2019 SIX-YEAR PLAN: NARRATIVE

VIRGINIA INSTITUTE OF MARINE SCIENCE

OVERVIEW:

The totality of the six-year plan should describe the institution's goals as they relate to goals of The Virginia Plan for Higher Education, the Higher Education Opportunity Act of 2011 (TJ21) and the Restructured Higher Education Financial and Administrative Operations Act of 2005. The instructions under institutional mission and alignment to state goals, below, ask for specific strategies around four priority areas. Other sections will offer institutions the opportunity to describe additional strategies to advance institutional goals and state needs. *Please be as concise as possible with responses and save this narrative document with your institution's name added to the file name.*

Section A. Institutional Mission, Vision, Goals, Strategies, and Alignment to State Goals: Provide a statement of institutional mission and indicate if there are plans to change the mission over the six-year period.

Provide a brief description of your institutional vision and goals over the next six years, including numeric targets where appropriate. Include specific strategies (from Part 3 – Academic-Financial Plan and Part 4 – General Fund Request) related to the following areas: (1) access and enrollment, particularly for underrepresented students; (2) retention, completion and time to degree; (3) affordability and funding; and (4) workforce alignment and retention of graduates. Strategies also can cross several state goals, notably those related to improved two-year and four-year transfer, and should be included here. If applicable, include a short summary of strategies related to research. The description of any strategy should be one-half page or less in length. Be sure to use the same short title as used in the Part 3 and Part 4 worksheets.

RESPONSE:

The Mission of the Virginia Institute of Marine Science is to seek and broadly communicate knowledge in marine and coastal science to the Commonwealth of Virginia, the nation, and the world through research, education, and advisory service.

As a nationally and internationally recognized premier marine science institute, our overarching goals in the VIMS Vision are to (1) make seminal advances in understanding marine and coastal systems through research and discovery, (2) translate research findings into practical solutions to complex issues of societal importance, and (3) provide new generations of researchers, educators, problem solvers, and managers with a marine-science education of unsurpassed quality.

Restore Saltwater Fisheries Survey Funding. Long-standing fisheries surveys by VIMS provide the scientific data on which saltwater fisheries in the Commonwealth of Virginia are managed. These surveys have been supported by a combination of state dollars and federal grants. Recent reductions in the state and federal funds resulted in five of our most important surveys being dramatically cut. Beginning in 2018, federal funding from the US Fish and Wildlife Service that flows through the Virginia Marine Resources Commission (VMRC) was reduced from $1.8M to $1.13M, largely as a result of a federal decision to alter the percentage split between freshwater and saltwater fish survey support provided to Virginia. At the same time, VMRC's source for providing their share of a 33% state match requirement (historically VMRC provided $300K and VIMS provided $300K of the required $600K match for $1.8M of federal funds) was reduced by the General Assembly so that most of those dollars could be used to support the Saltwater Fishing Tournament.

Secretary Strickler and the Commissioner Bowman managed to negotiate a slightly more favorable split in federal funds that resulted in a federal funding of $1.4 M going to saltwater fisheries surveys, but the total loss between the state and federal sources was approximately $700K. VIMS implemented austere cuts to these surveys, reduced personnel, and combined surveys to gain efficiency, but still fell

$250K short of having funding needed to sustain the surveys at a level to meet the needs of the Commonwealth. We are seeking to recover this lost support to maintain these surveys that are critical to wise management and economic viability of Virginia's saltwater fisheries.

***Manage Aquatic Diseases*.** Recent outbreaks of disease have damaged economically important and ecologically sensitive marine resources in the Commonwealth and nation. Examples include mycobacterial infections in striped bass, dermo and MSX in oysters, *Hematodinium* in blue crabs, morbillivirus in dolphins, wasting disease in seastars, bacterial infections in scallops, and parasitic infections in eels, to name a few. The pathogens responsible for these outbreaks are not well known, their risks to marine life and potential to spread remain understudied, and their ecological impacts have been difficult to assess with existing resources. To meet the challenge of diseases in marine systems, this initiative will provide science-based guidance on the management of existing and emerging disease threats to critical fishery and aquaculture resources in the Commonwealth and Chesapeake Bay region. VIMS scientists have considerable expertise working with diseases of marine animals; however, we aim to leverage this expertise by establishing state and regional response protocols, identifying and liaising with key groups such as state and federal resource managers and public health officials, as well as the fishing and aquaculture industries, serving as a clearinghouse for information to policy makers, and developing modeling tools to mitigate the effects of disease outbreaks. The health of marine resources such as fish and shellfish is fundamental to the growth of industries and the revitalization of coastal communities dependent upon them. This initiative will provide expert guidance on the management and mitigation of existing and emerging disease threats to vital fishery and aquaculture resources in the Commonwealth and Chesapeake Bay region. It will significantly enhance our responses to known pathogens and provide a clear framework, based on state-of-the-art science, for addressing the dangers of emerging diseases.

Support Virginia Department of Health (VDH) and Virginia Marine Resources Commission (VMRC) Needs in Shellfish Aquaculture Management. Shellfish aquaculture in one of the fastest growing economic drivers in coastal Virginia, especially in rural areas. With this growth has come the need for new monitoring and assessment programs to support the work that VDH does in protecting human health and that VMRC does in managing the use of the state's aquatic resources. VIMS has the technical skills to conduct these new programs, but lacks the state-supported personnel to conduct the monitoring and some of the needed field sensors. Federal grant funding, which we employ with great success in supporting our research programs, is typically not available to support such monitoring programs. State support, in three separate monitoring programs, will allow us to meet the needs that have been expressed to us directly by VDH and VMRC.

1. Improve Risk Management of Vibriosis. A key threat to the growth and sustainability of shellfish aquaculture is the association of human-pathogenic Vibrio bacteria with product marketed for raw consumption, in particular oysters. Infections by the two Vibrio species of concern, Vibrio vulnificus and Vibrio parahaemolyticus (or vibriosis) are responsible for an estimated 80,000 illnesses and 100 deaths in the U.S. annually, with most of these infections associated with consumption of raw or undercooked shellfish. These bacteria can also have significant repercussions for the shellfish industry through product recall, closure of harvest beds and reduced opportunity for sales associated with negative publicity. With the rise in shellfish production and in consumption of shellfish, particularly oysters, as a raw product, as well as the likelihood for Vibrio species abundance to increase with warming seawater, favorable conditions are in place for an increase in vibriosis cases. Because these bacteria occur naturally in shellfish and their surrounding environment, preventing illnesses relies on a robust monitoring program. Within this context, increased monitoring of our local waters and shellfish will enhance our understanding of the factors driving the distribution and abundance of these bacteria in the environment and in shellfish. We will collaborate with VDH to foster science-based risk management strategies.

2. Determine Carrying Capacity for Shell Production. Sustaining Virginia's shellfish aquaculture industry and enabling future expansion are dependent on an adequate food supply for the shellfish; this supply comes from primary production by phytoplankton which sets the amount

of shellfish that can be grown in an area (carrying capacity). Increasingly, VMRC is seeking VIMS' guidance on the carrying capacity of shellfish growing areas throughout Virginia's coastal waters. To satisfy this request, we need accurate, up-to-date measurements of local rates of phytoplankton production, a quantity that changes as nutrient inputs and temperature vary. This initiative will allow us to conduct monthly surveys in shellfish growing waters throughout Tidewater Virginia to build and maintain a spatially-explicit database that can be used to develop carrying capacity estimates for oyster and clam production in these waters. In conjunction with this we will develop user-friendly decision support modeling tools that can be directly used by VMRC and the shellfish aquaculture industry to assess carrying capacity and make informed decisions about the production capacity of a given water body.

3. Assess Coastal Acidification and its Impact on Shellfish Aquaculture. Coastal acidification, caused by increased atmospheric CO2, presents a serious and credible threat to the marine resources of the Commonwealth, including shellfish aquaculture industry, fisheries stocks, and health of Chesapeake Bay and the Eastern Shore ecosystems. In September 2018, the Northam administration joined the International Alliance to Combat Ocean Acidification, demonstrating its commitment to ensuring that Virginia is a leader in addressing coastal acidification issues. To meet this commitment, we need to assess the severity of coastal acidification, develop an early warning system for stakeholders, and predict its impacts on living resources. In recent years, VIMS has developed observational capacity, advanced modeling tools, and sophisticated experimental facilities that are capable of supporting the Commonwealth's commitment.

