CONTENTS

1. PROJECT PURPOSE AND NEEDS
   A. Project Purpose + Needs Statement
   B. Proposed Project Schedule
   C. Existing Site - Panoramas + Contextual Photos
   D. Existing Site - Analysis

2. BASIS OF DESIGN NARRATIVES
   A. Architectural
   B. Civil
   C. Landscape
   D. Structural
   E. Plumbing
   F. Mechanical
   G. Electrical

3. SITE LAYOUT + BUILDING DESIGN DRAWINGS
   A. Site Layout
   B. Building Floor Plan
   C. Building SF Program Spreadsheet
   D. Building Elevations
   E. Building 3D Views

4. OUTLINE SPECIFICATIONS
   A. Preliminary Project Specifications

5. COST ESTIMATE
   A. Total Project Cost Executive Summary
CONTENTS

1. PROJECT PURPOSE AND NEEDS
   A. Project Purpose + Needs Statement
   B. Proposed Project Schedule
   C. Existing Site - Panoramas + Contextual Photos
   D. Existing Site - Analysis

2. BASIS OF DESIGN NARRATIVES
   A. Architectural
   B. Civil
   C. Landscape
   D. Structural
   E. Plumbing
   F. Mechanical
   G. Electrical

3. SITE LAYOUT + BUILDING DESIGN DRAWINGS
   A. Site Layout
   B. Building Floor Plan
   C. Building SF Program Spreadsheet
   D. Building Elevations
   E. Building 3D Views

4. OUTLINE SPECIFICATIONS
   A. Preliminary Project Specifications

5. COST ESTIMATE
   A. Total Project Cost Executive Summary
PROJECT PURPOSE + NEEDS

Overview
Approximately 25 miles southeast of Richmond, the Rice River Center is currently home to the Inger and Walter Rice Center for Environmental Life Sciences (Education Building) and most recently the Inger Rice Lodge. Given the ability to teach and hold lectures at the Education building and now also the ability to house students and researchers at the Lodge, the University seeks to expand the capabilities of the Rice River Center Campus with the addition of a dedicated research facility.

Location Map

Vicinity Map: Not to Scale

Vicinity Map: Not to Scale
Purpose of the Facility
This facility will provide flexible research labs, space for research equipment, office space for faculty, staff and student researchers focused primarily on river and wetland research and to accommodate programmatic needs of the Center for Conservation Biology (CCB).

The facility is envisioned as a single story building which will complement, rather than be redundant with, space in existing Education Building. The project site is the field adjacent to the existing aquatic mesocosm facility.

Project Schedule Milestones
General project milestones for the research facility are as follows:
- Feasibility Study complete 1/31/18
- RFP issued for Architectural/Engineering services 2/5/18
- Architect selection approved by BOV 5/11/18
- Working drawings complete 5/10/19
- Advertise for bids 5/12/19
- Start construction August 2019
- Complete construction September 2020

See following page for more detailed schedule.
# Rice Center Research Building

## DRAFT SCHEDULE

<table>
<thead>
<tr>
<th>Task Name</th>
<th>Duration</th>
<th>Start Date</th>
<th>End Date</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Q1</td>
<td>Q2</td>
<td>Q3</td>
<td>Q4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Q1</td>
<td>Q2</td>
<td>Q3</td>
<td>Q4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Q1</td>
<td>Q2</td>
<td>Q3</td>
<td>Q4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Q1</td>
<td>Q2</td>
<td>Q3</td>
<td>Q4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Q1</td>
<td>Q2</td>
<td>Q3</td>
<td>Q4</td>
</tr>
<tr>
<td><strong>Pre Planning</strong></td>
<td>67d</td>
<td>12/01/17</td>
<td>02/05/18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Programming and budget</strong></td>
<td>67d</td>
<td>12/01/17</td>
<td>02/05/18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Survey</strong></td>
<td>14d</td>
<td>12/01/17</td>
<td>12/14/17</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>EIR</strong></td>
<td>60d</td>
<td>12/01/17</td>
<td>01/29/18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Feasibility Study</strong></td>
<td>55d</td>
<td>12/13/17</td>
<td>02/05/18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Business plan</strong></td>
<td>30d</td>
<td>12/01/17</td>
<td>12/30/17</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>A/E Selection</strong></td>
<td>101d</td>
<td>01/30/18</td>
<td>05/11/18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Planning</strong></td>
<td>361d</td>
<td>05/14/18</td>
<td>05/09/19</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Schematic Design</strong></td>
<td>60d</td>
<td>05/14/18</td>
<td>07/12/18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BCOM review</strong></td>
<td>14d</td>
<td>07/13/18</td>
<td>07/26/18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Preliminary Design</strong></td>
<td>90d</td>
<td>07/27/18</td>
<td>10/24/18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BCOM review</strong></td>
<td>28d</td>
<td>10/25/18</td>
<td>11/21/18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Working Drawings</strong></td>
<td>120d</td>
<td>11/22/18</td>
<td>03/21/19</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BCOM review</strong></td>
<td>28d</td>
<td>03/22/19</td>
<td>04/18/19</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BCOM Resubmittal</strong></td>
<td>14d</td>
<td>04/19/19</td>
<td>05/02/19</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BCOM review</strong></td>
<td>7d</td>
<td>05/03/19</td>
<td>05/09/19</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Approvals</strong></td>
<td>161d</td>
<td>07/06/18</td>
<td>12/14/18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>VCU ARC Review – Schematic</strong></td>
<td>0</td>
<td>08/03/18</td>
<td>08/03/18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>AARB Approval – Conceptual</strong></td>
<td>0</td>
<td>07/06/18</td>
<td>07/06/18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>AARB Approval – Final</strong></td>
<td>0</td>
<td>12/07/18</td>
<td>12/07/18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BOV Approval of Project Plans</strong></td>
<td>0</td>
<td>12/14/18</td>
<td>12/14/18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Bidding</strong></td>
<td>60d</td>
<td>05/10/19</td>
<td>07/08/19</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Construction</strong></td>
<td>420d</td>
<td>07/09/19</td>
<td>08/31/20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Outside construction restriction</strong></td>
<td>184d</td>
<td>12/15/19</td>
<td>06/15/20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CONTENTS

1. PROJECT PURPOSE AND NEEDS
   A. Project Purpose + Needs Statement
   B. Proposed Project Schedule
   C. Existing Site - Panoramas + Contextual Photos
   D. Existing Site - Analysis

2. BASIS OF DESIGN NARRATIVES
   A. Architectural
   B. Civil
   C. Landscape
   D. Structural
   E. Plumbing
   F. Mechanical
   G. Electrical

3. SITE LAYOUT + BUILDING DESIGN DRAWINGS
   A. Site Layout
   B. Building Floor Plan
   C. Building SF Program Spreadsheet
   D. Building Elevations
   E. Building 3D Views

4. OUTLINE SPECIFICATIONS
   A. Preliminary Project Specifications

5. COST ESTIMATE
   A. Total Project Cost Executive Summary
ARCHITECTURAL

General Building Design
Project Description + Background

The Rice River Center Research Facility is the construction of six new structures at the VCU Rice River Center Campus in Charles City. The new Complex will provide a collection of structures to support the research activities and operational needs of the Center’s four Core Areas of Strength. These areas are Conservation Biology, Wetlands Restoration and Restoration Ecology, Water Resources and Environmental Technology. In addition to these four groups, the Center for Conservation Biology will consolidate its current locations at the College of William and Mary and the Eastern Shore to this campus. The new complex will provide a new Research Laboratory Facility with supporting office and meeting space, a Green House, a Field Gear and Equipment Storage Building, a Maintenance Shop and two open Vehicle Storage Sheds.

The campus completed the development of an Education Center in 2008 and a Resident Lodge in 2017. The addition of this new Complex will complete the development needs for this campus and allow for students and researchers to locate for extended periods of time on this campus and perform actual long term research projects. Currently, there are no facilities for this to occur on this campus resulting in low usage of the Campus for the University and its affiliated programs.

While the project does include six separate structures, the planning and design of these structures must be thought of as a single project with a campus wide approach. Existing and new utility reconfiguration, storm water management approach and design, and the gateway nature of the site is critical to the planning results for this project.

Existing Conditions + Needs

The proposed site is an open grass field with a multitude of conditions which play a significant factor in defining the actual buildable area of property available to support the placement of these 6 structures and the vehicular paths required for access points. The field is surrounded by the campus access roadways on three sides; the north as the first point of visual contact as one enters the campus, the west as one passes by on their way to the Education Center and the East side as one may exit the campus or travel along for access to the Lodge. Thick forestation surrounds the site outside of the roadways and completely on the southern border. The site lies entirely in an Eagle’s Nest Resource Management buffer zone which brings forth regulations for development and implications to the project schedule. There is an existing mesocosm, a non RPA Wetlands area, a Vernal Pool, an existing pre-fabricated storage shed, multiple temporary storage sheds, and the sub-grade main sanitary feed line connecting the septic holding tanks of the Lodge to the Spray drain field. The following graphic depicts the locations of each of these features and reveals the determined buildable area for this project.

Program

The project consists of six (6) structures; a Research Facility, a CCB Field Equipment Building, a Maintenance Building, two vehicular storage sheds, and a greenhouse.

- The Research Facility is approximately 13,500SF and is comprised of laboratory and office space.
- The CCB Field Gear building has dedicated, enclosed storage space for the Center for Conservation Biology.
- The Maintenance building contains an enclosed storage area. This building also has covered but open high bay vehicle and boat storage space
- Vehicle Storage – 6 Bay: Adjacent to the Maintenance Building, this building has high bay vehicle spaces provided for boats and miscellaneous vehicles.
- Vehicle Storage – 8 Bay: Adjacent to the CCB Field Gear Storage, this building has pull-through, high bay vehicle spaces provided for boats and miscellaneous vehicles.
- Greenhouse – approximately 15’x30’ and is located adjacent to the research facility.
Code analysis

- Applicable Codes:
  - 2012 Virginia Uniform Statewide Building Code (VUSBC)
    - NOTE: 2015 VUSBC will be adopted in summer of 2018, with typically a one-year grace period for submitting under the previous code. Design team will need to evaluate impacts of the 2015 code based on the ultimate schedule for submitting plans for permitting.
  - VCU Facilities Management – Design + Construction Standards
  - VCU Higher Education Capital Outlay Man

- Occupancy Classifications:
  - Research Facility Building: Business Group B
    - For Education occupancies for students above the 12th grade
  - CCB Field Equipment Building: Utility Group U
  - Maintenance Building: Utility Group U

- Occupant Load:
  - Total Occupant Load: 138 +/- Occupants
  - Occupant Load Calculation:
    - Business Areas @ 100 SF gross
      - Gross SF method applied to entire building to determine occupant load. Space by space classification yields similar results.
      - Total Gross SF = 13,794
      - Occupant Load = 138

- Type of Construction:
  - Type VA
    - Per Section 602.5 of the VCC, Type V construction is that type of construction in which the structural elements, exterior walls, and interior walls are of any materials permitted by the code.
  - Building Heights and Areas Limitations:

<table>
<thead>
<tr>
<th>Allowable Heights + Areas per Table 503 Group B – Type VA</th>
<th>Actual Heights + Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height: 50’</td>
<td>21’/+-</td>
</tr>
<tr>
<td># of Stories: 3</td>
<td>1 Story</td>
</tr>
<tr>
<td>Area: 18,000 SF</td>
<td>13,794 SF</td>
</tr>
</tbody>
</table>

- Fire-Resistance Rating Requirements: Table 601

<table>
<thead>
<tr>
<th>Building Element</th>
<th>Type VA – Rating Requirement (HRS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Structural Frame</td>
<td>1 HRS</td>
</tr>
<tr>
<td>Bearing Walls:</td>
<td></td>
</tr>
<tr>
<td>• Exterior</td>
<td>1 HRS</td>
</tr>
<tr>
<td>• Interior</td>
<td>1 HRS</td>
</tr>
<tr>
<td>Nonbearing Walls and Partitions: Exterior</td>
<td>0 HRS</td>
</tr>
<tr>
<td>Nonbearing Walls and Partitions: Interior</td>
<td>0 HRS</td>
</tr>
<tr>
<td>Floor Construction:</td>
<td>1 HRS</td>
</tr>
<tr>
<td>Roof Construction:</td>
<td>1 HRS</td>
</tr>
</tbody>
</table>

- Fire-Resistance Rating Requirements for Exterior Walls Based on Fire Separation Distance:

<table>
<thead>
<tr>
<th>Distance</th>
<th>B Occ./ Type VA – Rating Requirement (HRS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 5’</td>
<td>1 HRS</td>
</tr>
<tr>
<td>≥ 5’ to &lt; 10’</td>
<td>1 HRS</td>
</tr>
<tr>
<td>≥ 10’ to &lt; 30’</td>
<td>1 HRS</td>
</tr>
<tr>
<td>&gt; 30’</td>
<td>0 HRS</td>
</tr>
</tbody>
</table>
Fire Protection Systems: Chapter 9
  o Automatic Sprinkler Systems - Per Section 903.2 – Where Required
    ▪ Per Section 903.2 –Group B Occupancies do not require an automatic sprinkler system.
  o Conclusion: Building will NOT require an automatic sprinkler system due to its B occupancy. Building will be designed without one unless otherwise directed by VCU.

Means of Egress: Chapter 10
  o Number of exits and locations will be coordinated with the overall occupant load of the building and individual spaces requiring more than one exit.
    ▪ Spaces with occupant load greater
      - Shared laboratory and its dedicated lab areas will have a maximum potential occupant load of 55 - 75, which will require multiple exits from this space. These are planned into the design.
  o Exit Access Travel Distance – Section 1016
    ▪ Table 1016.2 – B Occupancy w/o Sprinkler = 200’
      - Having no sprinkler requires us to evaluate exit access travel distance, however given the building shape and its configured access points, exit access travel distance will not be an issue.

Area Analysis
  • GROSS FLOOR AREA
    o Research Facility: 13,794 GSF
    o CCB – Field Equipment: 3,000 GSF
    o Maintenance Building: 740 GSF
    o Vehicular Storage 6 Bays: 2,167 GSF
    o Vehicular Storage 8 Bays: 3,840 GSF
    o Greenhouse: 454 GSF
    o Grand Total: 23,995 GSF

  • BUILDING EFFICIENCY FACTOR / RATIO
    o Research Facility
      ▪ Total GSF: 10,454 NSF / 13,329 GSF = 75% Efficiency

  • FLOOR PLANS, ELEVATIONS, + BUILDING SECTIONS PER CHAPTER 8 OF VCU HECO MANUAL
    o Schematic Floor Plan, Building Elevations, and 3D views provided. See Tab 3.

