Executive Summary

The proposed Anheuser Busch Coastal Research Center will build on an excellent foundation provided by the Long-Term Ecological Research program at the existing University of Virginia Coastal Research Center. In order for the full potential of the site and the research resources to be realized, a new facility will be constructed on land that is owned by the University. Planning has begun for the new buildings and funds have been secured that will enable construction to begin. A visiting group of outside experts (1) suggests further planning approaches, (2) proposes promising topics for future research, (3) analyzes the likely staffing, logistical and facility requirements for a viable field station, (4) lists reasonable expectations at the end of five-, 10- and 20-year periods, and (5) offers a number of funding possibilities. The newly configured ABCRC will be a tremendous asset for the University of Virginia, and for regional, national and international coastal science and conservation.

Panel of Outside Visitors:
Susan Lohr, Facilitator
Dennis Allen, Belle Baruch Institute for Marine Biology, University of South Carolina
Richard Dame, Coastal Carolina University
Gabriel Katul, Duke University
William Kustas, Agricultural Research Service, USDA
Mark Luckenbach, Virginia Institute of Marine Sciences
Robert Parmenter, Sevilleta Field Station, University of New Mexico
Denise Reed, University of New Orleans
Susan Rice, U.S. Fish and Wildlife Service
Mark Stromberg, Hastings Natural History Reservation, University of California
Hilary Swain, Archbold Biological Station
Ivan Valiela, Boston University

Participants from the University of Virginia:
John Albertson, Linda Blum, Randy Carlson, Mike Erwin, Bruce Hayden, Karen McGlathery,
John Porter, Jimmy Spitler, Jay Zieman

Background:

In May 2000 the University of Virginia Coastal Research Center convened a planning workshop partially funded by a grant received from the National Science Foundation’s program for planning and facility development at field stations and marine laboratories. The workshop follows earlier efforts to identify and purchase land and to develop plans for construction of an expanded coastal research laboratory. The new laboratory will be called the Anheuser Busch Coastal Research Center (ABCRC), in recognition of a generous corporate donation toward construction.

Workshop participants included a panel of outside visitors with experience in related research areas or at field facilities similar to those envisioned for the ABCRC. These visitors met in discussion sessions with personnel from the University of Virginia associated with the Long-Term Ecological
The planning workshop for the ABCRC had several tasks:
1. To envision what field facilities, logistical support and administrative structure are necessary to make the ABCRC a field station where scientists could conduct cutting-edge research of international importance.
2. To set forward the recommendations from Task #1 in the context of 5-, 10- and 20-year time frames.
3. To suggest funding mechanisms for ABCRC operations and activities.

I. Overview

The opportunity to build a new coastal research laboratory on land purchased by the University of Virginia (UVA) is provided by a major corporate donation that has ignited a capital campaign and planning effort. Currently the LTER program rents an old house from The Nature Conservancy and conducts all of its field research on leased land. This situation is inadequate for achieving the full potential of the LTER program and precludes any expansion of the current Coastal Research Center to a more comprehensive institution encompassing the LTER and other new research initiatives.

In general discussions the visiting panel agreed with the University of Virginia personnel that the intellectual and other research resources available have the potential for eventual development of an internationally recognized coastal research center. There don't appear to be serious limiting factors that would preclude achieving that level of prominence.

Implicit in this goal of achieving international scientific prominence is the intention that the ABCRC will become more than just a facility to house the LTER program. A mission statement expressing this broader research and educational vision has been crafted by the UVA and was discussed by the visiting panel. The panel concluded that the current mission statement is too long and mixes the overall mission with more short-term goals and objectives, but that the pieces are all there to be reworked. Here is a suggested revision:

Mission Statement: The mission of the ABCRC is environmental research and education concerning the long-term dynamics of the barrier islands, lagoons, marshes and watersheds of the Eastern Shore of Virginia.

Goals:
- Through research we will understand the long-term dynamics of the coastal environment.
- Through education we will foster environmental literacy.
- Through research and education we will advance the conservation of one of America's premier natural treasures.

Objectives:
- To provide a physical facility that supports and encourages accomplishment of the mission and goals.
- To achieve national prominence as a coastal research center.
- To become fiscally responsible, with a business plan that emphasizes financial self-sufficiency to a large degree, beyond a fundamental financial commitment from the University of Virginia (UVA).
The visiting panel suggested that a broad, general mission statement can be flexible enough to allow the development of different priorities over time as the field station evolves. More specific short-term goals and objectives that may arise in response to opportunities can be pursued within the broad outlines of the mission statement. A mission that is too specific often constrains long-range planning.

Throughout the workshop, visitors expressed admiration for the progress that has been made to date in identifying the land resource and general outlines of the physical plant, and in securing funding. However, there was concern that the facility opportunity is driving the planning, when in fact the best facilities evolve from an academic or research plan that is developed first, prior to designing facilities. The LTER researchers, who have so successfully spearheaded the effort to build a new ABCRC, are focusing largely on the facility needs of the LTER program. They haven’t yet composed a larger group of stakeholders to develop an academic plan that addresses research and education needs for a 20-year horizon in the broadest sense. Hopefully that planning effort will begin immediately upon the completion of this workshop report, so that the needs articulated in the academic plan can be incorporated into the facility design prior to construction. The best facilities develop in the context of an academic plan that is created through inclusive involvement of all potential users, stakeholders and interested parties.

II. Task One

"To envision what field facilities, logistical support and administrative structure are necessary to make the ABCRC a field station where scientists could conduct cutting-edge research of international importance."

Workshop participants were assigned to three smaller groups to address Task One: Field Research Opportunities, Logistics/Boats/Docking, and Facilities/Management/Administration. The results of their discussions follow. There is a small amount of redundancy among these reports because of the wide-ranging nature of their discussions.

