CONCEPT

The concept behind this design was formed by the motion found in passive flooding mitigation systems, primarily constructed wetlands. Wetlands are designed to take in the flow of an adjacent body of water and redirect it, during flooding conditions, downstream. When in motion, there is a sort of stepping down into the new wetland channel where the water is redirected through a multiple of different systems and eventually makes its way back into river.

This idea of moving from one system to another has shaped our construction, creating zones where the user can experience a multitude of environments. Going from the outdoor environment, to a mediated greenhouse, and finally into the built environment that forms the resiliency center that has been created out of the two existing structures.

We decided to leave the two existing structures as intact as possible and instead created a beautiful and educational construction wrapping around the buildings in a flowing form, reminiscent of the path that water takes when going through wetlands. This enabled us to showcase how simple moves can create elegant yet powerful messages to the locals and community abroad.
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CONCEPT FIRST FLOOR PLAN
ELEVATIONS

WEST ELEVATION

EAST ELEVATION
Tank 1 = Re-circulating water
   Used to filter over and over again
Tank 2 = Storage for water after number of circulations
   Now usable as grey water   Piped throughout building
Collection Pool = Water collected from all roofs   Piped into filtration loop
Filtration Stream = Area for water to circulate   Purified by vegetation
Rain Catcher = Artistic fixture designed to take water from the greenhouse roof and bring it into the greenhouse waterway
Tank 1 = Re-circulating water
Used to filter over and over again
Tank 2 = Storage for water after number of circulations
Now useable as grey water
Piped throughout building
Collection Pool = Water collected from all roofs
Piped into filtration loop
Filtration Stream = Area for water to circulate
Purified by vegetation
Rain Catcher = Artistic fixture designed to take water from the greenhouse roof and bring it into the greenhouse waterway

STRUCTURE AXONOMETRIC

METAL/STEEL ROOFING

GLULAM STRUCTURE

TIMBER COLUMNS
PASSIVE SYSTEMS

PASSIVE HEATING
Works in tandem with HVAC system. Greenhouse reduces heating costs drastically.

CROSS-VENTILATION
Catch wind in greenhouse from west coming from river. Circulates through buildings.
Cross Ventilation

Uses Openings to catch wind - In Greenhouse from West wind coming from river

Circulates through buildings - Funnels through Ritz up to higher exit

Passive Heating

Works in tandem with HVAC system

Greenhouse reduces heating costs drastically

Passive System Section

Winter Passive Section

Summer Passive Section

Thick Insulation

Green Roof

Intensive Garden

Ground Floor

NORTH SOUTH

In/filled Basement

Green House

Passive Heating

Buffer Zone

Ducts

Ventilation Cools Greenhouse

Closed Vents keep warmth in
MECHANICAL SYSTEMS

HVAC DUCT DISTRIBUTION
Uses attic of Opera House with 2 heat pump systems to distribute forced air

GEOTHERMAL HEAT PUMP
Uses entire site as source for coils
HVAC System Section

HVAC Duct Distribution

Uses attic of Opera House with 2 heat pump systems to distribute forced air

Winter System Section

Summer System Section

Geothermal Heat Pump

Uses entire site as source for coils then they move up to the Opera house mech. room in attic space of Opera house

Evaporator

Heat Pump mech. in roof of Opera House

Condenser

Compressor

3rd Floor

2nd Floor

1st Floor

Services Rits

Supply Air Intake at Greenhouse
*Only during Winter

Services Opera

Supply Air
*Only during Summer

Pervious Paving

Ground Floor

NORTH

SOUTH

Green Roof

Forced Air

Heat Pump

Ducts

Air

Extract

Air

Heat Recovery Unit

Heat Pump

Exhaust

Air

Supply Air From Greenhouse During Winter

Pervious Paving

Ground Floor

NORTH

SOUTH

Forced Air

Heat Pump

Ducts

Air Supply Air

Extract

Air

Heat Recovery Unit

Heat Pump

Exhaust

Air

Supply Air From Greenhouse During Winter

Pervious Paving

Ground Floor

NORTH

SOUTH

Forced Air

Heat Pump

Ducts

Air

Extract

Air

Heat Recovery Unit

Heat Pump

Exhaust

Air

Supply Air From Greenhouse During Winter

Pervious Paving

Ground Floor

NORTH

SOUTH

Forced Air

Heat Pump

Ducts

Air

Extract

Air

Heat Recovery Unit

Heat Pump

Exhaust

Air

Supply Air From Greenhouse During Winter

Pervious Paving

Ground Floor

NORTH

SOUTH

Forced Air

Heat Pump

Ducts

Air

Extract

Air

Heat Recovery Unit

Heat Pump

Exhaust

Air

Supply Air From Greenhouse During Winter

Pervious Paving

Ground Floor

NORTH

SOUTH

Forced Air

Heat Pump

Ducts

Air

Extract

Air

Heat Recovery Unit

Heat Pump

Exhaust

Air

Supply Air From Greenhouse During Winter

WINTER SYSTEM

SUMMER SYSTEM
GREEN HOUSE WALL ELEVATION
PROCESS MODEL PHOTOS
FINAL MODEL PHOTOS
PROCESS SKETCHES

The design has progressed through a number of iterations, going from a boxy linear form, to a curved and flowing form.
The design has progressed through a number of iterations, going from a linear boxy form, to a curved and flowing form.
Our project is meant to be a precedent for resiliency within Pennsylvania — an example of what can be done at both the building and community scale. At the building scale, the base floor height has been raised 18 inches to remove it from the 100 year flood plain. Additionally, all mechanical and sensitive program has been placed above the second floor. The site is sloped away from our building and works with the canopy to divert rainwater away from the building and into bio-retention zones. Our site also uses stormwater management techniques, such as permeable paving and bioswales, at a smaller scale to show strategies than can be implemented at a community scale as well. The canopy is meant to encourage exploration and learning, to bring the community and outside visitors in to learn about sustainability and resiliency within the Muncy Resilience Center of Excellence.
SITE: MUNCY, PA

Flood Map of Muncy
Our site falls in both the 100 year and 500 year flood plain.

* These buffer zones are areas that are currently underused plots that fall on the outskirts of town in the flood plain. Through utilizing green infrastructure at this city scale, it can help to mitigate flooding further in town. This is a great opportunity to implement things like permeable paving or bioswales.
Wind/Solar Planning

The winter wind is blocked by the trees, the raised mound, and the canopy on the site. The summer wind blows underneath the canopy across the site and through the existing opera house for cross ventilation. The sun path along the front of the opera house allows maximum daylighting in interior spaces.
EXISTING COMMUNITY CONDITIONS

Contextual Analysis of Muncy

Our site lies in the heart of Muncy at not only the busiest traffic intersection, but the intersection of the historical and commercial districts.
Our site lays in the heart of Muncy at the intersection of Main Street and Water Street. However, intersection describes more than just the junction of two streets. It is a meeting point. It is where commercial district meets historic district. It is where the community gathers. It is where old meets new.
EXISTING SITE CONDITIONS
The two existing structures on the site are the historic opera house and the vintage Ritz Theater. Preservation and restoration of the opera house is required, while only the marquis of the Ritz must be preserved. Between the two buildings is a brownfield where an auto parts store used to sit, and behind, there is an existing parking lot.
Our program is oriented around two distinct user groups, the community and the educators. Programmatically, we have created three main groups — education, exhibition, and community — but the proposed center provides the intersection point for all three. By providing flexible spaces within, we can create a classroom that can also serve as a conference room or workshop space. We can create an exhibition space for use by on-site researchers or community historians. It is this same flexibility that will allow our Center of Excellence to adapt to different communities.
Many of the early iterations of the project centered around keeping the Ritz Theater and the opera house, and adding an annex to the back between the two buildings. Large consideration was also given as to how to manipulate the landscape and open up the site to create an outdoor stage for the community.
As the project progressed, the decision was made to remove the Ritz Theater and preserve the memory of the theater with a new modern marquis, in the form of a canopy.
Second-Floor Plan
Third-Floor Plan
This is a view looking from the Main Street approach to our site.

