

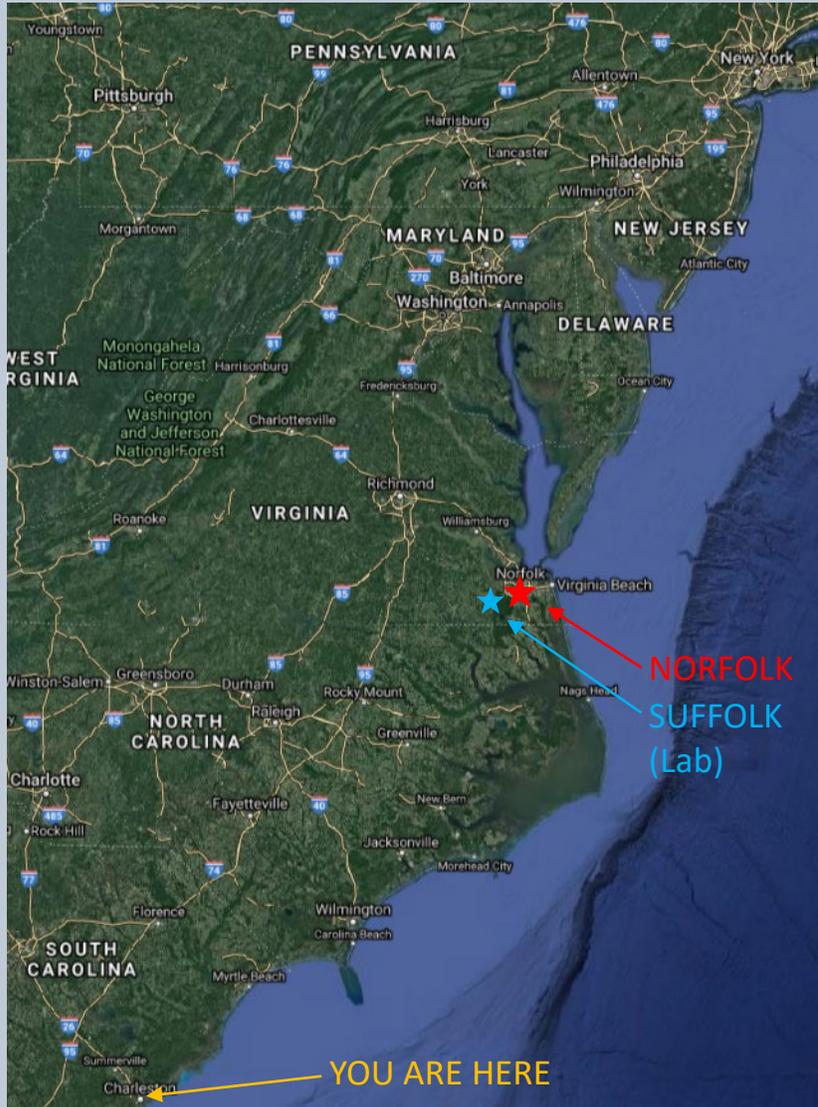


TESTING THE WATERS:

Flood Resiliency Testing of Pre-1970
Construction Building Materials &
Techniques



HOW DID WE GET HERE?



Karen Speights
Preservation Virginia's "Historic Preservation and Environmental Justice" Webinar
May 13, 2021

<https://www.youtube.com/watch?v=L0QjJPDrptY&t=3668s>



HOW DID WE GET HERE?



- 2009 – Begin seeing residential owners implementing FEMA mandated flood mitigation retrofits
 - Responding to inquiries about how to mitigate unintended consequences of retrofits