Establish a Molecular Core Lab. Rapidly advancing technology has led to a revolution in the realm of molecular biology and genomics, giving scientists much greater power to address complex problems in marine and estuarine systems. This revolution offers the opportunity for VIMS to improve its capabilities in fulfilling its advisory mission to the Commonwealth in the areas of fisheries and aquaculture, environmental health, and coastal ecology. Extremely large amounts of data can be generated in a relatively short period of time using this technology, offering unparalleled opportunities to create more sustainable environments, bolster regional economies, and protect human health.

Currently, VIMS researchers within three different departments use molecular approaches to address important research questions related to resource management and public health issues in Virginia, including fisheries and aquaculture management, harmful algae blooms, and shellfish health and safety. Key pieces of heavily used shared equipment are scattered across campus and are rapidly becoming outdated. VIMS' ability to accommodate this research, which requires massively high-throughput sequencing, digital PCR, transcriptomics and single cell genomics, is limited by the absence of a centralized facility with support.

We are seeking to upgrade critical instruments and to add technical expertise in advanced bioinformatics analyses, and dedicated technical staff to operate and coordinate the use of specialized equipment, and to advise researchers on appropriate strategies and approaches to answer their research questions. Almost all top-tier marine research institutions, including Woods Hole Oceanographic Institute, Scripps Institution of Oceanography, Rosenstiel School at University of Miami, University of Rhode Island, University of Washington, and others, support these types of core facilities with state-of-the-art equipment and technical expertise. As VIMS is in the process of designing and building a new science laboratory building, it is an excellent opportunity to acquire the needed equipment and additional staff to develop the molecular capabilities to remain competitive in the 21st Century and to provide the Commonwealth with state-of-the-art, science-based advice. VIMS has leveraged its existing molecular genetics capabilities for over $5M in extramural research funds. Enhancing our capabilities further would expand our capacity to leverage even more extramural money in support of our research, education and advisory missions.

***Support Commonwealth Fisheries Collection*.** The Nunnally Ichthyology Collection at VIMS is a library of preserved fishes from Virginia, the Chesapeake Bay, the North Atlantic, and the world beyond. The collection supports VIMS' institutional mission of research, education, and advisory service by

engaging a broad community of scientists worldwide, providing the foundation for graduate education and research, and inspiring the public by sharing the biodiversity of fishes and the research that is being done to gain a better understanding of the natural world. The collection also serves as the only active, cataloged repository in the Commonwealth for voucher specimens of fishes collected by biologists at VIMS, numerous state (VDGIF, VMRC and DEQ) and federal agencies (NOAA and USFWS), Virginia Parks and Recreation (various counties), and the Virginia Aquarium.

The Nunnally Ichthyology Collection at VIMS also houses approximately 54,000 individual fish from institutions of higher education in Virginia that have divested their collections, including: Virginia Commonwealth University, University of Richmond, College of William & Mary, and George Mason University, and another approximately 52,000 fish formerly from the Chesapeake Biological Laboratory collection in Maryland. It is the only state collection for marine and freshwater fishes, and serves as the state repository for fishes collected in the Commonwealth. VIMS bears the responsibility of ensuring that this valuable resource is maintained on behalf of the Commonwealth. To date we have managed this through some allocation of our existing funds, federal grants and philanthropic gifts. As the size and value of this collection has grown, we lack the resources to ensure that the collection is adequately maintained and that it is available for use by state agencies and academic institutions.

***Monitor Zooplankton and Larval Fish*.** Zooplankton (small marine organisms) serve both as trophic links between primary producers and higher trophic levels–such as commercially important fish and invertebrates. Furthermore, most commercially important fish and all shellfish in Chesapeake Bay have a pelagic, larval stage in the plankton–the survival of which exerts key control on the fisheries stock. However, for the past two decades there has been no systematic sampling of spatial and temporal variability in zooplankton or fish larval abundance in Virginia waters. The Commonwealth's current water quality monitoring programs and fisheries stock assessments completely exclude this key link in the estuarine and coastal food web. Indeed, predictive models of Bay water quality and fisheries stocks–if they include mid-trophic levels at all–are based on obsolete zooplankton data. Rising temperatures and changing salinity distributions in the Chesapeake Bay are certain to alter this important link in the food web.

With the Commonwealth's significant investment in the new R/V *Virginia*, recent upgrades and digitization of the Nunnally Ichthyology larval fish collection, and the wide expertise of faculty members including plankton and benthic ecology, ichthyology, and ecosystem modeling, VIMS is now uniquely poised to address this critical gap in our understanding of Bay and coastal food web dynamics. Recent advances in remote observation technology using an Underwater Vision Profiler and machine learning have also increased efficiency of zooplankton sampling, identification, and enumeration. This initiative will complete our fisheries monitoring program.

***Establish Virginia Harmful Algal Bloom (HAB) Monitoring Consortium*.** Harmful algal blooms pose a significant threat to human and animal health, as well as to aquaculture, commercial fisheries, aquatic food webs and safe recreational water use. Recent increases in the frequency, severity and distribution of algal blooms have occurred worldwide and the threats posed by emerging HAB species are predicted to increase. Specifically, in Virginia's waters there are emerging HABs, as well as increases in the severity and distribution of several harmful species. Additional coordinated and intensive monitoring efforts are needed to gain a better understanding of the conditions that lead to blooms of HAB organisms and to more accurately predict the potential human health effects and impacts on aquatic life.

Virginia citizens would be best served by a HAB monitoring consortium where VIMS personnel would work cooperatively with other Virginia state agencies, particularly the Virginia Department of Environmental Quality (DEQ), Virginia Marine Resources Commission (VMRC) and the Virginia Department of Health (VDH). This consortium would coordinate a larger-scale HAB monitoring program in Virginia waters, engage in public education, and develop appropriate response and notification protocols for future HAB events. Currently the stations in VA estuarine and marine waters are typically monitored only monthly and more frequent monitoring is necessary, particularly during the peak bloom season of summer and early fall. More frequent monitoring is particularly important for shellfish growing

areas where there is a risk to human and shellfish health. The role of VIMS scientists in this consortium would be species and toxin identification and quantification.

***Expand Tetraploid Technology for Improved Yields of Oyster Aquaculture in Chesapeake Bay*.** Virginia leads the east coast in aquaculture production of clams and oysters. These developments have been rooted in scientific advances and transfer of contemporary technologies to the industry by VIMS. In fact, VIMS has become a world leader in shellfish aquaculture technologies. One of those technologies has been a force in driving oyster aquaculture to the forefront: tetraploid technology.

Tetraploid oysters (which have 4 sets of chromosomes as opposed to normal diploid oysters with 2 sets) are used by commercial hatcheries to mate which produce sterile (spawnless) triploid oysters (3 sets of chromosomes), which comprises >90% of farmed oysters in Virginia, and increasingly, east coast states. This technology is part of the Intellectual Property portfolio of the Aquaculture Genetics and Breeding Technology Center at VIMS. To date we have used tetraploids largely for the purpose of mating them with diploids producing sterile oysters, while normal diploids have been the focus of our breeding efforts to produce faster-growing, disease resistant oysters.

That means that the remarkable progress that we have made to date in breeding an improved oyster has been accomplished through genetic selection on only one-third of the genetic material that makes up a triploid oyster. We have now produced thousands of tetraploid oysters and are prepared to make even greater advances by beginning to do selective breeding to improve the tetraploids.

This will increase the operational cost of the breeding program, but we expect it will lead to major advances in Virginia's oyster aquaculture industry. The initiative will allow us to expand the development of tetraploid strains by developing new genetic material for release to industry, all with the goal to ensure that Virginia maintains it world-leading role in research and development in support of oyster aquaculture.

Increase Base Operating Support. The normal formulas the state uses to assess and supply base operating support to higher education institutions does not readily apply to VIMS and, thus, disadvantages the Institute. Specifically, this request includes vital support for 1) service contracts for high tech scientific equipment purchased through the Equipment Trust Fund, 2) inflationary increases in general operating expenses, and 3) support for personnel services in support units.

Continue to Operate as a Year-round Facility. As an independent state agency that is heavily involved in research and graduate education, VIMS also provides advisory service to the Commonwealth in the form of expert scientific advice on marine-related issues throughout Chesapeake Bay and the coastal ocean. All three of our missions, the graduate program, research and advisory programs, are heavily operational for the entire 12-month calendar year, and in fact, all of our faculty hold 12-month appointments. Field research is most active between April and October, but most other activities occur equally throughout the year. VIMS always has been, and will continue to be, a year-round operation.

