National Oceanic and Atmospheric Administration

Great Lakes Environmental Research Laboratory

Five-Year Operations Plan

FY 2006 – 2011

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GLERL's Five-Year Operations Plan
FY 2006 - 2011

INTRODUCTION

The National Oceanic and Atmospheric Administration (NOAA) - Great Lakes Environmental Research Laboratory (GLERL) is one of 7 Federal research laboratories within the Oceanic and Atmospheric Research (OAR) line office of NOAA. GLERL was formed in 1974 to provide a focus for NOAA's environmental and ecosystem research in the Great Lakes. During its history, GLERL has made many important scientific contributions to the understanding and management of the Great Lakes and other coastal ecosystems. GLERL scientists thus play a critical role in international, federal, state and academic partnerships, and GLERL research provides information and services to support decisions that affect the environment, recreation, public health and safety, and the economy of the Great Lakes and coastal marine environments.

GLERL houses a unique combination of scientific expertise in biogeochemical, hydrological, ecological, physical and biological limnology and oceanography. Because of this broad interdisciplinary mix, GLERL is uniquely qualified to focus on ecosystem (both physical and ecological) forecasting. With ecosystem forecasting as a foundation, GLERL's science is dedicated to observing and predicting important characteristics of Great Lakes and coastal marine environments. GLERL's forecasting and tool development for observing and managing the Great Lakes and other coastal marine systems are aimed ultimately toward products that can be transferred to operations and information services.

Similar to the unique combination of scientific expertise needed to accomplish GLERL's mission, the branches, programs and committees that constitute GLERL's Operations consist of an equally unique combination of professionals. These professionals; computer scientist, logistics manager (Port Captain), industrial hygienist, administrative budget officer, information services and outreach officer, and facility specialist; through their human resources, branch capital and committees provide GLERL's researchers with quality infrastructure. Therefore, the purpose of the five-year Operations Plan is to set out guidance and priorities for the maintenance and improvement of GLERL's research infrastructure and operational services that are required for GLERL to carry out its mission.

SUMMARY OF GLERL'S VISION, MISSION AND GOALS

GLERL Mission Statement

GLERL's mission is to conduct high-quality research and provide scientific leadership on important issues in both Great Lakes and marine coastal environments leading to new knowledge, tools, approaches, awareness and services.

Ecosystem Forecasting

Definition: *Ecosystem forecasting predicts the effects of biological, chemical, physical, and human-induced changes on ecosystems and their components. These forecasts, both qualitative and quantitative, offer scientifically sound state-of-the-art estimations of likely outcomes.*

NOAA's Great Lakes Environmental Research Laboratory has a long history of addressing a wide range of environmental issues areas in the Great Lakes and other coastal environments. GLERL is the only NOAA research laboratory that has the breadth of scientific expertise to address complex ecosystem issues in the Great Lakes and other coastal systems. GLERL is committed to understanding the present state of the Great Lakes ecosystem in order to predict impacts of stresses placed on the ecosystem to provide information to decision makers that will aid management and decision making.

All of GLERL's long-range research is targeted toward producing a suite of forecasts and forecasting capabilities of physical and ecological conditions that will advance an ecosystem-based approach to management.

Mission Drivers

The Great Lakes are, arguably, the Nation's single most important aquatic resource from an economic, geographic, international, ecological, and societal perspective. It is because of this importance that NOAA does research here. NOAA is obligated under multiple statutory drivers to pursue research on the Great Lakes to advance our ability to manage this unique resource. The Great Lakes ecosystem is a clearly definable regional entity under NOAA's purview and mission responsibilities and it has a long history of interagency partnerships and collaborations, and thus has the greatest potential for success for testing any regional approaches. GLERL stands as NOAA's

representative to fulfill these requirements. The Great Lakes region has also led the nation in innovative management strategies that have spanned thousands of miles of coastline over decades, and they provide a large-scale testing ground for new science and management.

GLERL's mission is also defined by

- NOAA's Strategic Plan (http://www.spo.noaa.gov/pdfs/FinalMarch31st.pdf)
- NOAA's 20 Year Research Vision (http://nrc.noaa.gov/Docs/Final_20-Year_Research_Vision.pdf)
- 5 Year Research Plan (http://nrc.noaa.gov/Docs/NOAA_5-Year_Research_Plan_010605.pdf).

In its contribution to the 20 Research Vision and the 5 Year Research Plan, GLERL is developing forecasting capabilities that are designed to support an ecosystem approach to planning and management. GLERL is part of NOAA's ecosystem goal (Goal 1 below). GLERL research also contributes to other NOAA strategic plan goals.

NOAA's Mission Goals:

1. **Ecosystem: Protect, restore and manage the use of coastal and ocean resources through ecosystem management approaches**
2. **Climate: Understand climate variability and change to enhance society's ability to plan and respond**
3. **Weather and Water: Serve society's needs for weather and water information**
4. **Commerce & Transportation: Support the Nation's commerce with information for safe and efficient transportation**

GLERL's science issue areas support all 4 of **NOAA's Mission Goals (listed above)**.

GLERL's Main Science Issue Areas	*NOAA's Mission Goals*			
	1	**2**	**3**	**4**
Coastal Environmental Prediction	❖		❖	❖
Water Resources	❖	❖	❖	❖
Water Quality	❖		❖	
Human Health	❖		❖	
Fish Recruitment and Productivity	❖	❖		
Invasive Species	❖			❖

OPERATIONS PLAN

Successful achievement of GLERL's goals is highly contingent upon maintaining and enhancing infrastructure and operational services that provide the foundation for multi-disciplinary research.

GLERL's research depends not only upon well maintained facilities, but also on the efficiency and effectiveness of its operations. Accomplishment of research and observing requires a safe and secure workplace, an accurate accountability of funds, streamlined acquisitions, a continuous flow of information into and out of the laboratory, updated and dependable computer technology and access to vessels, facilities and vehicles. Without efficient and focused operations, research results can be costly, delayed or non-existent; thus hindering GLERL's ability to accomplish its mission.

This plan, therefore, will detail both goals and budgets necessary for smooth and efficient operations. GLERL infrastructure and operational services will be defined through the following sections:

1. *The Main Facility*
2. *The Lake Michigan Field Station Facility and Research Vessels*
3. *Computer Services Branch*
4. *Administrative Services Branch*
5. *Environmental Compliance and Safety*
6. *Information Services Branch*
7. *Instrumentation*

GLERL's Five Year Operations Plan is a living document and will be reviewed on a yearly basis for content. This review is necessary because some goals will require the full five years to complete while others may be completed within one or two years. For example, the Instrumentation Committee meets yearly to review the instrumentation list and make additions or deletions. Contrastingly, the facilities goals (field station and main facility) may take from two to nine years to achieve. Therefore, this plan is considered a draft, living-document which will be reviewed, edited and updated on a yearly basis to be consistent with GLERL's mission.