Utilities	Flood Openings	Basements	Elevation	Relocation
<p>If you locate any machinery or equipment that services your building (i.e., electrical, heating, ventilation, plumbing, and air conditioning equipment) below the base flood elevation, an additional surcharge will be added to your insurance premium causing your annual insurance rates to increase. If your house was elevated to a safer level, maximize your savings and reduce your losses by relocating your machinery and equipment above the base flood elevation. Consider using your attic, an extra closet, or an elevated platform (as shown) to store utilities.</p> <p><small>For more information on relocating utilities see FEMA publication 359: Engineering Principles and Practices of Retrofitting Flood-prone Residential Structures</small></p>	<p>One common reason why insurance policies are rated so severely is due to a lack of proper flood openings. IBC/IRC minimum building code requirements for "foundation vents" in areas outside the floodplain may not meet the same specifications as "flood openings" or "flood vents" within a floodplain. For buildings in the floodplain, there must be at least two openings with 1 sq. inch of opening per sq ft of enclosed area, and the bottom of those openings can be no higher than 1 ft above the exterior finished grade. There are no discounts for "partial credit." If you have 1000 sq feet of enclosed crawlspace and 900 sq inches of openings, you will be charged as though there are no openings (i.e., basement loading fees could apply). Don't forget that garage doors, windows, and doors do not count as flood openings unless they have openings installed within them.</p> <p><small>For more information on flood openings, see FEMA Technical Bulletin 11-93</small></p>	<p>Unless explicitly authorized, basements in new buildings constructed in the floodplain are prohibited. FEMA considers "crawlspace" that are sub-grade on all sides to be basements as well. If your community has adopted building standards that allows such construction, homeowners in the floodplain with an excavated sub-grade crawlspace will bear an additional financial burden through a 15-20% increase on their flood insurance premiums. When building, you can save that cost by backfilling any excavated areas within the foundation. It can also be done at a later date by using pea-gravel or other suitable material to raise the interior crawlspace floor elevation to the same height or higher than the exterior finished grade.</p> <p><small>For more information on basements, see FEMA Technical Bulletin 11-01</small></p>	<p>Elevating above the base flood elevation is the fastest way to reduce the cost of your annual flood insurance premium. You can save hundreds of dollars for every foot the elevated floor is located above your community's established base flood elevation. Elevating just one foot above the base flood elevation often results in a 30% reduction in annual premiums. A homeowner with an elevated home, like the one shown on this poster with its first floor elevated 3 feet above the base flood elevation, can expect to save 60% or more on annual flood insurance premiums.</p> <p><small>For more information on elevation, see FEMA Technical Bulletin 2-91</small></p>	<p>One of the most effective options is relocating your home on an area of your property that has its natural grade above the base flood elevation. This method may be costly, but can reduce or eliminate the need to pay flood insurance entirely. If you are preparing to build a new home or structure, evaluate your property to determine if there is a suitable building area outside of the floodplain. Be warned, homes constructed outside the floodplain (or on natural ground above the base flood elevation) are not 100% safe from flooding. On average, between 20-35% of all flood insurance claim payouts go to buildings that are located outside of the special flood hazard area. If your home is located outside the floodplain and you still want to be covered, affordable "Preferred Risk" policies are available.</p> <p><small>For more information on relocation, see FEMA Technical Manual 312, Homeowner's Guide to Retrofitting.</small></p>



HOW DID WE GET HERE?

Building Code Updates

Starting September 4, 2019, any new construction or substantial improvements will have to be built to the same standards as ones in the highest-risk coastal areas, said Jeff Brown, the director for the State Building Code Office.

- 2014 – Notice change in flood mitigation needs, practices that are policy driven
- 2018 – BRS formed to address traditional materials and flooding
- 2019 –
 - Building Code Updates
 - Traditional material testing lab development underway
- 2020: Testing lab permitting and funding
- 2021: Lab open





UNINTENDED CONSEQUENCES

Impact properties indiscriminately
Trigger not limited to flood related events

Loss of historic inherently resilient
building materials
Enter permanent cycle of replacement with
disposable materials

Property value reduction
Impact to real estate assessment



FEMA EXEMPTION ELIGIBILITY OPTION (For Localities)

A property must be listed on the:

National Register of Historic Places,
Virginia Landmarks Register,

OR

as a landmark or contributing within a locally designated
historic district....

Must Demonstrate that....

Repair or rehabilitation would preclude the structure's
continued designation as a contributing resource