Section B. Tuition and Fees Predictability Plans: Provide information about the assumptions used to develop tuition and fee charges shown in PART 1. The tuition and fee charges for in-state undergraduate students should reflect the institution's estimate of reasonable and necessary charges to students based on the institution's mission, market capacity and other factors. Include information, if applicable, on tuition increase plans for program- and level-specific charges or on any other alternative tuition and fee arrangement.

RESPONSE:

Not Applicable

Section C. Other Budget Items: This section includes any other budget items for which the institution wishes to provide detail. Descriptions of each of these items should be one-half page or less.

RESPONSE:

Not Applicable

Section D. Programs and Instructional Sites: Provide information on any new academic programs, including credentials and certificates, or new instructional sites, supported by all types of funding, that the institutions will be undertaking during the six-year period. Note that as part of the revised SCHEV program approval process, institutions will be asked to indicate if a proposed new program was included in its six-year plan. Also, provide information on plans to discontinue any programs.

RESPONSE:

Not Applicable

Section E. Financial Aid: TJ21 requires "plans for providing financial aid to help mitigate the impact of tuition and fee increases on low-income and middle-income students and their families, including the projected mix of grants and loans." Virginia's definitions of low-income and middle-income under TJ21 are based on HHS Poverty Guidelines. A table that outlines the HHS guidelines and the definitions is attached.

RESPONSE:

Not Applicable

Section F. Capital Outlay: Provide information on your institution's top two Education and General Programs capital outlay projects, including new construction as well as renovations, that might be proposed over the Six-Year Plan period that could have a significant impact on strategies, funding, student charges, or current square footage. Do not include projects for which construction (not planning) funding has been appropriated.

RESPONSE:

Construct New Fisheries Science Building. This request supports the construction of a new 34,000 square-foot state-of-the-art research laboratory building to replace the 29-year-old Nunnally/Fisheries Science Laboratory. It will include a fish processing laboratory, climate-controlled storage and faculty research offices and laboratories supporting the Department of Fisheries Science. The new building will consolidate most of the Fisheries Science Department into one location, improving the colloquy between faculty, staff and students of the department. Additionally, space for the Nunnally Ichthyology Collection will serve as the largest repository for freshwater, Chesapeake Bay and coastal fishes of Virginia. The New Fisheries Science Building will require a feasibility study to analyze the current program needs and identify opportunities to house complimentary institute programs not currently used by the facility. The building will be required to meet LEED Silver design standards, at a minimum. The total cost for this project is estimated at $25M.

Construct Field Operations Complex. This request supports the construction of a new 10,000 square-foot field operations facility to replace several existing structures that are deteriorated, in need of much repair and, due to their location, prone to flooding during storm and high tide events. The facility will be constructed with a raised elevation that will take into consideration sea level rise and will consist of offices for the department's administrative staff, a training/instruction classroom, a workshop to support the dive equipment program, a maintenance repair shop to support the field operations equipment repair program, and field and equipment storage. The new Field Operations Complex will require a feasibility study to analyze the current program needs and will be designed to meet LEED Silver standards, at a minimum. The total cost for this project is estimated at $5.9M.

Section G. Restructuring: Provide information about any plans your institution has to seek an increased level of authority, relief from administrative or operational requirements, or renegotiation of existing management agreements.

RESPONSE:

Not Applicable

Section H. Performance Pilots (optional): For this topic, any institution that wishes to include a Performance Pilot and provided notification by April 1 to relevant parties, should select one or more of the strategies presented in the institution's Academic and Financial plan (PART 3) and General Fund Request (PART 4) that constitute(s) "one innovative proposal" as defined in subsection F of § 23.1-306. Describe the proposal, the proposed performance measures and the requested authority or support from the Commonwealth.

RESPONSE:

Not Applicable

Section I. Evaluation of Previous Six-Year Plan: Briefly summarize progress made in strategies identified in your institution's previous six-year plan. Note how additional general fund support and reallocations were used to further the strategies.

RESPONSE:

Increase Graduate Financial Aid. VIMS faculty continue to aggressively pursue grant support from federal agencies and private donors, and recognize that meeting the need for graduate financial aid will require multiple sources of funds. In the 2019 General Assembly session, VIMS was provided $200K for Commonwealth Coastal Research Fellows. This funding will support graduate student research to strategically advance areas such as aquaculture, fisheries management, storm surge modeling, shoreline adaptation, water quality research, and resilience management approaches. The additional state support is a critical element if we are to maintain our historic leadership in graduate education in marine science and take advantage of our strategic institutional goal of further increasing enrollment via a professional master's degree program.

***Increase Base Operating Support*.** In the 2018 General Assembly session, VIMS was provided with $625K in each year of the biennium for operations and maintenance of new facilities coming online. This funding supports service contracts for high tech scientific equipment purchased through the Equipment Trust Fund, inflationary increases in general operating expenses, and technical support personnel.

Enhance Chesapeake Bay Water Quality Modeling and Monitoring. In the 2018 General Assembly session, VIMS was provided with $893,753, starting in FY 2020, for water quality improvement work. The funding includes $406,075 for on-going support, $84,678 for debt service costs under the Master Equipment Leasing Program (MELP) associated with the modeling and assessment technologies, and $403,000 for development of the State of the Elizabeth River Scorecard for pollution levels in the Elizabeth River.

***Monitoring Bay Grasses*.** In the 2019 General Assembly session, VIMS was funded $380K to monitor bay grasses, a critical living resource that must co-exist with aquaculture. These funds also provide VIMS with the resources needed to evaluate interactions between oyster aquaculture and bay grasses, and to develop Best Management Practices for this industry to reduce impacts on grasses.

Section J. Economic Development Annual Report (Due October 1): Describe the institution's contributions to stimulate the economic development of the Commonwealth and/or area in which the institution is located. If applicable, the information should include:

1. University-led or public-private partnerships in real estate and/or community redevelopment.
2. State industries to which the institution's research efforts have direct relevance.
3. High-impact programs designed to meet the needs of local families, community partners, and businesses.
4. Business management/consulting assistance.

RESPONSE:

1. University-led or public private partnerships in real estate and/or community redevelopment

VIMS has engaged in conversations over the last several years with Gloucester County's Economic Development Authority (EDA), a private developer, and W&M's Real Estate Foundation to explore the possibility of a mixed-use development contiguous to VIMS' Gloucester Point campus that would provide food, retail, and housing. VIMS does not have any auxiliary services, such as dormitories or food service. In fact, VIMS does not even have a campus center. While VIMS does not have the funds to put toward such a redevelopment, we do have approximately 450 faculty, staff, and students who would be very pleased to have these types of amenities contiguous to our campus with the majority willing to be patrons, if the price points are set favorably.

We learned from the EDA, in June 2018, that a prominent local restaurant owner was buying property within a short walking distance of VIMS for redevelopment into a restaurant, retail shops and, possibly, several apartments. The EDA has offered to bring VIMS into the conversation after the closing on the property so that we can convey our thoughts with regard to redevelopment.

Also in June, 2018, Gloucester County produced a video promoting economic development that featured in one segment its relationship with VIMS under the heading "where inquiring minds come to learn." VIMS is one of the county's economic drivers and maintains a strong relationship with the Director of Economic Development, always with an eye towards mutually-beneficial partnerships.

Finally, VIMS is located in GO Virginia Region 6, and the VIMS Dean and Director is a voting member of the Region's Council. The Region 6 Council awarded a planning grant in April 2018 to Virginia Sea Grant, housed at VIMS, to explore developing a partnership that would focus on flooding, resiliency, and research commercialization in the Middle Peninsula. The intent is to determine the most appropriate approach for submitting a larger collaborative project.

2. State industries to which the institution's research efforts have direct relevance

There are several industries in which VIMS' research efforts have had a direct impact. Examples include:

- *Oyster and Clam Aquaculture Industry.* In 2017, the farm gate value for Virginia's shellfish aquaculture industry was $56.6 million, of which $38.1 million was attributed to Hard Clams and $18.5 million to Oysters. This is an all-time high for the shellfish aquaculture industry. The research conducted at VIMS by our faculty and staff over the last 50 years has led to this economic success. Specifically, VIMS researchers provide genetically superior oyster brood stock to industry without charge, and provide guidance to industry on the leading diseases that impact shellfish to provide guidance to industry.
- *East Coast Off Shore Scallop Industry.* In the early 1990s, the scallop fishery along the U.S. Atlantic seaboard was on a sharp downward slide. Commercial fishermen were having to spend more and more time at sea, up to 240 days per year, but were catching fewer and smaller scallops. Today, that fishery is the second most valuable commercial fishery on the East Coast, with more than $400 million in scallops landed in 2014. Virginia alone unloaded $33.6 million in scallops in that year, generating an additional $21 million in economic activity in the Commonwealth for a total impact of over $50 million. A large part of the recovery and growth of the East Coast scallop fishery is due to a long-term collaboration between scallopers, fishery managers, and scientists at VIMS. Our scientists have spent thousands

of days on commercial scallop boats and research vessels during the last decades, testing and refining dredge equipment to maximize sustainable scallop harvests while minimizing bycatch of yellowtail flounder and sea turtles.