Building Assemblies
  • ENERGY CODE REQUIREMENTS
    o Buildings shall be designed and constructed in accordance with the International Energy Conservation Code.

Design Concepts
  • MASSING
    o Research Facility consists of two masses; a long, low horizontal bar along the main entry gravel road that contains office space, and a larger, high bay rectangular mass at the northeast corner of the bar, containing the laboratory and research space.
  • COLOR AND FINISHES
    o Reference the attached outline specifications in Tab 4 for additional information regarding material and product selections. See Tab 3 for preliminary schematic color scheme.
Furniture Fixtures and Equipment (FFE)

- FFE will be a mixture of furniture, office furniture and equipment, and lab equipment to be provided by the owner. General locations and approximate configurations of FFE have been suggested in the schematic building floor plan in Tab 3.

Acoustical Requirements

- HIGH NOISE ZONES + SEPARATIONS
  - The building plan was developed with the central concept isolating the shared laboratory spaces from the more quiet office environment. The point at which these two elements meet is divided by general function space such as bathrooms, staff break and intermingling areas, and conference and library space. In summary, the building plan is organized to isolate noise generating activity into a separate wing from office and administrative areas.
  - Mechanical equipment is located outside of the building adjacent to the laboratory space. This is partially enclosed for sound protection with a decorative architectural screen.
  - Laboratory activities frequently involve analyzing soil and rock samples. A dedicated room has been provided for “Geo Rock Cutting” which involves the operation of a wet saw. This function will require a 55+ STC separation rating.
  - The open laboratory space is designed to be as open and flexible as possible. Experimentation and research takes many forms, and flexibility here allows for the greatest.

Accessible Requirements + Design

- All laboratory and office space will be designed to be in compliance with the Americans with Disabilities Act of 1990 per the VCU HECO Manual.
- Laboratory desk space will be provided at accessible heights to allow for wheelchair bound patrons to use the facilities.

Equipment Rooms

- Mechanical space is provided through an ample exterior mechanical yard along with a centrally located interior mechanical room. Independent electrical and communications rooms are provided to increase available wall area for racks and panels as needed.
- The Environmental Technology is centrally located and fulfills the need for critical adjacency to a communications closet. This adjacency also creates a more secure condition.

Special Construction

- Vehicle and Boat Storage
  - Several configurations are included for the most flexible and functional vehicle storage. AN existing metal garage at the south end of the existing clearing will remain in place, with additional storage buildings nearby. Eight (8) pull-thru vehicle bays will be provided at the CCB Field Equipment Building, and six (6) back bays will be provided adjacent to the Maintenance Building.
Soils
Based on the results of testing at the adjacent Lodges project, existing soils are high in shrink-swell potential and have limited infiltration capacity.

Grading
The building pad will be raised above the existing grades to promote drainage. It may be necessary to import structural fill material for this purpose. Excess soil material that is not suitable for fill will be used to construct berms on-site.

Pavement
Roads and parking will be gravel except for handicapped parking spaces, which will be concrete. Sidewalks will be concrete.

Drainage
The existing site drains through existing culverts under the existing roads to east and west of the site. These culverts may need to be replaced to increase sizes and/or lowered to reduce on-site ponding elevations during larger storm events. Proposed drainage from impervious surfaces will be through sheet flow. Building downspouts will discharge to grade. Shallow swales may be required to convey sheet flow runoff from larger areas.

Stormwater
The project will comply with Virginia regulations for quality, channel protection, and flood protection. Quality compliance will be calculated based on a planning area larger than the site, which will result in no quality measures required. Channel protection will require either level spreaders in the wooded areas outside of the existing roads to the east and west and/or an on-site BMP to meet Energy Balance criteria. Soils on and adjacent to the site are highly erosive (K=0.55) and are sloped, so drainage areas to level spreaders need to limited in size. Flood protection criteria can be met without structural measures given the topography and adjacent drainage ways.

Water
Based on likely domestic flow and pressure requirements, the existing well based water system near the Lodges has sufficient capacity for the proposed project. Water pipe will be PVC, DR 21 with gasketed joints and solvent weld fittings.

Sewer
Based on likely sanitary flows, the existing septic treatment system near the Lodges has sufficient capacity for the proposed project. The existing septic system cannot accept discharges other than conventional domestic waste. Sewer pipe to the pump station will be PVC, SDR 35 with gasketed joints. The pump station will be similar to the Lodges project with a concrete septic tank basin for equalization and dual submersible pumps. Sewer force main will be PVC, DR 21 with gasketed joints and solvent weld fittings.

Eagles Nest
The site lies within the secondary management buffer of an existing bald eagle nest (see nest map below).

- Nest - 37°19'57.54"N, 77°12'27.20"W - The nest is in a loblolly pine within a mixed pine-hardwood stand. The structure itself is relatively small and built in a top crotch.
• **Territory History** – A pair has occupied this territory continuously since 2006 (see table below). The pair has built three nests in three different trees over this time producing at least 12 young. No nesting attempt was documented in 2009 when the nest blew out early in the season. The outcome of the breeding attempt in 2012 was not determined because the pair was incubating (likely a replacement clutch) in May when we conducted the productivity flight. The current nest has been occupied continuously since 2010.

• **Current Activity** – The nest has had some repair during the fall of 2017 and the adult pair is roosting at night in a tree adjacent to the nest tree and there is considerable whitewash on the ground. Within the Chesapeake Bay, this behavior is indicative of a nest that will be active during the coming breeding season.

• **Ingress and Egress** – The birds enter and exit the nest site to the east over Kimages Creek. They move back and forth out to the shoreline of the James following the creek. There is almost no activity out over the open field to the SW. I have never observed the adult pair flying over the field.

• **Forest Buffer** – The forest buffer between the nest and the roadway/open field is approximately 130 feet. The nest is not visible from the field even during the winter due to occlusion by pine trees. The visual buffer is more substantial after leaf on.

• **Existing Human Activity** – There has been a considerable amount of human activity within the open field and adjacent property since before the current nest was constructed. The field has an established set of mesocosms that are used throughout the spring and summer for ongoing research. The field also supports an active weather station in the center. The road that passes within 40 m of the nest has traffic throughout the day, year round. During 2017 this included heavy construction equipment that supported the construction of the lodge that is just to the south of the nest but outside the secondary buffer. I am not aware of any direct disturbance to the nest from this activity and have not witnessed any flushing event. The pair appears to slip in and out of the nest site over the creek and away from activity.
- History of bald eagle territory on Rice Property.

<table>
<thead>
<tr>
<th>Nest Code</th>
<th>Year</th>
<th>Occupied Territory</th>
<th>Active Nest</th>
<th>Young produced</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC-06-08</td>
<td>2006</td>
<td>Yes</td>
<td>Yes</td>
<td>2</td>
</tr>
<tr>
<td>CC-07-03</td>
<td>2007</td>
<td>Yes</td>
<td>Yes</td>
<td>2</td>
</tr>
<tr>
<td>CC-07-03</td>
<td>2008</td>
<td>Yes</td>
<td>Yes</td>
<td>3</td>
</tr>
<tr>
<td>CC-07-03</td>
<td>2009</td>
<td>Yes</td>
<td>No</td>
<td>NA</td>
</tr>
<tr>
<td>CC-10-01</td>
<td>2010</td>
<td>Yes</td>
<td>Yes</td>
<td>2</td>
</tr>
<tr>
<td>CC-10-01</td>
<td>2011</td>
<td>Yes</td>
<td>Yes</td>
<td>2</td>
</tr>
<tr>
<td>CC-10-01</td>
<td>2012</td>
<td>Yes</td>
<td>Yes</td>
<td>Unknown</td>
</tr>
<tr>
<td>CC-10-01</td>
<td>2013</td>
<td>Yes</td>
<td>Yes</td>
<td>0</td>
</tr>
<tr>
<td>CC-10-01</td>
<td>2014</td>
<td>Yes</td>
<td>Yes</td>
<td>0</td>
</tr>
<tr>
<td>CC-10-01</td>
<td>2015</td>
<td>Yes</td>
<td>Yes</td>
<td>0</td>
</tr>
<tr>
<td>CC-10-01</td>
<td>2016</td>
<td>Yes</td>
<td>Yes</td>
<td>1</td>
</tr>
<tr>
<td>CC-10-01</td>
<td>2017</td>
<td>Yes</td>
<td>Yes</td>
<td>1</td>
</tr>
</tbody>
</table>
LANDSCAPE

Terraces
Concrete pavement resting atop a stone bed will be the pavement for all terraces surrounding the building. Movable metal furniture (tables and chairs) will be placed within the terraces.

Building Foundation Plantings
Foundation plantings around the base of the building will consist of evergreen and deciduous drought tolerant native shrubs, grasses and perennials with 2” of shredded hardwood mulch place atop the planting soil (see below for planting bed preparation). Shrub plantings will be supplied in 3 to 5 gallon containers. Grasses will be supplied in 1 to 3 gallon containers. Perennials will be supplied in 3 quart to 1 gallon containers.

Parking Lot Plantings
Large deciduous shade trees will be placed within the parking lot islands where appropriate. Trees will be supplied in balled and burlap mesh, 2 ½” caliper, with gator bags and tree stakes for anchoring. The ground plane will be addressed with temporary/permanent seeding (see below).

Vernal Pool & Wetland Plantings
Native small deciduous trees, evergreen and deciduous shrubs, grasses, and perennials will be planted within the existing vernal pool and wetlands to accentuate and highlight their ecological role.

Temporary and Permanent Seeding
Areas disturbed by construction not specified to be a landscape bed will be covered in a cover crop suitable for the time of year. Upon the appropriate seasonal window, the cover crop will be removed and a seed mix consisting of native grasses and perennial seeds matching the nearby ecotype will be installed with a no-till drill with picker wheels.

Building Foundation Planting Bed Preparation
Topsoil excavated from the site is to be salvaged and stock piled during construction. Upon completion of building construction, planting beds consisting of trees, shrubs, grasses, and/or perennials within the operation of heavy construction equipment will be de-compacted to a depth of 3’ so the soil compaction registers at 80% compaction.
STRUCTURAL

General Description

The proposed facility consists of three new separate structures located adjacent to each other at the VCU Rice Rivers Center in Charles City, Virginia. The largest of the buildings, the Laboratory Building will be approximately 10,000 to 13,000 square feet and will consist of offices, laboratory areas and conference areas. The CCB Field Equipment building will provide enclosed storage as well as 8 covered vehicular and boat storage bays. The Maintenance Building will serve as its name implies and have 6 covered bays for vehicular and boat storage. All structures shall be one story and complement the recently constructed Lodge and the Education buildings at the Rice Rivers Center.

Foundation and First Floor Construction Description:

The foundations for the structures will presumptively be shallow foundations similar to the recently constructed buildings. The allowable bearing capacities of the recently constructed Lodge and Education buildings were 1,500 and 2,800 PSF. A similar allowable bearing capacity for these buildings is anticipated. Both existing structures had foundations bearing between 36” and 40” below finished floor therefore we anticipate a similar requirement. Concrete masonry unit (CMU) foundation walls bearing on continuous spread wall footings are anticipated. A subsurface investigation will be completed to verify these assumptions.

The first floor construction is anticipated to be a slab on grade that is isolated from foundation walls, columns and all other spread footing supported elements to allow some differential movement between the slabs and foundations. The slab will be underlain with a vapor barrier and 8” of porous fill. The porous fill is required to minimize capillary action due to the presence of expansive soils.

Type of Construction:

Laboratory Building:

The structural system of the Laboratory Building is anticipated to be primarily steel framed. The profile and shape of the roof will dictate the roof construction. Roof construction may utilize structural insulated panels on wood stud walls and steel beams and columns. Other conventional construction materials such as steel roof deck, open web steel joists, light gage or wood trusses, light gage stud or CMU bearing walls, etc. may also be considered.

CCB Equipment and Maintenance Buildings

The CCB Equipment and Maintenance Buildings are anticipated be similar in construction to each other. The roof construction is anticipated to consist of wood roof sheathing on wood roof trusses bearing on wood or CMU bearing walls. The covered vehicular and boat storage areas of these buildings are anticipated to be constructed similarly with wood roof trusses on wood framing and posts or on structural steel beams and columns.

Lateral Force Resisting System:

The lateral force resisting system for the Laboratory Building is anticipated to be steel moment frames and steel braced frames. The lateral force resisting system for the CCB Equipment and Maintenance Buildings are anticipated to be wood shear walls or CMU shear walls if utilized. The choice in exterior veneer will dictate the allowable story drift of the wall framing and lateral force resisting system as different types of veneers can accommodate different amounts of story drift and deflection.
Design Criteria:

**Structural Standards and Specifications:**
- ACI 318-11, Building Code Requirements for Structural Concrete
- ACI 530-11, Building Code Requirements for Masonry Structures
- ACI 530.1-11, Specifications for Masonry Structures
- AISC 360-10, Specification for Structural Steel Buildings
- AISI – American Iron and Steel Institute
- ASCE 7-10, Minimum Design Loads for Buildings and Other Structures
- ASTM International
- AWS D1.3-98, Structural Welding Code – Sheet Steel
- SDI, Steel Deck Institute
- SJI, Steel Joist Institute
- TPI, Truss Plate Institute

**Material Design Parameters:**
- Cast-in-place concrete (28 day compressive strength)  \( f'c = 3,500 \text{ psi} \)
- Reinforcing Steel Bars (ASTM A615, Grade 60)  \( F_y = 60 \text{ ksi} \)
- Structural Steel Beams (ASTM A992)  \( F_y = 50 \text{ ksi} \)
- Steel Tubes (ASTM A500, Grade B)  \( F_y = 46 \text{ ksi} \)
- All other steel shapes (ASTM A36)  \( F_y = 36 \text{ ksi} \)
- Concrete Masonry:  \( f'm = 2,000 \text{ net psi} \)

**Design Loads:**
- Risk Category: II
- Live Loads:
  - Slab on Grade: 100 psf
  - Storage: 125 psf
  - Roof: 20 psf
  - Roof Garden: 100 psf
  - Yards and Terraces: 100 psf
- Snow Load:
  - Ground Snow Load, \( P_g = 20 \text{ psf} \)
  - Snow Exposure Factor,  \( C_e = 1.0 \)
  - Snow Load Importance Factor,  \( I = 1.0 \)
  - Snow Thermal Factor,  \( C_t = 1.0 \) (heated structures)
  - Snow Thermal Factor,  \( C_t = 1.2 \) (unheated and open air structures)
- Wind Loads:
  - Ultimate Design Wind Speed,  \( V = 115 \text{ mph} \)
  - Nominal Design Wind Speed,  \( V = 89 \text{ mph} \)
  - Exposure Category,  \( C \)
- Seismic Loads:
  - Seismic Importance Factor,  \( I = 1.00 \)
  - Ss, 0.152g
  - S1, 0.058g
  - Site Class, D (Assumed)
  - Seismic Design Category, B (Assumed)
PLUMBING

Criteria and Codes

- American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Standards, including:
- Virginia Uniform Statewide Building Code (VUSBC) including:
  - Virginia Plumbing Code 2012 Edition

This project shall be designed to follow LEED Silver rating.