Main Facility

The Main Facility of the Great Lakes Environmental Research Laboratory is located in Ann Arbor, Michigan in leased facilities totaling about 26,000 square feet of usable space. In 2007, GLERL plans to move to a new leased facility located at 4790 S. State Street in Ann Arbor, Michigan. The new facility will increase the laboratory's net square feet to 40,225 and consist of 25,408 NSF of office, operations and storage space, 14,817 NSF of laboratory space and 12,100 NSF of outdoor storage.

The next few years will be a crucial time for GLERL operations as the commissioning of one building comes to an end and a new one begins. With a change of this magnitude it is inevitable that GLERL facilities will see significant changes over the next few years that will inherently change the way it operates.

Current operational areas will have added responsibilities for planning the move and establishing necessary functional areas at the new facility. As such, activity levels in the next two years will significant increase as operations must balance maintaining the current facilities while making preparations for the move and the set up of operations at the new facility.

Operational Elements involved with the new facility includes:

I. Working with architects to ensure building design specifications are met (space allocations, safety and DOC security).
II. Working with a construction engineer to ensure the architectural design is included in the building construction.
III. Moving
    A. Accurate Accounting for moving expenses
    B. Contracting Movers
    C. Purging obsolete files, equipment or property.
    D. Inventorying library/publications holdings before and after the move
    E. Wiring the new facility for communication technology (computers and telephones)
    F. Initializing a furniture outfitting scheme.

Vision

GLERL strives to have all facilities be safe, functional, comfortable, modern, easily maintained, durable, sustainable, flexible, and fully supportive of all the programs and missions.

Mission

To support GLERL science and promote laboratory excellence by providing a physical environment that meets operating needs while making best use of its physical resources and providing high quality and efficient services, advice, support and the information required to fulfill strategic needs.

Goals

1. **Continue to maximize the benefits of the current facility to the highest degree possible in support of GLERL science.**

   Although the new facility is on the horizon the challenges GLERL faces, striving to conduct its mission while residing in an aging facility that has half the laboratory and office spaces necessary, will continue to require close management until the move is complete. To accomplish this goal the following strategies will be employed.

   a) Maintenance issues will continue to be tracked and properly addressed through collaborative partnership with the lessor until completion of GLERL's residence.
   b) Improvements and renovations will be made where necessary and feasible.
   c) Relocate or economize low use areas to increase productivity of workspaces.

2. **Plan new facility for increased functionality, security and comfort.**

   Another major focus is the planning and design of the new building. To increase functionality, security and comfort of all the laboratory occupants, GLERL must be closely involved in the design and planning phases of this project. In doing so we anticipate greater satisfaction of employees and lower costs as our needs will be incorporated up front instead of through additional retro-fit designs.
   Strategies to meet this goal include:

   a) Working with architects to ensure basic building design specifications are met and proper infrastructure systems in place (wiring and circuitry needs, plumbing, HVAC)
   b) Designing new office, laboratory and common space layouts. A building committee with all functional groups represented will participate in this processes ensuring the specific requirements needed for all to be fully functional are met.
   c) Deciding on the proper specifications for a new security system. GLERL intends to install an upgraded security system in the new facility that will

eliminate the need for special internal programming and maintenance while increasing security capabilities.

d) Designing and initializing a furniture outfitting scheme to give the new facility a polished and professional cohesive appearance and atmosphere.

3. Proactively prepare for the movement of the laboratory.

There is much that will be done to prepare for and promote a smooth transition from the current facility to the new. It is anticipated that all employees will be proactive participants in at least some of the activities leading up to the move in order to minimize the length of disruption of their everyday functions. Some of these activities include:

a) Purge campaigns – By purging obsolete files, equipment or property ahead of the move the laboratory will optimize resources by lowering costs associated with moving (time and labor spent to pack and unpack, packaging and protective material costs, extra truck loads etc.)

b) Inventory – There is great benefit to inventorying furniture, equipment and items to be included in the move such as library/publications holdings before and after the move. By ascertaining what is truly on hand at the laboratory we will be able to more accurately account for moving expenses, identify items for purging or disposition, more readily identify what items were lost or damaged in the move, and identify items that are in need of replacement.

c) Services - Operations at GLERL require services from many different vendors. In preparation for the move, a consolidated list of activities that require contact and coordination with vendors and service providers is being created to assist us in staying on track and developing appropriate timelines for transfer of services (Phone, Computers, Utilities, Mail Services, etc.)

d) Contracting move services – Specifications for the moving needs of the lab will be generated and put out for bid. The more accurately laboratory requirements are evaluated upfront (IT, Phone, Lab specialty items, Hazardous materials), the more prepared the contractors will be to fully assist GLERL with the move and be able to stay on schedule minimizing the lab down time.

4. Relocate and establish operations at the new facility.

The intention is to have a smooth transition with continuous services and support with the least amount of disruption as possible. Whether the relocation occurs in one big move or in several phases, critical functions and operations will be established and implemented first. Then all other non-critical operations will be restored. Strategies to meet this goal include:

a) Establishing a good working rapport with the Lessor from the start. A good collaboration will be key to reestablishing regular maintenance and building operations.

b) Pre-planning schedules with our contractors and vendors to be sure our services are transferred and on-line at the appropriate time.

c) Providing all the appropriate information to our employees and moving contractors so that furniture and equipment gets to the properly designated locations.

5. Develop a facilities management program

a) Integrate departmental function and processes as it relates to facilities management – Current facilities responsibilities are housed in bits and pieces across the laboratory without clearly defined boundaries. Developing a more integrated facilities management program would improve communication and streamline facilities processes.

b) Refresh furniture – As part of a facilities management program the development of a furniture refreshment process would allow and ensure the replacement of the oldest and most dilapidated furnishings first and then a bit at a time on a cycle so costs can be spread out.

c) Develop new tools, approaches, and concepts for improving facilities management processes and maximizing facilities resources including conference rooms, fitness center, video conferencing equipment, etc.