This is a view looking down from the top of our audience mound towards the stage.

At night the canopy is lit from below and becomes a beacon of resiliency to the community. It becomes the end destination of various street fairs and community gatherings, where people can come to listen to music or simply to mingle.
From the start, it was hoped the canopy could serve as more than an architectural, aesthetic feature, but hold a functional purpose as well to enhance the site’s resiliency.
ARCH 480
ASSIGNMENTS

A-1 Context

This assignment focused on researching Muncy as a community. Evaluating the existing architecture and figuring out who made up the community were key components.
Our site lies in the heart of Muncy on the intersection of Main Street and Water Street. However, intersection describes more than just the junction of two streets. It is a meeting point. It is where commercial district meets historic district. It is where the community gathers. It is where old meets new.

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As living proof of resilience, the existing structures will be floodproofed and reused to maintain the history of Muncy, while a new circulation and service core will be added to provide new mechanical systems and increased accessibility. A sculptural canopy will also be added to house outdoor programs, facilitate rainwater management, and support solar panels. Phytoremediation and bioremediation techniques will be implemented to help remediate the existing brownfield. Our site will also use examples of storm water management, like permeable paving, to show systems that can be adapted at a larger community scale.

EXISTING SITE SECTION 1
SCALE 1/16" = 1'-0"

EXISTING SITE SECTION 2
SCALE 1/16" = 1'-0"

EXISTING SITE PLAN
SCALE 1/32" = 1'-0"
This assignment focused on researching the natural features of Muncy, such as the wind, rain, and sun, and how they affect the site.

**A-2 Site Resources**

**500 Year Flood Plain**

**100 Year Flood Plain**

**Flood Plain**

**Static Water Level**

**Projected Buffer Zones**

*These buffer zones are areas that are currently underused plots that fall on the outskirts of town in the flood plain. Through utilized green infrastructure at this city wide, it can help to mitigate flooding further in town. This is a great opportunity to implement things like permeable paving or bioswales.*

**Our Site**

**Bioretention Soil**

**Pea Gravel**

**Gravel Slump Perforated Drain Pipe**

**Mulch**

**Filter Fabric**

A method for dealing with the brownfield site is called phytoremediation. Phytoremediation uses certain types of plants to absorb and break down chemicals on the site. Additionally, the design can also be created to help manage flood water. Constructed wetlands, bioretention techniques, and bioswales can all be used for both purposes. Indian mustard and Indian grass could be used to treat metals and pesticides. Poplar trees can be used to treat lead and they also store large amounts of water. Refer to water management diagram for locations.

**WIND/SOLAR PLANNING**

**WIND/SOLAR DIAGRAM**

**RAIN/TEMPERATURE DIAGRAM**

**WATER MANAGEMENT DIAGRAM**

**SITE RESOURCES**

M. SHROUT, C. DIFAZIO, & A. RABOLD
As shown on A-2, there is a summer wind from the south west that can be used to cross ventilate the spaces to help with cooling. Through the use of operable windows and an open floor plan, the breeze will be able to carry across to the catwalks and atrium space between new and old building. The atrium allows the warm air to rise and exit the space. Air will also be brought in through the lobby, that has been naturally cooled by the garden and shade of the canopy.

Rainwater will be collected from the canopy at the down points and diverted to bioretention zones, refer to A-2 detail 2.1. The central down point, closest to the main entrance, will contain a turbine to collect energy for a back-up generator, to be used in emergency situations. The turbine will capitalize on the use of gravity and velocity to create greater energy. Overflow water will be diverted down to "stream" to a bioretention zone.

This assignment focused on the passive energy systems that would be utilized in the design based on the research from A-2. The largest part of the passive system is related to the collection of rainwater into the cistern in the basement of the opera house. Natural daylighting and natural ventilation are also utilized in the passive strategies.
A-4 Circulation

This assignment focused on the circulation of our program, both interior and exterior. After a conceptual circulation scheme, fire safety and accessibility were then added in and considered.

OCCUPANCY GROUPS

ASSEMBLY GROUP A2: Lobby in the new addition, the exhibit and event space on the first floor of the opera house, the gallery space on the first floor of the opera house, and the computer rooms on the second floor of the opera house.

EDUCATIONAL GROUP E: the classroom space on the first floor of the opera house.

OCCUPANT LOAD

Lobby: 20 people at 15 sq. ft. per person (net)
Event space: 50 people at 15 sq. ft. per person (net)
Exhibit space: 50 people at 15 sq. ft. per person (net)
Collaboration space: 24 people at 15 sq. ft. per person (net)
Computer rooms: 4 people at 15 sq. ft. per person (net)
Classroom: 16 people at 20 sq. ft. per person (net)
Gallery: 20 people at 15 sq. ft. per person (net)

TOTALS

First Floor Addition – 20 people, 305 sq. ft.
First Floor Opera House – 36 People, 620 sq. ft.
Second Floor Mezzanine Opera House – 28 people, 420 sq. ft.
Third Floor Opera House – 100 people, 1,500 sq. ft.

NOTES:

STAIR Width: 100 people x 0.3 in = 30 in, 2’ 6” minimum, 48” for accessible
DOOR WIDTH: 32” minimum
Occupant load is over 49 so there must be two fire stairs
Stair distance must be half or 1/3 of the building diagonal based on non-sprinklered or sprinklered, maximum distance depends on exit access travel distances
Occupancies A and E maximum travel distance of 150 feet non-sprinkler, 200 feet sprinkler.

CONSTRUCTION TYPE

TYPE IV: exterior walls are made of non-combustible materials, interior elements are made of solid or laminated wood without concealed spaces.
This assignment focused on the active energy systems that would be installed in our building to make it comfortable and efficient. The project utilizes geo-thermal coils along with radiant heating and fan coil units. Photovoltaic panels are also placed to help with providing energy.
A-6 Envelope

This assignment focused on a detailed area of our building envelope. Because the canopy was the most dominant feature, detailed drawings were done for the canopy.
A-7 Lighting

This assignment focused on both the natural daylighting and artificial lighting schemes for our project.
THE GOAL OF INTERIOR LIGHTING IS TO CREATE A SPACE THAT RELIES MORE ON NATURAL LIGHTING DURING THE WINTER MONTHS THAN ARTIFICIAL LIGHTING. DAYLIGHTING IS OPTIMIZED THROUGH WINDOWS THAT CAPTURE SUNLIGHT DURING THE WINTER MONTHS AND BLOCK SUNLIGHT DURING THE SUMMER MONTHS. AS SHOWN IN THE DIAGRAMS ON A-3.
MUNCY FLOOD RESILIENCY CENTER
Andrew Barnett, Alexia Cavazos, Suheng Li

Resilient communities are exceptional models of adaptation and unity within a community. This project enables the natural and community cycles of the town of Muncy in a way that utilizes its resources and responds to Muncy’s biggest community threat. The new Muncy Flood Resiliency Center reacts to the town’s yearly flood conditions through reimagining the ground plane and insides of the historical opera house and Ritz Theater. New programmatic pieces are lifted off the ground above the 500-year floodplain allowing for the building to have yearlong safe activation. Spaces like government offices, a flood research lab, public lounge, and production greenhouse are lofted above public spaces that are transitional for the community, such as public exhibition, greenhouse selling, FEMA intake, and a large public gathering space. Through insetting and offsetting the new architecture to the existing historical structures, the building doubles its use of transitional spaces to be used as buffer spaces that gather light and air. This allows the building as a whole to function with extremely passive systems for heating and cooling— these systems are pivotal during times that the building must be resilient on its own. The Muncy Flood Resiliency Center is a model of old and new, lifted and grounded, natural and built that engenders a new space for the community of Muncy.
Map of Muncy + Surroundings
Floodplain (Hatched), Residential (Blue), Industrial (Orange), Agricultural (Green), Commercial (Brown).
This map shows the major site surroundings, specifically those most activated and affected by flooding. The colored topography lines represent the most affected area (red), moderately affected area (blue), and safest area (green).
Diagrams showing 'islands' of program in existing buildings, lofted resiliency during a flood, and building usage relationships.
Study model showing community interaction with building
The natural resources available to and utilized by the Muncy Opera House.

