Resilient Coastal Communities Program

Vandemere Resilience Strategy

PREPARED FOR

North Carolina RESILIENT COASTAL COMMUNITIES PROGRAM

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Photo Source: Town of Vandemere Website

National Fish and Wildlife Foundation Disclosure Statement

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A. Introduction

A.1 Overview

The Resilient Coastal Communities Program (RCCP) was developed by the North Carolina Division of Coastal Management with the goal of helping to build more resilient communities through thorough planning with technical and financial assistance. This document outlines the deliverables created during Phases 1 and 2. Phase 1 focuses on performing a risk and vulnerability assessment to coastal hazards. Phase 2 focuses on identifying and prioritizing projects to improve the community's response to coastal hazards. Throughout both phases, steps were taken to engage the community through a Community Action Team (CAT) and stakeholder engagement strategy. Additionally, existing efforts, plans, and policies were reviewed.

A.2 Community Description

Vandemere is a town of approximately 250 residents in Pamlico County. The town is largely residential with a few churches, businesses, and a summer camp. In recent years, the town has been impacted by several hurricanes including Floyd, Dennis 1 & 2, Isabelle, Joquin, Irene, and Florence [1]. The Town was notably impacted by Hurricane Irene in 2011 and was still recovering when it was impacted by Hurricane Matthew (2016). Additionally, residents report frequent flooding due to heavy precipitation events, sea level rise, tidal flooding, riverine flooding, and Nor'easters. A photo taken by a community member after a recent windy day is shown in **Figure 1.** Vandemere is accessed by a singular road, NC-307/Pennsylvania Avenue, which struggles with flooding that isolates the community. Historically, the town has had difficulty funding infrastructure improvements and relies heavily on grants or outside assistance. Vandemere is a part of Pamlico County.

Figure 1: Road in Vandemere following a minor wind event

A.3 Definitions and Terms

Throughout the document, the following definitions and terms will be referenced.

1. *Resiliency* [2]– The capacity of a community, business, or natural environment to prevent, withstand, respond to, and recover from a disruption
2. *Community Action Team (CAT)* [3] – A group of key stakeholders that provided targeted input throughout the program
3. *Vulnerability* [2]– The propensity or predisposition of assets to be adversely affected by hazards.
4. *Risk* [2]– The potential for negative consequences where something of value is at stake.
5. *Hazard* [2] – An event or condition that may cause injury, illness, or death to people or damage to assets.

B. Vision and Goals

The vision and goals for the project were developed with the Community Action Team (CAT) as described in Step 2 of Phase 1 [3]. The vision focuses on where the community wants to be in the next 10 years in relation to coastal hazards. The goal statements identify the steps the community wants to take to reach the vision. The vision and goals were designed to consider the triple bottom line approach to resilience by considering people, the planet, and profit. Vision and Goals statements developed by the CAT are shown in **Figure 2.**

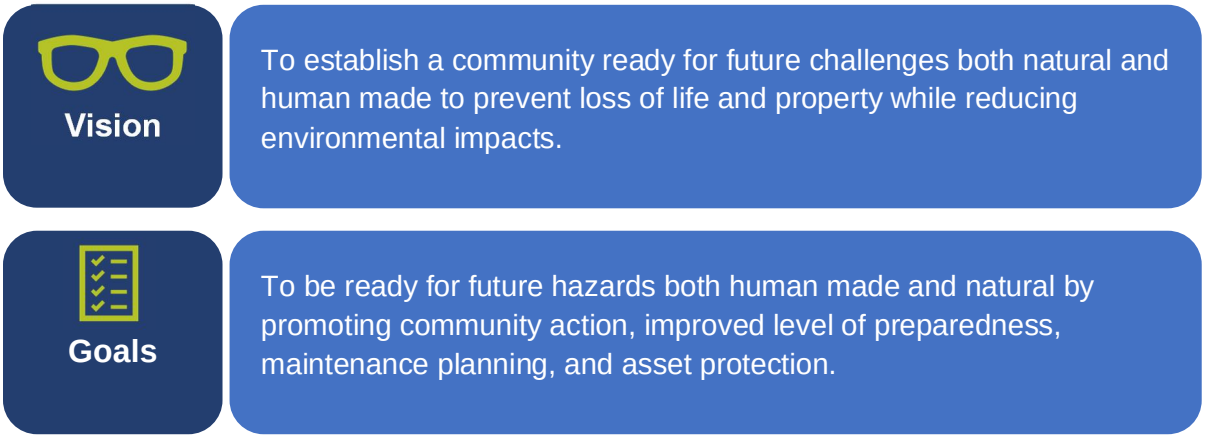


Figure 2: Vandemere Resilient Coastal Communities Program Vision and Goals

The vision and goals were developed at the first CAT meeting. The CAT was presented with examples and definitions of vision and goal statements. Additionally, the consulting team explained the triple bottom line approach. The CAT reviewed the example statements and highlighted any pieces that reminded them of their community. Following the review of the examples, the project consultants lead a brainstorming discussion. The CAT was presented with a series of questions and discussion points related to the vision and goals statements. Examples included discussions on coastal hazards faced by the community and ranking of community priorities. The consulting team then presented the CAT with draft statements which the CAT revised for their community. The selection represents the desire of Vandemere to embrace resiliency going forward to reduce community losses. They want to be ready for increasing future coastal hazards by acting early, being prepared, maintaining their infrastructure, and protecting assets.

