop the performance evaluation program and work with Executive Director to implement evaluation.

- Ensure that all required documentation for the QA/QC assessment and review process are completed and delivered in a timely manner.

## B. QUALITY SYSTEM COMPONENTS

### B1. DESCRIPTION OF THE SYSTEM

Because project implementation is carried out primarily through contracted activities, development and implementation of QA/QC protocols and processes are the responsibility of the contracted parties GLOS supports. To manage these multiple project and their related QA/QC systems, GLOS utilizes its project planning and contracting processes to establish, manage, share, and enforce its quality system. The GLOS quality management system is essentially a set of documentation, implementation, and evaluation procedures integrated into the GLOS project planning process to ensure the effectiveness of projects and activities. As previously stated, the quality management system is designed to protect the integrity and provenance of each GLOS project and adherence to the following goals:

- Project results contribute to the GLOS DMAC system.
- Project results are accurate, reliable, and practical;
- Project results are obtained in a timely manner;
- Project results are designed in a practical way for ease of implementation; and,
- Problems/issues that may arise throughout the project are addressed in accordance with the GLOS QMP process.

As projects or other partners contribute data, modeled outputs and data tools to GLOS, this information is integrated into the GLOS DMAC system. As mentioned earlier, DMAC activities are guided by the DIF and other standards and protocols adopted by IOOS. The DMAC system provides an added level of QC, oversight, and coordination of project level data as these contributions are integrated for easy retrieval, storage, access and/or interoperable use in tools and applications.

The GLOS quality management system consists of management processes and implementation tools that support the systematic planning process described further in the following section. Specifically, components include the GLOS Planning Process, IOOS DIF and DMAC protocols, the QA/QC Project Report, Annual Work Plan Development and Review process, contracting process, and staff management and training.

### B2. PRINCIPAL COMPONENTS

#### *Systematic Planning and Review of Projects*

Quality management is an integrated part of overall programmatic planning for GLOS. As described in further detail in the GLOS Business Plan, the process follows an adaptive management planning approach and has four phases: 1) determining priorities, 2) developing strategies, 3) implementation, and 4) evaluation and adaptation. This process was developed to ensure that GLOS programming will be developed in response to identified user needs. As part of the Strategic Planning process and with ongoing evaluation and adaptation, GLOS utilizes this phased approach for the:

- Identification and understanding of project needs and expectations in terms of strategic, technical and quality goals.
- Translation and/or documentation of the needs into specifications and performance measures to produce the desired products or results.
- Planning and conducting management assessments and implementing adaptive actions.

Quality management is an inherent component of this systematic process. Projects must identify, measure and demonstrate progress towards strategic, technical, and quality goals and are evaluated and prioritized based on their ability to do so. This planning effort becomes the basis for decisions on resource allocation and implementation as well as the foundation for review and adaptation of ongoing projects. Systematic annual review of the projects, including quality systems, takes place during annual work plan development (described further in the GLOS Business Plan). Project review results are shared with GLOS data providers to promote continued creation and documentation of high quality data. As GLOS staff and partners review project progress with the support of the Technical Advisory Panel or



GLOS board, implementation of project quality systems is also reviewed. The GLOS Quality Management Plan is reviewed by every 5 years or as needed, in coordination with GLOS' strategic planning cycle.

### **Protocols, Processes and Related Documentation**

*IOOS Data Integration Framework (DIF):* The Data Management and Communication (DMAC) activities that GLOS implements are directed by the standards and protocols developed and adopted as part of the Data Integration Framework established by the Interagency Ocean Observing Council (IOOC) that governs IOOS. There are several documents that outline the methods, procedures, technology, architecture and performance measures that make up the DIF or otherwise provide guidance to DMAC development. These documents can be found at:

<https://ioos.github.io/sos-dif/dif/>

*DMAC and OBS Quality Guidance Documents:* GLOS has DMAC and Observations (OBS) quality documents to serve as supporting documentation for this QMP. Following the outline of a typical QAPP or QMP, these documents provide additional details on the quality systems for data management and observing activities. Due to the variety of activities covered, these documents were written to address the protocols, procedures and policies that are commonly implemented among the current GLOS projects and partners. Where individual projects do not similarly follow these processes or otherwise are not covered by the DMAC or OBS Quality Guidance Documents, they are required to document quality systems for these project elements using the QA/QC Project Report Template described below.