Minimum Number of Plumbing Fixtures

The required number of plumbing fixtures per table 403.2 of the Virginia Uniform Plumbing Code.

Maintenance Shop

The Maintenance Shop will be used to house lawn mowers and lawn maintenance equipment. The owner has requested water and power. No water or drain requested.

CCB Field Equipment Building

The field equipment building will house the equipment that is used within the field to gather information. This includes cages, nets, shovels and such. No water or drain requirements for this building.

Research Facility

<table>
<thead>
<tr>
<th>Classification</th>
<th>Occupancy</th>
<th>Water Closets Male/Female</th>
<th>Lavatories</th>
<th>Bathtubs or Showers</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business</td>
<td>B</td>
<td>1 per 50</td>
<td>1 per 50</td>
<td>A</td>
<td>Service Sink/ Kitchen Sink</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Occupant Load</th>
<th># of Fixtures Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 – 30</td>
<td>1 – Male 1 - Female 1-Each</td>
</tr>
</tbody>
</table>

Note:
A Provide one (1) Emergency shower/eyewash in Wet Lab area and combination eyewash/faucets at Laboratory sinks in Main Lab.
  Provide 2 (two), shower rooms one male and one female with shower, water closet and lavatory.
B Provide double bowl kitchen sink with faucet and aerator in break room. Provide one (1) Service Sink to serve facility in housekeeping.
  Provide double bowl stainless steel sink with faucet in Environmental Technology.
  Provide double bowl stainless steel sink with faucet in Analytical Lab.
  Provide double bowl drinking fountain in common break area.
Plumbing fixtures shall be selected to meet LEED Silver and follow VCU Facilities Management Design and Construction Standards. Water closets shall be flush tank, dual flush, meeting EPA Water Sense Standards. Lavatories shall be provided with faucets approved by EPA Water Sense Standards and shall be manual type, auto flow not acceptable to owner.

Entering water will be extended from the existing well/storage tank system by Civil. Provide backflow preventer interior of the building with a downstream cartridge type filter matching existing filters used in the current Rice Center Facility, Aqua Pure – AD802. Filters shall match existing in order to maintain a common filter type.

Water heaters shall be electric instantaneous type located under each lavatory. The Laboratory sinks and Janitor’s sink shall be served from a single electric water heater with a circulator pump. Pump shall be controlled from time clock and temperature sensor.

Domestic water piping above ground shall be copper type “L” copper, type “K” below ground.

Storm, waste and vent piping will be schedule 40 PVC with DWV fittings.

Domestic cold water piping shall be insulated with 0.5” thick insulation for less than 1.0” diameter pipe and 1.0” thick insulation for 1.0” to 1.5” diameter pipe. Insulation shall have conductivity of 0.20-0.26 Btu*in./(h*sq.ft.*F).

Domestic hot water piping shall be insulated with 1.0” thick insulation for less than 1.0” diameter pipe and 1.0” thick insulation for 1.0” to 1.5” diameter pipe. Insulation shall have conductivity of 0.22-0.28 Btu*in./(h*sq.ft.*F).

Fiberglass insulation shall have vapor barrier and all service jacket in unconditioned spaces.

Emergency fixtures shall be supported with tempered water.

A small compressed air system with an air dryer shall be provided in a separated space from the Lab areas with piping extending to several stations in one part of the Lab. The compressor shall be approximately 2 HP, with a 30 gallon holding tank and provide approximately 5.7 CFM. An air dryer shall be provided to remove moisture from the compressed air. Air dryer shall be refrigerated type wall mounted with internal vibration isolation and handle up to 15 CFM. Pressures shall be 45 – 50 psig at maximum flow. Provide a main shut-off valve on the main discharge pipe to the system.

Compressed air piping shall be seamless copper water tube, ASTM B88 with wrought copper and bronze solder-joint pressure fittings, ASME B16.22.

In the same space housing the air compressor and air dryer, a vacuum system shall be provided with piping extending to a limited number of stations within the adjacent Lab space. The vacuum pump shall handle approximately 5 SCFM at approximately 0.6 SCFM per inlet for approximately 6 inlets with an 80% usage factor. Vacuum piping, fittings and Deck/Bench valves shall be from the same vacuum pump Manufacturer.

Vacuum piping shall be PTFE with compression fittings.

Compressed air terminals shall be counter mounted with ball type ¼ turn shut-offs and barbed fittings.

Provide packaged deionized water filter system to provide approximately 0.5 GPM flow per station, delivered to approximately 10 deionized water stations within the laboratory.

Piping for deionized water system shall be schedule 40 PVC (Polyvinyl Chloride) manufactured from virgin, rigid, PVC. Pipe shall be iron pipe size, fittings shall be injected molded schedule 40 conforming to ASTM D2467.
In the rock cutting area provide a floor drain with a sediment bucket. Provide water drops with valves on two walls of the Rock Cutting room. The sink in this space shall be provided with a sediment trap.

In the dedicated rooms for Water Resources, Conservation Biology and Wetlands Restoration & Ecology provide a 12” x 12’ floor drain with sediment bucket and water drop with hose reel and spray nozzle. Hose reel shall contain 10 feet of hose. Mount hose reel approximately 6 feet above finished floor.

In the small Sample Storage, Aquatics Lab and Mud Room, provide fiberglass trench drain covers for the integral concrete trench drains. Fiberglass grates shall be approximately 1 inch thick, 4” X 1” (rectangular pattern) 10 feet long in 2 foot sections, easily removable.

In the Open Lab area provide fiberglass trench drain covers for the integral concrete trench drains. Fiberglass grates shall be approximately 1 inch thick, 4” X 1” (rectangular pattern) 10 feet long in 4 foot sections, easily removable.

In the small Sample Storage, Aquatics Lab and Mud Room, provide a wall mounted hose reel with hose bib and nozzle, hot and cold water with mixing capability mounted at approximately 5’-0” above the finished floor.

In the Open Lab area provide a hose reel in each bay area with hose bib and nozzle, hot and cold water with mixing capability mounted at approximately 6’-0” above the finished floor with the hose nozzle adjusted to the user desired height above the floor. Mixing valve shall be mounted below the hose reel for accessibility.

At the east entrance of the building along the Housekeeping exterior wall, provide three (3) wall mounted shower heads, stainless steel, mounted approximately three (3) feet above grade with stainless steel self-closing chain pull shower valve. Exterior piping shall be stainless steel. Provide piping on interior wall with shutoff valve. Shower head shall be used for boot and gear cleaning. Mount shower valve above shower head for draining.

Within the Mechanical Yard provide a 200# LP-Gas cylinder. Follow NFPA 58 for location to exterior equipment, doors and windows. Provide piping from cylinder to within the Conservation Biology Lab area. Provide approximately three (3) termination bench top locations with barbed connections.

A greenhouse will be provided at one end of the Research Facility. Provide extension of a ¾” water line below grade to a yard type hose bib at the greenhouse.
MECHANICAL

Criteria and Codes

- American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Standards, including:
  - ASHRAE Standard 15-2013
  - ASHRAE Standard 62.1-2016
  - ASHRAE Standard 189.1-2014

- Virginia Uniform Statewide Building Code (VUSBC) including:
  - Virginia Plumbing Code 2012 Edition

- Sheetmetal and Air Conditioning Contractors (SMACNA) standards including:

- National Fire Protection Association (NFPA) codes including:
  - NFPA 90A Standard for the Installation of Air-Conditioning and Ventilation Systems


This project shall be designed to follow LEED Silver rating.

Maintenance Building

The Maintenance Building shall be provided with natural ventilation only.

CCB Equipment Building

The CCB Equipment building shall be provided with natural ventilation only.

Research Facility

For the purpose of this Feasibility Study, the Research Facility shall be viewed utilizing a closed loop Geothermal HVAC system, in following with the Education Building. This is a remote site and indications have been presented that the HVAC system for the Research Facility to match the existing Education building. This will provide for common maintenance procedures for the two buildings. The system shall be zoned between Office/Break areas, Common areas, Classroom Environment and Research areas. Design shall follow the International Ground Source Heat Pump
Design guide. Controls shall be simple electric/electronic type thermostats to handle heating, cooling, changeover and system occupied/unoccupied times. Ventilation shall be provided through each zone to meet current code compliance. Outdoor ventilation air ducts shall be provided with a manual balancing damper to provide repeatable air quantities. A motorized damper shall be provided in each outdoor ventilation duct to close when the system is not operation. At the discretion of the selected A & E team, the HVAC system of design and selection shall be coordinated with VCU.

Ventilation shall be provided through each zone to meet current code compliance. Outdoor ventilation air ducts shall be provided with a manual balancing damper to provide repeatable air quantities. A motorized damper shall be provided in each outdoor ventilation duct to close when the system is not operation.

Bathroom exhaust fans shall be ceiling mounted type with discharge to roof caps. Exhaust fans shall be active through wall occupancy sensors. Fans shall remain operational for a set (adjustable) time after the occupants have left the space.

A fume hood shall be provided within the building. The fume hood shall be approximately 48” long. The hood shall be provided with transfer air provide through an in-line fan. The inline fan shall transfer air from adjacent spaces. Both the fan and hood exhaust shall be provided with (VFD) variable frequency drives. Both fans shall be interlocked such that as the fume hood sash is opened both fans shall be activated. As the sash opening is increased, the hood exhaust fan speed shall be increased along with the speed of the inline fan to match air flows while maintain a negative pressure on the space housing the fume hood.

The Data-IT closet shall be provided with a ceiling mounted exhaust fan that will allow air to be drawn through the closet and exhausted to an open adjacent common area.

The Mechanical room shall be heated with an electric unit heater and ventilated with a small wall mounted propeller fan with interlocked motor operated intake damper/wall louver. Both shall be operated from wall thermostats.

Ductwork shall be galvanized constructed in accordance with ASTM A653 G90 Galvanized coating. The SMACNA seal class shall be A and a leak class for rectangular ducts shall be 6. The leak class for round ducts shall be 3. All supply and return air ducts where located in unconditioned spaces shall be insulated with a minimum of R-6 insulation. Any ducts located in unconditioned spaces outside the building envelope shall be insulated with R-8 insulation.

Below ground heat exchanger piping shall be polyethylene pipe and pipe fittings. Piping 1-1/4” diameter and smaller shall have a standard dimension ratio (SDR) of 11.0. Piping greater that 1-1/4” shall have a minimum SDR rating of 13.5.

Above ground geothermal water piping shall be ASTM Type L or M copper tubing or schedule 80 PVC piping. Above ground piping subject to sweating or freezing shall be insulated. No heat tape shall be utilized.

Wells shall be provided at a minimum of 1 well per ton of cooling load.
ELECTRICAL

Applicable Codes

- 2012 Virginia Construction Code (VCC)
- 2012 Virginia Statewide Fire Prevention Code (VSFPC)
- 2011 NFPA 70 National Electrical Code (NEC)
- 2010 ANSI/ASHRAE/IES 90.1 Energy Standard for Buildings Except Low-Rise Residential Buildings
- 2017 VCU Facilities Management Design and Construction Standards

Design Guides

Illuminating Engineering Society (IES), The Lighting Handbook, 10th Ed.
IES RP-33-14 Lighting for Exterior Environments

The project shall be designed to follow LEED silver rating requirements.

Project Description

The project includes the construction of three new buildings at the VCU Rice Rivers Center in Charles City County. The new buildings will consist of a 13,794 square foot Research Facility with an adjacent 454 square foot Greenhouse, a 3000 square foot CCB-Field Equipment storage building with an adjacent 3,840 square foot, 8 bay vehicular storage canopy, and a 740 square foot Maintenance Building with an adjacent 2,167 square foot, 6 bay vehicular storage canopy. The occupancy classification of the Research Facility will be Business Group, type “B”. The CCB-Field Equipment and Maintenance buildings will be Utility Group, type “U” occupancies.

Building Service and Distribution

The site primary distribution and transformers required to serve the new buildings will be furnished by the electrical utility, Dominion Energy Virginia. The existing electrical distribution system consists of underground primary distribution and pad mounted transformers. Empty conduits will be provided from the Research Building’s service entrance to the transformer location as required by the electrical utility. The electrical utility will provide primary conductors and secondary service conductors from transformer to CT cabinet at the Research Building. CT cabinet and meter base shall be obtained from utility and set in place by electrical contractor.

Electrical service available at the site is limited to 240/120V single phase. The building service is estimated to be a 1000-amp, 240/120V service. Service equipment will consist of a main distribution panelboard with 240/120V branch circuit panelboards. The building service will include a minimum of 25% spare capacity. All panelboards will be provided with a minimum of 30% spare breakers, spaces or a combination of spare breakers and spaces. A Type 2, remote mounted, surge protection device (SPD) will be provided adjacent to the main service distribution panelboard.

Power will be distributed from the Research Facility to the CCB – Field Equipment Building and the Maintenance Shop via underground conductors in concrete encased PVC conduit.

A building system ground bus bar will be provided in the electrical room. Main electrical system ground, structural steel ground, lightning protection system, ground from separately derived system generator, and communications grounding system will be connected to the building system ground bus bar.
A utility-owned meter capable of aggregating base building-level energy use to meet LEED prerequisites will be requested from Dominion Energy.