- *Agriculture Industry.* The Eastern Shore of Virginia is home to tomato farms and, increasingly, chicken farms. VIMS' researchers work with the state and local municipalities to understand the potential impacts of these industries on water quality, and assist in developing mitigation strategies to reduce the impacts.
- *Environmental Industry.* VIMS researchers developed state-of-the-art biosensors that have early detection functionality for oil spills, rapid quantification in real-time of polycyclic aromatic hydrocarbons (PAHs) concentration (EPA considers PAHs highly toxic and lists 17 as suspected carcinogens), and other contaminants.

3. High-impact programs designed to meet the needs of local families, community partners, and businesses

- *Oyster Aquaculture Training Program.* The Oyster Aquaculture Training program is a popular five-month hands-on program that focuses on the principles of oyster aquaculture. Participants learn and work alongside researchers during our oyster hatchery season from April to August. They receive a stipend for the duration of their involvement. To ensure a one-on-one experience, we accept a maximum of only 3-5 participants. During the five-month program, participants rotate through various stages of oyster aquaculture, from our hatchery and field grow-out operations, to our laboratory. Working through these rotations provides a sound understanding of all phases of the oyster life-cycle. Participants also work in the field, learning the importance of seawater flow rates, sieve and bag sizes, and oyster seed sizes and densities. They learn various field grow-out methods, such as suspended culture and rack and bag techniques. By the end of the program, participants have a clear understanding of all areas of oyster aquaculture and are highly qualified and confident in their ability to perform tasks in both oyster hatchery and field operations. Although there are only a small number of participants in any given year, the impact of the program is high and community and industry relations are enhanced.
- *Community Outreach.* VIMS and its federal partners offer a wide variety of free public programs both on VIMS' campuses in Gloucester Point and Wachapreague, as well as throughout Hampton Roads and the lower Chesapeake Bay region. In calendar year 2018, VIMS offered more than 280 outreach programs that reached more than 21,000 citizens. Our programs include After Hours Lecture Series, Discovery Labs, Annual Open Houses at Gloucester Point and Wachapreague, Public Tours, Seafood Symposia, Speakers Bureau, Technical Training and Workshops, Summer Camps for K-8th graders, Field and Classroom Experiences, and booths at local Fairs and Festivals.

4. ***Business management/consulting assistance***

As the state's mandated advisor on a wide range of natural resources management and use issues, VIMS plays a truly unique role as an institution of higher education. In fact, VIMS is a model for the nation in this regard because our advisory services mission is so significantly different from traditional university service to the community, and it shapes VIMS in a most fundamental way. VIMS is identified in 37 sections of the *Code of Virginia*, and as such we are on call and expected to provide advice based on the highest quality science when requested by the Governor, the General Assembly, state agencies, marine industries, and citizens. The charge put forth to us in the *Code of Virginia* is an asset, an advantage, and a vibrant part of our institutional culture. Advisory service is in many ways the public face of VIMS.

Currently, there are eight to ten major projects ranging from municipal surface water intakes, to Dominion Virginia Power river crossings, to the Chesapeake Bay Bridge Tunnel expansion. Expectations from stakeholders are high and we have a long history of furnishing advice of unsurpassed quality. Many of these projects require multiple permits and are complicated, time-consuming and often controversial. VIMS brings, at no charge, an objective voice that ultimately results in better policy and management decisions, and that help sustain the environment and protect public health.

The Commonwealth Center for Recurrent Flooding Resiliency (CCRFR), a partnership between Old Dominion University, W&M Law School's Virginia Coastal Policy Center (VCPC) and VIMS, was established in 2016 to bring university-based expertise to the growing challenge of recurrent flooding. The CCRFR conducts studies, provides training and offers a variety of services in the area of recurrent flooding resilience, and is currently working with local governments and state and federal agencies throughout Tidewater Virginia to enhance the region's resiliency to flooding. Examples include: 1) working with the City of Virginia Beach to assess resilience in the tourism industry and assemble policy recommendations; 2) collaborating with Newport News and Norfolk to install low cost-water level-monitors to enhance prediction and visualization tools; 3) assisting the City of Portsmouth in incorporating resilience to future storms in their comprehensive plan; 4) evaluating the effectiveness of various risk communication methods; 5) mapping local land subsidence rates; 6) contributing to the development of easy-to-use data portal, *Adapt Virginia*, that provides a wide range of technical and policy decision support for building resilience; 7) providing leadership in addressing storm water concerns in rural Tidewater, and; 8) developing an improved version of *TideWatch*, which currently predicts water levels at selected tide gauge stations 36 hours in advance, and will soon provide flood inundation predictions up to 48 hours in advance.

2019 SIX-YEAR PLAN: 2020-22 through 2024-26

Due: July 1, 2019

Institution:	***Virginia Institute of Marine Science***
Institution UNITID:	VIMS

Individual responsible for plan

Name:	DaNika Neblett Robinson
Email address:	drobinson@vims.edu
Telephone number:	804-684-7103

Part 1A: Tuition and Fees Predictability Plans for Institutions without Undergraduate Tuition Differentials
Virginia Institute of Marine Science

In-State Undergraduate Tuition and Fees Predictability Plans

Instructions: *Provide no less than three years (the worksheet allows for four years based on the biennial budget structure) of planned increases in in-state undergraduate tuition and mandatory E&G fees and mandatory non-E&G fees. The tuition and fee charges for in-state undergraduate students should reflect the institution's estimate of reasonable and necessary charges to students based on the mission, market capacity and other factors. Plans shall include a range of tuitions based on available state resources, but must contain a scenario that includes the assumption of no new state general fund support (SCENARIO 1). Add scenarios and tables, if more are needed, and provide brief information about the assumptions for each scenario. Include more detailed information about assumptions used to calculate increases in Section B of the Narrative document. Include anticipated tuition and fee charges affecting first-year students. (Please do not alter the shaded cells that contain formulas.)*

In-State Undergraduate Tuition and Mandatory E&G Fees

	2019-20	2020-21		2021-22		2022-23		2023-24	
	Charge	Charge	% Increase	Charge	% Increase	Charge	% Increase	Charge	% Increase
Scenario 1: No new GF			%		%		%		%
Scenario 2:			%		%		%		%
Scenario 3:			%		%		%		%

Assumptions for:

Scenario 2	
Scenario 3	

In-State Undergraduate Mandatory Non-E&G Fees

	2019-20	2020-21		2021-22		2022-23		2023-24	
	Charge	Charge	% Increase	Charge	% Increase	Charge	% Increase	Charge	% Increase
Scenario 1:			%		%		%		%
Scenario 2:			%		%		%		%

Assumptions for:

Scenario 1	
Scenario 2	

Part 1B: Tuition and Fees Predictability Plans for Institutions with Undergraduate Tuition Differentials
Virginia Institute of Marine Science

In-State Undergraduate Tuition and Fees Predictability Plans

Instructions: *Provide no less than three years (the worksheet allows for four years based on the biennial budget structure) of planned increases in in-state undergraduate tuition and mandatory E&G fees and mandatory non-E&G fees. The tuition and fee charges for in-state undergraduate students should reflect the institution's estimate of reasonable and necessary charges to students based on the mission, market capacity and other factors. Plans shall include a range of tuitions based on available state resources, but must contain a scenario that includes the assumption of no new state general fund support (SCENARIO 1). Add scenarios and tables, if more are needed, and provide brief information about the assumptions for each scenario. Include more detailed information about assumptions used to calculate increases in Section B of the Narrative document. Include anticipated tuition and fee charges affecting first-year students. For institutions that have differential tuition and fee charges by program or level, provide (a) anticipated tuition and fee charges for majority students; (b) a weighted average charge of all first-year students (with a detailed worksheet as attachment); and (c) additional spreadsheets with associated anticipated charges for all undergraduate students by program and level. (Please do not alter the shaded cells that contain formulas.)*