Relocation Budget

Action	**Responsible Party**	**Cost***
Moving Building Contents	Laura Newlin	
Installing Security System	Cynthia Sellinger	
Installing Computer and Phone wiring (purchasing additional phones)	John Fenton	
Disposing of obsolete property	Terry Miller	
Decommissioning Laboratories	Kim Kulpanowski	**$25,000**

** Costs yet to be determined – quotes are being requested*

Field Services

Overview

The Field Services Branch maintains and operates GLERL's research vessels and field stations. Its primary function is the support of scientific fieldwork throughout the Great Lakes as defined by GLERL researchers, collaborators and partner institutions. As a support group within GLERL, the Field Services Branch subscribes to the vision, mission and overarching goals defined by the laboratory's strategic plan.

Operational details are directly influenced by science direction and annual field support requirements. The branch also acts independently on technical issues, externally funded projects and in areas that advance GLERL's objectives, partnerships or NOAA's interests in the region.

Branch efforts are divided between the functional aspects of conducting fieldwork and the management of assets. For this reason, this operations plan is divided into sections on Functional Goals and Asset Management. Both plans must develop in parallel for the branch and laboratory to succeed.

Branch Functional Goals

1. Facilitate scientific field requirements

a) Develop and execute efficient annual cruise schedules, vessel manning plans, equipment inventories and field station resources.

b) Participate in science initiatives planning and proposal development as a technical resource and to acquire advance notice of future field needs.

c) Inventory and maintain vessel based instrumentation and gear.

2. Security, Safety and Regulatory Compliance

a) Ensure personnel safety through compliance measures, resource maintenance, risk management and personnel training.

b) Develop best management practices that meet or exceed all regulatory requirements.

c) Maintain and execute vessel and facility security plans.

3. Asset management

a) Facility and vessel acquisition, maintenance and regulatory compliance.

b) Develop acquisition and modernization plans for GLERL field resources that anticipate future scientific needs.

c) Acquire equipment, skills and resources to support efficient, cost effective equipment repair and fabrication.

4. Provide new field science tools and resources

a) Develop staff resources and skills that enhance field projects.

b) Acquire equipment and design systems that add scientific capabilities.

c) Develop shore facilities to expand lab resources.

5. Marine technology initiatives

a) Develop best management practices and innovations for research vessels.

b) Provide technical leadership and expert information.

c) Advance marine technologies that support NOAA's greater mission.

6. Expand customer base

a) Facilitate the One NOAA initiative through support of Agency interests in the region.

b) Enhance existing partnerships with NOS and Universities.

c) Secure externally funded projects that compliment GLERL interests, acquire new technologies and support operating budgets.

Asset Management

Lake Michigan Field Station

The Lake Michigan field station was acquired in 1993. The facility has evolved in function and capital improvements. It currently supports two GLERL researchers, the ship operations group and provides dormitory and laboratory space for seasonal and transient field scientists. Muskegon is homeport to all GLERL research vessels.

The 2004 renovation of the historic building #1, which houses offices, conference room, dormitories and laboratory spaces, did much to stabilize the structure, meet compliance requirements and improve aesthetics. Parking, grounds and utility upgrades were addressed within the scope of that project.

Building #2 is occupied by the ship operations group and has seen no capital upgrades since a high bay addition in the 1970's. The building provides modest machine shop

facilities, limited equipment storage and a small boat repair bay. There are deficiencies in utilities and insulation. Deterioration in windows, doors and the roof warrant immediate attention.

Building #3 is devoted to office and laboratory spaces. The building has not been upgraded in 10 years, and is adequate for supporting current on-site research. However, space restrictions are an important limitation for support of visiting scientists and summer researchers.

The station has small boat dockage and deepwater piers for larger research vessels. The real estate fronts on the Muskegon River channel, the inner harbor beach and a boat basin shared with the Coast Guard. All shoreline is maintained by stone rip-rap and sheet metal piling.

Lake Huron Field Station

The facility at Alpena, Michigan is made available to GLERL researchers through a partnership with the National Marine Sanctuary at Thunder Bay. GLERL provides vessels and marine support to the Sanctuary. The facility has both deep water and small boat dockage and shore utilities. The tremendous potential for research through this partnership is largely undeveloped.

Lake Erie Field Station

The facility at Monroe, Michigan is made available to GLERL through a partnership with the Monroe Lenawee Math and Science Center. GLERL maintains a small boat dock and has access to shop, office and laboratory spaces. A separate lease with the Port of Monroe allows deep water dockage and shore utilities. This facility is integral to GLERL's interests in Lake Erie as dockage in the western basin is limited. Proximity to the Ann Arbor labs greatly enhances research possibilities.

Research Vessels

Ships and Small Boats Inventory - 2006

Vessel	*Class*	*Length*	*Age*	*Primary Mission*
R8001 Laurentian	SRV	80	31	Multidisciplined, long duration cruises
R6501 Shenehon	SRV	65	53	Short duration cruises, heavy deployments
R4105 Huron Explorer	III	41	31	Assigned to TBNMS, buoys, hydrographic
R2601 Cyclops	II	26	16	Trailerable, near shore work, fisheries
R2301 Remorse	I	23	21	Trailerable, near shore work
R1102	I	21	20	Trailerable, limited buoy maintenance
R1501	I	15	10	Trailerable, physical science projects
R1301	I	13	28	Tender
R2115	I	21	26	Assigned to TBNMS, dive operations

The average age of GLERL's boats is 26 years and only one was built for its intended research mission. Vessel capabilities have been modified to suit versatility rather than specific missions. There is a growing need to have mission specific vessels to support event response projects, fisheries research and observing system buoys. Currently GLERL maintains one vessel of each general mission category, which does not allow for multiple projects with the same vessel requirements.

Vessel availability is subject to competing science demands due to the seasonal nature of fieldwork. This has caused compromises in the scope, timing and detail of some field projects and has limited the potential for external funds. As a result, all science needs cannot be met with the current vessel inventory. Geographical requirements and transiting between lakes has caused some inefficiencies and science limitations.

The Laurentian is operated under a 15-year lease with the University of Michigan. Over the past six years, the Laurentian has greatly expanded GLERL's field capabilities and has demonstrated the need for a NOAA vessel of her size and capabilities on the Great Lakes. When the lease expires in 2013, the vessel with be 50 years old and could be returned to the university or retained by NOAA under a new lease. Replacement of the Laurentian should be a priority in strategic planning due to project lead-time.

Capital Resource Plans

The dual missions of field research support and asset management require a capital plan that anticipates future science requirements. Investment in facilities and vessels requires longer lead times than are typically afforded in GLERL proposals and

initiatives. Funds for such capital improvements or additions are not allowed in most project proposals. Therefore, these field resources must be funded and developed in advance of specific projects.