The estimated load is as follows:

### Research Facility

<table>
<thead>
<tr>
<th>Description</th>
<th>Total Load (KVA)</th>
<th>Diversity</th>
<th>Demand (KVA)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interior Lighting</td>
<td>45.5</td>
<td>125%</td>
<td>56.9</td>
<td>Based on NEC Table 220.12 for Office Buildings</td>
</tr>
<tr>
<td>Exterior Lighting</td>
<td>1.5</td>
<td>125%</td>
<td>2.0</td>
<td>Based on ASHRAE 90.1 exterior power allowances</td>
</tr>
<tr>
<td>Receptacles</td>
<td>20.0</td>
<td>50% over 10KVA</td>
<td>15.0</td>
<td></td>
</tr>
<tr>
<td>IT Equipment</td>
<td>3.0</td>
<td>100%</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>Heat Pumps</td>
<td>63.0</td>
<td>100%</td>
<td>63.0</td>
<td>10 heat pumps</td>
</tr>
<tr>
<td>Geothermal pumps</td>
<td>1.9</td>
<td>100%</td>
<td>1.9</td>
<td></td>
</tr>
<tr>
<td>Refrigeration</td>
<td>14.4</td>
<td>100%</td>
<td>14.4</td>
<td>Including walk-in cold and refrigerator rooms</td>
</tr>
<tr>
<td>Vacuum &amp; Compressed Air</td>
<td>1.5</td>
<td>100%</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Water Heater</td>
<td>15.0</td>
<td>100%</td>
<td>15.0</td>
<td></td>
</tr>
<tr>
<td>Environmental Chambers</td>
<td>18.0</td>
<td>100%</td>
<td>18.0</td>
<td>3 chambers</td>
</tr>
<tr>
<td>Muffle Oven</td>
<td>1.4</td>
<td>100%</td>
<td>1.4</td>
<td>1 oven</td>
</tr>
<tr>
<td>Fume hood</td>
<td>1.2</td>
<td>100%</td>
<td>1.2</td>
<td>1 fume hood</td>
</tr>
<tr>
<td>CCB Bldg.</td>
<td>9.3</td>
<td>100%</td>
<td>9.3</td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td>2.5</td>
<td>100%</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>205.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spare Capacity</td>
<td>256.4</td>
<td>25%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### CCB – Field Equipment

<table>
<thead>
<tr>
<th>Description</th>
<th>Total Load (KVA)</th>
<th>Diversity</th>
<th>Demand (KVA)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lighting</td>
<td>1.5</td>
<td>125%</td>
<td>1.9</td>
<td>Based on NEC Table 220.12 for Storage</td>
</tr>
<tr>
<td>Receptacles</td>
<td>5.0</td>
<td>100%</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>Refrigeration</td>
<td>2.4</td>
<td>100%</td>
<td>2.4</td>
<td>1 chest freezer, 1 refrigerator</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>9.3</td>
<td></td>
</tr>
</tbody>
</table>
Power

All wiring will be copper and run in conduit, minimum size of ¾”. Wiring for branch circuit shall have a minimum size of #12 AWG (American Wire Gauge). Shared neutrals shall not be allowed. Motors ½ HP and less will be supplied by 120V circuits; motors greater than ½ HP will be supplied by 240V, single phase circuits. All branch circuits shall have a separate equipment grounding conductor.

General purpose receptacles will be arranged for a maximum of eight duplex outlets per 20A, single phase circuit. Special purpose receptacles and duplex receptacles indicated for specific equipment will be provided with a separate dedicated circuit. Workstations will be designed with a double duplex receptacle per computer location. Offices will be designed with one duplex receptacle on each wall and one double duplex receptacle at the wall adjacent to the desk. Conference room and common areas will be designed with one duplex receptacle per wall. Conference room will be provided with floor box for power, data, and A/V connections below the conference table and will be provided with additional duplex receptacles for A/V equipment as required. Freestanding lab benches will be provided with (2) bench pedestals per bench. Lab benches along walls will be provided with multi-outlet raceway. In addition, retractable power drops will be distributed throughout the shared laboratory space. Corridors will be designed with a receptacle spacing of approximately 40’ on center. Building support areas, equipment room, storage room, etc., will be designed with one duplex receptacle per wall. Ground fault receptacles will be utilized where receptacles are within 6’-0” of a water source. Ground fault receptacles in waterproof enclosures will be provided for all exterior receptacles.

50% of receptacles in private offices will be controlled by an automatic control device to comply with ASHRAE 90.1

Individual UPS plug-in units will be provided for IT equipment to provide power to equipment until the generator comes online.

Lighting

Interior

Luminaires will be dimmable LED and will be provided as scheduled. Luminaires will be 120V. Lighting circuits will generally be limited to a maximum of 16A per circuit. Interior lighting load will be based on ASHRAE 90.1 using Space-by-Space Method.

<table>
<thead>
<tr>
<th>Room</th>
<th>Luminaire Description</th>
<th>IESNA Recommended Footcandle (FC) Level</th>
<th>ASHRAE 90.1 2010 (w/sf)</th>
<th>Color Temperature</th>
<th>Min. CRI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corridors</td>
<td>2’x2’ LED Recessed Indirect or LED Downlights</td>
<td>5</td>
<td>0.66</td>
<td>3500 K</td>
<td>85</td>
</tr>
</tbody>
</table>
### Luminaire Specifications

<table>
<thead>
<tr>
<th>Room</th>
<th>Luminaire Description</th>
<th>IESNA Recommended Footcandle (FC) Level</th>
<th>ASHRAE 90.1 2010 (w/sf)</th>
<th>Color Temperature</th>
<th>Min. CRI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lobbies</td>
<td>LED Downlights, LED Pendant</td>
<td>15</td>
<td>0.90</td>
<td>3500 K</td>
<td>85</td>
</tr>
<tr>
<td>Labs (Research)</td>
<td>Linear Pendant LED</td>
<td>1.81</td>
<td>4000 K</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>Conference Room</td>
<td>Linear Pendant LED, LED Downlights</td>
<td>30</td>
<td>1.23</td>
<td>3500 K</td>
<td>85</td>
</tr>
<tr>
<td>Offices (Matte Screen Monitors)</td>
<td>2’x2’ LED Recessed Indirect</td>
<td>30</td>
<td>1.11</td>
<td>3500 K</td>
<td>85</td>
</tr>
<tr>
<td>Break Room</td>
<td>Linear Pendant LED</td>
<td>10</td>
<td>0.73</td>
<td>3500 K</td>
<td>85</td>
</tr>
<tr>
<td>Restrooms</td>
<td>LED Downlights, LED Cove</td>
<td>15</td>
<td>0.98</td>
<td>3500 K</td>
<td>85</td>
</tr>
<tr>
<td>Storage</td>
<td>LED wraparound/recessed</td>
<td>10</td>
<td>0.63</td>
<td>3500 K</td>
<td>85</td>
</tr>
<tr>
<td>Elec/Mech Rooms</td>
<td>LED wraparound</td>
<td>20</td>
<td>0.95</td>
<td>3500 K</td>
<td>85</td>
</tr>
</tbody>
</table>

The staff expressed interest in skylights to provide natural daylight within the space. The electrical designer will coordinate with the architect on skylight locations. Skylights with integral baffles that will provide user control over lighting levels in spaces will be investigated.

Emergency egress lighting will be connected to an emergency lighting inverter system.

**Exterior**

The site is in a rural area where artificial lighting could have adverse effects on the biological cycles of flora and fauna. Exterior lighting requirements of the VCU Design and Construction Standards are not applicable to this site. The site corresponds to Lighting Zone 0 (LZ0) as described in IES RP-33-14 and Exterior Lighting Zone 1 in ASHRAE 90.1. Exterior lighting will be designed to comply with the recommendations in IES RP-33-14 to minimize sources of light pollution, i.e. backlight, uplight, and glare. All exterior luminaires will be Dark Sky compliant.

The site lighting power density shall comply with ASHRAE 90.1 Exterior Lighting Zone 1.

Complying with IES RP-33-14 and ASHRAE 90.1 will make it possible to obtain the Light Pollution Reduction LEED credit.

Exterior luminaires will be dimmable LED. Luminaires will have a color temperature of 2700K.

Total initial lumens per site for non-residential outdoor lighting in lighting zone LZ0 is 0.5 lumens per square foot. Maximum allowable backlight, uplight, and glare (BUG) ratings for exterior luminaires within lighting zone LZ0 is B1/U0/G0.
Exterior Space | Luminaire Description | ASHRAE 90.1 2010 Allowances | Color Temperature | Min. CRI
--- | --- | --- | --- | ---
Uncovered Parking spaces | Pole mounted LED. | 0.04 w/sf | 2700 K | 85
Pedestrian Walkways | Building mounted LED wall packs or LED bollards | 0.7 w/f | 2700 K | 85
Patio/Open Areas | Building mounted LED wall packs or LED bollards | 0.25 w/sf | 2700 K | 85

Lighting Controls

**Interior**
Interior lighting controls will be designed to meet requirements of LEED Interior Lighting and Daylighting EQ credits.

In general, the building will be provided with occupancy/vacancy sensors, daylight sensors, and automatic time-based controls based on the space to comply with requirements of ASHRAE 90.1. Multilevel switching with programmed scenes will be provided in the Conference room.

Daylight sensors will be provided in rooms with exterior windows or skylights. Sensors will automatically dim the artificial light when sufficient ambient lighting is available. Skylights will be provided with a motorized internal baffle to allow occupants to adjust the lighting level within spaces.

Occupancy/vacancy sensors will be provided in offices, conference room, break room, storage rooms, restrooms and locker rooms.

**Exterior**
Exterior site lighting will be provided with motion detection, dimming, and time clock controls. Site lighting will be dimmed to lowest acceptable level during normal operations. Upon detection of movement, light levels will be increased to full output. Light levels will drop back to dimmed level 15 minutes after last motion detection.

**Emergency Power System**

A 25kW standby diesel generator will be provided for designated lighting, IT equipment, and refrigerated specimen storage in the Research Building. The generator will be provided with an integral tank with a 50 hour run time capacity. An automatic transfer switch will be provided with the generator. Controls shall comply with VCU Design Manual.

No electric loads in the CCB-Field Equipment or the Maintenance Shop will be connected to the standby generator.

**Renewable Energy**

Solar generated energy will be provided for demonstration purposes. Solar panels will be installed on the roof of the main lab area and the power generated will be fed back into the power grid.

**Lightning Protection**

A roof mounted lightning protection system will be provided on the Research Lab.
Fire Alarm System

Fire Alarm systems will not be provided for the three new structures included in this project.

A manual fire alarm system is not required in Group B occupancies where the occupant load of all floors is less than 500 and less than 100 persons above or below the lowest level of exit discharge and the fire area does not contain an ambulatory care facility.

An automatic smoke detection system is not required in Group B occupancies where the occupant load of all floors is less than 500 and less than 100 persons above or below the lowest level of exit discharge and the fire area does not contain an ambulatory care facility.

Communication Service and Distribution

The Rice Rivers Center is a research center which generates large amounts of data that require transmission back to the VCU main campus. The addition of the Research Building will increase the amount of data that will need to be transmitted back and forth over the internet. Existing communications and internet service at the site is provided by an underground fiber optic line, and the current bandwidth does not adequately meet the existing needs of the facility. The facility is currently investigating options to increase bandwidth at the site with the internet service provider. The A/E selected for the design shall coordinate with VCU on methods for improving internet connection.

Backboards constructed of ¾” fire-treated plywood will be provided in the IT room for the communications and internet system backbone equipment. Wireless repeaters shall be provided to provide wireless internet connection throughout the Research Facility. Data jacks will be provided at each workstation and desk location. Data jacks will be provided at each lab bench.

Data and phone service will not be extended to the CCB-Field Equipment Building or the Maintenance Shop.

Alertus alert beacon devices are not required at this site.

ERTZ emergency response phones are not required at this site.

Electronic Access Control & Intrusion Detection

Electronic access control and intrusion detection systems are not required at this site. A closed-circuit television system is not required at this site.
CONTENTS

1. PROJECT PURPOSE AND NEEDS
   A. Project Purpose + Needs Statement
   B. Proposed Project Schedule
   C. Existing Site - Panoramas + Contextual Photos
   D. Existing Site - Analysis

2. BASIS OF DESIGN NARRATIVES
   A. Architectural
   B. Civil
   C. Landscape
   D. Structural
   E. Plumbing
   F. Mechanical
   G. Electrical

3. SITE LAYOUT + BUILDING DESIGN DRAWINGS
   A. Site Layout
   B. Building Floor Plan
   C. Building SF Program Spreadsheet
   D. Building Elevations
   E. Building 3D Views

4. OUTLINE SPECIFICATIONS
   A. Preliminary Project Specifications

5. COST ESTIMATE
   A. Total Project Cost Executive Summary
<table>
<thead>
<tr>
<th>Space Type</th>
<th>Key Programming Descriptions</th>
<th>Furniture + Equipment</th>
<th>Subtotals</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIRTIEST</td>
<td>Built in base cabinets,</td>
<td>Dedication lab area,</td>
<td>62 3,242</td>
</tr>
<tr>
<td></td>
<td>Dedicated Lab Area</td>
<td>Dedicated lab space for Wetlands Restoration core strength area</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Desk, chairs, shelving</td>
<td>Dedicated lab space for Conservation Biology core strength area</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Office - Faculty (Shared by Up to 2)</td>
<td>Open office area with furniture/desk space for 2 staff, professor, researchers, or students use</td>
<td></td>
</tr>
<tr>
<td>WATER RESOURCES</td>
<td>Built in base cabinets,</td>
<td>Dedication lab area,</td>
<td>7 427</td>
</tr>
<tr>
<td></td>
<td>Dedicated Lab Area</td>
<td>Dedicated lab space for Water Resources core strength area</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Desk, chairs, shelving</td>
<td>Dedicated lab space for Conservation Biology core strength area</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Office - Faculty (Shared by Up To 2)</td>
<td>Open office area with furniture/desk space for 2 staff, professor, researchers, or students use</td>
<td></td>
</tr>
<tr>
<td>SHARED LABORATORY AREAS</td>
<td>Reconfigurable bench and table space, full height sample and storage cabinets,</td>
<td>Shared laboratory area,</td>
<td>38 665</td>
</tr>
<tr>
<td></td>
<td>38 Y 34 X 55 1,892</td>
<td>general stock storage cabinets,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>plenty of overhead power, data, and water drops; space for disposal access</td>
<td>bench top muffle furnace and drying ovens</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Staff/research/student transition + wash down room</td>
<td>VCU to provide desired</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Full height cabinets for field gear storage, benches for changing, and wall hooks for hanging gear</td>
<td>VIA to modify space as necessary</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Separate aquatics lab with large overhead door for indoor/outdoor use</td>
<td>Sample storage room with large overhead door for storage/experiment tanks for storage of live animals; plumbing drops, power, air access and connection to w/sediment basin for ease of cleaning</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mud Room</td>
<td>Incubation Chambers</td>
<td>6 Y 8 X 11 89</td>
</tr>
<tr>
<td></td>
<td>Gear storage, benches for changing, and wall hooks for hanging gear</td>
<td>Dedicated space for incubation chambers; VCU to verify equipment</td>
<td></td>
</tr>
<tr>
<td>CLEAN</td>
<td>Climate sensitive storage, used to store expensive optics and field electronics, requires storage shelves along the walls and lockable door, no windows required</td>
<td>Additional climate controlled storage for CCB, located on end of building closest to CCB field equipment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Storage shelving</td>
<td>Book shelves, table and chair</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Storage - Lockable</td>
<td>Storage - Archival Data</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Storage - Archival Data</td>
<td>Requires walls with shelving and a table, no windows required</td>
<td></td>
</tr>
<tr>
<td>Office - Director</td>
<td>Used by Director - Stand alone, closed door office, with limited filing cabinets, chairs for guest seating, a window and wall space for artwork</td>
<td>Limited shelving for books, desk, telephone, internet, limited filing cabinets, chairs for guest seating</td>
<td></td>
</tr>
<tr>
<td>Office - Administration</td>
<td>Used by CCB operations manager - Stand alone, closed door office, with a window and wall space for artwork</td>
<td>Limited shelving for books, desk, telephone, internet</td>
<td></td>
</tr>
<tr>
<td>Office - Staff</td>
<td>Used by senior biologists that manage various programs</td>
<td>Limited shelving for books, desk, telephone, internet</td>
<td></td>
</tr>
<tr>
<td>Office - Staff</td>
<td>Used by staff biologists, visiting biologists, field technicians, and graduate students - Stand alone, closed door office, with a window and wall space for artwork</td>
<td>Limited shelving for books, desk, telephone, internet</td>
<td></td>
</tr>
<tr>
<td>Office - Flex</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

