

Hampton Roads Research Institute (HRRI)

(November 4, 2003)

Executive Summary

Public and private leadership in Hampton Roads has focused on the region's competitiveness and improving certain economic indicators for much of the past 10 years. A concentrated effort has been directed at technology based economic development as an approach that offers impacts of the highest potential. There is a consensus as to the elements of successful technology development- the presence of world-class research and development capabilities is the most important. Recognizing this fact, the Hampton Roads colleges, universities and federal laboratories leveraged capabilities and formed the Hampton Roads Research Partnership (HRRP) in 2000. The goals were to: increase research funding through collaboration, become more engaged in regional economic development efforts, and improve communication of collective capabilities and needs. A two-phase study by the Research Triangle Institute identified regional research strengths matched against future "hot" technologies and current regional technology industries. Thrust areas were recommended for focused efforts in areas where matches were found. To address the issue of how to best accomplish the goals in the context of the identified thrust areas, HRRP members completed self analyses, benchmarked successful research/commercialization institutions, and identified best practices from the literature. A summary of findings includes the following:

- Other regions have significantly expanded research funding through institutes that focus on large, collaborative grants in new areas where individual institutions cannot successfully compete.
- Research entities can be structured to add significant value to their member institutions by contributing to their strategic research objectives, while also contributing to regional economic development.
- Many institutes have impressive records of expanding research at affiliated universities, particularly in new technology areas.
- Regional research institutes can provide unique laboratory facilities that complement facilities at affiliated universities.
- Institutes can provide critical mass in important resource areas and complement individual university capabilities.

An appropriate and necessary response to the above is the creation and successful operation of the Hampton Roads Research Institute (HRRI). It provides the best way to meet the needs of HRRP members and have the biggest impact on the region's economic development efforts. It is also fully consistent with Governor's agenda for collaborative research leading to technology based economic development.

Description

The Mission of the HRRI is to stimulate technology based economic development in the Hampton Roads region through 1) the expansion of targeted collaborative research, 2) commercialization of intellectual property/business incubation, 3) engagement in regional economic development efforts, and 4) promotion of collective capabilities both internally and external to the region.

With regard to 1), the HRRI will promote leading edge multi-disciplinary, multi-institutional research in the identified thrust areas and involve regional businesses as appropriate. Emphasis will be placed on large grant efforts involving two or more

member institutions. Typical activities will include: screening opportunities, building collaborative teams, providing pilot project seed funding, and assisting proposal development. With regard to 2), HRRP will contribute to the advancement of member institutions and regional communities by such activities as: providing assistance in intellectual property management, providing assistance in identifying the best most promising mode of commercialization, and providing links to industry partners and funding sources. For 3), HRRP will: develop relationships with state, regional, and local economic development organizations, provide assistance to them in recruiting new or growing existing technology based companies for Hampton Roads, and conduct technology based studies and evaluations. For 4), the HRRP will market collective capabilities through electronic (web based), media based, and printed means, and will work with member institutions to promote their individual capabilities.

In pursuing the activities described above, the HRRP will provide numerous benefits to members (universities and federal labs) and to other stakeholders (communities, state, investors, etc). For the members, these benefits include increased competitiveness resulting in greater research funding (conservatively, an additional \$15M to \$20M per year after about four years). In turn, this leads to increased ability to compete for the best faculty and students, and enhanced university and community partnerships. For other stakeholders, the benefits are substantial and tangible. For example, regional direct, indirect and induced multiplier effects for research and development (1.75) and universities (1.73) mean that the impact of \$20M of new research is about \$35M in the economy. The impacts are slightly higher at the state level, and the dynamic impacts, such as increased business formation, are additive. Also additive are the strategic and intangible benefits resulting from recognition of Hampton Roads as a regional technology 'hotspot'.

Administration

The HRRP will be a private, non-stock, non-profit 501(c)(6) research institute with a corresponding charitable fund to which contributions would be tax deductible. The Board of Directors will be composed of the Presidents of the HRRP colleges and universities, the Director of the Thomas Jefferson National accelerator Facility, and the President of the Hampton Roads Partnership. The Director of the NASA Langley Research Center will be a liaison to the Board. The HRRP will be managed by a President reporting to the Board of Directors. The organization, shown in the figure, reflects the four components of the HRRP Mission. It should be noted that the HRRP will maintain relationships with existing regional organizations currently involved in various aspects of the Mission – in particular, the Hampton Roads Technology Council, Hampton Roads Technology Incubator. A total of 7 employees are proposed; five of these will be present upon formation of the HRRP and 2 others (Technology Commercialization and Economic Development) hired when resources allow.

It is anticipated that the institute would begin operation in July, 2004. The current assets of the Hampton Roads Research Partnership will be retained. Funding will be provided by: currently planned HRRP sources, The Hampton Roads Partnership; the Commonwealth of Virginia; and HRRP by a fee-for-service model in an amount based on 10% of the grant/contract value for HRRP- obtained research.

I. The case for an Institute

- A. Public and private leadership in Hampton Roads has focused on the region's competitiveness and improving certain economic indicators for much of the past 10 years.
- B. A concentrated effort has been directed at technology based economic development as an approach that offers impacts of the highest potential. Technology based economic development has been shown to distinguish a state's or region's performance – and can for Hampton Roads too.
1. High technology development explained 65% of the difference in growth between metro regions in the 1990's¹.
 2. Hampton Roads wages in high technology industries are 40% higher than wages in non-technology industries².
 3. Hampton Roads wages in high technology occupations are 73% higher than wages in non-technology occupations – across all industries³.
- C. There is a consensus as to the elements of successful technology development – The presence of world-class research and development capabilities is the most important (Table 1).

| Table 1. High Technology Development Factors at Various Phases of Progression | | | |
|--|-----------|--------|---------------|
| | Inception | Growth | Fortification |
| Public Policy | | | |
| Tax Incentives | *** | * | |
| Public Investment | * | ** | |
| Commercialization of Ideas | * | ** | ** |
| Comparative Location Benchmarking | | | |
| Cost Factors | *** | | |
| Research Institutions | *** | *** | *** |
| Skilled or Educated Labor Force | ** | *** | *** |
| Transportation Center | * | | |
| Proximity to Supplies & Markets | ** | * | * |
| Social Infrastructure Developments | | | |
| Attending Changing Needs | | ** | *** |
| Re-education & Training Facilities | | *** | * |
| Establishing Trade Groups, & Affiliations | | *** | *** |
| Housing, Zoning, & Quality of Life | ** | ** | *** |

¹ Ross DeVol. America's High Tech Economy: Growth, Development, and Risks for Metropolitan Areas. Milken Institute. July 13, 1999.