Lake Michigan Field Station

Renovate and expand Building #2 to better support vessel acquisition and maintenance initiatives. Project will include utility upgrades, the addition of a 30' x 60' high bay boat repair area, and address structural deficiencies. ($100K)

Expand Building #3 capabilities by doubling the number of state of the art laboratories that will focus on ecosystems studies. This facility will capitalize on the station's proximity to lake and river water, which is its greatest asset. Running lake water will support aquaria, large flow through tanks and culture rooms for microcosm and ecosystem studies ($3.5M)

A mobile laboratory trailer has been proposed to further expand GLERL's field capabilities beyond the regions supported by the three field stations. This 28' trailer would be coupled with a small research vessel to provide quick field support in remote areas or event response projects such as Harmful Algal Blooms or Oceans and Human Health. ($15K)

Vessel Inventory and Modernization Plan

To support current and proposed science initiatives, the Field Services Branch must be proactive in the selection, acquisition and outfitting of vessels. The most cost effective means of meeting future science requirements is to acquire surplus Coast Guard vessels that closely match GLERL small boat missions. The success of the Huron Explorer (UTB) conversion has demonstrated its value to several GLERL projects. Class I and II vessels would meet event response, near shore and some buoy service requirements.

The capabilities demonstrated by the Laurentian must be maintained beyond the life of the lease agreement. This multidiscipline, extended cruise capability is vital to GLERL interests and warrants funding for a new construction with state of the art capabilities and mission specific design.

This vessel acquisition plan would support proposed initiatives in ecosystems forecasting, observing systems, event response and provide resources for partner institutions.

New Acquisitions – Vessels

Vessel Type	**2007**	**2008**	**2009**	**2010**	**2011**	**20012**
Class I	2 (20K)	2(20K)				
Class II						
Class III UTB41		1 (75K)	1 (75K)			
SRV			Design (50K)	Funding (2.5M)	Construction	Complete
Cost	$40K	$105K	$125K	$2.5M		

Laboratory and Field Instrumentation

In order for GLERL to carry out its research, equipment and platforms for collecting, storing and analyzing field samples must be obtained, maintained and upgraded. Much of GLERL's present laboratory and field equipment is old and needs to be either upgraded or replaced. At the same time, recent advances in instrument technology now make it possible to make observations that were only dreamed of a few years ago. In order to maintain GLERL's science programs, older instruments need to be replaced and new instruments need to be purchased. Therefore, an instrumentation committee was formed at GLERL with the charge to: ensure GLERL's research excellence by prioritizing state-of-the-art instrumentation that will be purchased with base funds; a challenge to: coordinate amongst researchers and field operations to ensure that prioritized instrumentation has the maximum disseminated usage; and, duties to: 1) develop a prioritized list of instrumentation, 2) evaluate long-term instrumentation resources and infrastructure needs, 3) provide recommendations on existing (outdated) infrastructure instrumentation, and 4) provide advanced notice of meetings so that interested staff can attend.

With the above mention charge, challenge and duties, the Instrumentation committee developed a prioritized list of field and laboratory instrumentation and equipment. The mechanism used for prioritization is relevance to NOAA mission, broad application to the greatest number of research programs, and time critical requirements.

Justification for top-ranked items

CTD Sensors – CTD sensors are widely used on many GLERL research projects. Replacement sensors are needed to upgrade to more advanced sensors and replace damaged sensors.

Small Boat Winches – Winches are needed on new Whalers to collect ponars, operate CTDs, plankton tows and instrument deployment.

Percival Incubator - Incubators to be used for phytoplankton experiments and for culturing phytoplankton and zooplankton on multiple programs.

Peak Motion Analysis Software – Zooplankton research will require the initiation of a service contract for the currently owned video motion analysis system for this time critical work.

Laminar Flow Hood – A laminar flow hood will benefit current and future projects involving otolith microchemistry research. At present, GLERL does not have Class 100 clean room capabilities. Researchers currently travel to Windsor, ON to prepare otoliths/statoliths for otolith microchemistry work. This portable fume hood would enable time consuming sample preparation at GLERL and completion of work at Windsor

reducing travel expenditures and time spent in transit. The hood will be used by other GLERL researchers in need of Class 100 clean room capabilities.

Eddy Flux Correlation System – The procurement of this instrumentation supports GLERL research in collaboration with the Hydrometeorological Testbed (HMT) program (hmt.noaa.gov). It will give in situ measurements of terms in the energy and water budgets of the lakes. This system is aimed at measuring the fluxes of latent and sensible heat from the lake at the Chicago water intake crib, but will also be capable of measuring fluxes of momentum and carbon dioxide. In consultation with Ola Persson of the ESRL Physical Sciences Division (formerly Environmental Technology Lab), the following main components are desired: LI-COR 7500 open path infrared gas analyzer (measures concentration of H2O vapor and CO2), sonic anemometer, and heating system to keep equipment ice-free. The Chicago water crib site is given first priority because of existing GLERL observing system infrastructure and distance from shore.

Acoustic current profiler – GLERL's vector averaging current meters (VACMs) were made ineffective due bio-fouling caused by invasive mussels. Replacement of the VACMs (now on loan to Woods Hole Oceanographic Institution), with acoustic doppler current profilers (ADCPs) will support oceanographic and physical/ biological coupling research in Lake Champlain and ongoing coastal projects formerly done with the VACMs.

Microscope Prisms - Two long-working length objectives (20X and 40X) and Differential Interference Contrast (DIC) prism for 10X objective are needed for the Leica DM6000 Microscope (Dyble lab) to allow morphological examination of whole Microcystis colonies and other colonial cyanophytes (natural and cultures) using DIC optics. The newly purchased microscope is fitted with standard (short working distance) objective lenses, which allows examination of material under a cover glass, which squashes the colonies (typically 100's of microns in size). The lenses and prism would allow examination of whole colonies (in a Palmer nanoplankton counting chamber). In addition to the spectacular optics for visualizing the colonies with DIC and fluorescent optics, we are particularly interested in quantifying the amount of mucilage relative to cell volume. Addition of India ink as a background coupled with the DIC optics allows quantitative examination of the thickness and volume of the mucilage using image analysis.