AND

Propose alternative strategies to reduce risk





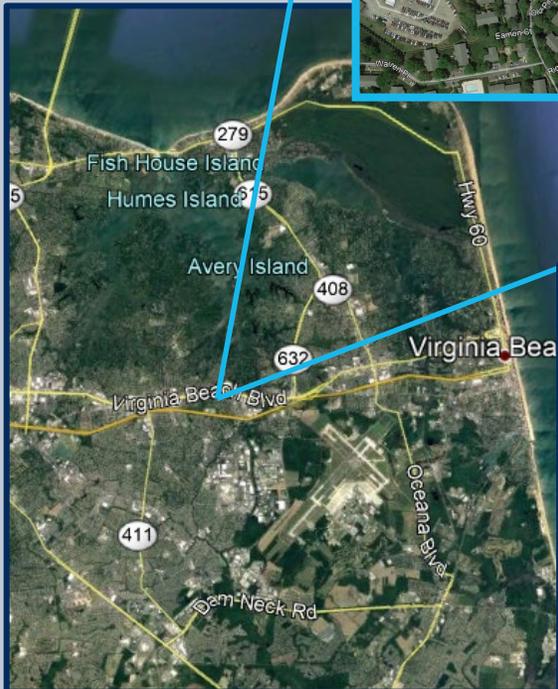
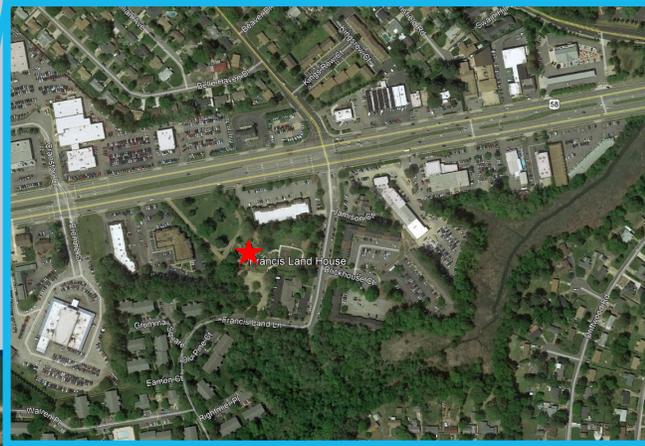
MAINTAINING A RESPONSIBLE APPROACH

- Exemption is not a free pass
- Design community must balance ethical standards with risk and solutions
- Responsibility to identify alternate, more effective, protective measures
- Opportunity to realize more cost effective and tailored retrofit solutions
- Exemption requests and alternative approaches should be site specific



CASE STUDY

- Landlocked in north central Virginia Beach
- House Built: c1805
- Historic District Designation(s):
 - Local Historic District
 - Individual Virginia Landmarks Register
 - Individual National Register of Historic Places
- Potentially eligible for exemption



CASE STUDY



Property Owner Goals:

- Retain and restore historic materials
 - Decrease and limit moisture retention
- Test site to determine water infiltration sources
 - Address questions of drainage, moisture dynamics, and interior climate
 - Seek recommendations based on testing to make informed decision on appropriate rehabilitation procedures

Foresee long-term ownership

- Okay with some regular maintenance not requiring special skills



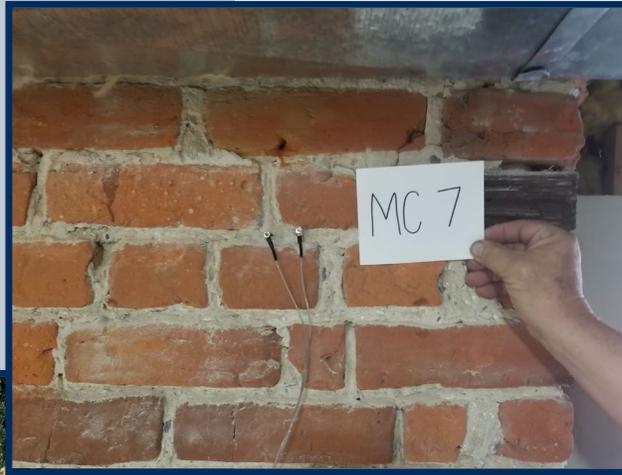
CASE STUDY



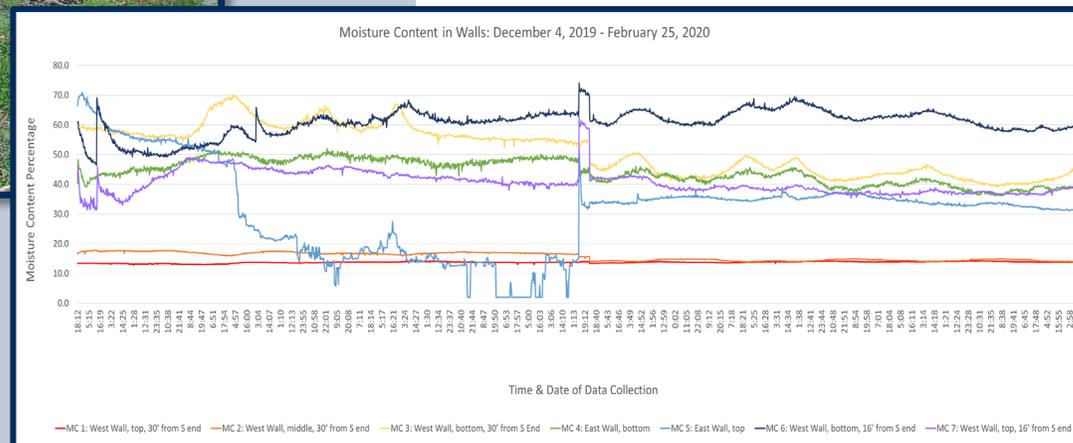
- 1950s:
 - Basement renovation - concrete floor then tiled
- Late 1970s and Early 2010s:
 - Installation of moisture barriers during rehabilitation projects
- 2020 Renovation
 - proposed materials replacement similar to above work
- Initial Assessment:
 - Previous renovations and maintenance issues contributed to historic material degradation
 - No initial testing performed before renovation plans
 - Proposed work does not address cause of moisture issues, rather applied contemporary solution to a historic building that would likely cause same damage