*Contracting Process-QA/QC Project Report:* Similar to the EPA's QAPP, the QA/QC Project Report is a required part of the GLOS contracting process for all partners involved in implementing a project with resources from GLOS. Because GLOS sponsored activities are varied, the document provides the Principal Investigator (PI) the opportunity to identify where they are currently meeting existing quality systems described in the GLOS QMP, DMAC, and/or OBS Quality Assurance Project Plan, and/or indicate appropriate activities that require additional quality management documentation. The PI can then document the protocols and procedures in place for data QA/QC that are unique to their project activities or are otherwise not covered by the supporting DMAC or OBS Quality Assurance Project Plans.

QA/QC Project Reports will be reviewed by the QA Manager and the Executive Director as well as the Board of Directors, Observations and/or DMAC Leads as appropriate as part of contract finalizing. This reporting protocol is integrated into the GLOS contracting process to accommodate the variety of projects and partners GLOS works with in an efficient manner while still providing oversight for quality assurance.

### **Training**

The QA Manager will work with personnel to ensure they have the appropriate documentation and training as needed. Periodic refresher training sessions will be undertaken on an as-needed basis. The Data Management Lead will be responsible for and provided the necessary resources to attend any trainings provided on developments in the IOOS DIF or other adopted SOPs, protocols and standards. In addition, the QA/QC Guidelines Document was developed by the QA Manager to provide a checklist for PIs as to the expectations for QA/QC Project Reports. The Guidelines Document is available as an attachment to this QMP and individual Project Reports will be kept on file with the QA Manager at GLOS offices.

## **B3. ADDITIONAL TOOLS FOR IMPLEMENTING COMPONENTS**

In addition to the planning, documentation, evaluation and training described above, GLOS will use the following tools for implementing its quality system.

**Training Plans-** GLOS staff and the QA Manager will participate in quality management training courses offered by US EPA or other relevant training.

**Business Plan/Standard Operating Procedures –** Quality systems management and DMAC activities will be conducted in accordance with the Business Plan and any related SOPs developed by GLOS.

Data Management Documentation – DMAC activities are documented and progress is tracked as part of regular reporting requirements.

Data Validation/Verification –PIs or project leads are responsible for all data validation/verification which is subject to review by the Data Management Lead or Observations Lead, as appropriate.

Corrective Action Program for QA Problems - Establishing and implementing a corrective action program for identified QA problems is an integral part of the overall QA program. Identifying problems and expediting appropriate corrective actions are the responsibility of all research team members.

Technical Staff – Contracted activities are staffed with personnel who are required and prepared to carry out QA policies and procedures.

Performance Standards- The QA Manager responsible for evaluations and with support from the Executive Director and other QA personnel, will conduct a project evaluation on an annual basis as part of regular work plan development. Evaluations include performance ratings for project work, implementation of the quality management system, and accomplishment of tasks described within the system.

GLOS Strategic/Business Plan-Please refer to the GLOS Blueprint for Great Lakes Decision-Making to learn more about our planning and prioritization process. <http://www.glos.us/wp-content/uploads/2016/03/Blueprint-for-GL-Decision-Making.pdf>

## C. PERSONNEL QUALIFICATIONS AND TRAINING

All quality management staff as well as contracted project staff must be adequately educated, trained, and experienced to perform the tasks and functions to which they are assigned. Experienced and knowledgeable personnel are the foundation of effective and efficient performance. Training is an important factor in ensuring that QA/QC requirements are met during all assignments and that there are continuous improvements related to environmental data collection and other work products. As part of standard GLOS contracting language, projects must demonstrate their ability to provide the most appropriate staff for assignments based on technical experience, specialized knowledge, and professional certifications. In addition, the QA/QC Guidelines Document developed by the QA Manager provides a checklist for PIs as to the expectations for Project Reports and data sharing/documentation requirements, and are provided to PIs or project leads during contracting process.

Staff involved with the coordination or management of quality systems will be trained and made familiar with the quality systems protocols and procedures. The Data Management Lead and other GLOS staff as appropriate will be responsible for and provided the necessary resources to attend any trainings provided on developments in the IOOS DIF or other adopted SOPs, protocols and standards. Retraining or other refreshers will be provided to quality management staff or project leads as needed.