A. Field Research Opportunities

Group members: Richard Dame (recorder), John Albertson, Linda Blum, Mike Erwin, Gaby Katul, Bill Kustas, Karen McGlathery, Aaron Mills, Ivan Valiela

This group discussed the variety of research efforts that could appropriately be undertaken at the ABCRC of the future, given the physical location of the facility, reasonable access to habitats and leased or owned land with research potential, and the more practical considerations inherent in achieving research productivity.

The group made a strong recommendation that specific research objectives for the ABCRC evolve from some general, fundamental principles:

- Have broad hypotheses, moving beyond the local resource to consider questions of regional, national and international implication
- Don't hesitate to use natural and/or human mediated changes and manipulations as experiments
- Use interdisciplinary approaches, which will require the direct interaction of investigators, facilitated by the Center
- Give great emphasis to synthesis and publication, which should be integrated into administration and operation of the ABCRC.

The following topics were identified by the discussion group as possible areas for future research:

1. Investigating the consequences of Sea Level Rise on coastal environments, including:
   - Tidal flow and sediment trapping
   - Habitat change in response to sea level rise
   - Carbon accumulation

2. Identifying the impacts of land use on coastal lagoons, including:
   - Landcover/landuse relationships
   - Transformation and transport materials in the subsurface environment
   - Lagoonal processes
   - Nitrogen saturation of forested areas

3. Greenhouse gas production across a land-lagoon interface, such as carbon gradients

4. Ecosystem consequences of intensive mariculture of bivalves (perhaps best studied as part of a larger research consortium), including:
   - Human mediated changes to ecosystems
   - Population/functional group processes

In developing a research plan for future activities, the emphasis should be on working with resources at hand and not duplicating the efforts of nearby scientific institutions. Either a formal research consortium or a less formal means of cooperating will be required, but there will be savings in the long run by not having to invest in the support facilities that may already exist within a reasonable distance. However, for this research cooperation to be accomplished, a great degree of coordination and knowledge will be required of the ABCRC administration. The current LTER research philosophy is a good model, and will be extended beyond LTER-funded efforts to new areas of research.

There was much discussion over which facilities and equipment should be the responsibility of individual researchers or research programs, and which should be the responsibility of the Center to provide. Note that a “field site” merely provides the physical presence for individual, unrelated scientists to bring their assistants and equipment and conduct their research. However, a “field station” or “center” provides a centralized facility with common research resources that can be shared and which are reliably accessible to a number of scientists who comprise a “critical mass” of scientific investigation. If the ABCRC truly wishes to be a center for research, then some items for common use must be provided independent of the equipment of individual researchers. These include (in order of importance):

1. An administrative presence to facilitate research efforts, minimize potential conflicts, and enforce any ABCRC research policies.
2. Maintenance of sample site integrity by having control over owned and (if possible) leased lands so research resources are reliable over time. Buy as much land as possible.
3. Access to experimental control areas, such as the marsh and nearby agricultural lands;
4. Access to basic laboratory facilities, including bench and storage space, water supplies, refrigerator and freezer space, and other lab necessities.
5. A baseline database maintained in a usable and up-to-date format, e.g. searchable, overlays, utilizing public agency resources, etc. A long-term monitoring plan for the site and associated research areas that builds on LTER data accumulation will be a great attractant to outside investigators.
6. A spatial uses laboratory with GIS capability, remote sensing data and spatial data.  
7. An analytical facility with ovens, hoods, autoanalyzer, gas chromatograph, balances, scopes, etc.  
8. Collaborative spaces.  
9. A data management technician on site.  
10. Laboratory technicians (one for analytical lab and two for GIS and spatial analysis labs).  
11. Towers (cost of about $300,000) to measure H2O, CO2, other trace gases.  
12. Individual researcher access to laboratory and field technicians for their projects.

B. Logistics/Boats/Docking  
*Group members: Dennis Allen (recorder), Randy Carlson, Mark Luckenbach, Denise Reed, Jimmy Spiller, Jay Zieman*

The group used the following general assumptions to guide their discussion.

- Work will take place in the lagoon and barrier islands.
- Routine field support will be provided by Center boat operators.
- Almost daily there will be a need for a one-hour round-trip to barrier islands.
- There will be some trips to more remote islands of 90+ minutes each way.
- The ABCRC won’t unnecessarily duplicate resources found at relatively nearby facilities, such as VIMS.

1. Boats

The following issues are important for consideration in planning for a vessel strategy at the ABCRC:

- Access must be provided in a timely fashion.
- Access must be provided to more remote areas.
- Local knowledge and experience will facilitate access.
- There will be a need for additional small boats to allow trained and oriented individuals (preferably in pairs) access to research sites without the ABCRC operator.
- Quality and reliability of service is critical to sustained use and growth of the program.
- There will be a wide range of needs and expectations regarding boats, which will only grow with time.
- Current staff just barely handles a heavy schedule, especially during summer. They would like to have another operator for current load. Even more operators will be needed for the future.
- Trucks for trailered boats and everyday tasks are needed. The lack of trucks is a bottleneck at all similar field stations. Trucks are necessary for access to other study sites as well. Even though trailered boat trips will be neither expected nor encouraged, trucks are absolutely necessary and there are never enough available. Vehicles are part of the vessel strategy, including van, pickup, suburban, etc. for people carrying capacity.

The group was comfortable with the current LTER program policies in place regarding boat use and safety. These policies will have to be extended and modified as operations expand. As a general principle, the ABCRC administration should rely on common sense rather than imposing policies that are too rigid and structured.
Increased interaction between the ABCRC and the UVA campus-based Environmental Health and Safety Office, including site visits, should be encouraged. Other liability issues can best be addressed through interaction with the University's Risk Management Office. There should be a track record of consulting and interacting with these campus resources. The group expects that the Coast Guard and/or the State will require licensing of all operators, which will reduce the liability burden on the ABCRC.

Currently all use is through the LTER program. In the future there will undoubtedly be requests for facility space from visitors who want to bring their own boats and also use lab space. Administrative policies for handling these requests need to be in place ahead of time. Similar policies have been developed by other state-funded research facilities in Virginia and these can provide useful models for the ABCRC.