² Roger Stough, Rajendra Kulkarni, and Mark Trice. Technology in Virginia's Regions. Mason Enterprise Center, Institute of Public Policy George Mason University. Prepared for Virginia's Center for innovative Technology. August 2000.

³ Gilbert Yochum. ODU Forecasting Project, 2000

*** Critical; ** Very Important; * Important

Source: Milken Institute 1999

D. Recognizing the importance of research and development capabilities, the Hampton Roads colleges, universities and federal laboratories, reacted by forming the Hampton Roads Research Partnership (HRRP)⁴ in 2000. A Strategic Plan was developed, and the following goals were established:

1. Increase research capabilities and funding in Hampton Roads and at HRRP member institutions.
2. Become more engaged in the region's economic development efforts.
3. Improve communication of collective capabilities and needs.

E. In an effort to meet the goals, numerous activities have been undertaken, and there have been significant accomplishments. The following activities are particularly important to the future of HRRP:

1. The Research Triangle Institute conducted a two-phase study to assess the commercialization efforts of HRRP member institutions and identify regional research strengths matched against future "hot" technologies and the region's current technology industries. The objective was to recommend "thrust" areas on which to focus efforts for maximum economic benefit. These thrust areas are:
 - a) Near-Term Opportunities – Maritime Transportation, Aerospace, Biomedical Devices, Modeling and Simulation. Software, and Sensors.
 - b) Long-Term Opportunities – Nanotechnology, Marine Research, Photonics, Genetics/Bioinformatics, Composite Materials, and Laser Processing.
2. HRRP members conducted extensive research for best practices, and made four out of region trips to see, first hand, the workings of successful research/commercialization/economic benefit activities. These activities included the use of research institutes to increase the amount and quality of research conducted in the target regions. A summary of best practices is as follows:
 - a) Other regions have significantly expanded research funding through institutes that focus on large,

⁴ Members of the Hampton Roads Research Partnership include: Christopher Newport University, College of William and Mary, Eastern Virginia Medical School, Hampton University, NASA Langley Research Center, Norfolk State University, Old Dominion University, Regent University, Thomas Jefferson National Accelerator Facility, and Virginia Wesleyan College

collaborative grants in new areas where individual institutions cannot successfully compete.

- b) Research entities can be structured to add significant value to their member institutions by contributing to their strategic research objectives, while also contributing to regional economic development.
- c) Many institutes have impressive records of expanding research at affiliated universities, particularly in new technology areas.
- d) Regional research institutes can provide unique laboratory facilities that complement facilities at affiliated universities.
- e) Institutes can provide critical mass in important resource areas and complement individual university capabilities particularly in the areas of:
 - (1) Identifying multi-million dollar grant and contract opportunities.
 - (2) Bringing researchers from various organizations together for large collaborative research projects.
 - (3) Providing skilled staff for grant preparation and review.
 - (4) Providing basic research administrative services.
 - (5) Providing a mechanism for adding more research space.
 - (6) Technology transfer and commercialization.
 - (7) Promoting and facilitating entrepreneurship.
 - (8) Building industry links.
 - (9) Enhancing state and regional economic development.

- f) Regional research institutes can enhance the reputation of the region to make it more attractive to the highest quality faculty, high potential students, new businesses, etc.
3. HRRP members completed an extensive self analysis, to identify functions that would be of most value in reaching their institutional goals and could be provided most efficiently in a collaborative manner by a regional research institute. A summary of member survey findings is as follows:
- a) Grant Funding.
 - (1) Identifying and screening grant opportunities.
 - (2) Forming collaborative teams to pursue grants.
 - (3) Assisting in proposal development.
 - (4) Providing seed funding for proposal development and refinement.
 - (5) Providing the ability for faculty and research space growth.
 - b) Technology Marketing and Incubation.
 - (1) Assisting in finding venture capital and prototyping money.
 - (2) Applying expert assistance to member commercialization efforts.
 - (3) Cultivating industry links and facilitating strategic collaborations with industry.
 - c) Marketing of Capability.
 - (1) Building awareness and support for the region's research institutions within Hampton Roads.
 - (2) Building awareness and appreciation for the region's research institutions outside Hampton Roads.
 - (3) Building state and federal legislative awareness and support for the region's research institutions.

- (4) Building awareness of regional capabilities within major funding agencies.
- (5) Develop conferences that contribute to the intellectual enrichment of the research community and enhance the region's reputation.

F. An appropriate and necessary response to the above is the creation and successful operation of the Hampton Roads Research Institute (HRRI) to be jointly controlled by member institutions. By providing collaborative research, technology commercialization, economic development and communications services, it provides the best way to meet the varied needs of HRRP members and make a significant impact on the region's economic development. It is also fully consistent with the Commonwealth of Virginia agenda to increase collaborative research leading to technology based economic development. To build this capability, The Hampton Roads Research Institute will develop new functions and new relationships with existing organizations, such as The Hampton Roads Technology Council, the Hampton Roads Technology Incubator, and Virginia's Center for Innovative Technology.

II. Description

A. Mission

The mission of the HRRI is to stimulate technology-based economic development in the Hampton Roads region through the expansion of targeted collaborative research, commercialization of intellectual property/business incubation, engagement in regional economic development efforts, and the promotion of collective capabilities.

B. Purpose

1. Expansion of Targeted Collaborative Research.

The HRRI will promote leading-edge multi-disciplinary, multi-institutional research in regional technology thrust areas and involve member institutions and regional businesses when appropriate. Emphasis will be placed on large grant efforts involving two or more HRRI member institutions.

- a) For each research thrust area, the HRRRI will perform the following activities:
- (1) Identify and screen large grant opportunities. Once identified, an HRRRI Research Advisory Committee, comprised of senior representatives from each member institution, will screen the portfolio of opportunities and identify those for which the HRRRI will respond.
 - (2) Build collaborative research teams (including industry where applicable).
 - (3) Provide seed funding for pilot projects with potential to develop into large scale efforts.
 - (4) Manage proposal development.
 - (5) Provide contract/grant administrative services where necessary or requested.
 - (6) Provide a mechanism for accessing faculty expertise from other universities – for increased breadth.
 - (7) Provide a mechanism for adding “soft money” research faculty as needed.
 - (8) Provide a mechanism to acquire and administer additional research space as needed.
- b) To facilitate accomplishments of this activity, HRRRI will engage in the following general activities that cut across thrust areas:
- (1) Initiate an ongoing campaign to educate member institution faculty and administrators on the capabilities and services of HRRRI, and the critical importance of the regional economic development mission of the HRRRI.
 - (2) Visit the major federal funding agencies to understand upcoming proposal

opportunities and to make the funding agencies aware of the existence, purposes and capabilities of HRRI.