The annual temperature (grey), hours of sun (orange), and inches of rain (blue) by month.
The natural resources available to and utilized by the Ritz Theater and Muncy Opera House.
Ground-floor plan in immediate site context
1. Muncy Government Offices
2. Conference Space
3. Break Area
4. FEMA + Flood Advisory Office
5. Research Laboratory
6. Community Gathering + Event Space
7. Meeting + Lounge Area

Second Floor Plan

1/4" = 1'

1. Presentation Space
2. Resource Library
3. Historical Document Storage
4. Greenhouse

Third Floor Plan

1/4" = 1'
1. Exhibition + Flexible Space
2. Muncy Government Offices
3. Presentation Space
4. FEMA Loading + Meeting
5. Research Laboratory
6. Community Gathering + Event Space
Section through opera house exhibition space, offices, and research laboratory
Above: Northern elevation | Below: Section through core, lab, forum, and greenhouse
View of opera house at night from corner of Main Street and Water Street
This is a roof plan diagram showing the lighting of the spaces in the project — fully natural light from skylights (blue), mixed natural and artificial light (dark yellow), and fully artificial light (light yellow).

View of building at night from northwest corner
The lighting scheme is clearly presented through the juxtaposition of the existing brick skins of the opera house and Ritz Theater and the new Resiliency Center interventions. By offsetting and shifting these pieces from the existing shells, natural light shines down from skylights that bridge old and new structure. Natural light therefore falls down onto the public forum mound and shines in the three-story height buffer space between the opera facade and the government office building. Keeping these skins also allows for the sun to cast interesting shadows of the existing shells onto the new structures. During night hours, new building pieces become apparent and lantern-like through being inset and offset to the existing structure. This allows light to exude through the skins. These interventions illustrate a clear marker between the history of the old skins and the new symbols of resilience, flood-resilient raised buildings.
View from opera house ground floor

West elevation of Ritz and Opera House from Main Street
304.1. Business Group B occupancy includes, among others, the use of a building including storage of records and accounts.

14,000 SF per Floor
3 Stories Maximum
42,000 SF project/type maximum
4,660 SF maximum mezzanine

2 Hr Fire Wall Rating
Class III A Construction

Occupancy Loads per Floor
Mezzanine 2 - 34 People
Mezzanine 1 - 50 People
Ground Floor - 198 People
Total - 282 People

Stair + Door Widths
Mezzanine 2 - 3'
Stair and Door
Mezzanine 1 - 3'
Stair and Door
Ground Floor - 6'

A-3
A-3
B

Type A-3 and B
Built to most stringent standards: A-3
303.4. Assembly Group A-3.
Assembly uses intended for worship, recreation or amusement and

Type B

304.1. Buisness Group B occupancy includes, among others, the use of a building including storage of records and accounts.
**SYSTEMS EXPLAINED:**

As a method of resilience, the existing Opera and Ritz structures are repurposed skins, now used in a way to buffer air between old, new, and new structures. This is highly efficient, a service space designed to keep the public spaces very well conditioned while the public spaces benefit from the exhaust of the buffer spaces.

Well lifted above the 100' Yr Flood line, the control zones inside capture the organic spaces that exist at the tip top of every program. This is part of the furniture in the conference space.

Solar PV Panels sit above the Opera House shell to capture energy for times when the building needs to function alone and especially serves the functions of FEMA and the activity of the returning crowd.

Buffer Spaces

As a method of resilience, the existing Opera and Ritz structures are repurposed skins, now used in a way to buffer air between outside, old, and new structures. This is highly efficient, as service spaces work little to none in order to keep the public spaces very well conditioned while the public space benefits from the exhaust of the buffer spaces.

Buffer Spaces

Well lifted above the 100' Yr. Flood line, the control zones inside capture the organic spaces that exist at the tip top of every program. This is part of the furniture in the conference space.

Buffer Spaces

Well lifted above the 100' Yr. Flood line, the control zones inside capture the organic spaces that exist at the tip top of every program. This is part of the furniture in the conference space.

**STATION 1:**

- **Type A-3:**
  - Class III A Construction
  - 2 Story + Stairway Tower
  - 2 Hr Fire Wall Rating

- **Type A-3 and B**
  - Built to most stringent standards: A-3

- **Type A-3**
  - Assembly uses intended for worship, recreation or amusement and other assemblies not classified elsewhere in Group A

- **Type B**
  - Building Type Group B occupancy includes, among others, the use of a building in structure or function for offices, professional, or similar transactions, including storage of records and accounts.

**Exhibit Spaces**

- **Exhibition + Gathering**
  - Public Exhibition Floor
  - Former Basement Filled In

**Office + Gov**

- **Local Government + Resiliency Center Offices**

**Greenhouse**

- WINTER SUN
- SUMMER SUN
- FRESH AIR INTAKE
- Conference Space Partition/HVAC

**AXONOMETRIC CIRCULATION DIAGRAM**

**1st-3rd FLOORS RESILIENCY CENTER**

**ANDREW BARNETT**

**ALEXIA CAVAZOS**

**SUHENG LI**

**14,000 SF per Floor**

- 3 Stories Building
- 40,000 SF Project: Type A building

- 4,660 SF maximum mezzanine

- 2 Hr Fire Wall Rating

- Class III A Construction

- 14,000 SF per Floor

- 3 Stories Building

- 40,000 SF Project: Type A building

- 4,660 SF maximum mezzanine

- 2 Hr Fire Wall Rating

- Class III A Construction

**Occupancy Loads per Floor**

- **Mezzanine 2**
  - 50 People
  - 42,000 SF Project/Type Maximum
  - 4,660 SF maximum mezzanine

- **Mezzanine 1**
  - 34 People
  - 303.4. Assembly Group A-3

- **Ground Floor**
  - 198 People
  - 303.4. Assembly Group A-3

- **Total**
  - 282 People

**Stair + Door Widths**

- **Mezzanine 2**
  - 32 ft. Stair and Door

- **Mezzanine 1**
  - 32 ft. Stair and Door

- **Ground Floor**
  - 60 ft. Stair and Door
The Elevated Sustainability Center brings new life to the historic opera house and Ritz Theater of Muncy Borough. The elevated form promotes social interaction through the integration of community program. It brings life to the site.
RESILIENCY

When a flood occurs and what is traditionally perceived as ground becomes irrelevant, the ESC provides a new ground level above water. This elevated social condenser stimulates the resiliency of Muncy Borough by creating a space for diverse interactions. Engaging the local community with strategies to tackle flooding, the ESC serves as a beacon of resiliency to Muncy and the Susquehanna region at large.
SITE ANALYSIS

Our analysis of the site led us to interpret how long people experience the spaces within Muncy.