## D. PROCUREMENT OF ITEMS AND SERVICES

### D1. DESCRIPTION OF THE PROCESS

GLOS selects, acquires and uses materials and services in a manner that provides essential accountability for GLOS expenditures. All purchases of goods and services must be done in an open and competitive environment to ensure that prices paid by GLOS are 'fair and reasonable'. As a 501(c) 3 non-profit organization, GLOS is committed to an environment that fosters open decision-making, practices and policies. Our business objective is to select quality vendors and suppliers, in accordance with our stated principles to obtain the best value for GLOS.

GLOS procurement of goods and services generally occurs through one of two processes: simplified acquisition procedures or formal contracting procedures. GLOS also performs contract administration services to ensure compliance with the provisions of awarded contracts as a part of its overall procurement policy.

### *Simplified Acquisition*

The Executive Director/Business Manager are required to compare prices between vendors even when purchase amounts do not require a formal bidding process. All items of \$100 or more will be purchased only after a comparison of at least three vendor prices is conducted. For items for which there is only one vendor, GLOS follows procedures for non-competitive purchase awards and records are retained for auditing purposes. A Non-Competitive Purchase Award is defined as the purchase of a product or service that is available from only one source, thereby exempting the purchase from the otherwise required competitive bidding policy of GLOS. This is done under exceptional and limited circumstances. To qualify for a non-competitive exemption, staff member requesting the exemption must provide the GLOS Treasurer with detailed written documentation explaining why bidding the product or service would be impractical and assurance that the cost charged by the vendor is reasonable and customary. Any necessary attachments must accompany the purchase requisition when it is sent to the GLOS Treasurer. Such documentation should include specific technical and quality requirements of the product or service, supportable evidence that due diligence has been performed in an objective market analysis, and proof of fair and reasonable pricing. The GLOS Treasurer reserves the right to negotiate pricing or to solicit additional information and remains the final authority on all procurement issues. It is GLOS policy to price transactions whenever practicable. Therefore, end users must obtain pricing from the vendor before purchasing.

The Business Manager is responsible for verifying that:

1. Pricing is consistent from the purchase order to the invoice, including line item pricing,
2. Goods and/or services have been received in acceptable form, and
3. The transaction is correctly recorded in the financial system (Statement of Activity).

If materials are to be returned to the vendor, the end user must arrange for the return. It is the responsibility of the Business Manager to verify that proper credit is made to the affected account and reported on the Statement of Activity.

### *Formal Contracting*

The competitive procurement of goods and services necessary for the operation of GLOS is the responsibility of the Treasurer, who has delegated that responsibility to the Executive Director, who in turn has delegated this function to the Business Manager. The Executive Director and Business Manager are the agents authorized to make commitments against GLOS funds for these purposes. The Executive Director and Business Manager are charged with the responsibility of maintaining an open and competitive process for procurement of goods and services. Bids and proposals from competing vendors are to be evaluated by the Executive Director/Business Manager, and contracts awarded. An open and competitive purchasing environment requires that information pertinent to the bidding process be kept confidential until the conclusion of that process.

## **D2. PROCUREMENT DOCUMENT APPROVAL**

Both methods of procurement require documentation and document review to ensure the procurement documents are accurate, complete and clearly describe the item or service needed as well as the associated technical and quality requirements for which the supplier is responsible. The requirements for documentation and approval for simple acquisitions have been described in the previous section above. This section will focus on describing document approval for GLOS' primary procurement method of goods and services, formal contracting.

GLOS communicates its requirements to prospective bidders by issuing a solicitation in the form of a Request for Quotation (RFQ) or a Request for Proposal (RFP). The structure and content of the solicitation varies depending upon the type of good or service being solicited. At a minimum, solicitations describe proposal submission requirements, anticipated terms and conditions that will apply to the contract, scope of work information required in the offer, and the criteria that will be used to evaluate the offer and the relative importance of evaluation factors. It is important that solicitations are crafted in a manner that clearly communicates GLOS' need, data quality and reporting requirements, and the planned evaluation methodology. Technical and quality requirements will vary depending on the type of good or service being solicited but are included as part of the scope of work requirements of any solicitation.