Flouroprobe – The bbeFluoroProbe and adapter is used for quantification of algal group abundance in natural seston and lab cultures. The instrument will be used to quantify abundance of the 4 dominant algal groups (blue-greens; greens, cryptophytes; diatoms plus dinoflagellates) found in natural seston and in laboratory cultures. The primary application is to quantify grazing of mussels on different algal groups found together in mixtures. For example, strains of *Microcystis* in culture can be systematically compared in grazing experiments with "control" algae, simultaneously. Presently, methods involve crude separations of *Microcystis* using screening followed by fluorometric analysis of total chlorophyll. The instrument will provide real-time output of results. The instrument is the most advanced of its kind and will be useful to phytoplankton ecologists and

especially useful for vertical profiling algal groups for exploring effects of the dead zone on ecology of the central basin of Lake Erie. Note this instrument tells you nothing about abundance of detritus or microzooplankton.

High Pressure Liquid Chromatograph (HPLC) upgrades – A new pump and fraction collector is needed for the Lake Michigan Field Station (LMFS) HPLC system. The pump is obsolete, and likely to fail soon. The pump and fraction collector were purchased in 1990, and are needed to keep the system running. The HPLC is used for microcystin analysis, growth rates, and algal pigments.

ROV Tracking System – An acoustic tracking system will be used on the University of Michigan's MROVER or other ROVs to correlate ROV-mounted instrumentation with latitude and longitude while data collection is taking place underwater. The system can used to guide ROVs during transects and for registration with physical, chemical, and biological sensor data in support of groundwater discharge, invasive mussel, and sediment classification mapping research.

Ice-maker for LMFS – An icemaker is needed to support preservation of field samples during transport from LMFS to GLERL in Ann Arbor.

Temperature Recorders - Temperature sensors are needed in conjunction with ADCPs to make speed of sound corrections in measurements.

Multiple Opening/Closing Net – MOCNets are needed to collect spatially distinct biological samples over a vertical profile.

Proposed Instrumentation and Field Equipment, 2006

Instrument	# of Units	Priority	Cost / Unit $	Total Cost $
Small Boat Trailer	1	1	15,000	15,000
Small Boat Rigging	2	1	5,000	10,000
CTD Sensors	10	1	5,000	50,000
Percival Incubator	1	1		7,000
Peak Motion Analysis SW	1	1		1,900
Laminar Flow Hood	1	2		2,500
Eddy Flux Correlation	1	2		30,000
Acoustic current profiler, RDI	2	2	30,000	60,000
Microscope Prisms (20,40X)	1	2		6,000
Flouroprobe – Phyto analysis	1	2		28,000
Upgrades for HPLC	1	2		20,000
Percival Incubators	2	2		11,600
ROV Tracking System	1	2	18,000	18,000
Ice Maker for LMFS	1	2	10,000	10,000
Temperature Recorders	15	2	1,500	22,500
Multiple opening/closing net	1	2	65,000	65,000
CTDs for use on Small Boats	2	3	25,000	50,000
HPLC System, LMFS	1	3	65,000	65,000
Acoustic current profiler, High Frequency	2	3	20,000	40,000
Broad band sonar	1	3	120,000	120,000
Single-point current meter	2		20,000	40,000
Temperature Recorders	25	3	1,000	25,000
Vertical profiler	2	3	20,000	80,000
Underwater observatory	3	3	50,000	150,000
Autonomous UW Vehicle	1	3	300,000	300,000
Environmental Laboratory – walk in	1	3	30,000	30,000
Plankton video recorder	1	3	50,000	50,000
Walk in freezer	1	3	15,000	15,000
Scintillation counter	1	3	30,000	30,000
LISST Particle Analyzer	1	3	30,000	30,000
LISST w/ Settling Chamber	1	3	40,000	40,000
McLane Water Filtration	1	3	23,000	23,000
ROV – Seabotix	1	3		30,000
Nortek Waves (rogue waves)	1	3		25,000
Dual Frequency Sidescan	1	3		65,000
Benchtop FlowCam	1	3		79,000
Inverted Microscope	1	3		70,000
TOTAL				

Note: The instrumentation list will be evaluated on a yearly basis and purchases will be made when funds are available.

Computer Services Branch

The GLERL Computer Services Branch (CSB) strategic objective is to develop a secure, reliable, technically robust operating environment to support GLERL's mission goals and ensure accessibility and the highest data quality for GLERL scientific and administrative users, as well as the public. This objective recognizes the importance of information technology at GLERL and within NOAA and must be poised to support the changing mission requirements in the decade ahead. The vision of the NOAA and GLERL Strategic plans will bring challenges in information technology planning, security, and network operations for the next five years. Investments not only in hardware and software, but also in human capital will be required. Developing state of the art, robust fault tolerant networks, ensuring the security of the enterprise, implementing an IT architecture, and knowledge management tools will be key to GLERL and NOAA's future. GLERL's IT infrastructure operates within the scope of the IT policy and architecture plans which are implemented by the Department of Commerce, NOAA and OAR.

Existing Computer Structure

The existing Information Technology (IT) environment at GLERL consists of a distributed computing network of desktop computers, UNIX workstations and supporting servers. GLERL plans to continue utilizing the distributed IT environment model. In GLERL's multi-discipline research environment, each researcher has benefited from having a distributed computing environment by not having a single point of failure or bottleneck which may cause an interruption in research analysis.

The responsibilities of the Computer Services Branch (CSB) are centralized server management, which includes web, data, directory, backup, software licenses, security and patch update services; internal networking; internet connectivity; email services; general applications support of scientific and administrative users; workstation system administration; and overall IT infrastructure support functions. In addition CSB coordinates all IT procurements and supports GLERL's video/voice communications systems and physical building security systems. Scientific programming for projects within the research division at GLERL is provided by research scientists and members of the Scientific Support and Technology Branch and Joint Institute (CILER) personnel and varies according to need and project budget.

GLERL's Computer Planning Committee consists of key IT staff and scientific researchers and meets at regular intervals to review GLERL's current IT infrastructure, plan future IT acquisitions and discuss how to best support GLERL's research mission with existing computing resources. Research scientists are consulted individually to determine the IT requirements for individual projects, ensuring that project computing requirements will be compatible with supporting IT infrastructure.

The acquisition strategy for IT investment at GLERL is reviewed and revised annually to reflect updated and revised research programs as well as to consider new technology developments that may affect these programs.

Metrics used for determining project success/failure are an intrinsic part of the individual research projects and the initial proposals for research from the granting agencies based on predetermined milestones. Research projects using IT technology for data analysis and modeling have regular reviews by project staff, collaborative researchers and representatives from the granting agency to determine that project budget, time line and quality are within the parameters established at the onset of the project.