TIME OF EXPERIENCE

This graphic shows that the location of our site is central to the region and that people will experience the site for different lengths of time. We want to take advantage of this by providing educational opportunities for a semester, a day, or even a moment.
EXISTING OPERA HOUSE

The existing historic structures presented a challenge and opportunity for the site. Documenting the existing conditions of these structures prompted interaction between old and new.

An elevation of the opera house from Water Street with the theater in the background.

A collection of images showing the exterior of the existing opera house.
EXISTING OPERA HOUSE
The elongated theater is significant to the community mainly because of its marquee. The signage is now upheld by the community as a symbol of its past.

An elevation of the Ritz Theater from Main Street with the opera house in the background.

A collection of images showing the exterior of the existing theater.
VIEWS
The beautiful views from atop the Ritz Theater inspired us to create a habitable roof so that Muncy residents could experience the natural beauty of their surroundings.

Popping out from the opera house, this view captures the forested mountains beyond Muncy.
CONCEPT
Our concept developed from the idea of varying time of experience.

+ZONED
PERMANENT, TEMPORARY, AND MOMENTARY ZONES

+GROUNDED
NEW GROUND LEVEL ABOVE FLOOD

+CURVED
LOFT FLOWS THROUGH SITE WHILE RESPECTING EXISTING BOUNDARIES

We zoned the site into permanent, temporary, and momentary zones to capture the variety of time that people will experience our site. A new ground level above the floodplain intersects these zones, unifying the different conditions of time. The form flows through the site and the existing structures.

SKETCHES OF CONCEPT
Early sketches show our thoughts on how the new ground level would interact with existing structures.
PROCESS
Our design for the elevated structure began with the idea of a raised deck over the corner of the site. We explored a variety of elevated shapes and forms.

Sketches of the deck intersecting the three entities of opera house, theater, and corner.

A sketch of the light intended to penetrate through the deck.
MODEL FORM
Physical models helped us explore the relationship between old and new.

DIGITAL FORM
Many model iterations helped determine the ESC’s final form.

Early forms that show the deck within the corner site.
PROGRAM
With the new elevated surface, the ESC introduces program that promotes social interactions.

EXTERIOR PROGRAM
The outdoor form offers an educational tool for sustainability through exposed building strategies, activities for children through a playground rain garden, entertainment for a crowd with an outdoor theater, and a beer garden geared toward a younger demographic. The ample outdoor space offers flexibility for community needs. By adding these elements, we will engage the community with the site and provide fun and educational opportunities for the residents to learn about resiliency.

INTERIOR PROGRAM
The interior exhibition spaces are separated into permanent and rotating exhibits. Historic artifacts of Muncy and flood history will be within the permanent exhibit. Sustainable strategies such as solar panels and wet floodproofing would be exhibited in the rotating exhibit, in addition to conferences or events. The introduction of a research facility called for the development of resident research spaces. There are three resident spaces provided, along with a common area and kitchenette.
This image shows the ground-floor plan of the building. On the ground level, the community can gather in the corner site and young ones can play within the rain garden exhibit. The forum steps provide opportunity for lunch gatherings or performance viewing. Visitors work their way through the lobby to an auditorium and market.
The ESC winds its way through the existing opera house and theater. Exhibition spaces and research residences are located on this level. The exterior space allows for formal or informal gathering at the beer garden.
The ESC winds once again to become the new roof of the existing Ritz Theater. This area provides flexible space for enjoying the surrounding views and viewing the culture of the town at a different level. A community garden is located between this new roof and existing structure.
TANGIBLE UNDERSTANDING
By creating a physical representation of the form, we explored materiality and the relationship between the new and existing conditions.

The existing opera house and Ritz Theater are represented in black in contrast to the flowing lightness of the new ESC.

Views of the model showing the curve folding up at the entrance, the cascading forum theater steps, and the curve folding up again to become the roof.
PERMANENT EXHIBIT

The ESC flows through the existing opera house to create this area for permanent exhibition of Muncy flood history. This area offers a view above to the beautiful historic brick structure.

The form curves from the second-floor level to become the roof of the existing theater. This curve serves as the shelter over the northern entrance.
OUTDOOR THEATER

The forum seating provides a viewing area for film and performances.

The ESC continues through the existing theater, cutting the volume in half for an exhibit space and auditorium but allowing for moments of experiencing a double height space.
The library area within the third floor of the opera house gives the research residents an area for quiet reflection.

The temporary exhibit within the existing theater provides flexible space. The space can display sustainable strategies or hold tables for a party.

The entrance view allows visitors to meander through the site, engage with the rain garden, and enter to the lobby while experiencing the form of the ESC above them.

The roof of the opera house has been replaced to allow for new windows with northern light and natural ventilation.
CONTEXT

LYCOMING COUNTY
The site is located in Muncy Borough, a small part of the county.

MUNCY BOROUGH FLOODING
Located along the West Branch of the Susquehanna River, Muncy is in a flood zone. At the crossroads of Water Street and Main Street in the north end, the site is currently 1' below the base flood elevation.

SUSQUEHANNA
Located along the West Branch of the Susquehanna River, Muncy is in a flood zone. At the crossroads of Water Street and Main Street in the north end, the site is currently 1' below the base flood elevation.

SUSTAINABLE SITE
The program requires a look at the entire community to assure wellness of the users. We proposed developments that will contribute to this wellness and assure the resilience of this community.

PENNSYLVANIA
The site is located in Lycoming County, in the center of the state.
RESOURCES

The site provides opportunity for capturing solar energy for electricity and rain water for roof irrigation and the cistern. The natural temperature and wind on the site inspire design that promotes passive energy for part of the year.

**Solace Path**
The South face of the building will be important to capture energy in Winter and shade in Summer.

**Current Green Space**
The site is surrounded by pavement and it has potential to reduce heat island effect - energy demand due to warming - by adding green space.

**Proposed Green Space**
By adding green space on the site and its context, we intend to create a greater sense of community and wellbeing.

**Resources**
The use of local resources will reduce energy and support the local economy while saving money.

- **Technology**
  Utilize the local manufacturing facility Andritz Inc, which produces feed & biofuel technologies. They supply hydraulic power generation, paper, metals and generate power from renewable resources.

- **Material**
  Purchase local lumber from lumber yards to minimize transportation costs and environmental effects. Purchase interior products from Koroseal, which has its manufacturing plant in Muncy.

- **Program**
  Use programs like Solare to help the local Muncy community capture its potential energy. This company provides renewable energy solutions, energy efficiency upgrades, and home energy audits for homes and businesses throughout North Central PA.

**Temperature**
The temperature in Muncy is moderate so we will rely solely on passive methods for the Spring and Fall.

**Rainfall**
The stormwater systems will collect rainwater to be used as graywater in our building. We anticipate a maximum 5”.

**Water Levels**
Wyoming County Observation Well shows that 2016 water levels are closer to the land surface, meaning more potential for flooding. These levels determine that historically, January and April will be most vulnerable to flooding.

**Water Usage**
Wyoming County Observation Well shows the daily usage of water in pounds over the years.
CIRCULATION
The circulation on the site flows with the new form through the existing buildings. The preserved stairs within the opera house allows for private circulation to the research residences while the majority of the site is open to exploration by the public.
ENERGY SYSTEMS

The design captures natural energy on site through a ground heat exchange and PV panels. A new clerestory in the existing theater and a new roof window in the existing opera house allow for both additional light and natural ventilation.
HVAC

The HVAC system complements the passive energy systems with minimal duct heating and cooling. The mechanical room on the second floor in the new core of the existing opera house provides this system.
ENVELOPE

The envelope design helps continue the form of the ESC from exterior to interior.
LIGHTING

The lighting design for each of the spaces promotes flexible and meaningful experiences.