2. Docks

Issues to take into consideration when planning docks include:

a. 12' surge pilings
b. Floating dock and slips for loading (see Figure 1)
c. Fuel access with upland tank, and hose and pump station close to land
d. Freshwater availability, with many hose bibs
e. Power supply and lighting
f. Cost needs should figure into overall facility planning
g. ADA requirements for docks
h. Strongly recommend ramps rather than steps all the way up to lab buildings, for ease of carrying equipment, loading and unloading, and facilitating with research gear

Figure 1. Preliminary Drawing of Dock Configuration
3. Logistics

A number of topics arose during the discussion of providing logistics for boats, docks, and similar research support.

a. Scuba

The group thought there would be no need to provide a compressor or other modifications to the proposed buildings to accommodate scuba. The Virginia Institute of Marine Sciences (VIMS) Eastern Shore Laboratory is nearby and can provide air and related services for scuba needs. As far as diving from the ABCRC, perhaps the AAU scientific diving policy certification can be required (and should be confirmed by ABCRC administration). In any case, the ABCRC will need to decide on a diving policy. Either 1) "Just Say No" and don’t accommodate diving at all, or 2) develop specific guidelines as to whether divers can use Center boats or operate out of the ABCRC facility.

b. Seawater system and mesocosms

There are concerns that poor water quality in the harbor may make the provision of a seawater system and mesocosms for experimentation problematic. Nutrients may be too high for the water to be useful for cultures. The group recommends that the ABCRC plan to install electrical and plumbing services on the dock to accommodate small pumps and a pipeline. Then basic services can be delivered for sieving, washing, and short-term holdings of animals for demos and field trip projects. A few seawater tables will satisfy short-term needs and expectations. Later expansion can occur from this basic level, if demand warrants. Starting with a simple system should cost about $20K for infrastructure. Eventual expansion to full provision of seawater and mesocosms can go up to $500K if eventually desired.

c. Toxic waste

On-site storage and off-site disposal of chemical waste will be required. The good working relationship currently in place with the UVA Environmental Health and Safety Office should be used to handle this storage/disposal need. Visitors who store toxic wastes and need to use the disposal system should pay the direct and indirect costs of doing so. Clear policies need to be developed stating procedures and protocols before visitors come. The ABCRC should not subsidize financially the storage and disposal of waste. Also, be aware of the use requirements for formalin in air-conditioned spaces.

d. Staffing

The group discussed staffing requirements for the ABCRC as relating to the provision of logistical support for research. In general, there will be a need for multifaceted staff with a wide range of responsibilities. Although recognizing that the Administration and Facilities group would be addressing this topic in depth, in the context of their logistics discussion they felt the following staff needs should be met:

i. A Director is needed, preferably a senior scientist, a recent Ph.D. or post doc, or a senior government or scientist/manager near retirement. This Director position would be a research faculty line rather than a tenure line. The person hired could need to work effectively at the Dept. Chair and Dean level, so as to maximize their ability to provide effective scientific support at the ABCRC. There needs to be a workweek presence on site from this position.
ii. A facilities manager/administrative assistant is needed. Job duties would include being available beyond the work week. Other duties may include being a "fiscal technician" (clerical/payroll/purchasing).

iii. Maintenance person or personnel.

c. Rates

It is difficult to determine rate structures without knowing what the full costs of providing the facility are. However, the group agreed that some effort to achieve cost recovery through a rate structure is essential for a fiscally responsible ABCRC. Nonetheless, the University of Virginia needs the ABCRC programs and will benefit tremendously in a variety of ways, and so should provide sufficient support to ensure ABCRC longevity.

d. Facility Thoughts Relating to Logistics

A somewhat wide-ranging discussion of the features of the ABCRC facility ensued. The group felt that the distinction between the ABCRC as a larger unit and the current LTER program may be functional for planning efforts, but the reality is that the LTER program will dominate the ABCRC for a number of years. In fact, as the Sevilleta Field Station evolved from its beginning as an LTER site, it took 10 years before the LTER use comprised less than 50% of station research activity.

In general, maximum flexibility should be built into the ABCRC facilities. There should be storage space of adequate size very close to the docks and boats. The group recommended an elevated building with open or breakaway walls, and storage below.

One great advantage the ABCRC has is good airport access. Rental car use has real potential for visiting scientists.

The issue of what equipment will be provided and operated by the Center and what is LTER equipment not available to visitors should be addressed soon. Shared common equipment might include such items as a walk-in refrigerator, hoods, centrifuges, furnaces, balances, microscopes, spectrophotometer, etc. Expected educational use is probably more by short graduate level courses or field trips, rather than full semester courses at the ABCRC. Common equipment should also be provided for these short courses and events.

There is a need for an ABCRC presence on campus. If the chosen model of governance is a Resident Director, then there should be a co-Director or other faculty presence to champion the ABCRC cause within the Department and College. "Out of sight, out of mind" is a problem too many field stations face, and hence they lose access to decision-makers, budget processes, and the institutional corridors of power that can benefit their field facility. Don't let this happen to the ABCRC.

g. Safety

In general, boat safety is the responsibility of the ABCRC. Laboratory and building safety is the responsibility of the University of Virginia. All of the appropriate University resources should be utilized when developing safety policies.
This group discussed what administrative and facility requirements are necessary to make the ABCRC a fully functioning field station, able to provide support for the current and future needs of the community of research and educational users. They made some fundamental assumptions:

- Research facilities will be as cutting-edge and modern as possible.
- Housing and lab facilities will be good enough to encourage long-term intellectual commitments by scientists to the ABCRC.
- Logistics will be centralized in an effective ABCRC administration.
- Growth in number of users and needs generated by them will be handled by forward-thinking planning efforts and policy-making.
- As much control as possible over research sites and facilities will be held by the ABCRC, including plans to buy sites or engage in scientifically beneficial long-term lease arrangements.
- Governance will be broader than the current group of LTER users, and will be located as high up in the University hierarchy as possible.
- Attracting long-term on-site administrative and scientific staff will be difficult given the nature of the ABCRC location and community environment.