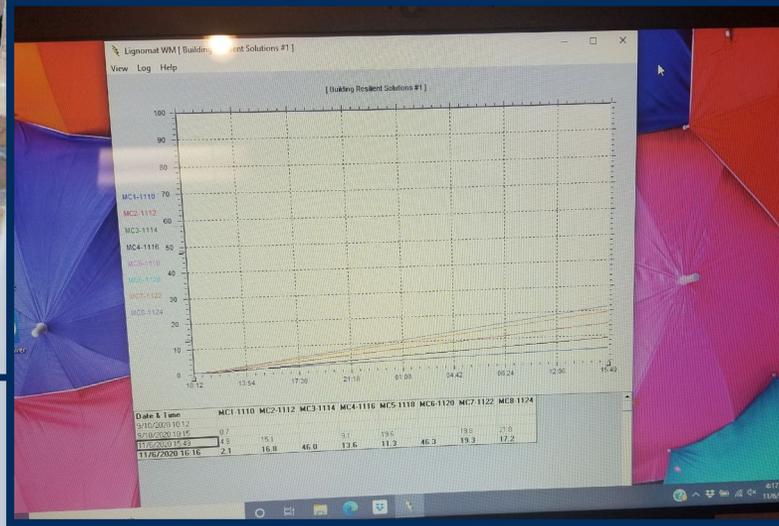
CASE STUDY



- Monitoring the site:
 - Equipment installed for 36-40 days
 - Soil moisture monitors measured for 26 days
 - Continuous measurements
 - Probes distributed throughout basement
 - Tidal position measurements
 - Temperature
 - Relative humidity



CASE STUDY

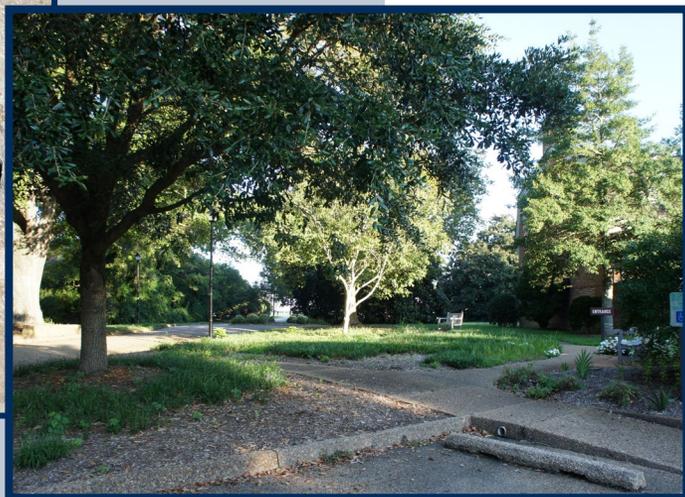


Findings - multiple conditions contributing to moisture problem:

- Poor drainage
- Poor grading
- Organic material near foundation walls
- Earlier waterproofing efforts failed
- Addition of the concrete slab forced more moisture up the masonry column, adding to the problem
- Unregulated RH in basement