NIGHTTIME VIEW OF THEATER

The lighting design for the outdoor theater space balances a level visibility for circulation and focus on the screen. Spot lights illuminate the flowing path located in the former brownfield site to guide visitors through the site and towards the lobby. Uplighting on the pre-existing brick facade emphasizes its age and respects the historic significance of the Ritz Theatre and Opera House. The lights around the theater screen intend to draw attention to the film of choice.

INTERIOR VIEW OF EXHIBIT

The lighting design for the interior exhibition space similarly balances circulation and focus. The temporary exhibition space features an array of ceiling mounted track lights, providing flexible, top-down illumination to any exhibit placed in the gallery. Visitors are guided through the exhibit by the uplit brick, emphasizing the relationship between the old and new.

DAYLIGHTING OF LIBRARY

The lighting design for the library compliments the natural daylighting it receives. A library as a place of study and reflection requires natural light. The historic arched windows of the Opera House allow southern light to illuminate the space, serving as a time clock as its shape changes throughout the day. The artificial lighting scheme provides evenly distributed task lighting for focus.

SUMMER

Morning 10 am 15 July
Afternoon 3 pm 15 July
Evening 8 pm 1 February and 15 July
Morning 10 am 1 February
Afternoon 3 pm 1 February
DAYLIGHTING OF LIBRARY

WHITE
GREEN SPACE
Our recommendations for the site include adding green space and stormwater solutions to the surrounding area, which is dense with parking lots and paved surfaces. This encourages local solutions to take pressure off the stormwater system.

CURRENT GREEN SPACE
our site is surrounded by pavement and it has potential to reduce heat island effect - energy demand due to warming - by adding green space

PROPOSED GREEN SPACE
by adding green space on our site and its context, we intend to create a greater sense of community and wellbeing.
FLORA AND SITE SURFACES

The surfaces of our site are important because they affect water drainage.

Specified native species will best complement the area and absorb waters. Some of these species are beneficial to flood prone areas. The surfaces and paths of the site will be porous so as to allow for natural drainage of water on site.
PRECEDE NTS
We took inspiration from a variety of precedents that affected structure, preservation, form, and material.
HAVEN COMMAND CENTER

Marlene Sharp, Bernardo Almeida, Andrew Novillo

For our project, our focus is on how we can use the surrounding context as a Haven Command Center, both on a daily basis and in times of emergency for the Borough of Muncy. The Haven Command Center will act as a haven in times of natural disasters (floods), and provide shelter, protection and safety for the local community if displacement occurs. It will also act as a command center and base of operations for the government workers and officials to use in emergencies. An educational facility will house a library and archive for historical resources, as well as for educational purposes.
CONCEPT DESCRIPTION AND DIAGRAM

Resiliency is the ability for our project to evolve and withstand ever-changing conditions such as a natural disaster. The Haven Command Center demonstrates resiliency through two ideas. Our first approach was to maintain the existing historical structures as support to hold up the new construction. Seeing how the existing historical society and borough offices were directly affected by flooding, we used that as our essential program. This then created the archive, historical exhibition, research and command center in our design and was placed well above base flood elevation, allowing our building to function daily and during times of emergency. Our command center is not the only building to serve the Muncy community, as shelter can also be sought in the local elementary school or fire department.
STREET CORNER PERSPECTIVE

Every Day

Emergency

Every Day vs. Emergency (view from intersection of East Water Street and Main Street)
SITE ANALYSIS

BUILDING TYPES

MUNICIPAL BUILDINGS

SITE LOCATION

Where is Muncy, Pennsylvania?

Context (location and building types)
URBAN ANALYSIS

Site Elevations and Sections
Weather conditions in Muncy, PA
We analyzed the direct sunlight that our site would receive as well as how much precipitation and wind there was.
Based on our climate analysis, we were able to incorporate different techniques to efficiently utilize the free energy provided by the environment.
In order to restore the historic canopy that once existed along the opera house, we recessed the storefront inward about 10’ to recreate the facade. This also helps to provide more space for people waking by as the existing sidewalk is narrow.
Looking at an overall urban design, there was an older auto part store that was demolished leaving behind an empty site. In order to restore the street line, while addressing flood issues, the newly constructed bridge cantilevers off the existing buildings as a symbol of resiliency.
PLANS AND SECTIONS

Second-Floor Plan

Longitudinal Section through Exhibition and Archive
PLANS AND SECTIONS

Third-Floor Plan

Longitudinal Section through Main Entrance and Command Center
EVER-GROWING ARCHIVE

Seeing how the existing historical society receives about 9’ of flood water, we decided to incorporate that program as a main idea for our project. The archive is a safe haven for historic documents, models, or any items. As time goes on, people can bring their own items to the archive that they would like to preserve, making this an evolving space.
Government officials don’t really have a place to gather and plan in Muncy. We added a command center on top of the existing Ritz Theater. The circular geometry helps provide views of the entire Muncy area as well as displaying critical information on TVs. Officials would be able to gather here in time of emergency with quick access to historical archives.
TRANSVERSE SECTION AND MAIN ENTRANCE

The main entrance incorporates a long ramp to get you off the base flood elevation as quickly as possible. Along the existing walls of the Ritz Theater are TVs displaying daily information about Muncy. The theater becomes a circulation hub with access to the continuous loop and surrounding landscape. You can also view the new command center through the glass ceiling. Solar thermal panels on top of the glass help provide shading for the theater.
FARMERS’ MARKET AND EXHIBITION SPACE

To help encourage the growth of the community, we added a farmers’ market on top of the existing parking lot (there is no local grocery store). Porous materials aid with drainage in the event of a flood. Looking down into the exhibition, you see the ramps divide the sublevels. Parts of the facade allow you to see clearly outside, while other parts allow only ambient lighting in.
WILL IT STAND?

Studying if this project was structurally feasible, we used a box truss system spanning over the empty lot, using the existing buildings as anchors. Even without the column, the scaled model was able to support a weight on its own. Later a column was added for rigidity, doubling over as a storm drain pipe into the cistern below ground.
**Landscape**: Broken down into three different parts utilizing bioremediation, capping, and remove and disposal and clean.

**Bioremediation**: Using Biological life (plants) to clean up contaminated soil and groundwater.

**Capping**: Pouring a concrete slab on top of existing contaminated soil.

**Remove and Disposal and Clean**: Digging up the existing soil, cleaning it, and placing it back to original location.

**Energy Systems**: Utilizing the sun and stormwater in an effort to ventilate the building.

**Stormwater**: Fills the cistern, which becomes a ground source for the heat pump.

**Photovoltaic**: Helps power the heat pump in winter and air handling unit in the summer.

**Solar Thermal**: Helps heat the water as it passes through the radiant flooring.

**HVAC**: Creating a comfortable environment inside the building.

**Summer**: A water to air cooling system is utilized. Cool air gets distributed by air ducts by the air handling unit. Heat gets transferred into the cistern.