Future Plans and Goals for 2006 - 2011

1. **Improved system backups and data storage for information products and services**.
   Upgrade PC backup software Veritas Backup Exec, to latest version. Install disaster recovery option of backup software. Unsupported version of Veritas Backup Exec currently in use, no disaster recovery option. Provide network connected systems with reliable backups. Backup exec software will be current with all vendor security patches. Easier system restores utilizing disaster recovery option.

2. **Improved operating systems support by reducing the number of variants allowing staff to focus on supporting mainstream operating systems.**

   Upgrade Linux systems using various version of the operating system to a single version of Red Hat Enterprise. Provide improved system administration by focusing on a single version of the Linux operating system. All Linux systems will be at same level of recommended software version. allowing system administrator and users to optimize system and user support.

3. **Improved network data throughput for user desktop computer.**

   Provide desktop systems with high speed data throughput of 1 Gbps.

4. **Plan and implement GLERL's IT and communications infrastructure at new facility.**

   Minimize downtime of essential IT services and impact on GLERL user community. Strive to achieve seamless migration of IT equipment and users to the new building.

5. **Improved PC server cluster support, performance and services**.

   Upgrade the PC server cluster to current server operating system levels to better support interoperability, file and application services, and IT security measures.

6. **Upgrade software licenses to utilize server based or site licensing**.

   To maximize the availability of software applications and tools to a wide user community, utilize server based licensing where possible and cost effective, rather than procuring individual user licenses. Applications currently implemented with server based or site licensing include Microsoft Office, Adobe Acrobat Pro, IDL, Systat and ArcView.

Hardware Refreshment

User Workstations - GLERL will optimize price-performance of next generation computer systems based on market trends. Best practice indicates that at any given time, a price-performance breakpoint occurs when purchasing systems whose performance is approximately 80% of the highest available performing systems in the market. GLERL will utilize commodity, off-the-shelf computer systems (i.e. Intel, AMD, IBM, Motorola, etc.). Market trends indicate a doubling of performance every 18 months. GLERL system refreshment will occur every 48 months. Assuming approximately 60 permanent users would require that 15 workstations per year be replaced. When evaluating performance the following system components are to considered:

CPU, Memory, Input/Output (I/O), Mass storage, Communication

GLERL will implement an annual bulk purchase of identical PC baseline computer systems. This will minimize procurement, configuration and support requirements for the life of the system. It's intended that users continue working with a system throughout its life cycle. IT Managers now agree that cascading desktop computers from high-end users/applications to low-end users/applications more than once during the lifetime of the computer is administratively burdensome and too costly.

When possible new users will be supplied with a newly acquired baseline computing system or one that has been recently reconfigured to meet baseline requirements If the user has required needs that cannot be met by a baseline computing system, and existing computing resources cannot be found, than the project manager for the new user will cover start up costs from within their project.

Current users who have computing needs beyond the baseline system will have to cover those costs through their own proposal projects. The NOAA and OAR IT Architecture Plan will be followed where possible. Systems which are not covered by the IT Architecture Plans need special consideration for compatibility, support, maintenance and security, and approval

This plan assumes, one user, one baseline PC system. Assuming pricing from Dell Computers, a baseline system would cost approximately $1400. Given a refreshment of 15 systems per year would require an investment of $21,000 per year

Display Monitors - Monitors generally do not need replacing as often as workstations and will be refreshed at a slower rate than systems. Current monitor technology trends favor flat panel displays. These units operate on less power and place smaller demands on air-conditioning systems. GLERL will replace CRT monitors with Flat-Panel monitors as part of this refreshment plan. Assuming a 6-year life cycle and 60 users, this would require the replacement of 10 monitors per year. Assuming costs of $600 per monitor, would require an investment of $6000 per year.

Servers - For Backups, Applications, Storage, Web, email, DNS, terminal, proxy and cross-platform gateway. Moving to a Linux based server operating system, will allow GLERL servers to utilize the standard PC baseline computer systems that is used throughout the lab. In the coming years servers should be replaced on the same cycle as workstations. GLERL currently uses 16 servers for various tasks, including the 7 servers performing network backups. Assuming a 4-year replacement cycle and taking into account the higher costs of tape storage devices, the estimated to cost to replace 4 servers per year is $12,000 based on the average server cost of $3000.

Printers – The network of 8 laser printers, color printers and one large format plotter at GLERL and LMFS should be refreshed on a 4-year cycle. This would require that 2 printers be replaced per year. Annual cost of replacement would be $7000 per year, assuming a cost of $2500 per printer plus a ¼ portion of the plotter cost at $2000.

Networking – firewalls, switches, hubs, cabling, analysis tools. GLERL's networking infrastructure is operating on a switched 100BaseT connection to each workstation with a 1000BaseT switched backbone in Ann Arbor. Currently LMFS is operating on a 100BaseT hub network. Assuming a 5-year refreshment cycle and based on a current hardware replacement value of $25,000, annual cost of networking hardware refreshment is $5000 per year. Modifying the network cabling infrastructure is primarily labor intensive and is only done for new construction or the technology completely changes. GLERL's Ann Arbor and LMFS facilities are currently wired with Cat-5 Ethernet cabling which should meet the networking needs for the next 5 years.

Internet Service – Merit Network provides GLERL's Ann Arbor and Muskegon facilities with network access to the Internet via 2x T1 (3.0 Mbit/s) and a partial T1 (256kbit/s) connections respectively. Merit also provides dialup Internet access for users who are not on-site. Currently, network bandwidth is meeting the needs of GLERL users at a annual cost of $23,000 per year.

Personal Peripherals - Scanners, printers and specialty devices, which are not intended for general network use, need to be refreshed individually as a separate proposal request and are not considered as part of this plan.

Programmatic Computing - Needs and requirements for systems that are not covered by the general replacement plan, should be requested individually and funded by separate proposal projects.

Software Refreshment

Office Suites - GLERL supports the NOAA Office Automation standard, using Microsoft Office Professional. GLERL participates in the Microsoft Enterprise Agreement through NOAA, which covers software licensing for 100 users. GLERL is a collaborative research organization and as such must conform to the standards embraced by external organizations, including universities, other government research organizations and publishers. In practically all cases these collaborators use the Microsoft Office Suite for Windows systems.