In-State Undergraduate Tuition and Mandatory E&G Fees

	2019-20	2020-21		2021-22		2022-23		2023-24	
	Charge	Charge	% Increase	Charge	% Increase	Charge	% Increase	Charge	% Increase
Scenario 1: No new GF									
Majority First-Year Students			%		%		%		%
All First-Year Students			%		%		%		%
Scenario 2:									
Majority First-Year Students			%		%		%		%
All First-Year Students			%		%		%		%
Scenario 3:									
Majority First-Year Students			%		%		%		%
All First-Year Students			%		%		%		%

Assumptions for:

Scenario 2	
Scenario 3	

In-State Undergraduate Mandatory Non-E&G Fees

	2019-20	2020-21		2021-22		2022-23		2023-24	
	Charge	Charge	% Increase	Charge	% Increase	Charge	% Increase	Charge	% Increase
Scenario 1:			%		%		%		%
Scenario 2:			%		%		%		%

Assumptions for:

Scenario 1	
Scenario 2	

Part 2: Tuition and Other Nongeneral Fund (NGF) Revenue
Virginia Institute of Marine Science

Tuition and Fee Increases and Nongeneral Fund (NGF) Revenue Estimates Based on the Assumption of No New General Fund (GF)

Instructions: *Based on enrollment changes and other institution-specific assumptions, provide the total revenue for educational and general (E&G) programs, by student level and domicile. Provide other anticipated NGF revenue, tuition used for financial aid (Program 108) and anticipated non-E&G fee revenue for in-state undergraduates and then all other students.(Please do not alter the shaded cells that contain formulas.)*

Items	2018-2019 (Estimated)	2019-2020 (Estimated)	2020-2021 (Planned)	2021-2022 (Planned)
	Total Revenue	Total Revenue	Total Revenue	Total Revenue
E&G Programs				
Undergraduate, In-State	$0	$0	$0	$0
Undergraduate, Out-of-State	$0	$0	$0	$0
Graduate, In-State	$0	$0	$0	$0
Graduate, Out-of-State	$0	$0	$0	$0
Law, In-State	$0	$0	$0	$0
Law, Out-of-State	$0	$0	$0	$0
Medicine, In-State	$0	$0	$0	$0
Medicine, Out-of-State	$0	$0	$0	$0
Dentistry, In-State	$0	$0	$0	$0
Dentistry, Out-of-State	$0	$0	$0	$0
PharmD, In-State	$0	$0	$0	$0
PharmD, Out-of-State	$0	$0	$0	$0
Veterinary Medicine, In-State	$0	$0	$0	$0
Veterinary Medicine, Out-of-State	$0	$0	$0	$0
Other NGF	$0	$0	$0	$0
Total E&G Revenue - Gross	$0	$0	$0	$0
Total E&G Revenue - Net of Financial Aid	$0	$0	$0	$0
Tuition used for Financial Aid (Pgm 108)	$0	$0	$0	$0
Non-E&G Fee Revenue				
In-State undergraduates	$0	$0	$0	$0
All Other students	$0	$0	$0	$0
Total non-E&G fee revenue	$0	$0	$0	$0

Part 3: ACADEMIC-FINANCIAL PLAN
Virginia Institute of Marine Science

Academic and Financial Plan

3A: Six-Year Plan for Academic and Support Service Strategies for Six-year Period (2020-2026)

Instructions for 3A: In the column entitled "Academic and Support Service Strategies for Six-Year Period (2020-2026)," please provide short titles to identify institutional strategies associated with goals in the Virginia Plan. Provide a concise description of the strategy in the Description of Strategy column (column J). Within this column, provide a specific reference as to where more detailed information can be found in the Narrative document. Note the goal(s) with which the strategy is aligned with the Virginia Plan (in particular, the related priority areas) in the VP Goal column and give it a Priority Ranking in column A. Additional information for 2022-2026 should be provided in column K (Two Additional Biennia). Strategies for student financial aid, other than those that are provided through tuition revenue, should not be included on this table; they should be included in Part 4, General Fund Request, of the plan. If an institution wishes to include any information about FTEs or fringe benefit adjustments (using DPB's FY2020 start-up instructions available by the end of May), it should list them as strategies in the Academic Plan not the Financial Plan. Funding amounts in the first year should be incremental. However, if the costs continue into the second year, they should be reflected cumulatively. Additional rows for strategies must be added before the gray line. Please update total cost formulas if necessary. **ASSUME NO ADDITIONAL GENERAL FUND IN THIS WORKSHEET.**

Priority Ranking	SECTION A: ACADEMIC AND SUPPORT SERVICE STRATEGIES FOR SIX-YEAR PERIOD (2020-2026)									
			Biennium 2020-2022 (7/1/20-6/30/22)						Description of Strategy	Two Additional Biennia
	Strategies (Short Title)	VP Goal	2020-2021			2021-2022			Concise Information for Each Strategy	Information for 2022- 2026
			Total Amount	Reallocation	Amount From Tuition Revenue	Total Amount	Reallocation	Amount From Tuition Revenue		
			$0	$0	$0	$0	$0	$0		
	Total 2020-2022 Costs (Included in Financial Plan 'Total Additional Funding Need')		$0	$0	$0	$0	$0	$0		

3B: Six-Year Financial Plan for Educational and General Programs, Incremental Operating Budget Need 2020-2022 Biennium

Instructions for 3B: Complete the lines appropriate to your institution. As completely as possible, the items in the Academic Plan (3A) and Financial Plan (3B) should represent a complete picture of the institution's anticipated use of projected tuition revenues. For every strategy in 3A and every item in 3B of the plan, the total amount and the sum of the reallocation and tuition revenue should equal one another. Two additional rows, "Anticipated Nongeneral Fund Carryover" and "Nongeneral Fund Revenue for Current Operations" are available for an institution's use, if an institution cannot allocated all of its tuition revenue to specific strategies in the plan. Also, given the long standing practice that agencies should not assume general fund support for operation and maintenance (O&M) of new facilities, O&M strategies should not be included in an institution's plan, unless they are completely supported by tuition revenue. **Please do not add additional rows to 3B without first contacting Jean Huskey.**

	Assuming No Additional General Fund	2020-2021			2021-2022		
	Items	**Total Amount**	**Reallocation**	**Amount From Tuition Revenue**	**Total Amount**	**Reallocation**	**Amount From Tuition Revenue**
	Total Incremental Cost from Academic Plan[1]	$0	$0	$0	$0	$0	$0
	Increase T&R Faculty Salaries ($)	$223,942	$0	$11,787	$223,225	$0	$12,504
	T&R Faculty Salary Increase Rate(%)[2]	3.00%	0.00%	0.00%	3.00%	0.00%	0.00%
	Increase Admin. Faculty Salaries ($)	$226,524	$0	$9,205	$225,964	$0	$9,765
	Admin. Faculty Salary Increase Rate (%)[2]	3.00%	0.00%	0.00%	3.00%	0.00%	0.00%
	Increase Classified Staff Salaries ($)	$232,815	$0	$2,914	$232,638	$0	$3,091
	Classified Salary Increase Rate (%)[2]	3.00%	0.00%	0.00%	3.00%	0.00%	0.00%
	Increase University Staff Salaries ($)	$235,729	$0	$0	$229,534	$0	$6,195
	University Staff Salary Increase Rate (%)[2]	3.00%	0.00%	0.00%	3.00%	0.00%	0.00%
	O&M for New Facilities	$0	$0	$0	$0	$0	$0
	Addt'l In-State Student Financial Aid from Tuition Rev	$0	$0	$0	$0	$0	$0
	Addt'l Out-of-State Student Financial Aid from Tuition Rev	$0	$0	$0	$0	$0	$0
	Anticipated Nongeneral Fund Carryover	$0	$0	$0	$0	$0	$0
	Nongeneral Fund for Current Operations	$0	$0	$0	$0	$0	$0
	Library Enhancement	$0	$0	$0	$0	$0	$0
	Utility Cost Increase	$84,779	$0	$0	$101,735	$0	$0
	Total Additional Funding Need	**$1,003,789**	**$0**	**$23,906**	**$1,013,096**	**$0**	**$31,555**

Notes:
(1) Please ensure that these items are not double counted if they are already included in the incremental cost of the academic plan.
(2) If planned, enter the cost of any institution-wide increase.