**Winter**: A water to water heating system is utilized. Heat gets dispersed by radiant flooring. The heat pump utilizes warmer water from the cistern and is powered by photovoltaic panels on the roof.
FIRE SAFETY AND CIRCULATION

We created a circulation loop throughout the building using ramps and catwalks, allowing you to experience all the important programmatic spaces. In the event of a fire, shutters would drop down, sealing the archive as a safe box within the building. Referring to the building code, our project follows the requirements for travel distances in an emergency.
ENVELOPE AS A SYSTEM

As the original historical opera house included a canopy, we chose to restore that feature as a sign of resilience by pushing the first-floor storefront back. In order to deal with the base flood elevation, concrete would be used to fill in the existing basement up until 3’ above grade. The porous nature of concrete would withstand flooding by draining the water to the soil below. The existing brick columns will be kept in order to support the second floor above. Because the storefront is set back 10’ from the sidewalk, no direct sunlight would enter and overheat the space. Instead, ambient lighting would be provided by the reflection off the concrete patio. Interior partitions will be reconstructed to meet two-hour fire rating. In order to allow for natural ventilation in the case of power loss, the top hung of the storefront can be opened to allow for passive ventilation on the second floor.
ARCHITECTURE AND LIGHT

With daylighting, we are trying to bring natural light into the main entrance lobby through the existing windows of the theater. By including a new partial glass roof, direct sunlight can hit the command center, highlighting it as a place of arrival once you enter the building. Because there are no southern windows along the theater, ambient lighting helps you see the ramp and lobby as well.

With electrical lighting, we are trying to highlight the archive and make it stand out as an important part of our program. The archive is designed to be a safe haven within the historical opera house, enclosed from exterior elements. As it is located at an intersection between the bridge’s ramps and the command center, we wanted light to help highlight the space as you approach. The bright light from within the archive penetrates the glass walls and illuminates the bordering brick existing facade of the opera house. Uplights placed along the perimeter help to highlight the rough texture of the brick wall and the aged wooden structure of the roof.

**ELECTRICAL LIGHTING**

**Daylighting**

- A. Bridge: Summer Solstice
  - 7:00am
  - 10:00am
  - 12:00pm
  - 4:00pm
  - 7:00pm

- A. Bridge: Winter Solstice
  - 7:00am
  - 10:00am
  - 12:00pm
  - 4:00pm
  - 7:00pm

**Electrical Lighting**

- B. View from outside the Archive
- C. View from inside the Archive
HEXAGON

Lojean Alali, Christopher Scalzo, Savannah Cranford

The resilience of this project is grounded in the historical importance of the site to the community. We acknowledge the need for any structure at this location to withstand the ecological challenges that so often confront this community, flooding. Our strategy for resilience is to combine preservation of the opera house’s exterior with retrofitting its interior into the Resiliency Center, housing the essential program for flood-resilience research and education. The site of the Ritz Theater respects the history of the site by providing a use of importance to the community - a new market space. To address flooding, the project uses are organized on vertical strata: classrooms, kitchens, mechanical spaces, and all sensitive materials and technologies are elevated to the second and third levels, 14’ above grade, to be above all risk of flooding. The ground level is reserved for more flexible uses (such as exhibition and market) that are designed using ‘wet-proof’ flood strategies to withstand a potential flood. The landscape design, a series of hexagonal terraces, step up 21 inches, above the 100-year flood level, to minimize the effect of flooding. Consistent with Army Corp of Engineering recommendations, the existing opera house basement is to be filled in and replaced with a system of closed-loop coolant pipes that extract energy for use in the building’s heating and cooling system. We are proposing a design reliant on passive and regenerative systems that best make use of the site’s natural conditions and showcase measures for resilience.
The project site is situated at Muncy’s central intersection, defined by two important and historic streets and adjacent to the existing commercial strip. Despite the development of a commercial center, the town continues to lack a central public space. Moreover, there is no market or grocer within the city center, although historically a grocer existed at the location of the Ritz Theater. Thus, the location is ideal to provide the community with a central public space that will complement the commercial district and foster community activities such as the monthly “Fourth Friday” event. As our central idea, we are proposing marrying the program of the Resilience Center of Excellence with a new central public market.
Muncy’s Fourth Friday is a monthly tradition that unites community members around their own artisans, craftsmen, restaurateurs, and other specialty tradesmen, and is therefore an appropriate social model to guide the development of this project.
Community history and need guided our decision to include a public market on the site to complement the resiliency center program, including (1) a grocer had historically existed the current site as archived by the 1885, 1890, and 1896 Sanborn Map records, and (2) that currently no market exists within the borough’s limits.
We have concluded that the best design approach for a new addition to the historic Muncy Opera House and for a central architecture is one that contrasts with the existing formal and material languages of the surrounding context, so that it becomes the identifiable and iconic center. More importantly, the geometry of a hexagon allows for decentralization within the architecture, promoting connection between interior and exterior spaces on the site and connecting the physical community. Hexagons are the simplest non-quadrilateral geometric form that can be connected and multiplied outward, suggesting an infinite array. Furthermore, the multidirectional nature of the hexagon creates paths that encourage connection within the community and to natural and climatic features of the site.
Level-Two Plan
Level-Three Plan
Ornate structural columns were devised to maximize central space of each hexagonal unit, diverting structural load to the edge of the geometry. Translucent and flood-proof materials clad the exterior of the new market space.

Accessible Green roofs serve as another opportunity for community interaction providing small-scale gardening and basic harvesting adjacent to a community kitchen space on the upper level of the market.
Our proposal is divided into two horizontal zones, the Muncy Market at the intersection of the streets and the elevated Muncy Resiliency Center for Excellence. The Resiliency Center includes educational and civic spaces - libraries, computer and classroom spaces, community forums, galleries, archives, and Borough office space and meetings spaces – elevated above the danger of flooding. The Muncy Market provides a complementary program to benefit the community and demonstrate methods for building on a site at risk of flooding. Community spaces on the ground level - market stalls, exhibition spaces, and lobbies - can temporarily move or withstand flooding. Accepting the reality of Muncy’s tendency for flooding, a successful design cannot resist such inevitability, but rather explore means to embrace it.
168
Ornately etched translucent cladding regulate sunlight in the market spaces, providing daylight without glare and assisting with temperature regulation on the interior of the market. The pattern of openings vary depending of the façade to address lighting and natural ventilation based on cardinal direction and seasonal climate conditions.
The Ritz Theater marquis, a symbol of Muncy’s legacy through history, is preserved as an iconic, monumental sculpture on the site. It serves as an informational bulletin for upcoming community events at the market, resiliency center, or around town.
Open, delicate and light, the design for the Muncy Market strives to anchor the community’s center geographically and socially. Largely open, spaces invite the community to explore and freely negotiate between the interior market and the generous plaza spaces outside.
Acknowledging the reality of Muncy’s tendency for severe flooding, a successful design must not seek to resist such inevitability, but rather explore means to embrace it.
Anticipating future floods, the Muncy Market and Resiliency Center are organized on two axes of strata: vertical and horizontal. Our strategy for flood resilience exists in our approach of the vertical: all program and space hosting material and technology sensitive or endangered by the onset of floodwaters are merely reserved to the upper floors.

Reserved for the ground level are all spaces that are by some nature temporary, mobile, or accepting of future floodwaters: market stalls, gallery spaces, lobbies, etc.

Mechanical spaces, computer spaces, kitchens, archives, etc., are found only above.

MUNCY MARKET
- community kitchens
- green roofs
- roof plazas
- market stalls
- performance spaces
- cafés
- patios
- community plazas

RESILIENCY CENTER
- archives / libraries
- lecture spaces
- community forum
- offices
- lounges
- exhibition / gallery spaces
NEXUS
David Ackerman, Allana Kapcsos, John Shinogle

Exhibit Opens Tonight!

Exterior Night View
SITE RESOURCES

Existing Site Conditions

Existing Site Materials

Average Wind Speed and Temperatures

AVERAGE RAINFALL & WIND SPEED

- During the months of July and September when the precipitations are at its highest, the rainfall will be incorporated into efficient systems and flood control.