The group submitted the following text as a summary of their discussions:

1. **Housing**
   Good housing is the primary demand by the research and educational community. All housing should be created equally, allowing maximum flexibility for room assignments for different groups of users. Sleeping units of small size (1-2 people per room) are best, with private access to bath facilities. Kitchenettes could be shared by 4-6 people. "Private space" is important for visitors, especially those who reside at the station for more than a few days. Dormitories are universally unpopular at field stations because they are inflexible structures, difficult to fill with willing residents. None of the experienced field station directors in this discussion group would voluntarily build a dormitory for field station housing.

2. **Staff housing**
   Staff should be available for emergency contact and questions 24 hours a day, year-round. This implies either a coordinator or caretaker who lives on site, or within a short distance of the facilities. As weekend use by conferences, workshops, and educational groups increases, someone will have to be available to assist with reception and emergency questions during this time.

3. **Staff needs**
   The station will evolve over the next 10-20 years, and will require a number of staff positions to ensure the efficient operation and maintenance of the station. Initially, the construction process of the first buildings will require a person on site to ensure that the building plans (blueprints) are being accurately followed, and to issue change orders as needed. These inspections will need to be daily, or at the minimum twice per week as construction is underway. Occasional visits by inspection officials (i.e., UVA facilities planning personnel) will not likely be sufficient.
Once the station becomes operational after completion of the first set of buildings, there will need to be a person to maintain the facility, supervise custodial activities and handle emergency repairs, power outages, safety problems, etc. This person will need to be permanently on site to ensure consistent and complete oversight of station activities. In fact, having this person hired before construction begins and letting them participate in the construction oversight process is recommended, since they will have full knowledge of the varied buildings’ inevitable idiosyncrasies and can handle future maintenance and troubleshooting much more effectively. It is likely that LTER staff will try to take on part of these responsibilities, but a full-time caretaker person will be needed for the facility right from the beginning, since LTER personnel are funded to perform research rather than maintain buildings.

As the station use expands from a primarily "LTER"-dominated community to an "independent" group of researchers and students (in which the LTER program will be but one of many users), additional permanent staff will be required. Educational and community activities will increase, and staff demands will increase concomitantly. Administrative and management needs were assessed as follows:

a. Director
This person should be someone with science background and credentials, and should be intimately familiar with the broad range of activities conducted at the station. The Director should be in charge of budgets, scheduling, facility development (grants, etc.), and scientific coordination of resource use. The Director should be someone living on site (i.e., in the local community), or present at the station a large percentage of the time if based on campus at UVA.

b. Operations Manager
This person will be responsible for day-to-day operations once the station is fully built and operational. The Operations Manager will supervise the caretaker's activities, coordinate maintenance of the facility, ensure compliance with station regulations, and assist the Director as needed.

c. Caretaker
This person will be responsible for facility maintenance of buildings, grounds, and to some extent scientific equipment and instrumentation. The Caretaker should be on call during and after business hours and on weekends to handle emergency problems, and hence should reside close to the station for rapid response to emergencies.

d. Administrative Assistant
This person would handle paperwork for all station activities, including accounting, secretarial duties, correspondence, and scheduling requests for approval by the Director. This person would be most effective if located on site, but could be based on campus with good communications from campus to the site. Over the first 5-10 years, a part-time position (0.25-0.5 FTE) would be sufficient for these duties.

4. Physical layout of the laboratory facilities
The location of the laboratory is functionally well sited, and aesthetically pleasing. Problems may arise with the close proximity of the residences with the laboratory buildings, such as noise, traffic, headlights disturbing sleeping residents, music, nighttime lab or office use, etc. While negotiations with TNC and the Zoning Commission have been concluded, additional considerations of moving the residence buildings into the field and away from the
laboratories should be undertaken if feasible. Perhaps the first phase of construction could be flexible enough to allow one of the two lab buildings to be used as a residence for a few years, until the residences are built in the open area away from the labs and shore. Then that second building could be converted to a lab, and all living units will be ultimately located in the field, a short walk from the labs. In the collective experience of the visiting field station directors, it is a mistake to have living spaces immediately adjacent to lab areas.

In addition, a truck access driveway should be added to the pier area for ease of transport of bulky/heavy equipment or sample loads. Parking for up to 70+ vehicles appears inadequate, and should be carefully planned.

5. **Administrative and maintenance costs**

Utility costs are often overlooked as a potentially significant item in the maintenance budget. Annual costs (based on other field stations) for electricity and/or propane range from $20-30,000 for 15,000 square feet of building space. Support from UVA in covering these costs should be pursued. Maintenance costs will increase with time, and these increases need to be included in operational budgets. Basic infrastructure budget support from UVA should be secured, and enhanced by user fees to cover selected aspects of station use (i.e., "residence" portions of utilities, custodial services). Additional fees for vehicle or boat use should be structured according to sound business practices, including capital equipment replacement costs.

6. **Additional NSF grant support**

The ABCRC would have an excellent opportunity to enhance the facilities through grant proposals to the NSF Field Stations and Marine Laboratories Program, or through other NSF programs dealing with education or infrastructure. Withholding some of the currently secured funds for initial station construction as cost-share for such grants is a good idea. Areas of grant topics with high probability of success include research training facilities (computer networks), laboratory equipment, and vehicles/boats.

7. **Research Policies Review Committee**

The group recommends that such a committee be constituted as soon as possible. During interviews we detected some existing problems at the Center that could be addressed by such a committee and the policies it would make regarding appropriate research behavior. This committee would have the responsibility of reviewing and approving requests to use the field station and established research sites. They would also assure compliance with any sampling or collection permit requirements, animal care and use permits, hazardous waste disposal procedures, etc. Priorities for station use and access to equipment or personnel resources would also fall under the committee's purview. A Research Code should be developed by this committee for adoption by the ABCRC administration. Having such a committee structure and policies in place gives potential researchers contemplating a career investment in the ABCRC a measure of comfort that their commitment will not be threatened.