VCU RICE RIVERS CENTER RESEARCH FACILITY FEASIBILITY STUDY
VCU PC# 2018-00815
VIA PROJECT # 17040
### Building Electrical Power Distribution Needs

<table>
<thead>
<tr>
<th>Department</th>
<th>Budget</th>
<th>Use</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office/Environmental Technology</td>
<td>NA</td>
<td>NA</td>
<td>6 X 11</td>
</tr>
</tbody>
</table>

### Building Mechanical Equipment Needs

<table>
<thead>
<tr>
<th>Department</th>
<th>Budget</th>
<th>Use</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office/Environmental Technology</td>
<td>NA</td>
<td>NA</td>
<td>6 X 11</td>
</tr>
</tbody>
</table>

### Restroom + Shower

<table>
<thead>
<tr>
<th>Department</th>
<th>Budget</th>
<th>Use</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office/Environmental Technology</td>
<td>NA</td>
<td>NA</td>
<td>8 X 10</td>
</tr>
</tbody>
</table>

### Housekeeping

<table>
<thead>
<tr>
<th>Department</th>
<th>Budget</th>
<th>Use</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office/Environmental Technology</td>
<td>NA</td>
<td>NA</td>
<td>8 X 11</td>
</tr>
</tbody>
</table>

### Mop Sink + Associated Storage

<table>
<thead>
<tr>
<th>Department</th>
<th>Budget</th>
<th>Use</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office/Environmental Technology</td>
<td>NA</td>
<td>NA</td>
<td>8 X 11</td>
</tr>
</tbody>
</table>

### Mobile Tables and Chairs, Base Cabinets + Countertop

<table>
<thead>
<tr>
<th>Department</th>
<th>Budget</th>
<th>Use</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office/Environmental Technology</td>
<td>NA</td>
<td>NA</td>
<td>14 X 16</td>
</tr>
</tbody>
</table>

### Storage Shelves, Large Conference + Library

<table>
<thead>
<tr>
<th>Department</th>
<th>Budget</th>
<th>Use</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office/Environmental Technology</td>
<td>NA</td>
<td>NA</td>
<td>20 X 22</td>
</tr>
</tbody>
</table>

### Refrigerator, Microwave, Sink, Countertop Space, Cabinets, and Table and Chairs

<table>
<thead>
<tr>
<th>Department</th>
<th>Budget</th>
<th>Use</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office/Environmental Technology</td>
<td>NA</td>
<td>NA</td>
<td>18 X 30</td>
</tr>
</tbody>
</table>

### Work Area 1

<table>
<thead>
<tr>
<th>Department</th>
<th>Budget</th>
<th>Use</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office/Environmental Technology</td>
<td>NA</td>
<td>NA</td>
<td>14 X 16</td>
</tr>
</tbody>
</table>

### Work Area 2

<table>
<thead>
<tr>
<th>Department</th>
<th>Budget</th>
<th>Use</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office/Environmental Technology</td>
<td>NA</td>
<td>NA</td>
<td>14 X 16</td>
</tr>
</tbody>
</table>

### Exterior Shower, Hose bibs, Hoses, etc. for Wash Down; Wall Hooks for Hanging Clothes/Gear

<table>
<thead>
<tr>
<th>Department</th>
<th>Budget</th>
<th>Use</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office/Environmental Technology</td>
<td>NA</td>
<td>NA</td>
<td>6 X 10</td>
</tr>
</tbody>
</table>

### Rice Center Maintenance

- Maintenance storage + workspace for John. Separate facility - ventilation only
- Miscellaneous maintenance equipment, Plenty of power for maintenance + workshop needs

### Rice Research Facility

- Vehicular and boat storage, 6 bays @ 12' wide each
- Unenclosed: 30 x 24'-8" 740 ft.
- Storage shelves on back wall, Field Equipment storage, envision as storage shed with freezers, bird trapping devices, rocket nets, mist nets, climbing gear, etc.
- Separate facility - ventilation only

### Center for Conservation Biology

- Vehicular and boat storage, 8 bays @ 12' wide each
- 8 vehicles, 3 boats
- Unenclosed: 40 x 96 3,840 ft.
CONTENTS

1. PROJECT PURPOSE AND NEEDS
   A. Project Purpose + Needs Statement
   B. Proposed Project Schedule
   C. Existing Site - Panoramas + Contextual Photos
   D. Existing Site - Analysis

2. BASIS OF DESIGN NARRATIVES
   A. Architectural
   B. Civil
   C. Landscape
   D. Structural
   E. Plumbing
   F. Mechanical
   G. Electrical

3. SITE LAYOUT + BUILDING DESIGN DRAWINGS
   A. Site Layout
   B. Building Floor Plan
   C. Building SF Program Spreadsheet
   D. Building Elevations
   E. Building 3D Views

4. OUTLINE SPECIFICATIONS
   A. Preliminary Project Specifications

5. COST ESTIMATE
   A. Total Project Cost Executive Summary
DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

DRAWING INDEX
NOTICE OF INVITATION FOR BIDS (DGS-30-256)
VENDOR EVA REGISTRATION REQUIREMENTS (DGS-30-384)
SWAM REPORTING REQUIREMENTS AND GOALS
VCU SECURITY REQUIREMENTS
COMMONWEALTH OF VIRGINIA GENERAL CONDITIONS (DGS-30-054) CO-7
INSTRUCTIONS TO BIDDERS (DGS-30-055) CO-7A
GENERAL NOTES
SPECIAL NOTES
BID FORM (DGS-30-220)
PRE-BID QUESTION FORM (DGS-30-272)
CONTRACT BETWEEN OWNER AND CONTRACTOR (DGS-30-064) CO-9
WORKERS' COMPENSATION CERTIFICATE OF COVERAGE (DGS-30-076) CO-9A
STANDARD PERFORMANCE BOND (DGS-30-084) CO-10
STANDARD LABOR AND MATERIAL PAYMENT BOND (DGS-30-088) CO-10.1
STANDARD BID BOND (DGS-30-090) CO-10.2
CONTRACT CHANGE ORDER (DGS-30-092) HECO-11
CHANGE ORDER JUSTIFICATION (DGS-30-096) CO-11A
GENERAL CONTRACTOR ESTIMATE FOR CHANGE ORDER (DGS-30-200) GC-1
SUBCONTRACTOR ESTIMATE FOR CHANGE ORDER (DGS-30-204) SC-1
SUB-SUBCONTRACTOR ESTIMATE FOR CHANGE ORDER (DGS-30-208) SS-1
SCHEDULE OF VALUES AND CERTIFICATE FOR PAYMENT (DGS-30-104) CO-12
AFFIDAVIT OF PAYMENT OF CLAIMS (DGS-30-108) CO-13
CERTIFICATE OF COMPLETION BY ARCHITECT/ENGINEER (DGS-30-112) CO-13.1
ARCHITECT/ENGINEER’S CERTIFICATE OF SUBSTANTIAL COMPLETION (DGS-30-116) CO-13.1A
CERTIFICATE OF COMPLETION BY CONTRACTOR (DGS-30-136) CO-13.2
CERTIFICATE OF PARTIAL OR SUBSTANTIAL COMPLETION BY CONTRACTOR (DGS-30-140) CO-13.2A
CHECKLIST FOR BENEFICIAL OCCUPANCY (DGS-30-152) CO-13.3B

DIVISION 01 - GENERAL REQUIREMENTS

011000 SUMMARY
Summary of the Work, phased construction, purchase contracts, Owner-furnished products, access to site, and work restrictions.

012200 UNIT PRICES
Provisions for unit prices.

012300 ALTERNATES
Provisions for change-of-scope and cost-comparison type alternates.

012500 SUBSTITUTION PROCEDURES
Procedural requirements for requests for substitutions during construction.

012900 PAYMENT PROCEDURES
Administrative requirements for Contractor's Applications for Payment.
013100 PROJECT MANAGEMENT AND COORDINATION
Administrative requirements for project meetings; preconstruction, pre-installation, and project closeout conferences; RFIs; and project Web sites.

013200 CONSTRUCTION PROGRESS DOCUMENTATION
Contractor’s Construction Schedule including Gantt charts and CPM schedules; Contractor’s reports.

013233 PHOTOGRAPHIC DOCUMENTATION
Construction photographs, video recordings, and web-based photographic documentation.

013300 SUBMITTAL PROCEDURES
Procedures for Action and Informational Submittals including Delegated-Design Submittals and Submittals Schedule.

014000 QUALITY REQUIREMENTS
Quality-assurance and -control requirements, special tests and inspections, and Contractor’s quality-control plan.

014200 REFERENCES
Common definitions and terms; and acronyms and trade names of associations, government agencies, and other entities referenced in MasterSpec.

015000 TEMPORARY FACILITIES AND CONTROLS
Temporary utilities and facilities for construction support, security, and protection.

015639 TEMPORARY TREE AND PLANT PROTECTION
Construction-phase tree and plant protection, trimming, protection- zone fencing, and pruning.

016000 PRODUCT REQUIREMENTS
Administrative and procedural requirements for product, material, and equipment selection and handling; warranties; and comparable products.

017300 EXECUTION
General requirements for product installation, cutting and patching, protection, field engineering, and progress cleaning.

017419 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL
Salvaging, recycling, and disposing of non-hazardous demolition and construction waste.

017700 CLOSEOUT PROCEDURES
Contract closeout including Substantial Completion and Final Completion procedures, warranties, and final cleaning.

017823 OPERATION AND MAINTENANCE DATA
Emergency, operation, and maintenance manuals for products and equipment.

017839 PROJECT RECORD DOCUMENTS
Record Drawings, Specifications, and Product Data.

017900 DEMONSTRATION AND TRAINING
Administrative and procedural requirements for instructing Owner’s personnel in operation and maintenance.

018113 SUSTAINABLE DESIGN REQUIREMENTS – LEED v4 BD+C
General requirements and procedures for LEED v4 BD+C

019113 GENERAL COMMISSIONING REQUIREMENTS
Administrative requirements and procedures for commissioning all systems.

DIVISION 02 - EXISTING CONDITIONS
024116 STRUCTURE DEMOLITION
Demolition of existing buildings, structures, and associated site improvements.

DIVISION 03 – CONCRETE
033000 CAST-IN-PLACE CONCRETE
General building and structural applications; concrete mixtures, formwork, reinforcing, finishing, and curing.

033300 ARCHITECTURAL CONCRETE
Specially formed, placed, and finished architectural concrete.

033543 POLISHED CONCRETE FINISHING
Ground and polished concrete floor slabs, including stained and polished concrete.

034500 PRECAST ARCHITECTURAL CONCRETE
Precast concrete cladding units, insulated units, and masonry-faced units.
DIVISION 04 – MASONRY

042000 UNIT MASONRY
CMU, brick, structural-clay facing tile, and stone trim units.

042200 CONCRETE UNIT MASONRY
Single-wythe CMU including decorative units.

042613 MASONRY VENEER
Brick veneer over wood- or metal-stud backup.

044313 ANCHORED STONE MASONRY VENEER
Stone laid in mortar and anchored to backup with masonry veneer anchors.

047200 CAST STONE MASONRY
Architectural features, facing, trim, and site accessories.

DIVISION 05 – METALS

051200 STRUCTURAL STEEL FRAMING
Structural steel framing for buildings.

051213 ARCH. EXPOSED STRUCTURAL STEEL FRAMING
Architecturally exposed structural steel framing for buildings.

052100 STEEL JOIST FRAMING
Standard manufactured open-web units, including steel joists, long-span steel joists, and joist girders.

053100 STEEL DECKING
Roof, floor, and form steel deck.

054000 COLD-FORMED METAL FRAMING
Load-bearing and exterior non-load-bearing wall studs; floor, ceiling, and roof joists; and rafters.

054400 COLD-FORMED METAL TRUSSES
Cold-formed steel trusses for roofs and floors.

055000 METAL FABRICATIONS
Metal items (not sheet metal) made from iron and steel shapes, stainless steel, and non-ferrous metals.

057000 DECORATIVE METAL
Custom fabrications from nonferrous and ferrous metals.

057500 DECORATIVE FORMED METAL
Miscellaneous decorative formed metal items that are shop fabricated from metal sheet to custom designs.

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

061000 ROUGH CARPENTRY
Wood framing, furring, frounds, nailers, and blocking.

061053 MISCELLANEOUS ROUGH CARPENTRY
Minor wood framing, furring, grounds, nailers, and blocking.

061063 EXTERIOR ROUGH CARPENTRY
Wood fences and other exterior wood construction.

061232 HEAVY TIMBER CONSTRUCTION
Solid timber framing.

061516 WOOD ROOF DECKING
Solid and laminated T & G decking.

061600 SHEATHING
Roof and wall sheathing, subflooring, and underlayment. Includes wood, non-wood, and composite products.