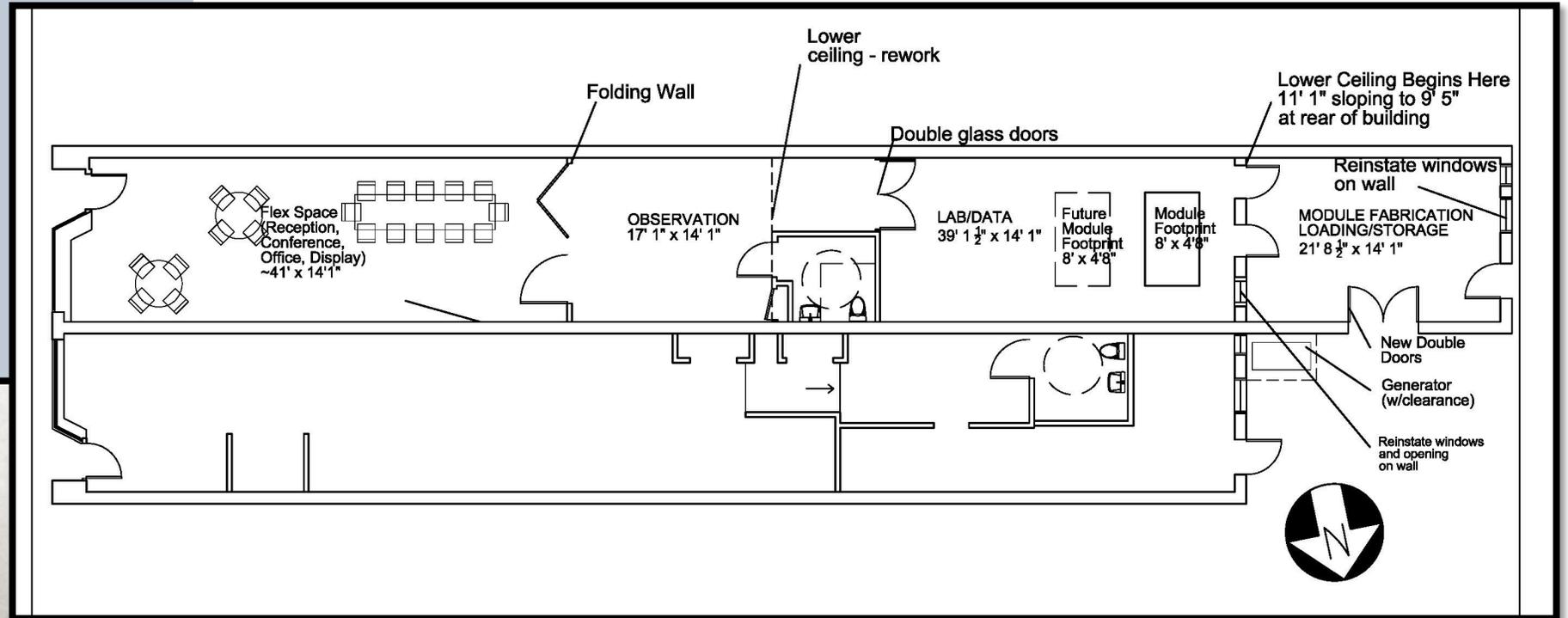
CASE STUDY



- Recommendations:
 - Apply for a Historic Structure in SFHA Exemption
 - Reutilize found culvert pipe for site drainage
 - Regrade site and remove organic material from house perimeter
 - Install and repair gutter system
 - Remove existing moisture barrier and clean brick; **apply vapor-permeable membrane**
 - Elevate HVAC units to allow for evaporation
 - Remove concrete slab in basement and install porous material under a brick floor
 - Perimeter underground drainage system
- Reinstall monitoring equipment and reassess