8. **“Green Building”**

Opportunities should be taken to make this laboratory and residence complex an environmentally compatible facility. This would include energy efficient heating/cooling systems, water use, waste disposal, and so on. Excellent examples exist for this type of engineering, such as the new Audubon building in New York and the Disney environmental center in Florida. Recently the Bodega Marine Laboratory built a new lab facility incorporating many environmentally responsible features (see Appendix 1 for suggestions).
9. Partnerships

Formal and informal partnerships with nearby agencies and nonprofits can benefit the ABCRC greatly. For example, a partnership with the local VIMS lab can facilitate shared use of resources, such as the VIMS compressor for scuba support. While the current working relationship with the U.S. Fish and Wildlife Service is clearly excellent, the relationship with The Nature Conservancy (TNC) is obviously complex and uneven. While the missions of TNC and the ABCRC may not consistently overlap, there are obvious similarities in information needs and clear opportunities for close collaboration that would be mutually beneficial. Future efforts should be directed at improving the working relationship between the two organizations.

III. Task Two

"To set forward the recommendations from Task #1 in the context of 5-, 10- and 20-year time frames."

Hopefully the planning process currently underway for the ABCRC will result in three plans:

1. an Academic Plan that will guide future research and education directions;
2. a Master Plan that will delineate the interrelationship of administration, facilities, and research and educational programs; and
3. a Business Plan that will articulate a financial pathway to achieving the mission, goals and objectives of the master plan.

Placing these plans in a timeline creates a Strategic Plan. Since the other plans are not yet complete, timeline suggestions are somewhat premature. However, the following general time frame expectations are realistic for field station development, given the progress that has been made to date.

A. Reasonable First Year Goals:

1. Hire ABCRC Director (this has to come first in order to accomplish all of the rest).
2. Make site visits by ABCRC staff to Bodega Marine Lab and St. Croix Watershed Research Center to see recently constructed lab facilities, and to the Sevilleta Field Station to see a research center that has evolved from an LTER field site.
3. Complete Academic Plan and define research mission.
4. Refine facility plan for acceptance by all identified potential stakeholders.
5. Establish Building Committee and hire supervisory personnel.
6. Involve higher UVA administrators (eg. Dean of the College) in some planning or other activities to expand their knowledge of the ABCRC and its needs and potential.
7. Complete Master Plan.
8. Complete Business Plan for long-term funding strategies and goals pertaining thereto.
9. Place all plans into a timeline to generate a Strategic Plan.
10. Complete data base and monitoring plans, based on research mission articulated in the Academic Plan.
11. Establish Research Advisory Committee and articulate research code and policies.
12. Hire additional boat operator.
13. Hire support staff for Director.
14. Secure funding to complete construction and to provide matching funds for future NSF grant opportunities.
15. Complete purchase of land for ABCRC.
16. Establish cooperative relationships with TNC, FWS, VIMS, other entities that will eventually lead to a functioning consortium.
17. Maintain current Coastal Research Center operations.
18. Establish other committee structures as desired, such as a professional Advisory Board comprised of community members and professionals that will assist with finance and development.
19. Select one new research area for solicitation of new investigators and collaborators.
20. Improve "buy-in" for the ABCRC within other UVA departments and the higher administration, so that the LTER investigators aren't the only stakeholders in eventual ABCRC success.

B. Reasonable Five-Year Goals
1. Establish and implement cost recovery mechanisms.
2. Establish and implement overhead charges and indirect cost income.
3. Establish and implement a research use marketing plan.
4. Seek collaborators in the other new research areas identified by the Academic Plan.
5. Write some grants appropriate to programs resulting from the Strategic Plan.
6. Successfully secure some NSF grants from the FSML, NEON, ARI and other programs.
7. Pursue an active development program for long-term funding viability, as outlined in the Business Plan.
8. Complete the first phase of construction.
9. Make progress on the capital campaign for the second phase of construction.
10. About 30% of research use of the ABCRC should come from investigators outside of the LTER program.
11. Actively promote visibility of the ABCRC within UVA, state and federal government circles.
12. Make some progress toward an operational endowment that will eventually guarantee the permanence of an ABCRC administrative presence. Perhaps $1M is raised.
13. Host at least two international meetings related to coastal research investigations during this five-year period.
14. Receive and implement a NSF Site Research Experience for Undergraduates grant based on LTER research opportunities.
15. Provide several community outreach programs related to coastal sciences each year.
16. Ensure that resident scientific and administrative staff participate actively in local community affairs.
17. Receive at least 50% of the central (non-LTER) staffing and operations costs of the ABCRC from the University of Virginia. UVA also subsidizes selected programs as agreed upon during the planning processes.

C. Reasonable 10-Year Goals
1. Research programs at ABCRC are nationally prominent and gaining international respect.
2. More than 50% of researchers are from outside the LTER program.
3. A regional consortium of coastal and marine labs, other field facilities, public agencies and private nonprofits such as The Nature Conservancy works toward mutual goals of effective conservation and compiling scientific knowledge of the regional environment.
4. All new research areas are being pursued.
5. About $3 million has been raised toward the ABCRC endowment.
6. Second phase of construction is complete.
7. More applicants than can be handled apply for research and teaching space each year.
8. The program subsidy period by the University of Virginia has ended. The UVA contributes a set percentage of basic administration expenses.
9. Fee structures generate cost recovery for all ABCRC expenses except the most fundamental administrative presence.
10. At least four NSF grants have been received besides the LTER program funding.