Site Licenses - GLERL, OAR and NOAA maintain several application software site and server based licenses with annual maintenance costs approximately $6000 per year. These licenses include: Adobe Acrobat Professional, McAfee Virus Scan, WinZip, ArcView, IDL, Systat, Sas, End-Note, IDL, ProCite and Reference Manager.

Programmatic Applications - If application software is not available as part of the GLERL software infrastructure, then these applications need to be funded from within the project manager's proposal. If there is a lab-wide need for an application that is not part of the software infrastructure, it could be proposed that it be added.

Administrative Applications - GLERL administrative software is generally Web based or are custom applications and are funded outside of GLERL.

Operating Systems – Linux, Microsoft Windows XP, and Mac O/S 10.x will become mainstream operating systems at GLERL. It is critical that GLERL limit the variants of Operating Systems to minimize maintenance complexity of workstations and servers. Refreshment of operating systems will generally occur when the system is put into service during the 4-year refreshment cycle. However there may be times when an operating system may require updating before the lifecycle of the system is completed, in order to maintain compatibility or meet security requirements.

Administrative Services Branch

Vision

The Administrative Branch aspires to provide outstanding customer service to go above and beyond in meeting the administrative needs of the employees at GLERL.

Mission

The Administrative Branch provides a wide range of administrative support including domestic and foreign travel, time and attendance, procurement, budget, vehicle fleet management, property management, human resource assistance, etc.

Current Goals

1. ***Provide exceptional services and expert information to internal and external customers.***

The purposes of these services are to:

a) Facilitate fluid operations in support of the scientific goals of the lab.

- Accurately prepare and maintain time and attendance and related records.
- Accurately process foreign and domestic travel arrangements and documents within a given timeframe.
- Accurately process and reconcile purchase card transactions within given timeframes.
- Maintain adequate and orderly stock of office supplies.
- Assist in the timely procurement of goods and services.
- Assist supervisors in recruitments and promotions.
- Coordinate interactions with our cooperative institute including proposals and funding.
- Coordinate collaborations with other agencies including grants, proposals, memorandums of understanding, and transfer of funds.
- Maintain and coordinate the use of the government vehicle fleet.
- Maintain GLERL's property in an accurate and efficient manner.

b) Provide expert administrative information to employees, supervisors, management, headquarters, other agencies and the public.

- Coordinate the arrival of new and visiting personnel and ensure proper security clearances are performed.

- Accurately track and report on human resource related activities such as training, awards and equal employment opportunity.
- Promptly assist visitors and answer the public phone line in a friendly and professional manner.
- Handle requests for information promptly and effectively.
- Communicate with lab personnel to identify needs and expectations.

2. *Manage the fiscal resources of the lab.*

- Formulate the annual budget and assist management in making funding decisions within the limits of our allocations.
- Conduct cost analyses and suggest implementation of new measures to cut operational costs.
- Maintain accurate financial records.
- Provide accurate and timely budget information to managers and headquarters.
- Process bills, invoices and receiving reports in a timely manner and resolve discrepancies.

Future Goals

1. Develop new tools, approaches, and concepts for improving processes.

Develop methods to streamline or otherwise improve office procedures and processes related to administrative function and activities. Identify and develop procedures, macros, and/or templates to facilitate input of information quickly and easily.

- Implement new procedures or improve an existing process within each functional area (e.g., budget reporting, time and attendance, travel, human resources, etc.).
- Develop fully functional Human Resources Capability.
- Streamline vehicle acquisition, maintenance and allocation.
- Develop and streamline property accountability procedures and maintenance.
- Maintain and streamline GLERL's granting process.

2. Provide for the smooth transition to new programs and procedures.

- Disseminate information and coordinate implementation and training for new programs to ensure a smooth transition and no interruption in service.

3. Assist in coordinating the move to a new facility.

- Close out the utilities at the current location and assist new lessor with coordinating the start up of utilities at the new location.
- Develop and implement a plan to transition services from current location to new location with little to no interruption to include Time and Attendance, Travel, Office Supplies, etc.
- Assist in necessary procurements for the new facility.

Environmental Compliance and Safety

Mission

Promote safety and environmental compliance as an integral part of the way GLERL does business.

Short-term Goals (March 2006-March 2007)

1. **Training: To provide ECS training opportunities in accordance with regulations**.

   This will include the planning and coordination of 06-07 required ECS recurring training and safety orientation sessions in addition to conducting the New Fellows orientations in May/June 06.

2. **Inspections: To perform routine inspections in accordance with the NOAA Safety Policy and use this activity as a mechanism to facilitate continuous improvement, routine maintenance and timely recognition of deficiencies.**

   Action items will be tracked in safety inspection reports submitted to the Deputy Director.

3. **Radiation Safety Program: To conduct GLERL's Radiation Safety Program in accordance with NRC requirements.**

   Decommissioning surveys for 2205 Commonwealth Blvd will need to be performed in accordance with NRC requirements/protocols. An NRC license amendment will need to be created and submitted for the removal of 2205 Commonwealth Blvd from our license and the addition of the new building location if radioisotopes will be used/stored at the new building. Radioactive waste shipments will need to be prepared to transport and dispose of rad waste before moving to new building. The radioisotope inventory will need to be updated. The RSO and Deputy RSO will need to attend a refresher course and/or decommissioning training course. TOTAL Decommissioning Estimate: 25K

4. **Written Programs: To provide useful operational documents and comply with the regulations.**

   A complete rewrite of Radioactive Materials SOP will be needed to reflect new building design and use. A major revision of most written programs will be needed in FY07 to reflect the new facility amenities, research programs, and procedures.

5. **Hazardous Waste Program: To comply with the regulations that govern the handling of hazardous waste generated as the result of our activities.**

   Hazardous waste shipments will be conducted before the move to the new facility. Hazardous waste characterizations of previously unidentified waste streams may be necessary.

6. **Project Reviews: To consider environmental, health and safety issues associated with research projects by meeting with PIs to discuss their funded projects and to participate on the New Building committee and make ECS recommendations**.

7. **Department of Transportation: To comply with DOT requirements for the transportation of hazardous materials while coordinating the transportation of hazardous materials from the old building to the new building with the lab team and others and for the transfer of radioactive material to Muskegon if necessary.**

Long-term Goals (March 2006-2011)

1. **ECS Training: To enhance ECS training capabilities to promote timely, effective completion of required training, address any new research program training needs such as biological laboratory safety and fall protection, and reinforce training content through a continuous improvement inspection program that promotes a safety culture where all take an active role.**

2. **ECS Program: To develop ECS program procedures and practices that address the new building location and features and new research efforts.**

   To support the computer modeling efforts associated with several of the GLERL research areas and the move into new offices, the ergonomics of computer work station design will need to be a major focus of the ECS program. In addition, improved access to user friendly ECS procedures will be established to facilitate their use, effectiveness, and timeliness as well as compliance with regulations.