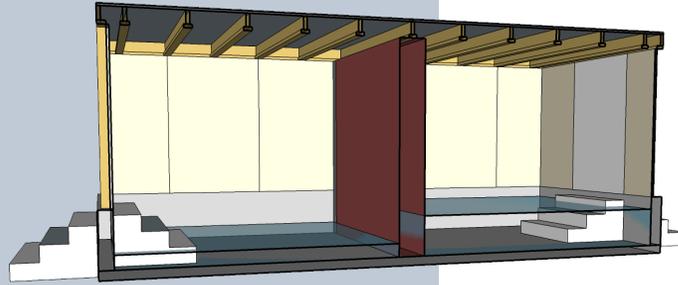
TESTING LAB - OPERATIONAL IN 2021



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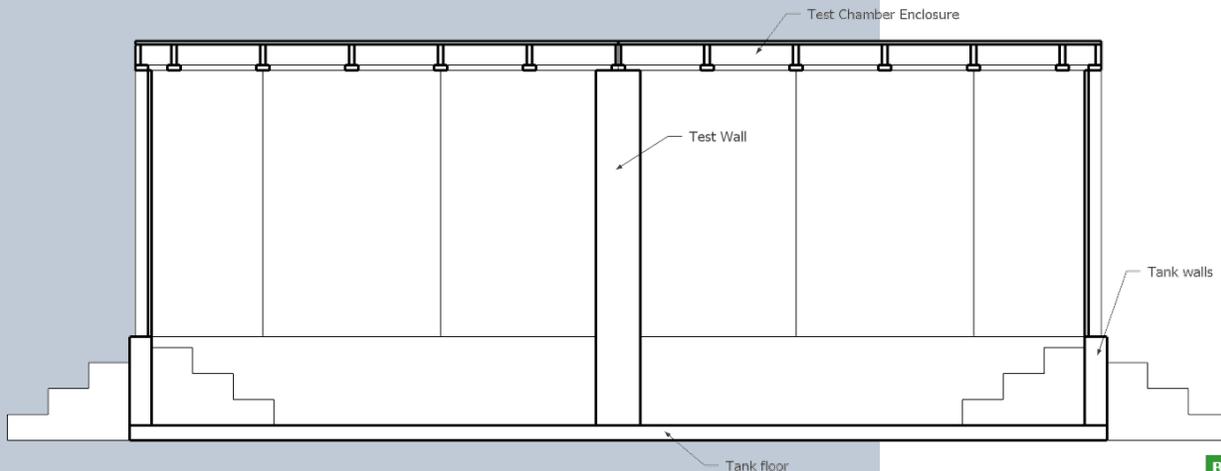
TESTING LAB - OPERATIONAL IN 2021



Opportunity to test alternative retrofits

- Water infiltration prevention assemblies
- Materials wet/dry analysis as well as survivability
- Insulation
- Flood proofing
- Moisture analysis
- Relative humidity for developing best post event solutions

Resulting in thoughtful, informed retrofit solutions.



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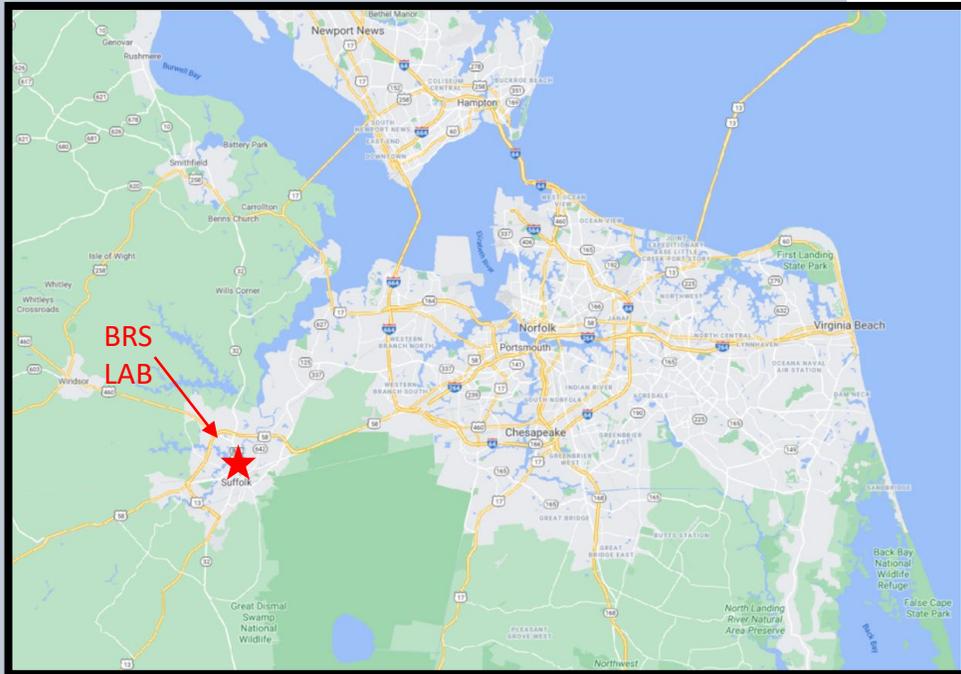
TESTING LAB - OPERATIONAL IN 2021

Located in Suffolk, VA (Hampton Roads area)

Laboratory with public space for training/workshops and observation area

Initial testing proposal submitted

- Evaluating building material performance of historic wood
- Reaction of materials classified as level 3 resistant (FEMA classification)
- Testing historic wood compared to new growth or readily available modern materials



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CONTRIBUTING PARTNERS



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Thoughtful, informed retrofit design.

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