- (3) Pursue federal funding for research infrastructure that supports HRRI thrust areas. See Appendix 1 for an example of a current HRRP initiative that will be continued under the HRRI.

2. Commercialization of Intellectual Property/Business Incubation.

HRRI will contribute to the advancement of member institutions as well as the economic well being of stakeholder communities through a systematic commercialization effort involving technologies developed individually or collaboratively by member institutions. As noted in Section 1, such a capability addresses the key recommendations of the Research Triangle Institute study of HRRP member technology commercialization capabilities as well as the results of HRRP's member survey. HRRI commercialization efforts will generally focus on the following:

- a) Providing expert assistance in intellectual property management.
- b) Identifying commercialization potential during the research proposal phase and working with principal investigators to increase post research commercialization opportunities.
- c) Providing assistance in choosing the most promising mode of commercialization.
- d) Providing assistance in implementing the chosen mode of commercialization.
 - (1) Marketing technologies to regional or outside-of-region businesses of all sizes (technology transfer).
 - (2) Helping entrepreneurs establish and successfully operate companies through

links to the Hampton Roads Technology Incubator and related services.

- e) Identifying sources of venture capital and assisting in obtaining financing.
- f) Linking university/lab capability with industry needs (extension-like services).
- g) Producing events that facilitate the networking of member institution and high technology industry research personnel. This will be done in coordination with the Hampton Roads Technology Council and the Center for Innovative Technology.

3. Engagement in Regional Economic Development Efforts.

HRRI will actively seek opportunities for member institution human and/or intellectual property assets to be deployed in ways that stimulate regional economic development. HRRI economic development efforts will generally focus on the following:

- a) Developing relationships with state, regional and local economic development organizations.
- b) Familiarizing economic development professionals with regional research capabilities.
- c) Providing marketing assistance to state, regional and local economic development officials in recruiting technology-based companies to Hampton Roads, including:
 - (1) Targeting high technology prospect companies.
 - (2) Linking university/lab capability with economic development efforts.
 - (3) Participating in marketing trips.
 - (4) Participating in in-region prospect visits.

- d) Participating in state, regional and local economic development conferences, events or commissions
- e) Conducting technology-based economic development policy studies and evaluations.
- f) Providing educational programs, networking events and opportunities, and industry information to the region's high tech companies, working in conjunction with the Hampton Roads Technology Council.

4. Promotion of Collective Capabilities.

A final way HRRRI will provide value will be to effectively market the collective capability of member institutions at the regional, state and national level by:

- a) Developing an internet presence via an expanded, reformulated HRRP website.
- b) Aggressively promoting local media coverage of Institute activities.
- c) Developing and making marketing materials describing HRRRI available to regional economic development organizations, educational institutions, high technology industry and governmental agencies.
- d) Educating relevant departments of local government about HRRRI and its member institutions.
- e) Educating relevant departments of state government about HRRRI and helping establish a recognized role for HRRRI member institutions in the Commonwealth of Virginia's various university research initiatives.
- f) Showcasing Hampton Roads as a center for advanced research and technology development.
- g) Working with member institutions to promote their capabilities within the region, to various

funding agencies, and to entities external to the region (industry, etc.) to enhance national visibility.

- h) Communicating capability to state and federal legislators for the purpose of obtaining funding for member institutions and institute activities.
- i) Developing and sponsoring technical and business related events/conferences to promote member institution capability and to facilitate outside partnerships with industry and other funding sources.

C. Stakeholder and Member Benefits.

In pursuing the activities described above, the HRRRI will provide numerous benefits to members (universities and federal laboratories) and other stakeholders (state, local community, regional technology business, etc). Generally, increased research funding will provide financial and prestige benefits for the research institutions as well as direct and indirect economic impacts in the region and Commonwealth. Specifically, these benefits will accrue from the following:

1. University Benefits.

a) Increased Research Competitiveness.

HRRRI will facilitate collaboration on large grants in technical areas the region's universities could not competitively pursue individually. Collaborating with other regional universities through the research institute will provide critical mass in important technology areas, complementing individual university capabilities in today's research environment where, increasingly, federal funding agencies are requiring or "strongly suggesting" cross-institutional collaboration in proposals.

Such building of critical mass is particularly important in the current state funding environment where Hampton Roads based universities are competing against the state's largest research universities as well as major

national universities. Additional R&D enhancements will increase this competitiveness and allow the region to partner with outside institutions on more equal terms.

b) Greater dollars flowing into University R&D

One result of increased research competitiveness is a significant increase in research expenditures, and related indirect cost recovery, at member institutions. A July 31, 2003 search of the “Community of Science” research database revealed over 4,000 research opportunities over \$1 million. Of these, 90 were over \$3 million total and 46 in technology areas where HRRI member universities and labs have significant capability (Table 2). The average of these 46 grants is \$1.2 million/year over multiple years.

Table 2. Potential Large Grants from the “Community of Science” Database

| RTI CATGORY | TOTALGRANT AMOUNT | GRANT AMOUNT PER YEAR |
|--------------------------------|--------------------------|------------------------------|
| BIOMEDICAL | \$ 160,975,000 | \$ 24,795,000 |
| GENETICS | \$ 3,000,000 | \$ 600,000 |
| LASER PROCESSING | \$ 3,000,000 | \$ 750,000 |
| MODELING AND SIMULATION | \$ 34,500,000 | \$ 7,333,333 |
| MARINE SCIENCE | \$ 3,000,000 | \$ 1,000,000 |
| MATERIALS | \$ 8,750,000 | \$ 1,750,000 |
| MISCELLANEOUS | \$ 38,950,000 | \$ 9,803,333 |
| NANOTECHNOLOGY | \$ 17,500,000 | \$ 4,166,667 |
| SENSORS | \$ 32,100,000 | \$ 6,200,000 |
| SOFTWARE | \$ 3,000,000 | \$ 1,000,000 |
| TOTAL | \$ 304,775,000 | \$ 57,398,333 |
| NUMBER OF GRANTS | 46 | 46 |
| AVERAGE GRANT SIZE | \$ 6,625,543 | \$ 1,247,790 |

The potential impact of capturing even a small number of these grants is shown in Table 3, which shows the total annual amount of funding at 1 to 6 awards per year, at the average grant size, for 4 years. Assuming an HRRI target of 4 grants per year, and noting that these are

typically multi-year commitments between 3 and 10 years, the impact of HRR I activities would be cumulative up to a point (to be conservative, sometime between year 3 and 4) where annual new grant awards will equal those expiring. This would result in increased university research expenditures of about \$14.9 to \$19.9 million per year. At a typical university rate of 42%, this represents between \$6.3 and \$8.4 million per year of indirect cost recovery.