Part 4: General Fund (GF) Request
Virginia Institute of Marine Science

Requesting General Fund Support

Instructions: *Indicate items for which you anticipate making a request for state general fund in the 2020-22 biennium. The item can be a supplement to a strategy or item from the academic and financial plan or it can be a free-standing request for which no tuition revenue would be used. If it is a supplement to a strategy or item from the academic and financial plan, then describe in the Notes column how additional general fund will enhance or expand the strategy. Requests for need-based financial aid appropriated in program 108 should be included here. If additional rows are added, please update the total costs formulas.*

Priority Ranking	Initiatives Requiring General Fund Support						Notes
			Biennium 2020-2022 (7/1/20-6/30/22)				
	Strategies (Match Academic-Financial Worksheet Short Title)	VP Goal	2020-2021		2021-2022		
			Total Amount	GF Support	Total Amount	GF Support	
1	Restore Saltwater Fisheries Survey Funding	3,4	$243,933	$243,933	$250,095	$250,095	Long-standing fisheries surveys by VIMS provide the scientific data on which saltwater fisheries in the Commonwealth of Virginia are managed. These surveys have been supported by a combination of state dollars and federal grants. Recent reductions in the state and federal funds resulted in five of our most important surveys being dramatically cut. We are seeking to recover lost support to maintain these surveys that are critical to wise management and economic viability of Virginia's saltwater fisheries. More information is provided in Section A of Narrative document (p. 1).
2	Manage Aquatic Diseases	3,4	$219,074	$219,074	$224,746	$224,746	Recent outbreaks of disease have damaged economically important and ecologically sensitive marine resources in the Commonwealth and nation. The pathogens responsible for these outbreaks are not well known, their risks to marine life and potential to spread remain understudied, and their ecological impacts have been difficult to assess with existing resources. To meet the challenge of diseases in marine systems, this initiative will provide science-based guidance on the management of existing and emerging disease threats to critical fishery and aquaculture resources in the Commonwealth and Chesapeake Bay region. More information is provided in Section A of Narrative document (p. 2).

Part 4: General Fund (GF) Request
Virginia Institute of Marine Science

Requesting General Fund Support

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Priority Ranking	Initiatives Requiring General Fund Support						Notes
			Biennium 2020-2022 (7/1/20-6/30/22)				
	Strategies (Match Academic-Financial Worksheet Short Title)	VP Goal	2020-2021		2021-2022		
			Total Amount	GF Support	Total Amount	GF Support	
3	Support Virginia Department of Health (VDH) and Virginia Marine Resources Commission (VMRC) Needs in Shellfish Aquaculture Management	3,4	$389,975	$389,975	$311,575	$311,575	Shellfish aquaculture in one of the fastest growing economic drivers in coastal Virginia, especially in rural areas. With this growth has come the need for new monitoring and assessment programs to support the work that VDH does in protecting human health and that VMRC does in managing the use of the state's aquatic resources. VIMS has the technical skills to conduct these new programs, but lacks the state-supported personnel to conduct the monitoring and some of the needed field sensors. Federal grant funding, which we employ with great success in supporting our research programs, is typically not available to support such monitoring programs. State support, in three separate monitoring programs, will allow us to meet the needs that have been expressed to us directly by VDH and VMRC. More information is provided in Section A of Narrative document (p. 2).

Part 4: General Fund (GF) Request
Virginia Institute of Marine Science

Requesting General Fund Support

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Priority Ranking	Initiatives Requiring General Fund Support						Notes
			Biennium 2020-2022 (7/1/20-6/30/22)				
	Strategies (Match Academic-Financial Worksheet Short Title)	VP Goal	2020-2021		2021-2022		
			Total Amount	GF Support	Total Amount	GF Support	
4	Establish a Molecular Core Lab	2,3,4	$1,100,000	$1,100,000	$450,000	$450,000	Rapidly advancing technology has led to a revolution in the realm of molecular biology and genomics, giving scientists much greater power to address complex problems in marine and estuarine systems. This revolution offers the opportunity for VIMS to improve its capabilities in fulfilling its advisory mission to the Commonwealth in the areas of fisheries and aquaculture, environmental health, and coastal ecology. Extremely large amounts of data can be generated in a relatively short period of time using this technology, offering unparalleled opportunities to create more sustainable environments, bolster regional economies, and protect human health. Currently, VIMS researchers within three different departments use molecular approaches to address important research questions related to resource management and public health issues in Virginia. Key pieces of heavily used shared equipment are scattered across campus and are rapidly becoming outdated. We are seeking to upgrade critical instruments and to add technical expertise in advanced bioinformatics analyses, and dedicated technical staff to operate and coordinate the use of specialized equipment, and to advise researchers on appropriate strategies and approaches to answer their research questions. More

Part 4: General Fund (GF) Request
Virginia Institute of Marine Science

Requesting General Fund Support

Instructions: *Indicate items for which you anticipate making a request for state general fund in the 2020-22 biennium. The item can be a supplement to a strategy or item from the academic and financial plan or it can be a free-standing request for which no tuition revenue would be used. If it is a supplement to a strategy or item from the academic and financial plan, then describe in the Notes column how additional general fund will enhance or expand the strategy. Requests for need-based financial aid appropriated in program 108 should be included here. If additional rows are added, please update the total costs formulas.*

Priority Ranking	Initiatives Requiring General Fund Support						Notes
			Biennium 2020-2022 (7/1/20-6/30/22)				
	Strategies (Match Academic-Financial Worksheet Short Title)	VP Goal	2020-2021		2021-2022		
			Total Amount	GF Support	Total Amount	GF Support	
5	Support Commonwealth Fisheries Collection	2,3,4	$209,106	$209,106	$225,022	$225,022	The Nunnally Ichthyology Collection at VIMS is a library of preserved fishes from Virginia, the Chesapeake Bay, the North Atlantic, and the world beyond. It is the only state collection for marine and freshwater fishes, and serves as the state repository for fishes collected in the Commonwealth. VIMS bears the responsibility of ensuring that this valuable resource is maintained on behalf of the Commonwealth. As the size and value of this collection has grown, we lack the resources to ensure that the collection is adequately maintained and that it is available for use by state agencies and academic institutions. More information is provided in Section B of Narrative document (p. 3).

Part 4: General Fund (GF) Request
Virginia Institute of Marine Science

Requesting General Fund Support

Instructions: *Indicate items for which you anticipate making a request for state general fund in the 2020-22 biennium. The item can be a supplement to a strategy or item from the academic and financial plan or it can be a free-standing request for which no tuition revenue would be used. If it is a supplement to a strategy or item from the academic and financial plan, then describe in the Notes column how additional general fund will enhance or expand the strategy. Requests for need-based financial aid appropriated in program 108 should be included here. If additional rows are added, please update the total costs formulas.*

Priority Ranking	Initiatives Requiring General Fund Support						Notes
			Biennium 2020-2022 (7/1/20-6/30/22)				
	Strategies (Match Academic-Financial Worksheet Short Title)	VP Goal	2020-2021		2021-2022		
			Total Amount	GF Support	Total Amount	GF Support	
6	Monitor Zooplankton and Larval Fish	3,4	$400,000	$400,000	$400,000	$400,000	Zooplankton (small marine organisms) serve both as trophic links between primary producers and higher trophic levels–such as commercially important fish and invertebrates. Furthermore, most commercially important fish and all shellfish in Chesapeake Bay have a pelagic, larval stage in the plankton–the survival of which exerts key control on the fisheries stock. However, for the past two decades there has been no systematic sampling of spatial and temporal variability in zooplankton or fish larval abundance in Virginia waters. The Commonwealth's current water quality monitoring programs and fisheries stock assessments completely exclude this key link in the estuarine and coastal food web. This initiative will complete our fisheries monitoring program. More information is provided in Section A of Narrative document (p. 4).

Part 4: General Fund (GF) Request
Virginia Institute of Marine Science

Requesting General Fund Support

Instructions: *Indicate items for which you anticipate making a request for state general fund in the 2020-22 biennium. The item can be a supplement to a strategy or item from the academic and financial plan or it can be a free-standing request for which no tuition revenue would be used. If it is a supplement to a strategy or item from the academic and financial plan, then describe in the Notes column how additional general fund will enhance or expand the strategy. Requests for need-based financial aid appropriated in program 108 should be included here. If additional rows are added, please update the total costs formulas.*

Priority Ranking	Initiatives Requiring General Fund Support						Notes
			Biennium 2020-2022 (7/1/20-6/30/22)				
	Strategies (Match Academic-Financial Worksheet Short Title)	VP Goal	2020-2021		2021-2022		
			Total Amount	GF Support	Total Amount	GF Support	
7	Establish Virginia Harmful Algal Bloom (HAB) Monitoring Consortium	3,4	$200,000	$200,000	$200,000	$200,000	Harmful algal blooms pose a significant threat to human and animal health, as well as to aquaculture, commercial fisheries, aquatic food webs and safe recreational water use. Recent increases in the frequency, severity and distribution of algal blooms have occurred worldwide and the threats posed by emerging HAB species are predicted to increase. Specifically, in Virginia's waters there are emerging HABs, as well as increases in the severity and distribution of several harmful species. Additional coordinated and intensive monitoring efforts are needed to gain a better understanding of the conditions that lead to blooms of HAB organisms and to more accurately predict the potential human health effects and impacts on aquatic life. This consortium would coordinate a larger-scale HAB monitoring program in Virginia waters, engage in public education, and develop appropriate response and notification protocols for future HAB events. More information is provided in Section A of Narrative document (p. 4).