061753 SHOP-FABRICATED WOOD TRUSSES
Metal-plate-connected members.

061800 GLUED-LAMINATED CONSTRUCTION
Glued-laminated structural framing.

062013 EXTERIOR FINISH CARPENTRY
Exposed and nonstructural.

062023 INTERIOR FINISH CARPENTRY
Exposed and nonstructural.

064113 WOOD-VENEER-FACED ARCHITECTURAL CABINETS
Custom-made veneer-faced cabinets.

064116 PLASTIC-LAMINATE-FACED ARCH’L CABINETS
Custom-made plastic-laminate cabinets.

064216 FLUSH WOOD PANELING
Veneer-faced flush panels.

064400 ORNAMENTAL WOODWORK
Miscellaneous shop-assembled woodwork items.

064600 WOOD TRIM
Standing and running trim.

067413 FIBERGLASS REINFORCED GRATINGS
Fiberglass bar gratings and frames.
### DIVISION 07 - THERMAL AND MOISTURE PROTECTION

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>071326</td>
<td>SELF-ADHERING SHEET WATERPROOFING</td>
</tr>
<tr>
<td>071354</td>
<td>THERMOPLASTIC SHEET WATERPROOFING</td>
</tr>
<tr>
<td>071413</td>
<td>HOT FLUID-APPLIED RUBBERIZED ASPHALT WATERPROOFING</td>
</tr>
<tr>
<td>072100</td>
<td>THERMAL INSULATION</td>
</tr>
<tr>
<td>072500</td>
<td>WEATHER BARRIERS</td>
</tr>
<tr>
<td>072600</td>
<td>VAPOR RETARDERS</td>
</tr>
<tr>
<td>074113</td>
<td>STANDING-SEAM METAL ROOF PANELS</td>
</tr>
<tr>
<td>074213</td>
<td>FORMED METAL WALL PANELS</td>
</tr>
<tr>
<td>074616</td>
<td>ALUMINUM SIDING</td>
</tr>
<tr>
<td>074625</td>
<td>WOOD SHINGLE AND SHAKE SIDING</td>
</tr>
<tr>
<td>075419</td>
<td>POLYVINYL-CHLORIDE (PVC) ROOFING</td>
</tr>
<tr>
<td>076200</td>
<td>SHEET METAL FLASHING AND TRIM</td>
</tr>
<tr>
<td>077100</td>
<td>ROOF SPECIALTIES</td>
</tr>
<tr>
<td>077129</td>
<td>MANUFACTURED ROOF EXPANSION JOINTS</td>
</tr>
<tr>
<td>077200</td>
<td>ROOF ACCESSORIES</td>
</tr>
<tr>
<td>077253</td>
<td>SNOW GUARDS</td>
</tr>
<tr>
<td>078413</td>
<td>PENETRATION FIRESTOPPING</td>
</tr>
<tr>
<td>079200</td>
<td>JOINT SEALANTS</td>
</tr>
<tr>
<td>079219</td>
<td>ACOUSTICAL JOINT SEALANTS</td>
</tr>
<tr>
<td>079500</td>
<td>EXPANSION CONTROL</td>
</tr>
</tbody>
</table>

### DIVISION 08 - OPENINGS

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>081113</td>
<td>HOLLOW METAL DOORS AND FRAMES</td>
</tr>
<tr>
<td>081119</td>
<td>STAINLESS-STEEL DOORS AND FRAMES</td>
</tr>
<tr>
<td>081216</td>
<td>ALUMINUM FRAMES</td>
</tr>
<tr>
<td>081416</td>
<td>FLUSH WOOD DOORS</td>
</tr>
<tr>
<td>083113</td>
<td>ACCESS DOORS AND FRAMES</td>
</tr>
<tr>
<td>083326</td>
<td>OVERHEAD COILING GRILLES</td>
</tr>
<tr>
<td>083613</td>
<td>SECTIONAL DOORS</td>
</tr>
<tr>
<td>084113</td>
<td>ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS</td>
</tr>
</tbody>
</table>
084213 ALUMINUM-FRAMED ENTRANCES
Entrance doors and hardware; and framing for sidelights, transoms, and vestibules.

084229 SWINGING AUTOMATIC ENTRANCES
Power-operated power-assist and low-energy swinging units.

084413 GLAZED ALUMINUM CURTAIN WALLS
Curtain wall framing; also used for window walls, ribbon walls, strip windows, and punched openings.

084513 STRUCTURED-POLYCARBONATE-PANEL ASSEMBLIES
Aluminum-framed assemblies glazed with structured polycarbonate panels.

087111 DOOR HARDWARE (DESCRIPTIVE SPECIFICATION)
For specifying door hardware by using a schedule that includes nonproprietary product descriptions.

088000 GLAZING
Plain, laminated, and insulating glass.

089116 OPERABLE WALL LOUVERS
Operable (adjustable) metal louvers including those with insulated blades.

089119 FIXED LOUVERS
Fixed metal louvers.

DIVISION 09 - FINISHES

092216 NON-STRUCTURAL METAL FRAMING
Steel framing for gypsum board and plaster partitions and ceilings.

092900 GYPSUM BOARD
Interior gypsum board, exterior gypsum board for ceilings and soffits, and tile backing boards.

093013 CERAMIC TILING
Ceramic mosaic, quarry, pressed floor, porcelain, and glazed wall tile.

093033 STONE TILING
Thin, modular, cut stone units.

095123 ACOUSTICAL TILE CEILINGS
Mineral-base tile with concealed suspension systems, and direct-attached acoustical tile.

095423 LINEAR METAL CEILINGS
Strip, decorative metal systems.

096513 RESILIENT BASE AND ACCESSORIES
Resilient base, stair accessories, and molding accessories.

096543 LINOLEUM FLOORING
Linoleum tile and sheet flooring.

096623 RESINOUS MATRIX TERRAZZO FLOORING
Thin-set, epoxy-resin terrazzo flooring and precast terrazzo units.

096723 RESINOUS FLOORING
Fluid-applied monolithic flooring including decorative epoxy and urethane resins.

096813 TILE CARPETING
Modular carpet tile for commercial applications.

097200 WALL COVERINGS
Vinyl, textile, and woven glass-fiber wall coverings, and wallpaper.

097523 STONE WINDOW STOOLS
Dimension stone interior window stools.

098433 SOUND-ABSORBING WALL UNITS

099113 EXTERIOR PAINTING
Exterior painting.

099123 INTERIOR PAINTING
Interior painting.

099300 STAINING AND TRANSPARENT FINISHING
For interior and exterior wood: includes solid-color stains.

099653 ELASTOMERIC COATINGS
Pigmented, water-based, elastomeric coatings for use over concrete, masonry, and stucco.

099726 CEMENTITIOUS COATINGS
Polymer-modified cementitious coatings on masonry and concrete; exterior and interior.

DIVISION 10 - SPECIALTIES

101100 VISUAL DISPLAY UNITS
Chalkboards, markerboards, tackboards, floor-to-ceiling assemblies and support systems, sliding units, and conference units.

101200 DISPLAY CASES
Illuminated and non-illuminated types.
101300 DIRECTORIES
101416 PLAQUES
101419 DIMENSIONAL LETTER SIGNAGE

101423 PANEL SIGNAGE
102239 FOLDING GLASS-PANEL PARTITIONS
102800 TOILET, BATH, AND LAUNDRY ACCESSORIES
104413 FIRE PROTECTION CABINETS
104416 FIRE EXTINGUISHERS
105116 WOOD LOCKERS

DIVISION 11 - EQUIPMENT

113100 RESIDENTIAL APPLIANCES
115213 PROJECTION SCREENS
115313 LABORATORY FUME HOODS

DIVISION 12 - FURNISHINGS

122413 ROLLER WINDOW SHADES
123213 MANUFACTURED WOOD-VENEER-FACED CASEWORK
123553 METAL LABORATORY CASEWORK
123553 PLASTIC-LAMINATE-CLAD LABORATORY CASEWORK
123616 METAL COUNTERTOPS
123661 SIMULATED STONE COUNTERTOPS
124816 ENTRANCE FLOOR GRILLES
129300 SITE FURNISHINGS

DIVISION 22 - PLUMBING

220513 COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT
220517 SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING
220518 ESCUTCHEONS FOR PLUMBING PIPING
220519 METERS AND GAGES FOR PLUMBING PIPING
220523 BALL VALVES FOR PLUMBING PIPING
220523 CHECK VALVES FOR PLUMBING PIPING
220529 HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

VCI RICE RIVERS CENTER RESEARCH FACILITY FEASIBILITY STUDY
VCU PC# 2018-00815
VIA PROJECT # 17040
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT
Labels, stencils, and tags

PLUMBING PIPING INSULATION
Insulation materials, jackets, and installation accessories for plumbing piping

DOMESTIC WATER PIPING
Potable-water distribution within the building

DOMESTIC WATER PIPING SPECIALTIES
Specialties, valves, and fittings for domestic water piping

SANITARY WASTE AND VENT PIPING
Soil, waste, and vent piping within the building

SANITARY WASTE PIPING SPECIALTIES
Backwater and air admittance valves, cleanouts, sanitary assemblies, FOG systems, and sanitary drainage specialties.

SANITARY DRAINS
Floor and trench drains, and channel drain systems

GENERAL-SERVICE COMPRESSED-AIR PIPING
Nonmedical piping, equipment, and accessories

GENERAL-SERVICE PACKAGED AIR COMPRESSORS AND RECEIVERS
Nonmedical air compressors, filters, and dryers

DOMESTIC WATER FILTRATION EQUIPMENT
Separators; and bag, cartridge, carbon, sand, and greensand filters

ELECTRIC, DOMESTIC-WATER HEATERS
Household and commercial; tankless, instantaneous, and storage types

COMMERCIAL WATER CLOSETS
Commercial water closets, supports, flushometer valves, and supplies

COMMERCIAL URINALS
Commercial urinals, supports, and flushometer valves

COMMERCIAL LAVATORIES
Commercial lavatories, supports, faucets, traps, and supplies

COMMERCIAL SINKS
Commercial sinks, supports, faucets, traps

WASH FOUNTAINS
Stone, metal, and plastic wash fountains

PRESSURE WATER COOLERS
Freestanding, wall mounted, and wheelchair accessible

COMPRESSED-AIR PIPING FOR LABORATORY FACILITIES
Piping for nonmedical laboratory air, medical air, dental air, instrumental air, and medical laboratory air

COMPRESSED-AIR EQUIPMENT FOR LABORATORY FACILITIES
Compressors, filters, and dryers for laboratory and healthcare facilities

VACUUM PIPING FOR LABORATORY FACILITIES
Piping for laboratory vacuum, medical surgical vacuum, waste anesthetic gas, dental vacuum, oral evacuation, and healthcare laboratory vacuum

VACUUM EQUIPMENT FOR LABORATORY AND HEALTHCARE FACILITIES
Vacuum producers and accessories for laboratory and healthcare facilities

GAS PIPING FOR LABORATORY FACILITIES
Piping for CO2, helium, NO2, and O2

DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT
Universal default values for small and medium, ac motors

SLEEVES AND SLEEVE SEALS FOR HVAC PIPING
Sleeves and sleeve seals for piping at floor and wall penetrations

ESCUCTIONS FOR HVAC PIPING
Escutcheons and floor plates for piping at ceiling, floor, and wall penetrations

BALL VALVES FOR HVAC PIPING
Ball valves common to multiple systems

CHECK VALVES FOR HVAC PIPING
Check valves common to multiple systems

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT
Single and multiple hangers, framing systems, and stands and supports

TESTING, ADJUSTING, AND BALANCING FOR HVAC
Air distribution and hydronic systems

DUCT INSULATION
Insulation materials, jackets, and installation accessories for HVAC ducts

HVAC EQUIPMENT INSULATION
Insulation materials, jackets, and installation accessories for HVAC equipment
### HVAC Piping Insulation
- Insulation materials, jackets, and installation accessories for HVAC piping

### Energy Meters
- Thermal and electric power energy meters that connect to direct digital control systems

### Facility Liquefied-Petroleum Gas Piping
- LP gas piping, specialties, and storage equipment

### Ground-Loop Heat-Pump Piping
- Horizontal and vertical, direct-buried, ground-loop piping

### Hydronic Piping Specialties
- Specialties and special-duty valves for heating and cooling water piping

### Metal Ducts
- Rectangular and round, single- and double-wall ducts, including hangers and supports

### Air Duct Accessories
- Volume dampers, fire and smoke dampers, vanes, duct silencers, and hardware

### Flexible Ducts
- Non-insulated and insulated flexible ducts and flexible duct connectors

### Centrifugal HVAC Fans
- Bl & FC indoor type; tubular and in-line units

### HVAC Power Ventilators
- Roof, wall, and ceiling-mounting ventilators

### Commercial Air Curtains
- Commercial air curtain fans over entranceways, with and without heating

### Air Diffusers
- Round, rectangular, perforated, and linear diffusers

### Registers and Grilles
- Fixed and adjustable registers and grilles

### Water-Source Unitary Heat Pumps
- Concealed horizontal and vertical units

### Division 26 - Electrical

#### U260519 Low-Voltage Electrical Power Conductors and Cables
- Building wires, cables, connectors, splices, and terminations rated 2000 V and less

#### 260526 Grounding and Bonding for Electrical Systems
- Methods and materials for grounding systems and equipment

#### U260529 Hangers and Supports for Electrical Systems
- Hangers, supports, and concrete bases

#### 260533 Raceways and Boxes for Electrical Systems
- Conduit; pull, junction, and outlet boxes; and electrical cabinets

#### 260544 Sleeves and Sleeve Seals for Electrical Raceways and Cabling
- Sleeves and seals for penetrations through floors and walls

#### 260553 Identification for Electrical Systems
- Labels, markers, tags, ties, tape, bands, and signs

#### 260573 Short-Circuit Studies
- Fault-current and protective device short-circuit studies

#### 260573 Coordination Studies
- Fault-current and protective device coordination studies

#### 260573 Arc-Flash Hazard Analysis
- Fault-current and protective device arc-flash studies

#### 260913 Electrical Power Monitoring and Control
- Remote and local monitoring, metering, and control of individual circuits

#### 260923 Lighting Control Devices
- Time switches, photoelectric relays, occupancy sensors, and multipole lighting controls