| Table 3. Annual Grant Funding at Various Award Levels | | | | |
|--|--------------|---------------|---------------|---------------|
| | Year | | | |
| | 1 | 2 | 3 | 4 |
| New Funding at 1 Grant Per Year | \$ 1,247,790 | \$ 1,247,790 | \$ 1,247,790 | \$ 1,247,790 |
| Total Annual Grant Amount | \$ 1,247,790 | \$ 2,495,580 | \$ 3,743,370 | \$ 4,991,159 |
| New Funding at 2 Grants Per Year | \$ 2,495,580 | \$ 2,495,580 | \$ 2,495,580 | \$ 2,495,580 |
| Total Annual Grant Amount | \$ 2,495,580 | \$ 4,991,159 | \$ 7,486,739 | \$ 9,982,319 |
| New Funding at 3 Grants Per Year | \$ 3,743,370 | \$ 3,743,370 | \$ 3,743,370 | \$ 3,743,370 |
| Total Annual Grant Amount | \$ 3,743,370 | \$ 7,486,739 | \$ 11,230,109 | \$ 14,973,478 |
| New Funding at 4 Grants Per Year | \$ 4,991,159 | \$ 4,991,159 | \$ 4,991,159 | \$ 4,991,159 |
| Total Annual Grant Amount | \$ 4,991,159 | \$ 9,982,319 | \$ 14,973,478 | \$ 19,964,638 |
| New Funding at 5 Grants Per Year | \$ 6,238,949 | \$ 6,238,949 | \$ 6,238,949 | \$ 6,238,949 |
| Total Annual Grant Amount | \$ 6,238,949 | \$ 12,477,899 | \$ 18,716,848 | \$ 24,955,797 |
| New Funding at 6 Grants Per Year | \$ 7,486,739 | \$ 7,486,739 | \$ 7,486,739 | \$ 7,486,739 |
| Total Annual Grant Amount | \$ 7,486,739 | \$ 14,973,478 | \$ 22,460,217 | \$ 29,946,957 |

- c) Increased Flexibility as Provided by a New Organizational Tool.
- (1) HRR I will provide a mechanism for adding “soft money” faculty and contract research space to the university inventory of assets, particularly for member institutions without this current capability.
 - (2) HRR I will provide important neutral leadership to the collaboration process. Building cross-institutional relationships necessary for research collaborations is a

time consuming process that can be aided greatly when facilitated by a third party. Collaboration through a mechanism like the HRRRI, which would be jointly controlled by the member institutions, should lessen the time required to build the necessary relationships for partnering and increase the likelihood of building strong research collaborations.

- d) Enhanced ability to compete for the best faculty and students.
 - (1) HRRRI will create more research opportunities which should, in turn, enhance the region's reputation for such activity. In the process, member universities become more attractive to top researchers and graduate students. Also, by offering enhanced opportunities to engage in research, HRRRI undergraduate institutions will be better able to attract top student and faculty talent.
 - (2) A stronger, more vibrant economy resulting from increased R&D activity and commercialization of new technologies will offer greater spousal employment opportunities as well as entrepreneurship opportunities for those faculty inclined to engage in such activities.

- e) Enhanced university-community partnership.
 - (1) Even small universities are significant institutions which impact and interact with their host communities in myriad ways. HRRRI's outward-looking, economic development focus constitutes a substantial commitment to the community's well being which should enhance the university-community relationship and become a source of good will (helpful when embarking on major initiatives like campus expansion or capital campaigns).

- (2) HRR's economic development activities help to serve member universities' long term strategic interests. Ample evidence suggests that universities are vital to economic development. Economic development research in the past decade has proven this connection. Less publicized is the importance of a strong regional economy to the health and competitiveness of universities.

Vibrant regional economies and the amenities they provide help attract the very best students and faculty. Moreover, in difficult financial times local business and elected leadership can be passionate advocates for university funding. Metropolitan areas with robust cross-sector alignment such as Austin, San Jose, San Diego, and the Research Triangle in North Carolina demonstrate the extent to which mutual enhancement can be realized when these sectors [university and community] engage in collaborative and collective growth strategies.

2. Regional and State Economic Benefits

a) Immediate Economic Benefits

Traditional economic impact analysis measures the flow and effect of new money entering the economy. Once dollars enter the region, they circulate as firms buy from, and sell to, one another to produce the final good or service. Dollars also circulate through the region as wages are earned and spent in the region. Finally, dollars circulate as other earnings, interest, rents, and profits are earned in the region as a result of the initial transaction. There are, therefore, three forms of impact to report: direct, indirect, and induced.

- (1) Direct impacts from the initial transaction bringing money into the region

- (2) Indirect impacts as regional firms buy from and sell to one another in order to produce the good or service
- (3) Induced impacts as wages and other earnings from the activity circulate through the region.

“Output” is a standard term used to measure the economic activity created by some spending stimulus. "Multipliers" are numbers developed to estimate the total direct, indirect and induced effect on output generated per dollar of spending on various types of goods and services in a given study area.

Using IMPLAN™⁵ output multipliers for the Hampton Roads region (Table 4), “colleges, universities, schools” in general (1.73) and “research, development and testing services” in particular (1.75) have significant output multipliers relative to some common Hampton Roads industries. In particular, HRRRI related multipliers are higher than “computer and data processing services” (IT services) at 1.62, “motor vehicles” at 1.47, “shipbuilding and repair” at 1.40 and “military” at 1.38. Clearly, in terms of such economic impacts, HRRRI activities are high value when compared with many other industries.

| Table 4. METROPOLITAN LEVEL OUTPUT MULTIPLIERS | | | |
|---|---|---|---|
| Industry | Output Multipliers (Direct, Indirect and Induced Effects) | Industry | Output Multipliers (Direct, Indirect and Induced Effects) |
| Motor Freight Transport and Warehousing | 1.87 | Paper Mills, Except Building Paper | 1.60 |
| Engineering, Architectural Services | 1.87 | Manufacturing Industries, NEC | 1.60 |
| Water Transportation | 1.76 | Insurance Carriers | 1.57 |
| Radio and TV Broadcasting | 1.76 | Wholesale Trade | 1.56 |
| Management and Consulting Services | 1.75 | Automotive Dealers and Service Stations | 1.54 |
| Research, Development and Testing Services | 1.75 | Miscellaneous Retail | 1.54 |

⁵ Minnesota IMPLAN Group, Inc., Stillwater, Minnesota

| | | | |
|--|------|--|------|
| Colleges, Universities, Schools | 1.73 | Federal Government - Non-Military | 1.54 |
| Legal Services | 1.70 | Communications, Except Radio and TV | 1.51 |
| Accounting, Auditing, Bookkeeping | 1.69 | Electronic Computers | 1.48 |
| Railroads and Related Services | 1.67 | Computer Peripheral Equipment | 1.47 |
| Hospitals | 1.67 | Motor Vehicles | 1.47 |
| Transportation Services | 1.66 | Motor Vehicle Parts and Accessories | 1.47 |
| Hotels and Lodging Places | 1.65 | Banking | 1.45 |
| Computer and Data Processing Services | 1.62 | Shipbuilding and Repairing | 1.40 |
| Newspapers | 1.61 | Federal Government – Military | 1.38 |
| SOURCE: Hampton Roads Planning District Commission using IMPLAN model. August 2003 | | | |

Using these multipliers, the total regional impact of HRFI activities based on the previous example will total between \$25.9 and \$34.9 million annually (Table 5).