3. **Radiation Safety Program: To develop new and improved procedures for handling radioactive materials at the new building in accordance with NRC requirements**.

   This goal will be driven by the decision to request the use of radioactive materials at the new GLERL building. If that is the case, upon approval of NRC, the RSO will develop a program that is as simple as possible while complying with the requirements of the NRC regulations and license. A new radioisotope inventory tracking system will need to be developed to manage the program in addition to written standard operating procedures. The RSO and Deputy RSO will need to

attend refresher training to maintain working knowledge of NRC regulations and requirements.

4. **Chemical Hygiene Plan: To develop new and improved procedures to address the use of chemicals at the new facility and in new research programs**.

   The Chemical Hygiene Officer will coordinate the establishment of a new Material Safety Data Sheet library, chemical inventory system and a written program to address the new research program needs such as biological laboratory safety. New safety signs and equipment, emergency response information, etc. will need to be selected and posted. The Safety Committee Chair will solicit input into these and other areas of the CHP development during routing Safety Committee meetings.

Information Services Branch (ISB)

Mission

ISB's mission is composed of the following goals:

1. Coordinate and expedite the internal review, editing and submission of GLERL scientific manuscripts to peer-reviewed journals and subsequently ordering and managing the inventory of published reprints for dissemination to the scientific community and other interested constituents.

2. Coordinate and facilitate internal review and editing of GLERL/NOAA Data Memos and Technical Memos.

3. Provide GLERL/CILER scientists with graphical support in production of figures, images, etc. for use in scientific manuscripts, as well as layout and production of posters for scientific conferences.

4. Manage GLERL Library resources to ensure that GLERL/CILER scientists are afforded full and timely access to all required references in the scientific literature and other scholarly information sources.

5. Manage GLERL's Web activities to ensure that GLERL's mission is clear and accessible to the Great Lakes, National and International communities.

6. Inform GLERL's constituents of the lab's scientific products, services, and expertise and provide access to such resources as needed in a prompt and appropriate manner. GLERL constituents include the Great Lakes and coastal science communities, state and federal government agencies, state, national and international commissions, K-12 and higher educational institutions, professional scientific organizations, other non-government organizations (including the private sector) and the general public.

Information Services Branch Components

Outreach and Publications Unit - Consists of federal full-time permanent Writer-Editor and ISB Branch Chief

Library – Consists of full-time CILER Librarian / Web Master

Web Content and Web Database Management Teams - Librarian serves as Web Master, Leader of Web Database Management Team and member of Web Council.

Writer-Editor and ISB Branch Chief serve on Outreach Group of Web Content Team and ISB Chief is Head of Outreach Group as well as a Web Council member. It should be noted that the Web Content and Web Database Management Team are ***ongoing working groups*** whose members have a defined percentage amount of their time assigned to carry out tasks required to maintain and further develop GLERL's web site resources.

Sea Grant Liaisons – Writer-Editor and ISB Chief serve as liaisons with two in-house Michigan Sea Grant agents to make GLERL scientific products, services, expertise available and work collaboratively on outreach, communications and education projects.

Immediate Objectives (March 2006 – March 2007)

1. Develop position description for permanent full-time federal Librarian / Web Master position by October 1, 2006 and conduct subsequent hiring action.

2. Successfully plan and coordinate the move of all ISB assets, including the GLERL Library from GLERL's existing facility to the new facility (October 2007 – February 2007)

3. Work with the Web Content Team, Data Management Team and Computer Group to create and maintain an interim GLERL web site to transition the move from GLERL's existing facility to the new facility

4. Plan and coordinate Great Lakes Tour for National Ocean Sciences Bowl 4th-place finisher in national NOSB competition to be held in Monterey, California in May 2006 (Great Lakes Tour to be held in July or August 2006).

5. Plan and coordinate 10th annual Great Lakes Bowl regional NOSB, February 2007

6. Plan and coordinate outreach events including:

   a) Great Lakes Congressional Day and Congressional office visits, March 16, 17, 2006

   b) Novi Boat Show, March 17-19th, 2006 in cooperation with National Weather Service White Lake, MI Weather Forecast Office (WFO)

   c) Washtenaw Community College Earth Day Festival, April 2006

   d) Department of Energy Award ceremony honoring petroleum-free GLERL R/V Huron Explorer, April 18, 2006

   e) Set up and staff GLERL exhibit at 49th Annual Conference on Great Lakes Research, University of Windsor, Windsor, ON, May 22 – 26, 2006

f) Plan and coordinate groundbreaking ceremony for new GLERL facility. time/location to be determined.

g) Plan and coordinate July 2006 Great Lakes exhibit at Ann Arbor Public Library in cooperation with Michigan Sea Grant, Great Lakes Commission, and USGS Great Lakes Science Center

h) Set up and staff GLERL exhibit at NOAA 100th Anniversary celebration to be held at the National Weather Service Weather Forecast Office (WFO), White Lake, MI on Saturday, September 30, 2006

i) Set up and staff shared exhibit with NWS White Lake WFO at Metropolitan Detroit Science Teachers' Meeting, October 2006, Lawrence Tech. University, Southfield, MI

Long-term Objectives (2006 -2011)

1. Continually explore new opportunities to use advanced and emerging technology to streamline any/all ISB support activities to improve overall efficiency in 1) manuscript processing; 2) graphical production / processing of figures, images, and posters; 3) Library support; 4) Outreach, communications and education.

2. Continually explore new opportunities, partnerships and related mechanisms to improve and expand success of ISB outreach, communications and education activities.

3. Identify new potential constituent groups that might benefit from use of GLERL scientific products, services, and expertise and develop means of making such benefits available too such groups.

4. Work in an ongoing fashion with the GLERL Library Committee to ensure that library resources are managed to fully support the needs of GLERL/CILER PI's while serving the need of external users.

5. Work ongoing with the GLERL Web Content Team and Web Database Team to ensure that GLERL web site resources are: 1) accurate and up-to-date; 2) fully compliant with all NOAA/DOC/ federal web requirements; and 3) fully reliant on advanced and emerging technology to ensure a "state of art" level.

6. Work cooperatively with the GLERL Operations Council to ensure that ISB goals and objectives are fully integrated with Ops Council goals and objectives.