Part 4: General Fund (GF) Request
Virginia Institute of Marine Science

Requesting General Fund Support

Instructions: *Indicate items for which you anticipate making a request for state general fund in the 2020-22 biennium. The item can be a supplement to a strategy or item from the academic and financial plan or it can be a free-standing request for which no tuition revenue would be used. If it is a supplement to a strategy or item from the academic and financial plan, then describe in the Notes column how additional general fund will enhance or expand the strategy. Requests for need-based financial aid appropriated in program 108 should be included here. If additional rows are added, please update the total costs formulas.*

Priority Ranking	Initiatives Requiring General Fund Support						Notes
			Biennium 2020-2022 (7/1/20-6/30/22)				
	Strategies (Match Academic-Financial Worksheet Short Title)	VP Goal	2020-2021		2021-2022		
			Total Amount	GF Support	Total Amount	GF Support	
8	Expand Tetraploid Technology for Improved Yields of Oyster Aquaculture in Chesapeake Bay	3,4	$300,000	$300,000	$300,000	$300,000	Virginia leads the east coast in aquaculture production of clams and oysters. These developments have been rooted in scientific advances and transfer of contemporary technologies to the industry by VIMS. In fact, VIMS has become a world leader in shellfish aquaculture technologies. One of those technologies has been a force in driving oyster aquaculture to the forefront: tetraploid technology. We have now produced thousands of tetraploid oysters and are prepared to make even greater advances by beginning to do selective breeding to improve the tetraploids. This will increase the operational cost of the breeding program, but we expect it will lead to major advances in Virginia's oyster aquaculture industry. The initiative will allow us to expand the development of tetraploid strains by developing new genetic material for release to industry, all with the goal to ensure that Virginia maintains it world-leading role in research and development in support of oyster aquaculture. More information is provided in Section B of Narrative document (p. 5).

Part 4: General Fund (GF) Request
Virginia Institute of Marine Science

Requesting General Fund Support

Instructions: *Indicate items for which you anticipate making a request for state general fund in the 2020-22 biennium. The item can be a supplement to a strategy or item from the academic and financial plan or it can be a free-standing request for which no tuition revenue would be used. If it is a supplement to a strategy or item from the academic and financial plan, then describe in the Notes column how additional general fund will enhance or expand the strategy. Requests for need-based financial aid appropriated in program 108 should be included here. If additional rows are added, please update the total costs formulas.*

Priority Ranking	Initiatives Requiring General Fund Support						Notes
			Biennium 2020-2022 (7/1/20-6/30/22)				
	Strategies (Match Academic-Financial Worksheet Short Title)	VP Goal	2020-2021		2021-2022		
			Total Amount	GF Support	Total Amount	GF Support	
9	Increase Base Operating Support	2,3	$350,000	$350,000	$350,000	$350,000	The normal formulas the state uses to assess and supply base operating support to higher education institutions does not readily apply to VIMS and, thus, disadvantages the Institute. Specifically, this request includes vital support for 1) service contracts for high tech scientific equipment purchased through the Equipment Trust Fund, 2) inflationary increases in general operating expenses, and 3) support for personnel services in support units.
10	Continue to operate as a year-round facility	1,2,4	$0	$0	$0	$0	As an independent state agency that is heavily involved in research and graduate education, VIMS also provides advisory service to the Commonwealth in the form of expert scientific advice on marine-related issues throughout Chesapeake Bay and the coastal ocean. All three of our missions, the graduate program, research and advisory programs, are heavily operational for the entire 12-month calendar year, and in fact, all of our faculty hold 12-month appointments. Field research is most active between April and October, but most other activities occur equally throughout the year. VIMS always has been, and will continue to be, a year-round operation.
			$3,412,088	$3,412,088	$2,711,438	$2,711,438	

Part 5: Financial Aid Plan
Virginia Institute of Marine Science

FINANCIAL AID PLAN

Instructions: *Provide a breakdown of the projected source and distribution of tuition and fee revenue redirected to financial aid. To ensure compliance with the state prohibition that in-state students not subsidize out-of-state students and to provide the review group with a scope of the strategy, projections must be made for each of the indicated categories. Please be aware that this data will be compared with similar data provided by other institutional offices in order to ensure overall consistency. (Please do not alter shaded cells that contain formulas.)*

Note: If you do not have actual amounts for *Tuition Revenue for Financial Aid* by student category, please provide an estimate. If values are not distributed for *Tuition Revenue for Financial Aid* , a distribution may be calculated for your institution.

Allocation of Tuition Revenue Used for Student Financial Aid

***2018-19 (Estimated) Please see footnote below.**

T&F Used for Financial Aid	Gross Tuition Revenue	Tuition Revenue for Financial Aid (Program 108)	% Revenue for Financial Aid	Distribution of Financial Aid
Undergraduate, In-State	$0	$0	%	$0
Undergraduate, Out-of-State	$0	$0	%	$0
Graduate, In-State	$0	$0	%	$0
Graduate, Out-of-State	$0	$0	%	$0
First Professional, In-State	$0	$0	%	$0
First Professional, Out-of-State	$0	$0	%	$0
Total	$0	$0	%	$0
Total from Tuition & Other NGF Revenue worksheet	$0	$0	%	
In-State Sub-Total	$0	$0	%	$0

2019-20 (Planned)

T&F Used for Financial Aid	Gross Tuition Revenue	Tuition Revenue for Financial Aid (Program 108)	% Revenue for Financial Aid	Distribution of Financial Aid
Undergraduate, In-State	$0	$0	%	$0
Undergraduate, Out-of-State	$0	$0	%	$0
Graduate, In-State	$0	$0	%	$0
Graduate, Out-of-State	$0	$0	%	$0
First Professional, In-State	$0	$0	%	$0
First Professional, Out-of-State	$0	$0	%	$0
Total	$0	$0	%	$0
Total from Tuition & Other NGF Revenue worksheet	$0	$0	%	
In-State Sub-Total	$0	$0	%	$0
Additional In-State	$0	$0	%	$0

2020-21 (Planned)

T&F Used for Financial Aid	Gross Tuition Revenue	Tuition Revenue for Financial Aid (Program 108)	% Revenue for Financial Aid	Distribution of Financial Aid
Undergraduate, In-State	$0	$0	%	$0
Undergraduate, Out-of-State	$0	$0	%	$0
Graduate, In-State	$0	$0	%	$0
Graduate, Out-of-State	$0	$0	%	$0
First Professional, In-State	$0	$0	%	$0
First Professional, Out-of-State	$0	$0	%	$0
Total	$0	$0	%	$0
Total from Tuition & Other NGF Revenue worksheet	$0	$0	%	
In-State Sub-Total	$0	$0	%	$0
Additional In-State	$0	$0	%	$0
Additional In-State from Financial Plan		$0	%	

2021-22 (Planned)

T&F Used for Financial Aid	Gross Tuition Revenue	Tuition Revenue for Financial Aid (Program 108)	% Revenue for Financial Aid	Distribution of Financial Aid
Undergraduate, In-State	$0	$0	%	$0
Undergraduate, Out-of-State	$0	$0	%	$0
Graduate, In-State	$0	$0	%	$0
Graduate, Out-of-State	$0	$0	%	$0
First Professional, In-State	$0	$0	%	$0
First Professional, Out-of-State	$0	$0	%	$0
Total	$0	$0	%	$0
Total from Tuition & Other NGF Revenue worksheet	$0	$0	%	
In-State Sub-Total	$0	$0	%	$0
Additional In-State	$0	$0	%	$0
Additional In-State from Financial Plan		$0	%	

** Please note that the totals reported here will be compared with those reported by the financial aid office on the institution's annual S1/S2 report. Since the six-year plan is estimated and the S1/S2 is "actual," the numbers do not have to match perfectly but these totals should reconcile to within a reasonable tolerance level. Please be sure that all institutional offices reporting tuition/fee revenue used for aid have the same understanding of what is to be reported for this category of aid.*

Part 6: Economic Development Annual Report for 2018-19
Virginia Institute of Marine Science