Table 5. Total Regional Impact

| Category | Multiplier | Range of Annual Research Funding (Table 3): | |
|---|------------|---|--------------|
| | | \$14,973,478 | \$19,964,638 |
| Resulting Annual Economic Impact of: | | | |
| Research, Development and Testing Services | 1.75 | \$26,203,587 | \$34,938,116 |
| Colleges, Universities, Schools | 1.73 | \$25,904,117 | \$34,538,823 |

At the state level (Table 6), the output multipliers are even higher for both “colleges, universities, schools” (1.79) and “research, development and testing services” (1.78) than at the metropolitan level. HRFI related multipliers are higher than computer and “data processing services” (IT services) at 1.65, “motor vehicles” at 1.43 “shipbuilding and repair” at 1.43 and “military” at 1.39. As with the metropolitan impact, HRFI activities are of high value to the state when compared with many other industries.

| Table 6. STATE LEVEL OUTPUT MULTIPLIERS | | | |
|--|---|----------|---|
| Industry | Output Multipliers (Direct, Indirect and Induced Effects) | Industry | Output Multipliers (Direct, Indirect and Induced Effects) |
| | | | |

| | | | |
|---|------|--|------|
| Engineering, Architectural Services | 1.92 | Newspapers | 1.62 |
| Motor Freight Transport and Warehousing | 1.87 | Manufacturing Industries, NEC | 1.62 |
| Radio and TV Broadcasting | 1.83 | Wholesale Trade | 1.59 |
| Water Transportation | 1.82 | Insurance Carriers | 1.58 |
| Management and Consulting Services | 1.80 | Automotive Dealers and Service Stations | 1.56 |
| Colleges, Universities, Schools | 1.79 | Federal Government - Non-Military | 1.56 |
| Research, Development and Testing Services | 1.78 | Communications, Except Radio and TV | 1.55 |
| Hospitals | 1.75 | Miscellaneous Retail | 1.55 |
| Legal Services | 1.75 | Computer Peripheral Equipment | 1.54 |
| Accounting, Auditing, Bookkeeping | 1.73 | Electronic Computers | 1.53 |
| Paper Mills, Except Building Paper | 1.71 | Banking | 1.49 |
| Transportation Services | 1.71 | Motor Vehicle Parts and Accessories | 1.46 |
| Hotels and Lodging Places | 1.69 | Motor Vehicles | 1.43 |
| Railroads and Related Services | 1.66 | Shipbuilding and Repairing | 1.43 |
| Computer and Data Processing Services | 1.65 | Federal Government - Military | 1.39 |

SOURCE: Hampton Roads Planning District Commission using IMPLAN model. August 2003

Using these multipliers, the total state impact of HRR activities based on the previous example will total between \$26.6 and \$35.7 million (Table 7).

Table 7. Total State Impact

| Category | Multiplier | Range of Annual Research Funding (Table 3): | |
|--|------------|---|--------------|
| | | \$14,973,478 | \$19,964,638 |
| | | Resulting Annual Economic Impact of: | |
| Research, Development and Testing Services | 1.78 | \$26,652,791 | \$35,537,055 |
| Colleges, Universities, Schools | 1.79 | \$26,802,526 | \$35,736,701 |

b) Long Term Economic Benefits.

Not accounted for in the input-output models (above) are the impacts of university research on productivity and new business formation. University graduates with advanced degrees that are retained in the local economy put the knowledge gained through research to work for local employers. Researchers engaged in consulting with local companies similarly transfer knowledge.

Another way research benefits the local economy is when technology generated through research, is licensed by local firms. Lastly, professors and graduates may form their own companies to commercialize their research. In all these ways university research contributes to regional output in ways not measured by traditional input-output models.

HRRI will include a comprehensive technology commercialization function and develop a strong working relationship with the already-successful Hampton Roads Technology Incubator. It is not possible at this time to completely quantify impacts. However, anecdotal evidence from such technology centers as Silicon Valley, the Research Triangle and Boston show that these spillover benefits can often be more important than the immediate (output multiplier) economic impacts of the research itself. This is particularly true in metropolitan economies which have the requisite critical mass of industry and support firms necessary to efficiently translate such

research flow into significant economic development.

c) Strategic Benefits

University research, and the various benefits listed above, also impact outsider perception of the region in ways unachievable by many other means. Developing a reputation as a “hotspot” and a vibrant, exciting place to live and work can be of great benefit in economic development marketing.

3. Regional Business Benefits

As noted above, the outputs of university research, technology and talent (knowledge) have potential to significantly enhance the competitiveness of regional businesses if the proper connections and relationships are built. For most businesses, the number one benefit of proximity to a university is access to faculty and student talent. Professors engaged in innovative research often consult for local businesses. Likewise, graduate students learn by performing research and take that knowledge with them into the workplace upon graduation.

The HRRI proposes to develop these industry-university linkages through its own efforts and by aligning with the existing Hampton Roads Technology Council (HRTC) and the Commonwealth of Virginia’s Center for Innovative Technology.

III. Administration

A. Legal Designation and Governance

The HRRI will be a private, non-stock, non-profit 501(c)(3) research institute.

The **Board of Directors** of the HRRI will be composed of the Presidents of the HRRP colleges and universities electing to participate in HRRI, the Director of the Thomas Jefferson National Accelerator Facility and the President of the Hampton Roads

Partnership. The Director of the NASA Langley Research Center shall serve as liaison to the board. The HRR I will be managed by a President reporting to the Board of Directors.

B. Board of Directors

Primary Board responsibilities are:

1. Setting HRR I policy.
2. Approving and monitoring the annual work plan and budget.
3. Hiring and oversight of the HRR I President.

C. Advisory Committees.

Separate advisory committees will be established as needed. The committees will focus on a particular aspect of HRR I operations and shall generally be composed of high level university or lab representatives as well as interested stakeholders from public and private sectors. Such committees may be standing or ad hoc. One standing committee has been identified to date.