GLOS contractual guidelines stipulate that contractors are accountable for all equipment purchased under GLOS contracts. Title to equipment purchased under this contract will transfer to contractor at the time of acquisition unless GLOS or primary funder directs otherwise. The contractor agrees to utilize such equipment for the benefit of the project and shall maintain appropriate records to enable GLOS to fulfill its responsibilities to the primary funder. Contractors are subject to the terms and conditions as part of the general provisions of GLOS contracts including:

1. DOC standard terms and conditions which are incorporated herein by reference and available from the NOAA website at <http://www.ago.noaa.gov/atoz.html>
2. 15 CFR Part 14 (Code of Federal Regulations) can be found at: <https://www.gpo.gov/fdsys/granule/CFR-2011-title15-vol1/CFR-2011-title15-vol1-sec14-44>
3. Quality Assurance requirements outlined in Standard Award Conditions section of GLOS Contracts.

It is the responsibility of the contractor or Primary Investigators (PIs) to ensure that suppliers are providing exactly what procurements have requested.

### D3. SOLICITATION RESPONSE APPROVAL

On all purchase orders awarded by the Executive Director and Business Manager, it is GLOS policy that all contracts or correspondence pertaining to negotiations affecting purchases or prospective purchases which involve pricing, terms, conditions, and delivery shall be initiated by the Executive Director and/or the Business Manager. Additionally, the Business Manager shall coordinate all correspondence pertaining to a purchase order which has been placed and which involves pricing, terms, conditions, delivery, quantity, substitution, or complaint.

The Executive Director maintains signature authority for all procurement contracts and agreements. Contracts and agreements requiring a GLOS signature should be forwarded to the Business Manager for processing. All information pertaining to the contract or agreement must be included. Note that license agreements and maintenance contracts are specifically included with other types of contracts. These contracts or agreements are then forwarded to the Executive Director for approval and may also require approval from the GLOS Treasurer. Only those with specifically delegated authority may sign contracts on GLOS behalf; therefore, end users who sign contracts or agreements may incur a personal liability.

Proposals may be reviewed by an appointed review committee selected by the Executive Director and approved by the Board. Grants will be awarded to those applicants that ranked highest in the evaluation process and satisfy GLOS terms and conditions including technical and quality requirements as stated within the RFP. Ensuring that procured items and services are of acceptable quality includes the review of objective evidence of quality for applicable items and services furnished by suppliers and subcontractors, source selection, source inspections, supplier audits, and examination of deliverables. It is the responsibility of the QA Manager to review and approve procedures for mandatory quality-related documentation from suppliers.

As needed, RFPs/RFQs will be drafted by GLOS staff and reviewed by an appointed review committee members and/or Board members with requisite technical expertise. All reviewers will be required to avoid discussing content of the RFP with any potential proposer/competitor to ensure no perceived or real conflict has been created. The RFP/RFQ will be

released via multiple channels to ensure broadest possible distribution. A minimum open period of 30 days is required for each RFP/RFQ unless circumstances demand a shorter turnaround time. In such a case, an advance notice of RFP/RFQ release will be circulated as soon as staff understand the full timeline. The RFP/RFQ will include the level of specificity required to ensure that GLOS needs are met. RFP/RFQ will include specific, weighted selection criteria so that proposers know on what basis the successful projects/teams will be selected. At least three written reviews per proposal will be solicited. Reviewers will be free of conflict and sign a statement to that effect. A selection sub-committee of the Board of Directors, potentially including one or more review committee members as may be necessary to ensure sufficient technical expertise, will use the written reviews and their own technical expertise to rank the proposals/teams. The Executive Director will enter negotiations with the top ranked principal investigator(s)/team leader(s) to secure a contract to complete the work. If, for any reason, the Executive Director is unable to secure a contract with the top ranked PI or team, he/she shall move on to the next ranked team, continuing this process as necessary until a contract with a highly-ranked team is secured. If the Executive Director is unable to secure a contract with a highly-ranked team, GLOS has the option of posting the same RFP/RFQ or an amended RFP/RFQ considering lessons learned during the negotiation process. Subsequent selection will occur as described above.

Solicitation approval is conditional upon agency oversight requirements including: a) Purchases on federally sponsored funds must be made in accordance with Circular A-133; Cost Principles for Non-Profit Organizations (<http://www.nonprofitaccountingbasics.org/topic/omb-circular-133>). Purchases for sponsored projects must also comply with the specific project's requirements.

b) Foreign Vendors must be designated as such as part of the Vendor Certification process. United States income tax may be required to be withheld.