ECONOMIC DEVELOPMENT: CONTRIBUTIONS (HB515; which was enacted as Chapter 149, Virginia Acts of Assembly, 2016 Session)

Requirement: *As per § 23.1-306 (A) of the Code of Virginia each such plan and amendment to or affirmation of such plan shall include a report of the institution's active contributions to efforts to stimulate the economic development of the Commonwealth, the area in which the institution is located, and, for those institutions subject to a management agreement set forth in Article 4 (§ 23.1-1004 et seq.) of Chapter 10, the areas that lag behind the Commonwealth in terms of income, employment, and other factors.*

Instructions: *The reporting period is FY19.* ***THE REPORT IS NOT DUE UNTIL OCTOBER 1.*** *The metrics serve as a menu of items that institutions should respond to as applicable and when information is available to them. Leave fields blank, if information is unavailable. (Please do not alter shaded cells that contain formulas.) Please note the narrative question at the bottom of the page. The response should be provided in the separate Narrative document, Section J.*

6A: Provide information for research and development (R&D) expenditures through June 30, 2019 by source of fund with a breakdown by Science and Engineering (S&E) specific and non-S&E. (Definition: The response is an unaudited version of the data to be submitted to the NSF Higher Education R&D [HERD] Survey in early 2020.)

VA PLAN Strategy Reference	6A: Research and Development (R&D) Expenditures by Source of Fund			
	Source of Funds	***S&E**	**Non S&E**	**Total**
4.3	Federal Government	$13,816,869		**$13,816,869**
	State and Local Government	$1,562,935		**$1,562,935**
	Institution Funds	$462,663		**$462,663**
	Business	$804,386		**$804,386**
	Nonprofit Organizations	$378,748		**$378,748**
	All Other Sources	$80,102		**$80,102**
	Total	**$17,105,703**	**$0**	**$17,105,703**
	** S&E - Science and Engineering*			

6B: For the following items, provide responses in appropriate fields. Insert an X for yes/no responses. Use Number/Amount field for other information. A Comments field has been provided for any special information your institution may want to provide.

VA PLAN Strategy Reference	6B: General Questions	Yes	No	Number/Amount	Comments
4.1	1. Does your institution offer an innovation- or entrepreneurship-themed student living-learning community (student housing)?		X		While there is not a formal offering, students are engaged in innovation and entrepreneurship research activities with their faculty advisors.
4.1	2. Does your institution offer startup incubation/accelerator programs? If yes, please comment if people/companies external to the institution can access them and, if so, how. (Definition: Incubation or accelerator programs are structured multi-week or multi-month programs for which a cohort of start-up companies are chosen; includes mentoring and connections to investors)		X		
4.2	3. Does your institution have an entrepreneurship center? If yes, please comment if people/companies external to the institution can access it and, if so, how.	X			William and Mary has identified two labs at the Virginia Institute of Marine Science as maker-space.
4.2	4. Does your institution use Entrepreneur(s)-in-Residence? (Definition: EIRS are usually experienced founders of high-growth start-up companies who partner with a university to explore active research projects and seek out opportunities to commercialize the products of research; alternatively, an EIR could be a grad student, post-doc, business major, etc., who assists to evaluate IP and provide assessments of market pull potential, business planning, etc.)		X		
4.1	5. Number of students paid through externally funded research grants or contracts.			68	Fall 2018 Headcount = 78
4.1	6. Please answer Yes if (i) your institution's written tenure policy specifically mentions the development of intellectual property and/or the commercialization of research; or (ii) the policies of any schools or other divisions mention IP and/or commercialization as a consideration for promotion and tenure; or (iii) the instructions for compiling a P&T portfolio include providing information about patents, licenses, and other commercialization activities? If Yes, please provide a brief explanation in the comments field. If No, use the comments field to describe other ways a promotion and tenure committee might value those contributions, if any.		X		Commercialization is not explicitly identified in the Virginia Institute of Marine Science's tenure evaluation criteria; however, commercialization from faculty research is strongly encouraged and faculty receive credit for their efforts in this area.
4.2	7. Does your institution or an affiliated entity offer translational research and/or proof of concept funding? If yes, please provide the dollar amount awarded in FY19 in the number/amount field. In the comments field, please provide the number of grants awarded; additional comments can also be entered if needed.		X		
4.2	8. Does your institution or an affiliated entity offer a seed fund or venture capital fund that awards money to start-ups? If yes, please comment on whether it awards funding only to university-based start-ups or to the general public as well? If yes, please provide dollar amount awarded in FY19 in the number/amount field and the number of awards made in the comments field.		X		

6C: Provide information for federal research and commercialization grants by type, number, and dollar value with a breakdown by college and department. If additional rows are needed, please contact Jean Mottley (jeanmottley@schev.edu) for assistance.

VA PLAN Strategy Reference	6C: Research and Commercialization Grants	No.	$ Value	College	Department
4.3	SBIR - Small Business Innovation Research				
	STTR - Small Technology Transfer Research				

6D: The Intellectual Property (IP) section captures information on disclosure, patent, and licensing activities. It is divided into three tables. Tables 1 and 2 capture information regardless of source of funds or nature of entity to whom IP is transferred. Table 3 is required by § 23.1-102 subdivision 2 of the Code of Virginia. It details assignment of IP interests to persons or nongovernmental entities and the value of externally sponsored research funds received during the year from a person or nongovernmental entity by the institution, any foundation supporting the IP research performed by the institution, or any entity affiliated with the institution. Information is sought on research that yields IP regardless of the project's intent. Information is sought about IP transferred as a result of either basic or applied research. Tables 2 and 3 capture separate aggregate data on entities that have a principal place of business in Virginia and those with a principal place of business outside of Virginia.

VA PLAN Strategy Reference	6D: Table 1 - All Activity for FY 2018-19	No.
4.2	1. Number of Intellectual Property disclosures received	0
	2. Number of Provisional Patent Applications filed during the year	0
	3. Number of Patent Applications filed during the year (by type)	
	Design	0
	Plant	0
	Utility	1
	Total	1
	4. Total number of Patent Applications pending (by type)	
	Design	0
	Plant	0
	Utility	1
	Total	1
	5. Number of Patents awarded during the year (by type)	
	Design	0
	Plant	0
	Utility	0
	Total	0

VA PLAN Strategy Reference	6D: Table 2 - All Activity for FY 2018-19	Principal Place of Business in VA	Principal Place of Business Outside VA
4.2	1. Total number of intellectual property licenses executed in FY18-19	0	0
	2. Number of start-ups created through IP licensing in FY18-19	0	0
	3. Amount of licensing revenue in FY18-19 resulting from all intellectual property licenses	$0-$500K	$0-$500K
	4. Number of jobs created as a result of university start-ups	0	0

VA PLAN Strategy Reference	6D: Table 3 - Research Supported by Persons or Nongovernmental Entities	Principal Place of Business in VA	Principal Place of Business Outside VA
4.2	1. Value of funds received (not expended) from persons or nongovernmental entities to support research	$0	$0
	2. Number of patents awarded during the year (by type) developed in whole or part from research projects funded by persons or nongovernmental entities:	This is a subset of Table 1, #5.	
	a. Design Patent	0	0
	b. Plant Patent	0	0
	c. Utility Patent	0	0
	d. Total	**0**	**0**
	3. Number of assignments of intellectual property interests to persons or nongovernmental entities (definition: "assignment" is the outright conveyance, sale and transfer of the IP, in contrast to "license" of IP rights, which is the contractual permission given to another party to use the IP)	0	0

6E: These items are VCCS specific. Please provide responses in appropriate fields. A Comments field has been provided for any special information the VCCS may want to provide.

VA PLAN Strategy Reference	6E: General Questions - VCCS Specific	Number	Comments
4.1	1. Number of training programs leading to workforce certifications and licensures.	0	
	2. Number of students who earned industry recognized credentials stemming from training programs.	0	
	3. Number of industry-recognized credentials obtained, including certifications and licenses.	0	
	4. Number of Career/Technical Education certificates, diplomas and degrees awarded that meet regional workforce needs.	0	

NARRATIVE REQUIREMENT (Section J):

Contributions to Economic Development – Describe the institution's contributions to stimulate the economic development of the Commonwealth and/or area in which the institution is located. *If applicable*, the information should include:

a. University-led or public-private partnerships in real estate and/or community redevelopment.
b. State industries to which the institution's research efforts have direct relevance.
c. High-impact programs designed to meet the needs of local families, community partners, and businesses.
d. Business management/consulting assistance.