D. Reasonable 20-Year Goals
1. A $10M endowment is established to perpetuate ABCRC programs, administration and capital improvements.
2. All of the planning undertaken in Year One is obsolete and needs to be revisited.
3. More than 70% of research use comes from outside the LTER program.
4. The science produced at the ABCRC is internationally respected.
5. The ABCRC is a line item in the State and/or Congressional budget as an important national asset in coastal research and education.
6. The ABCRC has a national reputation for communicating science to the general public and promoting scientific literacy at all levels of education.
7. The Eastern Shore has become a national park, with the assistance of the regional consortium established by Year 10.
8. The ABCRC provides research scholarships and contributes income to related programs at the University of Virginia because of its healthy financial situation.

III. Task Three
"To suggest funding mechanisms for ABCRC operations and activities."

A. Business Plan

A plan should be developed for the ABCRC that outlines responsible business practices for operating the facility and specifies the financial expectations for each contributing entity. Usually a stepwise procedure is used for creating a business plan that leads to cost-recovery for a field station. Here are suggested steps to follow:

1. Recognize and quantify the fundamental institutional obligation.
   There should always be a fundamental financial commitment to the ABCRC from the University of Virginia. Such a commitment is expected by donors and by outside funding sources such as the National Science Foundation and other granting agencies. This institutional obligation should be calculated and agreed upon early in the planning process for the eventual configuration of the field station. For example, this commitment might reasonably be on the order of $165,000/year, covering the provision of core staff (Director, Facilities Manager, Caretaker, Administrative Assistant) and a maintenance budget of about $25,000. These are the base level of operations to keep the facility available for programs besides the LTER. Some LTER funds may also contribute to this administrative presence. Other noncash UVA contributions may include insurance, legal assistance, development office assistance, physical plant personnel, and access to the many resources the UVA provides its various departments.
2. Cost center all activities.
   Determine the full cost of providing research space, courses, housing, food service, annual utilities, maintenance and deferred maintenance, depreciation, etc. by assessing the expenses associated with each area. Include opportunity costs also, such as giving housing to staff that might otherwise be occupied by a paying user. This process will enable the ABCRC to initiate a cost recovery system. The basic cost of providing the facility can be divided by the number of potential daily users to develop a station use fee. Eventually this fee will lead to reducing and then minimizing the basic expense to UVA of providing the ABCRC facility. Note that it will be critical for the ABCRC to have the freedom to set usage fees and not be unnecessarily constrained therein by University policies.

3. Determine which programs can legitimately recover costs.
   There are a number of policy decisions that must be made to determine how to charge for ABCRC facility use. Should university faculty be charged for lab rental? Can faculty expenses be charged back to departments? If faculty have research grants, then they definitely should be charged use fees. Once areas of subsidy are recognized and accepted, space allocations need to be made for each type of activity, to avoid having all the space at the ABCRC taken up by subsidized programs, leaving no room for income-producing users.

4. Develop programs that recover costs.
   There are an almost infinite number of possible programs that will pay fees for use of the ABCRC, and will also generate revenue to offset the UVA’s financial obligation. Some examples are summer courses for high school, undergraduate, graduate and professional scientists and students, intensive workshops, corporate training or retreats, conferences relating to science and policy, and sponsored research with grant and overhead income. Each of these relates directly to the mission of the ABCRC. Any proposed program should undergo an effort/return analysis, and decisions should tend to promote those programs that offer maximum financial return for minimum effort, as long as the mission of the ABCRC isn’t violated.

5. Grants, donations and gifts should be targeted in a focused development program.
   Although fundraising shouldn’t provide the basic operational income for the ABCRC, it certainly can be a significant component of the overall financial health of the field station. Any opportunity to generate an endowment should be taken. For example, ideally a portion of funding for capital improvements would be set aside in a maintenance endowment to provide future annual income toward the expense of staff and materials for facility upkeep. Development consultants at the UVA will be very helpful in outlining realistic approaches to the wide variety of fundraising options available. Planned or deferred giving (wills, trusts, etc.) should not be overlooked.

   There will necessarily be a transition from beginning the expanded programs at the ABCRC to eventual near self-sufficiency. Initially all on-going operations and building-related expenses will have to be borne by the University or the LTER program. However, cost recovery should begin no later than Year 5 and certainly by the 10th year of expanded operation income should significantly exceed the institutional contribution. If not, the ABCRC will not be well managed.

   Figure 2 shows a schematic representation of how cost recovery might work over time. If the period of subsidy by the UVA is to be minimized, careful planning must be implemented in a timely and effective manner by the ABCRC. Here is another reason to hire the Director position as soon as possible, rather than relying on the current committee approach for management. The only way for a field station
to achieve financial health is for it to be tightly managed financially, and to be directed in a creative, yet focused and functional manner.

**Figure 2. Cost Recovery over Time**

B. Summary of Funding Ideas

As the last session of our visit, we spent an hour brainstorming ideas for raising funds for the ABCRC. The italicized suggestions received the most support for having potential. These ideas should be run through an effort/return evaluation matrix, to see where the least effort can be spent for the greatest return. Consider this simply a list of possibilities, not necessarily recommendations.

1. Federal Government Possibilities
   a) NSF programs (FSML, NEON, ARI, CCLI, ILI, REU, RUI, LTER, Bioinstrumentation, Water Cycle, etc.)
   b) NOAA
   c) Sea Grant
   d) Department of Defense
   e) Department of Energy
   f) EPA – indicators and risk assessment
   g) NASA – EOS validation site
   h) National Weather Service
   i) USACOE
   j) USDA
   k) USFWS
   l) USGS
   m) the pork barrel – e.g. congressional appropriation
   n) Federal agency MOUs for services contracted
   o) Federal park status

2. State Government Possibilities
   a) Office of Natural Resources
   b) Department of Environmental Quality
   c) State lottery funds
   d) VA MRC
   e) State bond issue
   f) State line item appropriation
   g) VA 2020 campaign thrust area
3. Local Government Possibilities
   a) County tax $$
   b) Local government grants
   c) Local government service contracts