## E. QUALITY DOCUMENTATION AND RECORDS

Program managers and quality management personnel are required to ensure that records and documents accurately reflect completed work through continual communication, data checking and oversight of all GLOS projects. All GLOS reports receive final approval by the Executive Director and all financial statements are approved by the Business Manager and are to be available for auditing or assessment. Maintaining documents and records is the responsibility of all staff. Access to records is at the discretion of the Executive Director. All contracts including those that cover loss or damage (insurance based) are negotiated by the Executive Director and approved by the Board of Directors.

### *Requirements for Documents and Records, based on US EPA standards:*

GLOS financial – payables are archived for a minimum of seven years, general accounting/general ledger records date back to the establishment of GLOS, payroll is archived for a minimum of seven years.

GLOS project files – are archived for a minimum of seven years.

There is no formal chain of custody as all records are maintained by the Business Manager and all confidentiality and evidentiary procedures are at the discretion of the Executive Director.

## F. COMPUTER EQUIPMENT

GLOS requires reliable computer equipment to perform its administrative and operational tasks. This equipment includes individual computers used by GLOS staff, network equipment such as servers, switches, storage and backup, desktop and network software, and numerous services, such as internet connectivity.

For network equipment supporting the management and communications of data, purchases are recommended by the Program Manager and approved by the Executive Director. Network equipment – servers, peripherals and software – will be purchased from recognized enterprise hardware vendors such as Cisco, Dell and HP. Similarly, network software will be purchased from recognized software houses like Microsoft, Symantec, Veeam, and VMWare. Installation and configuration of network equipment will be performed by members of the contracted Data Management and

Communications project team. Extensive use will also be made of common open-source platforms and tools for development and deployment of intelligent data access products, such as Apache Tomcat, 52 North SOS, PostgreSQL, Python, GeoServer, THREDDS, ERDDAP and more, which will be added to the GLOS DMAC infrastructure only after review by the DMAC Team Lead.

Documentation and monitoring of the network hardware and software will be performed on an ongoing basis by the DMAC team to ensure common understanding and proper operation of the DMAC infrastructure. The DMAC team will identify useful metrics for measuring performance and capacity of network components, and provide regular reports on equipment inventory and on performance to the Program Manager no less often than quarterly.

Regular backups of data on hard drives and servers are performed to prevent the loss of data in the event of a hard drive failure, user error, disaster or accident. These backups also assist in longer term data storage and management as needed. Active data files stored on the server are copied in case of hard drive failure, and copies of completed data files are archived to tape for long-term storage and for distribution to other agencies. In addition, selected data are formally archived at NCEI.

Office computers and peripherals to support administrative activities are name-brand products purchased as needed under the direct supervision of the Executive Director with recommendations as needed from the Program Manager and DMAC Team Lead. All computer operating system and most application software will be commercially available, industry-standard products, which includes open source solutions. Customizing is permitted to enhance productivity within a given application, carried out using the macro languages and techniques designed for that particular application. When required, beta testing of products before purchase will be implemented if there is any question of performance.

Any needs for updating or changing any systems requirements will be addressed and approved by the DMAC Team Lead and Program Manager. All related software is industry standard and well documented, which includes open source software solutions. All hardware and software implemented is reviewed and assessed annually. Should hardware or software not perform to standards, equipment will be updated or replaced at cost to the supplier, GLOS or according to other provisions made under the particular project.

## G. PLANNING

The process including roles, responsibilities, and authorities of management and staff for planning data operations is integrated into the systematic project planning process which includes:

### *Personnel*

- **GLOS staff and Executive Director (ED)** – GLOS staff participate by directing, managing, and facilitating projects. The Program Manager and ED are responsible for coordinating all internal and external reviews including by the Data Management or Observations Lead.
- **Principal Investigator (PI)** – oversees cradle to grave operations of a project which includes development of all communications and deliverables including data collection, compilation, analysis and appropriate metadata and QA/QC compliance.
- **Project Personnel** – Contracted staff perform data collection, compilation and analysis level tasks and assist the Principal Investigator in meeting the goals of the project and the goals of the quality management plan.
- **Stakeholders/ Data User Groups**– Assess the relevancy of project work and advise on development and process.

### *Project Goals/Objectives and Issues Addressed*

The project management team, with all appropriate personnel as described above, will formulate appropriate goals and objectives. Data collected, compiled and analyzed will be required to be statistically defensible and be in a standard format for modeling purposes.