1. The **Research Advisory Committee**, composed of chief research officers from member institutions, will provide the HRR I with input regarding the appropriateness, advisability, and timing of research initiatives (including access to facilities, equipment, and staffing) to ensure that they meet the overall HRR I supported research initiative objectives. The committee will also serve as the primary liaison between the HRR I and member institutions.

D. Organization

The proposed HRR I organization is shown in Figure 1. It is structured to provide the four primary functions described in Section II-B. Execution of the roles and responsibilities described in Section II will be accomplished under the supervision of the HRR I President.

Hampton Roads Research Institute

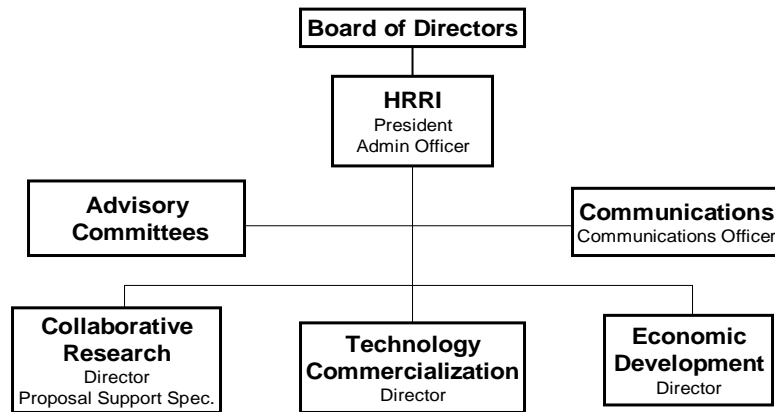


Figure 1

1. The **President** of the HRI will report directly to the Board of Directors. The President is responsible for organizing and directing the work of the institute as described in Section II, including hiring and supervising institute staff, developing relationships and promoting the HRI with state and federal political officials and funding agencies, and actively promoting the collective capability of HRI and its member institutions.
 - a) The **Administrative Officer** will provide complete administrative support to the staff of the HRI and provide the initial interface between the Institute and the outside world.
2. The **Collaborative Research Director** will be responsible for Expansion of Targeted Collaborative Research as described in Section II-B-1.
 - a) The **Proposal Support Specialist** will provide administrative and technical support to the Collaborative Research Director, including grant identification, proposal meeting facilitation and proposal writing support.

3. The **Technology Commercialization Director** will be responsible for Commercialization of Intellectual Property/Business Incubation described in Section II-B-2.
4. The **Economic Development Director** will be responsible for Engagement in Regional Economic Development Efforts described in Section II-B-3.
5. The **Communications Officer** will be responsible for supporting the President and Directors in Promotion of Collective Capabilities as described in Section II-B-4.

E. Intellectual Property Management and Commercialization.

Unless otherwise agreed, ownership of any intellectual property first created or conceived by an HRRRI employee or university employee working at HRRRI will belong to HRRRI or the university respectively. Joint inventions by employees of HRRRI and university employees shall be owned jointly by HRRRI and the university. Inventors shall abide by the terms of the intellectual property provisions of their employer, whether HRRRI or the university.

F. Financial.

1. Financing.

- a) In developing the financing plan, the following assumptions have been made:
 - (1) The HRRRI will be on a July to June budget year commencing July 1, 2004.
 - (2) The assets, liabilities and current funding sources of the HRRP will be assumed by the Hampton Roads Research Institute (HRRRI).
 - (3) Personnel.
 - i. The HRRRI will have five personnel at startup.

1. The HRRP Executive Director will assume the concurrent duties of the **HRRI President**.

2. An Administrative Officer, Collaborative Research Director, Proposal Support Specialist and Communications Officer will be hired by search processes. Priority is given to these positions because of the importance of generating the research programs, and promoting capabilities.

- ii. It is anticipated that the remaining employees making up the HRRI staff of 7 (as listed in Section III-D) will be hired as resources allow.

(4) Facilities.

Class A office space will be utilized by all employees of the HRRI.

(5) Funding Sources

- i. The Hampton Roads Partnership will provide \$250,000 over the first three years of operation

- ii. HRRI will receive a fee for service equivalent to 10% of the total amount for contracts and grants obtained by HRRI. The amounts assumed in years 1 to 3 (see Appendix 2) are produced by a conservative estimate of approximately 3, 3-year grants received over the period. Disposition of fees in excess of those required by this budget will be determined by the Board of Directors.

- iii. The Commonwealth of Virginia will commit to five years of funding at \$500,000 per year.

iv. At the end of the initial 5 year period, the HRRRI will be self-sustaining, primarily through source ii above.

b) Budget

The proposed budget for the first three years is shown in Appendix 2.

2. Financial Management

The President and the Board of Directors are ultimately responsible for the financial management of the HRRRI. The President will have authority to sign checks and enter into contractual obligations on behalf of the Institute. In the President's absence, alternates chosen by the Board of Directors will have the same powers. It is anticipated that certain routine functions including payroll, benefits and bookkeeping will be outsourced to a third party.

G. Relationship to other Key Organizations

A fundamental premise of the HRRRI is that it will complement and augment the missions and capabilities of existing organizations in the Commonwealth and region, not compete with them. To this end, appropriate and complementary relationships with other key organizations involved with research and technology-based economic development will be established and maintained. Five of these relationships are shown in Figure 2:

Relationships with Other Organizations

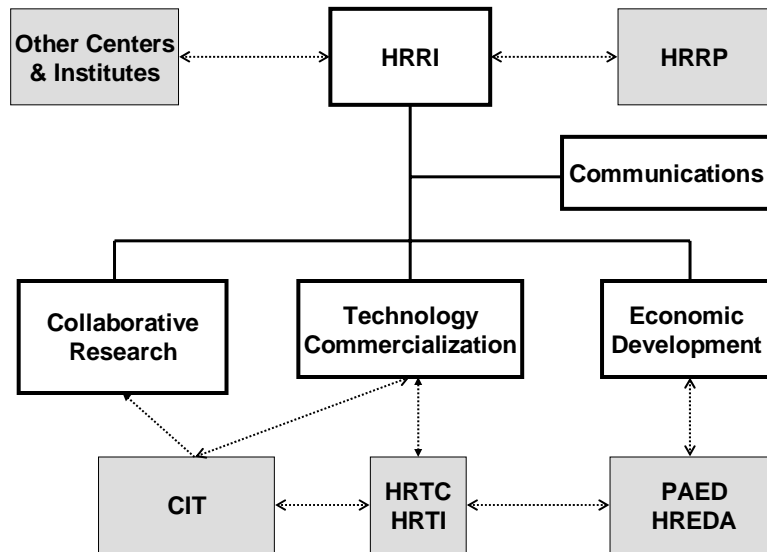


Figure 2

1. Hampton Roads Research Partnership (HRRP)

The Hampton Roads Research Institute is an initiative undertaken by the Hampton Roads Research Partnership. HRRP will not eliminate the Hampton Roads Research Partnership. Members of the HRRP can elect to join the HRRP but are not required to do so. Therefore, the HRRP remains a mechanism for its members to interact with other regional institutions. Because of the considerable overlap of membership, the President of the HRRP will have complementary duties as Executive Director of HRRP.