- The annual average wind speed for Muncy, PA is 18.01 mph. With the highest wind speed in May at 23.2 mph and the lowest wind speed in December at 8.1 mph, Wind turbines need a minimum 5 mph winds to generate electricity, therefore all twelve months can be incorporated into wind efficiency systems.

AVERAGE TEMPERATURE

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<tr>
<td>JAN</td>
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<tr>
<td>FEB</td>
<td>38.0</td>
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<tr>
<td>MAR</td>
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<td>APR</td>
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<tr>
<td>DEC</td>
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While paying attention to the highest and lowest temperatures of Muncy, there are the specific months in which energy site resources will be incorporated to heating and cooling.
Wind Speed (mph) will be incorporated into efficient solutions and flood control. Wind turbines in Muncy, PA are at their highest wind speed in July and September, reaching 23.2 mph. The lowest wind speed is in December at 8.1 mph. Wind turbines need a minimum 5 mph winds to generate electricity, therefore all twelve months can be used for energy site resources.

Seasonal Sun Path Diagram
SITE CONTEXT

1873 Historical Map

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<tr>
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<tr>
<td>2016</td>
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<td>1.3%</td>
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Muncy Population

END OF RAPID GROWTH

BEGINNING OF STAGNATION

NEW BEGINNINGS

2007 as a small classic theatre, and then transformed into a place for concerts and movies. In 2009, it began as a full time movie theatre. With the decline of funds, the theatre closed in 2014 and has been recently put on the market for $165,000.

Mosley's Opera House

Ritz Theater
Pennsborough was founded in 1787 by William, Benjamin, and Isaac McCarty, and was called what used to be called Pennsborough. The town was established in 1797 in Muncy, PA, and got its name from the Munsee Indians who once lived in the area. The Munsee Indians dominated the region, and the town was named after them.

In 1827, with a population of only 600 people, Pennsborough was established. The McCarty brothers then started a town in what used to be called Pennsborough. The town was laid out on Main Street and Water Street in January 1827.

The town was named Muncy, PA, and was settled in 1797. It got its name from the Munsee Indians who once lived in the area. The Munsee Indians dominated the region, and the town was named after them.

The Muncy Opera House, also known as the Mozley's Opera House, is located at 7 E Water Street and was built in the early 1900s. It was later transformed to have storefronts for entertainment. It was the Mozley's Opera House, and it later transformed to have storefronts for entertainment. It was the Mozley's Opera House, and it later transformed to have storefronts for entertainment.

The Muncy Opera House is vacant. The town was later transformed to have storefronts for entertainment. It was the Mozley's Opera House, and it later transformed to have storefronts for entertainment. It was the Mozley's Opera House, and it later transformed to have storefronts for entertainment.

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EARLY PROCESS DIAGRAMS

Original Concept Diagram: The original concept of the design incorporated a green blanket that wrapped along and throughout the building to create the programmatic spaces inside.

Rainwater Recycling Section Diagram: The green blanket also provided sustainable elements to the design such as rainwater recycling and irrigation and protection from solar radiation and heat.
EARLY PROCESS MODELS
As visitors enter the Muncy Resiliency Center through the original front entrance of the opera house (Water Street), they will be immediately greeted with an educational center and accompanying exhibit to their right. This exhibit seeks to explore much of Muncy's unique history, and present-day Muncy. In addition, there will be rotating exhibit space and a videography room that will present visitors with a history of the Muncy Opera House, its significance to the town, and the renovation process that has transformed the architectural artifact into its current Center of Resilience. Opposite this educational space on the ground floor, visitors to the center will be able to shop at the Ritz Market, Cafe, and Brewery. (The name “Ritz” is a nod to the Ritz Movie Theater that previously occupied this space within downtown.) This part of the program will play an imperative role in the city because of Muncy’s current lack of a grocery store. The ground floor will feature locally sourced foods and items. The market and cafe will also be able to grow their own products and ingredients within the adjacent greenhouse and conservatory. This greenhouse will also act as a heating element for the center in the winter months.
As visitors ascend one of the Muncy Resiliency Center’s two main staircases, they will enter the cafe and brewery components of the Ritz Market, Cafe, and Brewery. I will be a place for visitors to Muncy and residents of the town to unwind and enjoy themselves.

The adjacent office space, while off-limits to the general public, will provide the city of Muncy with meeting and collaborative working spaces in which to both operate the Muncy Resiliency Center and make important decisions for the future of the town. The office will consist of two meeting rooms, six cubicles, three collaborative working centers, table space for two rotating interns, and an archival room for documentation and storage purposes.
As visitors reach the third floor, they will be able to enter an exhibit that promotes scientific enrichment through the use of state-of-the-art technology. This exhibit will explore the solar system, renewable energy resources, and the earth and its oceans, forests, and geographic makeup. At the center of the exhibit exists a circular platform that can be used as a stage component for lecturers or timed educational presentations or demonstrations. When it is not being used for the aforementioned purposes, an interactive exhibit element can be placed on top of the platform. Touch tables, LED displays, videography, and graphic elements will make up much of this exhibit space, allowing the staff to easily update portions of the exhibit when new scientific discoveries are made. Opposite the science exhibit is a multi-purpose event hall. This space can be utilized for receptions, large town meetings, performances, and dinners, among other events. In the event of a 500-year flood, the open nature of the third-floor event hall can allow it to be transformed into a temporary refuge center for residents of the town. Immediately adjacent to the event hall will be a year-round conservatory for the purposes of growing flowers and food resources.
PASSIVE HEATING/COOLING SYSTEMS

rainwater is collected on green roof and ground terrace and stored in cistern and recycled for irrigation.

natural ventilation during summer on north facade.

tromb wall stores heat from direct winter sunlight, heating adjacent event hall.

chimney effect in greenhouse: rises and collects at conservatory.

heat rises and circulates through the market and restaurant.

photovoltaic panels create energy for mechanical louvers.

rainwater is collected on green roof and ground terrace and stored in cistern and recycled for irrigation.
photovoltaic panels create energy for mechanical louvers

mechanical louvers reflect direct summer sunlight and allow direct winter sunlight
heat generated in greenhouse during winter is redistributed into opera house spaces

ventilation through skylights in nexus during summer

Active Systems

natural ventilation during summer on north facade
heat rises and circulates through the market and restaurant

chimney effect in greenhouse rises and collects at conservatory
tromb wall stores heat from direct winter sunlight, heating adjacent event hall

Mechanical louvers reflect direct summer sunlight and allow direct winter sunlight

Passive Systems

heat generated in greenhouse during winter is redistributed into opera house spaces

ventilation through skylights in nexus during summer

photovoltaic panels create energy for mechanical louvers

natural ventilation in summer

heat generated in greenhouse during winter is redistributed into opera house spaces

Rainwater is collected on green roof and ground terrace and stored in cistern and recycled for irrigation.
natural ventilation in summer
FINAL DESIGN MODEL
The name Muncy is derived from the Monsey or Wolf Tribe Indians.