### *Project Schedule*

Individual project work plans will specify the project schedule. Schedules will differ for each project, but each will contain many or all of the following elements:

### *Project Scoping*

All GLOS projects are required to provide a scope of work that includes but is not limited to:

- Identifying information needs and management issues addressed
- Establishing protocols for funding the program
- Establishing strategic, technical, quality and outreach goals and objectives
- Developing project management structure, work plan and timeline
- QA/QC Assessment including quality documentation
- Evaluation of results
- Projects that include the development of models, decision-support or data visualization tools must address how data used will be evaluated for use in the context of identifying information needs, assessments, and results evaluation.

### *Support to Project Objectives*

Data collection, analysis and compilation is often required and will therefore directly support project objectives. Databases will serve as an information management tool and be valuable throughout project time frames and beyond. Quality requirements for data usage include quality checks of data before being released. Quality checks should be part of the data creation process and documented as such. As part of QA/QC checks, data submitted as results to projects are tested and validated by GLOS staff, the project management team, and the DMAC Team. More detailed quality and performance requirements and specifications are provided in the *DMAC and OBS Quality Assurance Project Plans*

### *Specifications of Performance Criteria for Measuring Quality*

Quality measurements will be assessed at the beginning of each project, and will therefore be project specific.

Performance criteria should be stated in quantitative terms whenever possible. Performance criteria will include:

- Data accuracy, comparability, representativeness, and completeness
- Meets the goals of the project
- Meet deadlines
- Issue resolution
- Within budget
- Personnel, supplier and contractor evaluations
- Meets all QA/QC requirements
- Complies with the Quality Management Plan
- Report writing to document data creation and management methods
- Access to research data
- Future considerations/recommendations
- Practical
- Reviews were positive and recommended acceptance

### *Approved Planning and Technical Documents*

Many projects are required to follow approved Quality Assurance Project Plans (QAPPs), and revise or update them according to periodic reviews by GLOS and the project management team. QAPPs required for U.S. EPA projects must adhere to the elements listed in EPA's quality planning document. Relevant links to U.S. EPA QAPP requirements include:

- An overview of EPA QAPP requirements - [https://www.epa.gov/sites/production/files/2016-06/documents/r5-final\\_o.pdf](https://www.epa.gov/sites/production/files/2016-06/documents/r5-final_o.pdf) (this is the main EPA quality planning document)
- Additional details on QAPP requirements for modeling requirements - <https://www.epa.gov/quality/guidance-quality-assurance-project-plans-epa-qag-5>
- QAPP a development tool - <https://www.epa.gov/quality/quality-assurance-project-plan-development-tool>

### *Review Procedures and Documentation*

GLOS is responsible for all review procedures as outlined in its Quality Management Plan. GLOS is responsible for collecting or developing all project documentation including procedures relevant to the project. All procedures are reviewed under the quality management review process. Release of procedures is consistent the project work plan. Verification of any changes or updates to procedures are the responsibility of the Program Manager. The Program Manager is responsible for reporting findings to the appropriate personnel. Procedures will be reviewed by GLOS who in turn will assure that they fall within guidelines and communicate with GLOS data providers on addressing deficiencies. GLOS will approve all updates, revisions or changes to policy and procedures related to each project and will keep records of these activities for up to five years after project completion.

## **H. IMPLEMENTATION OF WORK PROCESSES**

GLOS is dedicated to translating the quality goals described in the scoping documents into well-documented quality results and products. The QA Manager will ensure that all contracted projects are executed in strict accordance with the project contract, QA/QC Reports, scoping documents, and other applicable documents and SOPs. The level of management oversight and assessment will be determined during the contracting process and will be commensurate with the importance of the project data. To ensure that the plans are strictly and consistently followed, GLOS will perform internal reviews as part of the annual work plan development process.

Environmental data operations will be implemented fully in accordance with the QMP and QA/QC Project. To ensure integrity of all plans, exceptions must be brought to the attention of the QA Manager, considered and evaluated, and approved by the Executive Director prior to implementation. Exceptions will be fully documented to include considerations leading to their approval. As part of annual reviews, the Program Manager will ensure that obsolete documentation is removed and replaced with updated versions as necessary.