2. Centers and Institutes at Member Institutions

It is recognized that HRRP members have centers and institutes in a variety of research and application areas. Conflict and competition between these organizations and HRRP will be precluded by procedures discussed in Section B-1; participation by member institutions in selection of HRRP activities ensures proper controls. Further, to the extent desired by members, HRRP can support specific activities of other centers/institutes,

coordinate center/institute activities across the region,
and facilitate the creation and operation of new centers.

3. Virginia Center for Innovative Technology (CIT)

As required by mandates from the Governor and the Legislature, CIT is changing its mission, beginning in 2004, to focus on acceleration of next-generation technology and technology companies. Defense and Homeland Security, Nanotechnology, and Life Sciences have been identified as target areas; the CIT roles are to identify opportunities for expanded research in these areas, and to facilitate and support the startup/buildup of new businesses. A new Institute for Defense and Homeland Security has been created under CIT, and similar institutes in the other two areas may soon follow.

HRRI and CIT will cooperate with each other to serve the needs of Hampton Roads and the Commonwealth. Collaborative research opportunities appropriate for HRRI may be identified by CIT and passed along for implementation pursuant to the process outlined in Section II B-1. Correspondingly, for technologies developed by HRRI, or handled by HRRI, CIT will be a critical partner in the process described in Section II B-2, particularly in implementing commercialization, assisting in finding and obtaining financing, and providing business links. Here HRRI will be a client of CIT. This relationship is one in which each organization recognizes the other's mission and capabilities and leverages accordingly.

4. Hampton Roads Technology Council (HRTC)

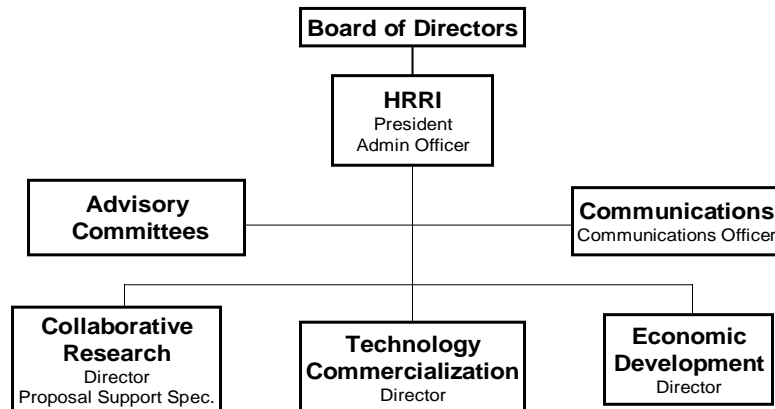
HRTC is an organization promoting high technology business in Hampton Roads through networking opportunities, communications initiatives, and linkages with investors and legislators. It works closely with the economic development organizations in this regard. In addition, HRTC has taken a leadership role in communications and event production for the region. The intent of HRRI is to partner with HRTC and CIT in the business-related activities in Section B-2, and to leverage HRTC capabilities for communications and events. The Hampton Roads Technology Incubator (HRTI) is an organizational element of HRTC and is already a successful incubator with a portfolio of clients and alumni employing about 110 people. The HRRI will

provide university linkages for these clients, and will refer potential new clients based on commercialization opportunities identified by HRRI partners.

5. Economic Development Organizations

The Peninsula Alliance for Economic Development (PAED) and the Hampton Roads Economic Development Alliance (HREDA), represent the interests of the communities of Hampton Roads in growing the economies of the region. In addition, each community has dedicated staff promoting its own economic interests. For technology-based economic development, the HRRRI will provide a valuable resource to these organizations by providing a connection between them, and their clients to the collective technology-generating capabilities of the region. This will involve support to their technology business recruiting efforts through educational activities and direct contact with clients. In this regard it is intended that the HRRRI Economic Development function will serve as an agent for PAED and HREDA efforts.

Hampton Roads Research Institute



APPENDIX 1

Proposal: Laser Bioscience Center at the Jefferson Lab Free Electron Laser User Facility

Introduction

Jefferson Lab's Free Electron Laser Facility operated the world's most powerful laser tunable from infrared to ultraviolet wavelengths. During its initial operation period (1999 – 2001) over thirty different research groups used the free electron laser (FEL) for a variety of frontier experiments in photochemistry, materials science and biophysics. The FEL has recently been upgraded to higher power and extended wavelength tuning capabilities. There exist numerous opportunities for application of this unique light source to bioscience and biomedicine. This proposal addresses a two pronged approach for adding additional infrastructure and related operation funds to support bioscience applications of the FEL.

Scientific Focus

The unique capabilities of the Jefferson Lab FEL (high average power, broad tuning range and short pulse -picosecond-time structure) offer opportunities for the following types of bioscience experiments:

- Energy flow mechanisms in proteins
- Ultraviolet photodamage studies in cellular and animal systems
- Biomolecule and cell sorting by light
- Photodynamic dermatology treatments and cancer therapy
- Tomographic imaging with visible and infrared light

Prof. Ariel Gomez, Vice President for Research at UVA and Prof. Rox Anderson from the Wellman Laboratory of Photomedicine at Harvard Mass. General Hospital, have agreed to lead the effort to generate the specific scientific focus of this proposal. We expect additional institutions to join the proposal team, including significant participation from EVMS and other members of the Hampton Roads Research Partnership (HRRP).

Planned Proposal to NIH for Laser Bioscience Center Operation Funds

The NIH currently funds two university based laser bioscience centers that both focus on the application of conventional laser to bioscience and biomedicine. The NIH grant provides the order of \$2M/yr. for center operations. The above mentioned proposal team leaders have agreed to organize a proposal team and a preparatory workshop in order to produce and submit a similar grant proposal to NIH.

Supporting Infrastructure Proposal by the HRRP

The HRRP considers bioscience activities and expanded R&D use of the Jefferson FEL Facility as programmatic focal points. In concert with the above NIH proposal, the

HRRP proposes to submit a complementary \$5M capital grant request to the federal government for an expansion of the FEL User Facility to accommodate the above planned laser bioscience activities.