4. Private Organizations and Foundations
   a) The Nature Conservancy grants and fellowships (e.g. Smith Fellowship)
   b) Other conservation organizations
   c) Private foundations
   d) International foundations
   e) Small private foundations

5. Corporate Resources
   a) Business community donations
   b) Corporate donations
   c) Corporate in-kind giving
   d) Corporate conferences or retreats
   e) Income from providing public relations opportunities for corporations
   f) Income from required corporate mitigation efforts

6. University Resources
   a) UVA capital campaign
   b) UVA administrative funding for ABCRC
   c) UVA general fund
   d) Indirect cost recovery for grants where work is conducted at ABCRC
   e) Funds from other UVA departments with a stake in the ABCRC
   f) Internal departmental or college budgetary support
   g) UVA Dept. of Environmental Science endowment

7. Operational Income
   a) Research user fees
   b) Ecotourism activities
   c) Visiting group fees
   d) Facility rental fees for private functions, retreats, workshops, conferences, concerts, etc.
   e) Recreational use fees
   f) Service contracts with Elderhostel or Earthwatch programs
   g) Consortium fees from other institutions who need coastal access
   h) Fees for private research/lab contracts
   i) Staff lecture circuit income
   j) Mariculture income
   k) Resource extraction income

8. Fundraisers
   a) Gift shop sales of shirts, hats, cups, calendars, recipes, etc.
   b) Cookouts
   c) Hold a Wetlands Olympics
   d) Raffles
   e) Hold an auction with donated items
   f) Bake sales
   g) Beer sales
9. **Private Donations (Work with UVA Development Office)**
   a) Develop a deferred giving plan, including life insurance donations
   b) *Solicit private gifts from wealthy individuals, especially UVA alumni*
   c) Solicit real estate donations for resale to generate cash income for the ABCRC
   d) Begin ABCRC endowments for directorship, research, education
   e) Start a “Friends of the ABCRC” group
   f) Solicit local donations on the Eastern Shore
   g) Begin a volunteer program for donations of time and/or cash
   h) Name a building after a large donor or in honor of someone in return for donations, eg.
      “John Warner Research Laboratory” or “Robert Byrd Family Housing”

**IV. Summary**

The LTER group that has worked so hard to establish a solid foundation for the ABCRC is to be commended. They have made great progress in identifying the needs of an expanded coastal research center, in locating appropriate property, and in working with the administration and development resources of the University of Virginia to progress well down the road toward securing the necessary funding for the construction phase.

The next steps relate to planning to ensure that the best possible facility is developed in the most efficient, cost-effective and careful manner to provide a solid future for the ABCRC. As inclusive a process as possible should be undertaken to develop an Academic Plan articulating research and educational goals, a Master Plan combining administrative and facility development goals to achieve the goals of the academic plan, and a Business Plan outlining the financial path for the ABCRC. A realistic timeline should be developed combining all of these plans into one Strategic Plan, which will guide the ABCRC for the next 20 years.

A Director for the ABCRC should be hired as soon as possible. This person should have the highest possible visibility within the University, and should have free and easy access to the multitude of University resources that will contribute to the successful achievement of the ABCRC Strategic Plan. In fact, this person should be guiding the planning efforts from the beginning.

The first construction phase of ABCRC facilities seems imminent. The visiting group strongly urges that some more planning take place before ground is broken. It won’t take long to create an academic plan articulating research and educational goals for 20 years, and such a plan is important to have in place so that facility plans can be developed to support the academic goals. Otherwise the resulting facility defines the academic goals, rather than those goals being defined by an inclusive process involving all potential users, including those outside of the LTER group.

Issues relating to the building site should be revisited, such as zoning the area so that housing is separate from busy research and other work areas. The current configuration of proposed housing might not be in the best interests of the ABCRC. Even though the LTER group has collectively spent many nights at a variety of field stations, none of them has administered a field station so they aren’t “thinking like a director”, who has to balance everyone’s needs to create a harmonious working and living environment. Site visits to facilities that have recently evolved from LTER field sites (Sevilleta Field Station) or that have recently built aquatic facilities (Bodega Marine Lab and St. Croix Watershed Research Center) would be beneficial for either the LTER group and/or for a new ABCRC Director.
The visiting group detected what could be best described as “enthusiastic innocence” on the part of the LTER group with regard to the construction process. A construction committee should be assembled with representatives from each potential user group, and also with persons experienced with constructing remote laboratory facilities. One person should be assigned the full-time job of overseeing the construction process on behalf of the ABCRC, and of interacting with the architects, engineers, general contractors, subcontractors, planning officials, suppliers, and all others that will inevitably be involved in a very complicated process. Experienced field station directors who have recently built similar facilities should be consulted. See Figure 3 for a diagram of the construction planning process.

Full University support should be provided at all levels to the proposed ABCRC. Any institutional impediments that might adversely affect success should be removed. Such impediments include regulations that make cost-recovery difficult, problems with using the UVA physical plant resources effectively, rules about architect and contractor selection that are cumbersome in a remote rural county far from campus, or not having a development officer or planning expert assigned specifically to assist with the ABCRC. There are two other field stations at the University of Virginia that have built facilities and developed successful programs. The Directors of these stations should be consulted, and perhaps an informal or even more formal consortium within the UVA of the three field stations could be formed. The Natural Reserve System of the University of California is an example of the power resulting from a group of field facilities leveraging University resources to their benefit.