#### 262416 Panelboards
- Distribution, branch circuit, and surge-suppression panel boards and load centers

#### 262713 Electricity Metering
- Energy and demand metering by utility and Owner

#### 262726 Wiring Devices
- Switches, receptacles, lighting-control devices, and plates

#### 262743 Electric-Vehicle Service Equipment—AC Level 1 and Level 2
- Charging equipment for AC level 1 and 2

#### 262816 Enclosed Switches and Circuit Breakers
- Fusible, nonfusible, receptacle, shunt trip, and molded-case switches; molded-case circuit breakers; enclosures

#### 263100 Photovoltaic Collectors
- Photovoltaic laminates, modules, charge controllers, inverters, and mounting structures
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>263213</td>
<td>DIESEL EMERGENCY ENGINE GENERATORS</td>
</tr>
<tr>
<td>263323</td>
<td>CENTRAL BATTERY EQUIPMENT FOR EMERGENCY LIGHTING</td>
</tr>
<tr>
<td>263600</td>
<td>TRANSFER SWITCHES</td>
</tr>
<tr>
<td>264113</td>
<td>LIGHTNING PROTECTION FOR STRUCTURES</td>
</tr>
<tr>
<td>264313</td>
<td>SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS</td>
</tr>
<tr>
<td>265119</td>
<td>LED INTERIOR LIGHTING</td>
</tr>
<tr>
<td>265213</td>
<td>EMERGENCY AND EXIT LIGHTING</td>
</tr>
<tr>
<td>265619</td>
<td>LED EXTERIOR LIGHTING</td>
</tr>
<tr>
<td></td>
<td>DIVISION 28 - ELECTRONIC SAFETY AND SECURITY</td>
</tr>
<tr>
<td>281300</td>
<td>ACCESS CONTROL</td>
</tr>
<tr>
<td>282300</td>
<td>VIDEO SURVEILLANCE</td>
</tr>
<tr>
<td></td>
<td>DIVISION 31 - EARTHWORK</td>
</tr>
<tr>
<td>311000</td>
<td>SITE CLEARING</td>
</tr>
<tr>
<td>312000</td>
<td>EARTH MOVING</td>
</tr>
<tr>
<td></td>
<td>DIVISION 32 - EXTERIOR IMPROVEMENTS</td>
</tr>
<tr>
<td>321313</td>
<td>CONCRETE PAVING</td>
</tr>
<tr>
<td>321400</td>
<td>UNIT PAVING</td>
</tr>
<tr>
<td>321713</td>
<td>PARKING BUMPERS</td>
</tr>
<tr>
<td>329113</td>
<td>SOIL PREPARATION</td>
</tr>
<tr>
<td>329200</td>
<td>TURF AND GRASSES</td>
</tr>
<tr>
<td>329300</td>
<td>PLANTS</td>
</tr>
<tr>
<td></td>
<td>DIVISION 33 - UTILITIES</td>
</tr>
<tr>
<td>330500</td>
<td>COMMON WORK RESULTS FOR UTILITIES</td>
</tr>
<tr>
<td>334100</td>
<td>STORM UTILITY DRAINAGE PIPING</td>
</tr>
<tr>
<td>334600</td>
<td>SUBDRAINAGE</td>
</tr>
</tbody>
</table>
CONTENTS

1. PROJECT PURPOSE AND NEEDS
   A. Project Purpose + Needs Statement
   B. Proposed Project Schedule
   C. Existing Site - Panoramas + Contextual Photos
   D. Existing Site - Analysis

2. BASIS OF DESIGN NARRATIVES
   A. Architectural
   B. Civil
   C. Landscape
   D. Structural
   E. Plumbing
   F. Mechanical
   G. Electrical

3. SITE LAYOUT + BUILDING DESIGN DRAWINGS
   A. Site Layout
   B. Building Floor Plan
   C. Building SF Program Spreadsheet
   D. Building Elevations
   E. Building 3D Views

4. OUTLINE SPECIFICATIONS
   A. Preliminary Project Specifications

5. COST ESTIMATE
   A. Total Project Cost Executive Summary
EXECUTIVE SUMMARY:

1. PROJECT, DESIGN SUBMITTAL & ORGANIZATION: This is the schematic design construction cost estimate for the proposed Rice River Research Center project at Charles City, VA. This Executive Summary is organized as follows:

1.1 PARAGRAPH 2. Provides an overall summary of project scope, available funding, proposed bid schedule (base bid, allowances, unit price items, options/alternates), contracting strategy, basis of cost estimate, construction time, phasing, escalation, design contingencies, assumptions, clarifications, exclusions, etc.

1.2 PARAGRAPH 3. Provides a narrative describing the basis estimate relative to the proposed building systems.

1.3 PARAGRAPH 4. Provides a narrative/summary describing the basis of estimate relative to the sitework.

1.4 PARAGRAPH 5. Provides a narrative describing the basis for direct cost, i.e., labor, equipment and materials; and contractor mark-ups (general conditions, overhead, profit, bonding, insurance, etc.); contingencies, escalation, phasing and other applicable mark-ups utilized in this estimate.

1.5 PARAGRAPH 6. Provides a summary of cost (extracted from the cost estimate) by bid item.

1.6 PARAGRAPH 7. Provides Point of Contact information.

2. SCOPE OF PROJECT: The overall purpose of this submittal and cost estimate is to determine funding requirements for this project.

2.1 BUILDING(S). The overall scope of this project with respect to buildings includes the 1-story 13,794 SF Research Facility, the 1-story 3,000 SF CCB Field Equipment Bldg (FEB), the 1-story 740 SF Maintenance Bldg, a 6-Bay 2,147 SF Vehicular Storage Shed, an 8-Bay 3,840 SF Vehicular Storage Shed and a 450 SF Greenhouse. Total project scope 23,971 SF. See Paragraph 3 below for a brief description of the proposed building systems and building parameters used to prepare this cost estimate. Building Parameters: Research Facility perimeter is approximately 800 LF and height is approximately 14’ average height. CCB FEB perimeter is approximately 260 LF and height approximately 14’ average height. Maintenance Bldg perimeter is approximately 109 LF and height approximately 14’ average height.

2.2 SITEWORK: The overall scope of this project with respect to sitework includes the site preparation based on the clearing of trees, erosion control, grading, and earthwork. The site improvements include roadways, parking, walks, and landscaping. Also includes adding 2” 21A stone to existing gravel roads at the site. The civil/mechanical utilities include water, sanitary sewer, storm sewer, and electrical utilities (site electrical power, lighting and communications distribution) based on overall proposed site plans.
See Paragraph 4 below for a brief description of the proposed site demolition, preparation, improvements, utilities and site electrical distribution.

2.3 PROPOSED BID SCHEDULE.

2.3.1 CLIN 0001 - BASE BID: Includes all building(S) and all associated sitework.

2.3.1.1 CLIN 0001A – Research Facility

2.3.1.2 CLIN 0001B – CCB Field Equipment Bldg

2.3.1.3 CLIN 0001C – Maintenance Bldg

2.3.1.4 CLIN 0001D – 6-Bay Vehicular Storage Shed

2.3.1.5 CLIN 0001E – 8-Bay Vehicular Storage Shed

2.3.1.6 CLIN 0001F – Greenhouse

2.3.1.7 CLIN 0001G – All Sitework Outside the Bldg 5’ Lines

2.3.2 CLIN 0002 - ALLOWANCES. TO BE DETERMINED (TBD)

2.3.3 CLIN 0003 – UNIT PRICE ITEMS. (TBD)

2.3.4 CLIN 0004 – OPTIONS/ALTERNATES. (TBD)

2.4 CONTRACTING STRATEGY. Based on a Design-Bid-Build, full & open competitively bid solicitation. Less than full & open competition (8A negotiated, small business set-aside, out of state/area MATOC’s, etc.) can greatly affect cost estimate.

2.5 BASIS OF COST ESTIMATE. This estimate is based on the schematic level drawings and Basis of Design provided by VIA Design Architects. This Basis of Design is considered of excellent quality and allows OACCI to temper the design contingency factor we might otherwise apply to a project at this level of design. For this submittal the design contingency factor applied is 10%.

2.5.1 DIRECT COST - LABOR, EQUIPMENT & MATERIALS. Cost estimate based on a detailed takeoff of the Schematic level design documents to the level of detail provided. We have attempted to “fill-in” or complete the cost estimate for missing details using best judgment. The estimate is based on utilizing the most current RS Means cost databases available. Labor rates/cost are based on current hourly rates (either union or non-union depending on project requirements) and with fringe benefits (where applicable) for the specific project location. For Federal projects requiring union scales, the labor rates are revised with each submittal to either the most current Davis Bacon Decision, or, in some cases the current year RS Means database “Labor Rates for the Construction Industry”. Equipment costs are based on RS Means rental rates for small projects. For large projects involving large volumes of earthwork (heavy equipment), a 20% equipment reduction factor will be applied to the RS Means equipment costs to reflect “equipment ownership” versus “rental”. Material costs are generally based on current RS Means databases. Where quotes are obtained they will be described in the specific building
system narrative, or, in the details of the cost estimate. Applicable state and local taxes on materials are included.

2.5.2 INDIRECT COST - CONTRACTOR MARK-UPS. The estimate is based on there being a minimum of three (3) prime contractor bids. It is assumed the project solicitation method will result in local contractor bids, unless otherwise informed. We have assigned sub-contractors mark-ups to work normally subcontracted for a project of this scope, or for the proposed contracting methodology. Prime contractor General Conditions/Field Overhead have been determined by using the calculated method by month/overall construction time. Subcontractor General conditions are based on an average overall percentage mark-up depending on project scope. There is no way to project the final composition of contractor division of work on bid day. It is anticipated there will be several prime and sub-contractors bidding, each with different overhead and profit objectives therefore not possible to predict low-bid. This is an estimate of our projected total project cost based on our cost engineers/estimators experience and judgment.

2.6 AVAILABLE PROJECT FUNDING: $7,500,000 (To be confirmed at a later date.

2.7 ALLOWANCES: TBD

2.8. OPTIONS: TBD

2.9 CONSTRUCTION SCHEDULE/PHASING/TIME:

2.10 ESCALATION. Proposed escalation factor is based on Engineering News Record dated 29 January 2018 indicating a current Building Cost Index of 3.9% for the past year. An escalation factor has been applied determined from the date of our pricing database and projected to mid-point of construction. Where applicable, the BCI index factors and escalation are adjusted due to labor rates/cost being more current than the materials database. Paragraph 5 discusses in more detail the escalation factor applied to this submittal.

2.11. DESIGN CONTINGENCY: For projects at less than 100% final design, a design contingency factor will be applied to our cost estimate as a percentage mark-up to the Prime Contractor. The percent applied is determined based on status of design and will vary with each submittal based on our cost engineers/estimator’s opinion of overall design status and confidence in the cost estimate based on the level of design, incomplete details, omissions, etc. This is strictly a judgment factor. At 100% pre-Final design stage there will be no design contingency applied. Paragraph 5 discusses in more detail the design contingency factor applied to this submittal.

2.12 SPECIAL CONDITIONS. Where applicable and when informed conditions are applicable to the project, the cost estimate will include allowances for special site security requirements, personnel restrictions, work-hour restrictions, restricted vehicle access/inspection requirements, special inspections, connection fees, etc. Since we rarely participate in site visits these special conditions need to be brought to our specific attention.

2.13 OWNER COST. Unless specifically requested, our estimate excludes owner costs, i.e., funds set aside for construction contingencies, construction management, owner funded special testing, FFE, electronics, security and A/V equipment, etc. Our estimates generally include construction cost only.
USACE projects, which specifically require estimates to include owner construction contingencies and SIOH, these projects will include.

### 3. PRIMARY FACILITIES:

A brief description of the building systems proposed for this project follows.

#### 3.1 ALL BUILDINGS:

##### 3.1.1 SUBSTRUCTURE SYSTEM:

- **3.1.1.1 Research Facility.** Cost estimate is based on shallow foundation consisting of wall footings, CMU foundation walls, spread footing, and a 4” slab on grade. Also includes is indicated lab spaces pre-fabricated polyester polymer trenches with fiberglass grating.
- **3.1.1.2 CCB Field Equipment.** Cost estimate is based on shallow foundation consisting of wall footings, CMU foundation walls, and a 4” slab on grade.
- **3.1.1.3 Maintenance Building.** Cost estimate is based on shallow foundation consisting of wall footings, CMU foundation walls, and a 4” slab on grade.
- **3.1.1.4 Vehicle Storage Bays.** Cost estimate is based on a 6” slab on grade.

##### 3.1.2 SUPERSTRUCTURE SYSTEM:

- **3.1.2.1 Research Facility.** Cost estimate is based on steel framing, including columns, beams and joists with a steel roof deck.
- **3.1.2.2 CCB Field Equipment.** Cost estimate is based on conventional wood truss roof framing, with plywood deck on load bearing CMU.
- **3.1.2.3 Maintenance Building.** Cost estimate is based on conventional wood truss roof framing, with plywood deck on load bearing CMU.
- **3.1.2.4 Vehicle Storage Bays.** Cost estimate is based on heavy timber truss roof framing, with 3” T&G deck on 8” treated wood driven piles.
- **3.1.2.5 Greenhouse.** Cost estimate is based on a pre-fabricated/assembled on site Greenhouse.

##### 3.1.3 EXTERIOR CLOSURE SYSTEM:

- **3.1.3.1 Research Facility.** Cost estimate is based on 6” metal stud back-up with insulation and sheathing, metal wall panels, composite metal fascia and soffit, insulated hollow metal personnel doors, glazed overhead sectional doors, and glazed storefront systems. Also includes architectural screen walls.
- **3.1.3.2 CCB Field Equipment.** Cost estimate is based on 8” load bearing CMU, insulated metal panels, insulated hollow metal personnel doors, and insulated overhead doors.
- **3.1.3.3 Maintenance Building.** Cost estimate is based on 8” load bearing CMU, insulated metal panels, insulated hollow metal personnel doors, and insulated overhead doors.
3.1.4 ROOFING SYSTEMS:

3.1.4.1 Research Facility. Cost estimate is based on standing seam metal roofing, insulation, coverboard, and all flashings, gutters, etc.

3.1.4.2 CCB Field Equipment. Cost estimate is based on standing seam metal roofing, insulation, coverboard, and all flashings, gutters, etc.

3.1.4.3 Maintenance Building. Cost estimate is based on standing seam metal roofing, insulation, coverboard, and all flashings, gutters, etc.