Path Forward: September, 2003 – March 2004

Sept. – Dec. 2003

- Planning for workshop(s) to delineate scientific focus and identify investigators at collaborating institutions
- Preparation of white paper on scientific applications
- Inclusion of FEL User Facility expansion in the HRPP (FY05) funding campaign

Jan. – Mar. 2004

- Working group meeting at FEL Users Meeting (Jan. 15-16, 2004).
- Site visit to NIH by proposal team
- Preparation and submission of final proposal to NIH
- Submission of HRPP capital request to federal government

APPENDIX 2

| APPENDIX 2 | | Year 1 | Year 2 | Year 3 |
|------------------------------------|------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| | Total | July 2004 - June 2005 | July 2005 - June 2006 | July 2006 - June 2007 |
| REVENUE | | | | |
| <u>Contributions</u> | | | | |
| - | | | | |
| Hampton Roads Partnership | \$90,000 | \$90,000 | \$80,000 | \$80,000 |
| Member Fees for Service | \$248,557 | \$107,100 | \$150,765 | \$180,608 |
| State of Virginia | \$500,000 | \$500,000 | \$500,000 | \$500,000 |
| Event Fees/Sponsorships | \$5,000 | \$5,000 | \$5,000 | \$5,000 |
| | | | | |
| Total Revenues | \$- | \$702,100 | \$735,765 | \$765,608 |
| EXPENSES | | | | |
| <u>Personnel</u> | | | | |
| <u>Salaries & Wages</u> | | | | |
| President | \$120,000 | \$120,000 | \$126,000 | \$132,300 |
| Administrative Officer | \$40,000 | \$40,000 | \$42,000 | \$44,100 |
| Collaborative Research Director | \$100,000 | \$100,000 | \$105,000 | \$110,250 |
| Proposal Support Specialist | \$55,000 | \$55,000 | \$57,750 | \$60,638 |
| Communications Officer | \$50,000 | \$50,000 | \$52,500 | \$55,125 |
| | | | | |
| Total Salaries & Wages | \$365,000 | \$365,000 | \$383,250 | \$402,413 |
| <u>Benefits and Taxes</u> | | | | |
| Fringe Benefits @ 30% | \$109,500 | \$109,500 | \$114,975 | \$120,724 |
| Professional Development | | \$2,500 | \$2,625 | \$2,756 |
| | | | | |
| Total Personnel | \$477,000 | \$477,000 | \$500,850 | \$525,893 |
| <u>General Operating</u> | | | | |
| Telephone Services (Cell) | \$2,500 | \$2,500 | \$2,625 | \$2,756 |
| Office Supplies | \$2,300 | \$2,300 | \$2,415 | \$2,536 |
| Travel/Entertainment | \$25,000 | \$25,000 | \$26,250 | \$27,563 |

| | | | | |
|--|-----------------|-----------------|-----------------|-----------------|
| Dues & Subscriptions | \$3,500 | \$3,500 | \$3,675 | \$3,859 |
| Payroll/Accounting | \$9,000 | \$9,000 | \$9,450 | \$9,923 |
| Audit | \$4,000 | \$4,000 | \$4,200 | \$4,410 |
| Telecommunications/E-mail | \$2,500 | \$2,500 | \$2,625 | \$2,756 |
| Liability/E&O Insurance | \$5,000 | \$5,000 | \$5,250 | \$5,513 |
| Legal Fees | \$5,000 | \$5,000 | \$5,250 | \$5,513 |
| Meetings | \$2,500 | \$2,500 | \$2,625 | \$2,756 |
| Postage/Freight | \$3,000 | \$3,000 | \$3,150 | \$3,308 |
| Printing/Reproduction | \$500 | \$500 | \$525 | \$551 |
| | | | | |
| Subtotal Operating | \$64,800 | \$64,800 | \$68,040 | \$71,442 |
| | | | | |
| <u>Collaborative Research, Technology Commercialization and Related Support</u> | | | | |
| Skilled Services (Corporate Wide) | \$30,000 | \$30,000 | \$31,500 | \$33,075 |
| Seed Funding (Corporate Wide) | \$30,000 | \$30,000 | \$31,500 | \$33,075 |
| | | | | |
| Subtotal Program Development & Support | \$60,000 | \$60,000 | \$63,000 | \$66,150 |
| | | | | |
| <u>Communications and Economic Development</u> | | | | |
| Marketing Communications | \$30,000 | \$30,000 | \$31,500 | \$33,075 |
| Web Services | \$6,000 | \$6,000 | \$6,300 | \$6,615 |
| Events Production | \$7,000 | \$7,000 | \$7,350 | \$7,718 |
| Events Sponsorship | \$2,500 | \$2,500 | \$2,625 | \$2,756 |
| Trade Shows/Exhibits | \$4,000 | \$4,000 | \$2,625 | \$2,756 |
| | | | | |
| Subtotal Marketing & Communications | \$49,500 | \$49,500 | \$50,400 | \$52,920 |
| | | | | |
| <u>Equipment, Furniture and Furnishings</u> | | | | |
| Computer Equipment | \$5,000 | \$5,000 | \$3,500 | \$2,000 |
| Miscellaneous-Phones | \$800 | \$800 | \$400 | \$400 |
| Lease Equipment | \$- | \$- | \$5,000 | \$- |
| Furniture/Furnishings | \$3,500 | \$3,500 | \$1,000 | \$1,050 |
| Maintenance & Repair-Computer | \$500 | \$500 | \$525 | \$551 |
| Maintenance & Repair-Equipment | \$1,000 | \$1,000 | \$1,050 | \$1,103 |

| | | | | |
|--|--------------------|------------------|------------------|------------------|
| | \$- | | | |
| Subtotal Equipment, Furniture and Furnishings | \$10,800 | \$10,800 | \$11,475 | \$5,104 |
| | | | | |
| <u>Facilities</u> | | | | |
| HRRI Rent Expense | \$30,000 | \$30,000 | \$31,500 | \$33,075 |
| | | | | |
| Subtotal Facilities | #REF! | \$30,000 | \$31,500 | \$33,075 |
| | | | | |
| <u>Miscellaneous</u> | | | | |
| Miscellaneous Expense | \$10,000 | \$10,000 | \$10,500 | \$11,025 |
| | | | | |
| Subtotal Miscellaneous | \$10,000 | \$10,000 | \$10,500 | \$11,025 |
| | | | | |
| Total Expenses | \$700,600 | \$702,100 | \$735,765 | \$765,608 |
| | | | | |
| Excess Revenues over Expenses Surplus/(Deficit) | \$(700,600) | \$- | \$- | \$- |
| | | | | |
| | | | | |
| | | | | |
| | | \$248,557 | \$472,305 | \$605,073 |
| | | \$141,457 | \$321,540 | \$424,465 |
| | | \$107,100 | \$150,765 | \$180,608 |