In order for the ABCRC to be attractive to users other than the current LTER program, governance of the Center has to come from beyond LTER. The new Director could indeed be an LTER scientist, and this model has been successful for the Sevilleta Field Station. That director has Sevilleta station development responsibilities beyond LTER, and the University of New Mexico provides his salary out of university funds. However, locating the entire ABCRC governance within the LTER group as a committee is off-putting to outside scientists or other users, who will come to suspect that the facility is really only an LTER resource. If the planning process results in articulating goals for research and education that go beyond the LTER program, then staff and financial resources from beyond LTER should be provided from the beginning.
Figure 3. Facility Development Process from Conception to Construction
(developed by Paul Siri and Susan Lohr)

**Initial Concept**
- Master Plan
- Changes Required by EA and Planning

**Regulatory Process**
- Environmental Planning
  - Environmental Assessment
  - Mitigation

**Personnel**
- Faculty and Administration
- All Users and Staff
- Contracted Architect
- Design Firm and Sub-Consultants

**Documents**
- Academic Plan
  - Project Planning Guide
  - Detailed Design Plans
  - Schematics
  - Working Drawings

**Task**
- Define Activities and Numbers of Rooms
- A Definition of the Type of Building
- Size of Spaces
- Initial Design Concept
- Construction Documents
- Bid
- Award Contract
- Construction

Activities Facilitated by Planning Consultant
Appendix 1. Suggestions Regarding “Green” Building Design
(adapted from material provided by Paul Siri of Bodega Marine Laboratory)

Although there is no consensus on a definition of green architecture, David Orr provides several operational definitions in his 1994 publication *Earth in Mind: On Education, Environment and the Human Prospect*. Orr’s premise is that conventional building design and operation fails to assert itself in establishing the values society is attempting to instill in the educational process. He says that academic buildings limit the imagination and promote the notion that carelessness, waste and inefficiency are the convention in building design and operation. The irony that academic institutions teach great ideas in buildings that are oblivious to basic aspects of life support is most extreme in the facilities where life sciences are taught. Biological field stations would be the worst place to allow poor building design if an institution truly cares about the values it communicates to its students. If green architecture can be defined as combining siting, design and operation with integrated technologies to minimize waste, increase efficiency, reduce operational costs and provide an opportunity to use the building as an educational tool, then it is an ideal goal for the ABCRC.

The challenges for efficient design are greatest in laboratories. Chemical fume hoods pump conditioned air out at a great flow rate. Temperature controlled environmental chambers and ultra cold freezers have high energy demands and create heat. The application of recent computer technology in the operation of building heating, cooling and air flow can increase building efficiency and reduce operational expense. When coupled with high appropriate solar design building, significant efficiencies can be attained.

Aquatic laboratories provide the greatest number of solutions for reducing energy costs. The high heat capacity of water and efficient heat exchange technologies create options for heating and cooling. Biological field stations are consistently underfunded due to small operating budgets. These new technologies allow field stations to support numerous tasks simultaneously, thereby maximizing financial and operational efficiency. For example, logic controllers, when coupled with graphic user interface software, increase field station capability and options for rapid and efficient development of a sophisticated environmental monitoring system. A number of biological laboratories have demonstrated the utility of these new methodologies, and more field stations are embracing creative design solutions each year. This is an important planning and design consideration for ABCRC laboratory facilities. A functional data acquisition system and long term data management plan are criteria for being competitive in the NSF program for funding field station facilities. The Organization of Biological Field Stations is a resource that can offer a great deal of information.

By incorporating green technology into the design process for new ABCRC facilities as a sustainable solution for long-term viability, options for future funding are created. Presently there are a significant number of private foundations that support new construction or retrofit existing facilities based on sustainable concepts. Once functional, an efficient ABCRC can also serve to recruit the good will and friendship of donors to both the ABCRC and University of Virginia. The integration of appropriate building design and educational goals that underpin sustainable concepts would also assist in having the site serve as a conference or retreat location.
Appendix 2. List of Common Field Station Facilities

1. Nature or visitor center separate from research activities.
2. Roads and trails. When planning roads, consider both ease of construction and also later routine access issues. Bury utilities along the road. For safety, provide two lanes, regular pull-outs, or a one-way loop. Consider county road regulations. Site trails so research sites aren't adversely affected.
4. Data accumulation and management. Need a centralized system with archiving efficiency and easy access. Building needs to be hardwired, preferably in conduits or cable trays. Could use floor chases. Do every room. Identify hubs for telecommunications and data storage, so extra conduit goes between these hubs. Need an office and computer room for multi-user equipment. Use building technology to piggy-back with baseline data accumulation and analysis (eg. logic controllers).
6. Animal care facility and committee. Must consider these needs when planning. Storage facilities. Need space for field equipment, flammables storage, hazardous chemicals.
7. Fire suppression system. This will influence siting, building design and many other construction features. Could combine exterior sprinkler system with manipulated research areas needed experimental water supplies and moisture regimes.
8. Safety shower requirements. Affects water supply, drain locations, needs for chemical holding tanks separate from septic systems.
10. Shop buildings. Need covered boat storage, lockable private storage, maybe a large barn with both work space and storage. Need a warm and comfortable shop to work in, with a fabrication area and basic tools. Need a use policy, to decide who can use tools and when and how.
11. Cleaning. Need a cleaning supply closet in every building.
12. Water supply.
13. Housing. Need a variety of flexible options to be maximally appealing to potential users.
14. Dining Hall. Should be able to serve 70. Keep separate from other use areas; this is a noisy function. Very hard to combine a dining hall with research, teaching, lecturing or sleeping.
15. Research lab space. Keep separate from residences. Have some small private labs and some larger shared spaces. Need water to all labs. Look for "tinker toy" lab equipment that is maximally flexible.
16. Teaching labs. Perhaps a large classroom with rolling lab tables).
17. Seminar room.
18. Lecture hall for 40-70 people or more. This is an important asset for a field station.
19. Lounge for recreation. It would be a huge mistake to leave this one out.
20. Recreation fields outdoors. Need volleyball as a minimum.
21. Small meeting areas scattered throughout.
22. Administrative offices. Director's office needs windows with a glorious view.
23. Reception area. This becomes the interface with the public and should be nice but reasonably separate from the hustle and bustle of daily activity.
25. Director's housing and resident manager's housing. Ideally both would be available and comfortable, with the ability to conduct all aspects of family daily life in the housing.