3.1.4.4 Vehicle Storage Bays. Cost estimate is based on standing seam metal roofing, coverboard, and all flashings, gutters, etc.

3.1.5 INTERIOR CONSTRUCTION SYSTEMS:

3.1.5.1 Research Facility. Cost estimate is based on 6” metal stud partitions, 8” CMU partitions, glazed folding/stackable partitions, solid core wood personnel doors, glazed overhead door, toilet accessories, lockers, shelving, casework, etc.

3.1.5.2 CCB Field Equipment. Not Applicable.

3.1.5.3 Maintenance Bldg. Not applicable.

3.1.6 INTERIOR FINISH SYSTEMS:

3.1.6.1 Research Facility. Cost estimate is based on following finishes. Floors – carpet, porcelain tile, VCT, epoxy. Walls – paint, porcelain tile. Ceiling – suspended acoustical tile, gypsum wallboard, and painted exposed.

3.1.6.2 CCB Field Equipment. Not Applicable.

3.1.6.3 Maintenance Bldg. Not applicable.

3.1.7 CONVEYOR SYSTEMS: NOT APPLICABLE.

3.1.8 PLUMBING SYSTEMS:

3.1.8.1 Research Facility. Plumbing cost is based on the BOD provided and email exchanges between OACCI and the plumbing engineer. Besides typical toilet fixtures there are a number of special plumbing systems to include gas, compressed air, vacuum and deionization systems. Fixture count based on floor plans and BOD narrative. Water heaters per BOD to include instantaneous under counter heaters at lavatories and a 15kW 120 gallon electric heater serving showers/laboratory spaces. Domestic water and sanitary piping cost are based on using assemblies developed by OACCI (and proven to be reliable for budgeting purposes) based on fixture count, # floor drains, etc. Laboratory trench cost included under Substructure. Quotes were obtained for deionization and vacuum systems.

3.1.8.2 CCB Field Equipment. Not Applicable.

3.1.8.3 Maintenance Bldg. Not applicable.
3.1.9 HVAC SYSTEMS:

3.1.9.1 Research Facility. HVAC cost is based on the BOD provided and email exchanges between OACCI and the mechanical engineer. HVAC system is based on a geothermal system with water source heat pumps. Estimate for the primary system includes 40-each 250VLF geothermal wells, 2-each 2-HP condenser water pumps, 10-each 4-ton (1600 CFM) water to air heat pumps, 10-each 1600 CFM air distribution systems, condenser water piping distribution (based on 480-MBH), fresh air intakes, heat pump coils, etc. Also included are a fume hood, exhaust systems, DSS for comm/data room, unit heaters, TAB, and allowances for controls and commissioning.

3.1.9.2 CCB Field Equipment. Minor. Included allowance for gravity ventilation.

3.1.9.3 Maintenance Bldg. Minor. Included a 10kW electric unit heater.

3.1.10 FIRE PROTECTION: Not Applicable.

3.1.11 ELECTRICAL POWER & LIGHTING:

3.1.11.1 Research Facility. Power and Lighting system cost is based on the project Basis of Design (BOD) and email exchanges between OACCI and the electrical engineer. Power service to the Research Building is sized at 1000 amperes, 120/240 volts single phase. A 1000A main distribution panel serves 4 lighting and appliance panelboards and the CCB and Maintenance buildings. TVSS surge protection is provided at the service equipment. Receptacle, HVAC and lighting loads are served at 120 or 240 volts single phase as applicable. Work benches along walls are served from multi-outlet raceway mounted receptacles. Free-standing benches are fitted with bench mounted power/comm pedestals. An allowance is included for a 45KW photo-voltaic solar power system. This PV system will be a utility connected system without storage. A 30KW outdoor packaged diesel engine generator set is included with 50-hour capacity base fuel tank. Lighting is accomplished by LED fixtures, direct/indirect types. Areas with finished ceiling have troffer type fixtures and areas with open ceiling have pendant types. Exit marking and emergency lighting is provided. Emergency light is accomplished by a small central battery/inverter system. Lighting controls utilize occupancy sensors extensively, both wall and ceiling, with daylighting controls in areas with adequate fenestration.

3.1.9.2 CCB Field Equipment. Minor. Included load-center panelboard, LED lighting and convenience receptacles.

3.1.9.3 Maintenance Bldg. Minor. Included load-center panelboard, power for a 10kW electric unit heater, LED lighting and convenience receptacles.

3.1.12 SPECIAL ELECTRICAL SYSTEMS:

3.1.12.1 Research Facility. Special electrical system cost is based on the project Basis of Design (BOD) and email exchanges between OACCI and the electrical engineer. Included is a complete horizontal pre-wiring for voice and data (conduit, cable tray, cat 6 cabling, jacks, patch panels) required for all workstations, wi-fi outlets, etc. Communication outlets are recessed wall mounted, mounted in multi-outlet raceway or bench pedestal mounted as applicable. A conduit stub-out beyond building footprint is provided to receive service cabling form the communications service provider. Infrastructure (conduit,
boxes) for an audio-video/teleconference system within the conference room is provided. A roof mounted lighting protection system complete with air terminals and ground electrode system is provided for the Research Building.


3.1.13 EQUIPMENT:

3.1.13.1 Research Facility. Included 2-each 8’ X 12’ pre-fabricated walk in refrigeration units.

3.1.13.2 CCB Field Equipment. Not Applicable.

3.1.13.3 Maintenance Bldg. Not Applicable.

3.1.14 FURNISHINGS: NOT APPLICABLE.

3.1.15 SPECIAL CONSTRUCTION: NOT APPLICABLE.

3.1.16 SELECTIVE DEMOLITION: NOT APPLICABLE.

3.1.16.1 NON-HAZARD DEMOLITION: NOT APPLICABLE.

3.1.16.2 HAZARDOUS MATERIALS DEMOLITION: NOT APPLICABLE.

3.1.17 OTHER FUNDING - FFE. TBD.

3.1.18 OTHER REQUIREMENTS. TBD.

4.0 SITEWORK/SUPPORTING FACILITIES:

4.1 SITE PREPARATION. The total site area is approximately 4.0 acres or approximately 19,360 SY.

4.1.1 SITE CLEARING & DEMOLITION. The site is mostly open and has minor clearing and demolition.

4.1.2 SITE EARTHWORK. Estimate is based on 17,000 SY of site grading. This includes topsoil stripping, rough grading, and fine grading. Also included is site cut, spreading of excavated material, and select fill under the building. Excavated material with heavy organics from clearing and excess excavated material will be hauled off-site. Erosion control measures include silt fence, temporary sediment trap, construction entrance, culvert inlet protection, and temporary seeding.

4.2 SITE IMPROVEMENTS.

4.2.1 SITE ROADWAYS. Includes approximately 5,683 SY of road improvements. Includes gravel pavement (6” stone w/geotextile fabric) at the mechanical yard access, 2-each site access entrances, and access drive through the site. Includes concrete pavement (6” concrete, 4” base) at the mechanical yard and vehicle wash down area. The existing access roads around the perimeter of the site will also be resurfaced with 2” of 21-A stone.
EXECUTIVE SUMMARY: RICE RIVER RESEARCH CENTER   DATE: 5 FEBRUARY 2018

4.2.2. SITE PARKING LOTS. Estimate is based on 21 spaces and 407 SY of pavement. Includes 20-each gravel parking spaces and 1-each concrete Handicap space. The handicap pavement is 6” concrete w/4” base, and the main parking area pavement is permeable gravel pavers w/4” stone.

4.2.3 SITE WALKWAYS. Estimate is based on 7,045 SF of walkways. Includes standard 4” concrete sidewalk, 4” stamped concrete at the terraces, and 4” gravel around the greenhouse.

4.2.4 SITE DEVELOPMENT.

4.2.4.1 SITE FENCING. Estimate includes 700 LF of temporary safety fence.

4.2.4.2 FURNISHINGS. Not Applicable.

4.2.4.3 SITE SIGNAGE. Not Applicable.

4.2.4.4 SITE DUMPSTER PADS & SCREEN WALLS. Dumpster pad is included with mechanical yard pavement in Site Roadways, and screen walls are included in Exterior Closure.

4.2.4.5 SITE MECHANICAL & ELECTRICAL EQUIPMENT PADS AND SCREENWALLS. Pad is included with mechanical yard pavement in Site Roadways, and screen walls are included in Exterior Closure.

4.2.4.6 ATHLETEC FIELDS. Not Applicable.

4.2.4.7 HARDCOURT PLAY AREA. Not Applicable.

4.2.4.8 FITNESS AREA. Not Applicable.

4.2.4.9 GREENHOUSE. Estimate is based on a 15’ X 30’ greenhouse. (450 SF)

4.2.5 SITE LANDSCAPING. Estimate is based on 9,000 SY landscaping and includes spreading topsoil, plant be preparation, and general seeding. Plantings including trees, shrubs, grasses, and perennials. Maintenance allowance during construction also included.

4.3 SITE UTILITIES.

4.3.1 SITE WATER DISTRIBUTION. Estimate is based on 1,100 LF of water distribution. Includes 900 LF of 2” PVC domestic water supply with connection point at the existing well, and 200 LF of 1” PVC to yard hydrants at the greenhouse and maintenance building.

4.3.2 SITE SANITARY SEWER DISTRIBUTION. Sanitary sewer distribution includes approximately 100 LF of 4” PVC gravity and 700 LF of 2” PVC force main. The sanitary force main connects to the Dual Bio-Microbics and EZ Treat treatment systems near the Lodge. One air release valve and a pump station are included. The pump station is based on the Lodge pump station.

4.3.3 SITE STORM DRAINAGE. Site storm drainage based on grading to promote sheet flow to existing culverts, 2- ea new culverts leading to level spreaders in the woods, and new bioretention (4,250 SF).

4.3.4 SITE GAS DISTRIBUTION. Not Applicable.
4.3.5 SITE CHILL WATER DISTRIBUTION. Not Applicable.

4.3.6 SITE UTILITIES MISCELLANEOUS. Not Applicable.

4.4 SITE ELECTRICAL DISTRIBUTION.

4.4.1 Site Power. Dominion Energy will provide primary power service, service transformer, metering and building service lateral cables. The building contractor will provide a pad for the Dominion transformer, 10 LF of 2W-6’ concrete encased primary service ductbank and 40LF of 2-Way 4” concrete encased secondary ductbank to the Research Building plus direct buried underground conduit service laterals to the Field Equipment and Maintenance Buildings.

4.4.2 Site Lighting. Parking and area lighting is accomplished with 4-each pole mounted LED fixtures controlled by integral motion detectors and time of day controls.

4.4.3 Site Communications. Includes an allowance for 100 LF of 2-Way 4” concrete encased ductbank. Cabling by others.

5. DEVELOPMENT OF ESTIMATE:

5.1 PRICING DATABASE: Used the RS Means 2017 Master Union Database.

5.2 MATERIALS: Included, as a prime contractor mark-up, is the current 5.3% Virginia State sales tax on materials. Used RS Means 2017 for material pricing except where noted otherwise (quoted) above or in the estimate details.

5.3 LABOR: Used current non-union rates for Richmond, VA. Included workman’s compensation, payroll taxes and insurance as a labor mark-up at a 20% mark-up.

5.4 EQUIPMENT: Means 2017 database. Included as a prime contractor mark-up a 5.3% tax on equipment costs.

5.5 SUB-CONTRACTOR MARK-UPS: Includes 5% General Conditions, 6% home office overhead and 6% profit.

5.6 PRIME CONTRACTOR MARK-UPS. General Conditions/Field Overhead was calculated based on a 13-month construction time. The estimated total amount included for general conditions/field overhead (including full-time quality control manager) is approximately $411,372. All non-carpentry type work was assumed to be subcontracted. For work performed by Prime contractor included a 6% home office overhead, 6% profit and for 1.5% for bond and insurance. For work subcontracted, included Prime Contractor mark-ups of 3% home office overhead, 3% profit and 1.50% for bond & insurance.

5.7 OTHER ADJUSTMENTS:

5.7.1 DESIGN CONTINGENCY: Includes a 10.00% design contingency due to status of design and unknowns.
5.7.2 ESCALATION TO MID-POINT OF CONSTRUCTION. Based on Engineering New Record (ENR) - Construction Economics Report (29 January 2018) indicated a 3.9% escalation rate for the past year. ENR material escalation for the past year is indicated as 0.0%. Using 1 January 2018 (current labor database) and escalating to mid-point of construction from beginning of 2018 to mid-point of construction assuming a June 2019 construction start and 13-month construction time results in 2-years of escalation or 7.8% escalation factor.

5.7.6 PHASING REQUIREMENTS. Not Applicable.

6. COST SUMMARY: (Amounts Rounded to Nearest $1,000)

6.1 BASE BID:

6.1.1 CLIN 0001 -

CLIN 0001A Research Facility $4,489,000 ($325.42 /SF based on 13,794 SF)
CLIN 0001B CCB Field Equipment $358,000 ($119.21/SF based on 3,000 SF)
CLIN 0001C Maintenance Bldg $136,000 ($184.45/SF based on 740 SF)
CLIN 0001D 6-Bay Vehicular Storage $186,000 ($86.51/SF based on 2,147 SF)
CLIN 0001E 8-Bay Vehicular Storage $295,000 ($76.76/SF based on 3,840 SF)
CLIN 0001F Greenhouse $28,000 ($63.29/SF based on 450 SF)

CLIN 0001G SITEWORK:

Site Preparation $116,000
Site Improvements $282,000
Site Civil/Mech Utilities $127,000
Site Electrical Distribution $54,000
TOTAL SITEWORK $579,000

CLIN 0001 TOTAL $6,071,000

6.1.2 CLIN 0002 - Allowances $ (TBD)

6.1.3 CLIN 0003 - Unit Price Items $ TBD

6.1.4 CLIN 0004 - Options $ TBD

6.1.5 TOTAL ESTIMATED PROJECT COST ESTIMATE $6,071,000 (Excludes FFE, Privatized Utilities and other non-construction related costs such as A/V equipment (infrastructure included), comm servers, etc.)
6.2 AVAILABLE CONSTRUCTION FUNDING. $7,500,000

6.3 AMOUNT OVER/UNDER AVAILABLE FUNDING: UNDER $1,620,000.

7. P.O.C. This estimate was prepared by Osmundson & Associates Cost Consultants. Point of Contact for questions or clarifications concerning this estimate may be directed to John Osmundson (540) 289-6417.