Visitors’ Center

“...The sea, once it casts its spell, holds one in its net of wonder forever.”
--Jacques Cousteau

Third-Floor Exhibit
COHESIVE SYNERGY

Darius Hopkins, Jomar Santiago

Combining the old and the new, the new Muncy, Pennsylvania Center for Resiliency is designed using the principles of cohesive synergy. The concept is a collection of independent modules, interlocked with one another, and lastly oriented in a curved format to create a circulatory stream that begins and ends at the restored Muncy Opera House. In designing this project, a question arose: “what does it mean to be resilient?” Does it mean to return restored or renovated in the same physical format, or can it mean to return in a completely new form, conditioned and sensible to its environment? The opera house will be aesthetically restored to its original form. The current abandoned apartments will be removed for rentable community space on the ground floor, while a double-height second floor begins the interior experience of the new Resiliency Center. A three-foot raise will occur for the floor of the opera house, alongside a three-foot plinth that lifts the steel-cladded Resiliency Center to prevent any flooding. A green, filtering staircase resides in the nucleus of the plot of land alongside a constructed rainwater catch-basin to intake and utilize any floodwater that infiltrates its center. Finally, a south and east entranceway opens the catch-basin to the public for leisure gatherings and organized events made available to the Muncy community.
Cohesive Synergy
Darius Hopkins & Jomar Sanago

Borough of Muncy, Lycoming County, Pennsylvania
CONCEPTUAL DESIGN
Aware of the pavement/greenery ratio, reintroducing green areas around the structure was essential. Noble Alley was replaced with open space ideal for recreational use.

Minimal glass placed on the rear modules emphasize their Deconstructivist-style geometries and scale. A secondary entranceway linked to the commercial area is shown.
EAST WATER STREET AND GREEN ALLEY PERSPECTIVES

Clear physical connection between the old and new is shown. The roof of the beginning module also doubles as an outside eating area.

To counteract shadowing occurring inside the central courtyard, a cage-like module was attached. A wrap-around window creates viewpoints for the outside recreational area.
Sharply angled module becomes the “master marquee” for the busy Main Street/Water Street intersection. Shredded windows on the roof allow passive solar intake.

A stormwater catch-basin supported by wetland plants doubles as scenery for the gathering area. The terracing staircase filtrates tainted water to later be filtered for structural reuse.
The double-height second floor of the opera house is restored and open for lectures and tour briefings. Exposed roof structure will return, while arched windows generate views of the new addition.
FINAL MODEL
BUILDING SECTIONS

North Main Street

Green Alley
BUILDING ELEVATIONS

Green Alley

Noble Alley
BUILDING FIRST-FLOOR PLAN
Cohesive synergy involves a platform that allows for two main objectives on the site. Firstly, it prevents the new building from encountering any floodwater. The platform will be set at three feet above grade where three entry points allow access onto the site. Secondly, to secure the opera house from major damage, the platform acts as a barrier that blocks water north and west side of the site. In the case of heavy rainfall and potential flooding, a proposed basin collects the water and disperses it towards the stormwater sewage line. The creation of the basin allows the collection and reuse of gray water and floodwater. Above ground, wetland plants in the platform clean and reduce waste that accompanies the waters. As water flows toward the basin, the waste is contained in a tank that is placed underground. The collected water is recirculated throughout a closed water loop. The water is filtered and pumped into the opera house and new building. Green spaces are increased to allow the regeneration of the aquifer, as well as the reduction of paved areas. An air-to-air system is powered by wind turbines or photovoltaic panels positioned on the roof of the buildings. Photovoltaics and wind turbines produce electricity that reduce the consumption of the grid system. In the case of an emergency, both buildings are not dependent on the grid system, thus creating a resilient center.
1. Muncy, Pennsylvania is named after the Munsee Indians, or converted Christian Indians who first inhabited the land.
2. Two prominent forts, Fort Brady and Fort Muncy, were built to keep out attacking Indians along the Susquehanna River.
3. Natives and squatters of the area suffered from smallpox and influenza.
4. First settled by Four Quaker brothers from Bucks County.
5. An abolitionist speech led to a riot in 1842 where a schoolhouse was destroyed.
6. The “Fair Play System” was integrated to stop illegal squatters in the 1770’s.
7. Mozley’s Opera House first opened in the early 1900’s, and consecutively operated a billiard room on the ground floor and stage area on the upper floors.
8. Ritz Theater opened in the 1920’s and was a single-screen movie theatre that has a lot of nostalgia for the community.
CONTEXT Muncy’s History
CONTEXT Map of Muncy and Historic Buildings
RESILIENCY STRATEGIES Solar Study

Equinox

Summer Solstice

Winter Solstice

Muncy, PA Wind-Rose

Wind Velocity

- 0
- >0
- >3
- >7
- >12
- >17
- >24
- >31
- >38 mph
RESILIENCY STRATEGIES Rain and Heat Studies

Precipitation Analysis

Temperature Analysis
RESILIENCY STRATEGIES
Flood Prevention System | Exploded Axonometric Diagram
RESILIENCY STRATEGIES
100-Year Flood Level Study
RESILIENCY STRATEGIES Pavement/Greenery Ratio

PA Native Plants and Trees

Bolboschoenus fluviatilis
Red Oak Tree
RESILIENCY STRATEGIES Water Recirculation

1. Water runs off roof
2. Filtrated down wetland stairs
3. Drains into basin
4. Collects inside container tank
5. Passes through treatment filter
6. Mechanically pumped into building
7. Reaches bathrooms (toilets)
8. Waste water drained, treated, and recirculated
RESILIENCY STRATEGIES Wind Turbine Location

Northwest and southeast winds rotate turbines to generate energy for structures.

Interior Artificial Lighting Study
RESILIENCY STRATEGIES Photovoltaic Panels Strategic Locations
RESILIENCY STRATEGIES
Heating, Ventilation, and Air Conditioning, Photovoltaic Alternative

1. Sun rays contact photovoltaic panels.
2. Photons from sun rays knock electrons loose from conductive material.
3. Conductors attached to positive and negative side of cells receive electrical circuit.
4. Captured electrons then create electrical current, which empowers air handling unit.
5. Unit diffuses treated air and releases exhaust air via raised floor system.
6. Underground coil farm minimizes air handling unit work (coils at a constant 55 degrees).
RESILIENCY STRATEGIES
Heating, Ventilation, and Air Conditioning, Wind Turbine Alternative

Interior Solar Study
RESILIENCY STRATEGIES Facade System

Plan (A)
RESILIENCY STRATEGIES Facade System (Wall Section)

- Sheathing Bracket
- 3/8" OSB Sheathing
- 9" Wide Flange
- Sheathing Bracket
- 3/8" OSB Sheathing
- Vapor Retarder
- Veneer Finish
- Steel Rainscreen
- Rainscreen bracket
- Waterproofing Membrane
- Air Retarder
- 2" Rigid Insulation
- Blown Cellulose Insulation
- Steel to Steel Bracket
- 8" Wide Flange
- Sheathing Bracket
- 2" Rigid Insulation
- Blown Cellulose Insulation
- Steel to Steel Bracket
- White Interior Wall

- 2' Floor Pedestal
- 12" Floor Beam
- 1" Raised Wood Floor
- Air Vent
- Air Exhaust
This report is a result of a community-university initiative to address climate change impact and community degradation. A centrally located community threatened by recurring flooding was identified for a “Resilient Makeover.” Partners include governmental organizations from state, county, and local levels and a Research and Land Grant university, Pennsylvania Department of Community and Economic Development (PA DCED), Lycoming County, Muncy Borough, The Hammer Center for Community Design, and Penn State. Design is at the center of this initiative, specifically Passive Low Energy Architecture retrofit and new construction combined with green and renewable energy infrastructure solutions.

The study is undertaken as an engaged scholarship project applying principles of Integrative Design. During the fall semester of 2016, teams of architecture students were challenged to research, program, and design a Resilience Center of Excellence (RCoE) through a process that included strong benefactor participation and workshops with sustainability specialists.

The resulting projects demonstrate innovative designs for flood protection and resilience that inform and are informed by the community.