## **I. ASSESSMENT AND RESPONSE**

### *Annual Assessment*

Systematic annual review of the projects, including quality systems, takes place during annual work plan development (described further in the GLOS Business Plan). As GLOS staff and partners review project progress, the implementation of project quality systems is also reviewed. The GLOS Quality Management Plan is reviewed by every 5 years or as needed, in coordination with GLOS' strategic planning cycle.

Assessors of quality performance include the project PIs, project personnel, Data Management and/or Observation Leads and stakeholders to the project. Assessments of process and work performance will ultimately reside with GLOS staff and the Board of Directors. Assessments or evaluations will be made using a variety of applications as appropriate.



- Peer reviews – will be conducted of all RFP drafts and proposal submissions.
- Technical reviews – relevant technical experts will provide technical review of work.
- Performance evaluations – will be conducted annually and semiannually at the GLOS level and at various stages of the project in coordination with annual work plan development and reporting periods.
- Data quality assessments – will be conducted by PIs, the Data Management and/or Observations Leads as needed.

### *Assessment Documentation*

An annual work plan is developed for each project and serves as an update for GLOS management and the project team. PIs are required to document assessments of data quality, document their QA/QC processes, and identify need for corrective actions as part of regular reporting. GLOS staff and Data Management and Observations Leads will evaluate, as needed, projects and quality systems and any recommendations or corrective actions will be included in annual work plan documentation.

### *Assessor Checklists*

PIs will be provided a “checklist” for quality system assessment as part of the *QA/QC Report Guidelines* document. During regular reporting the PIs are required to provide updates and document assessments of data quality and identify need for corrective actions. The Program Manager will act as a resource for any questions/issues that arise. All corrective action is at the discretion of the GLOS Executive Director and in this role will address any disputes encountered as a result of assessments.

### *Corrective Actions*

Corrective actions will take place as a result of the annual work plan development and be approved by the Executive Director. Corrective action will be made promptly so as not to cause further delay to the project’s progress, and PIs are required to provide review and updates after the corrective action has taken place to determine whether the situation has been rectified and to assess whether further action needs to take place. The Program Manager is responsible for documenting any such action.

### *Disputes*

Should there be a dispute after corrective measures have been made, GLOS will confer with the PI on steps to ensure project integrity.

## **J. QUALITY IMPROVEMENT**

The Executive Director is responsible for review, approval, and implementation of the quality system. Working together, the QA staff and the Executive Director respond to problems identified within the project, identify solutions and implement them. All actions will be documented. The Executive Director will act from a collaborative, consensus driven process and track each issue through to an acceptable level of completion.

The Program Manager is responsible for leading the effort to identify, plan, implement and evaluate the effectiveness of quality improvement activities. Quality improvement activities may include:

- QMP
- QA/QC Reports (or QAPP)
- Checklists
- Evaluations
- Assessments
- Data collection, management, storage and access
- Evaluation

Planning procedures  
Technical procedures  
Training procedures  
Documentation and record keeping  
Staffing  
Related project elements

A checklist for quality improvements will include the above and be circulated by the Program Manager to GLOS staff and the project team. This checklist will be circulated on an annual basis.

### *Conditions for Quality*

**Prevention** – The Executive Director delegates decisions related to quality management to the Program Manager. Through implementation of the quality management plan including regular assessments and reviews of QA/QC reports and other procedural practices, issues should be minimized. Open and frequent communication with all project staff should prevent misunderstandings and misconceptions and also highlight expectations.

**Nature and extent** – The Program Manager, in consultation with the Director, will determine the nature and extent of action to be taken after an occurrence has been noted or disclosed through a site visit or regular review and assessment. All occurrences will be documented. Any corrective action (as determined necessary – described above) will be documented.

**Correction** – Any corrective actions will be taken as soon as necessary (see above). Through regular review and incorporation of enhancements and frequent communication, recurrence should be kept at a minimum.

**Documentation** – The Program Manager tracks all corrective actions.

**Tracking to closure** – GLOS conducts weekly staff meetings to ensure that problems encountered are identified early and dealt with immediately. Additional technical expertise is sought as needed, such as the members of the GLOS DMAC Team. All issues not addressed within a two-week time frame will be documented and tracked to completion.

**Communications** – The Program Manager will encourage GLOS staff and other project participants to communicate and document all project activities they are involved in, including supplier reviews, evaluations and other management system elements. They will identify process improvement opportunities as well as offer solutions to problems and forward these recommendations to the Program Manager.