C. Community Action Team Report

C.1 Introduction

The Community Action Team (CAT) was developed in line with Step 1 of Phase 1 [3]. Members were selected with the goal of identifying key stakeholders to provide targeted input and champion the efforts. Additionally, an effort was made to create a diverse team with a variety of experience. Throughout the project, four CAT meetings were held to get targeted input from the community throughout the process. These meetings were focused on the community vision and goals, critical assets and critical natural infrastructure, local hazards and calls for action, and vulnerability solutions. Additionally, the consulting team reached out to the CAT for assistance engaging the community throughout the project and providing local knowledge.

C.2 Community Action Team Development

The Community Action Team (CAT) was selected by the Town Manager and Mayor after reviewing the requirements of the Program Handbook with Kimley-Horn staff. Kimley-Horn provided the Town Manager and Mayor with a form that detailed the CAT selection guidelines and criteria and worked with the town to select the Community Action team. The table below reflects the selected members of the CAT for the Town of Vandemere.

Figure 3: Vandemere CAT Members

Name	*Organization/ Stakeholder Group*	*Title*	*Contribution / Reason Selected*
Tom Woodruff	Town of Vandemere	Town Manager	Town manager, aware of local conditions and assets
Sue Britt	Town of Vandemere	Town Clerk	Town clerk, aware of local conditions and needs. 32 years working in state government.
Judy Thaanum	Town of Vandemere	Mayor	Life-long resident of Vandemere. Regular coordinator during extreme weather events. Family history of being involved with local governance.
Carolyn Jones	Town of Vandemere	Commissioner	Lives on outskirts of town in an under-served area. Carolyn is also a life-long resident who can advocate for this area of town.
Skip Lee	Town of Vandemere	Pamlico County Building Inspector	Skip is the Pamlico County CAMA representative that will help direct in regard to CAMA coordination. He knows a lot about soils, drainage, culverts, etc. because of his building inspection work and as CAMA representative.

Name	*Organization/ Stakeholder Group*	*Title*	*Contribution / Reason Selected*
Beth Bucksot	Pamlico County	Economic Planner	Beth and parents lived in Vandemere. Assisted in writing grant proposals. Provided statistics and has a good overarching knowledge of the County as a whole.
Don Kennedy	Town of Vandemere	Town Resident	Long time property owner with extensive local knowledge of drainage and flooding, civil engineer

C.3 Meeting Summaries

C.3.1 CAT Meeting 1 – Community Vision and Goals

Meeting Agenda

Location:	Microsoft Teams
Time / Date:	1:30 pm 9/8/2021
Subject:	RCCP CAT Meeting 1

Introduction of CAT members

- Welcome and Introduce CAT Members
- Summary of RCCP project and goals
- Role of CAT members

Introduction of Meeting Topic: Vision and Goals

- Review Pamlico County Hazard Mitigation Plan vision and goals
- Example statements and goals from other communities

Drafting of Community Specific Vision and Goal Statements

- Discussion on community specific vision and goal statements
- Draft community specific vision and goal statements
- Finalization of vision and goal statements if consensus reached

Next Steps

- CAT framework
- Project next steps

Attendees

- Travis Crissman (KHA)
- Danielle Curri (KHA)
- Tancred Miller (DCM)
- Judy Thaanum (CAT)
- Sue Britt (CAT)
- Don Kennedy (CAT)
- Beth Bucksot (CAT)
- Tom Woodruff (CAT)

Minutes

The consulting team began the meeting by giving an overview of the project and the steps outlined in the Planning Guide. Each of the steps in Phases 1 and 2 were highlighted and the final deliverables were reviewed. Next, the consulting team reviewed the role of a CAT member. CAT members were asked to provide local insight and expertise, help set vision and goals, provide targeted input, and encourage community engagement. The consulting team requested that the members actively participate, be transparent, consider alternative ideas, work towards an optimal solution, and think big. The consulting team then shifted to the main objective of the meeting of setting the project vision and goals. The CAT team was presented with definitions of vision and goal statements and an explanation of the triple bottom line approach. They were then shown examples from the Pamlico Sound Regional Hazard Mitigation Plan (PSRHMP) and other community plans. They were asked to reflect on the statements and highlight anything that resonated with their community. Next, the consulting

team led a brainstorming session to frame the discussion towards their specific community. The CAT discussed challenges they have faced from coastal hazards and priorities of the community. Following the discussion, the consulting team shared some draft vision and goal statements. The CAT reviewed the statements and revised them per their community. The CAT ultimately selected the following statements:

Vision: “To establish a community ready for future challenges both natural and human made to prevent loss of life and property while reducing environmental impacts.”

Goals: “To be ready for future hazards both human made and natural by promoting community action, improved level of preparedness, maintenance planning, and asset protection.”

From the discussion and formation of the vision and goals, the following key points were identified:

- The CAT’s main concern is drainage throughout the town. They reported the current drainage system needing maintenance, repairs, and increased capacity. A drainage study was performed by a consultant in 2019. Since then, they believe their drainage system needs more capacity to respond to increasing hazards and a maintenance plan to keep it operating.
- Vandemere was severely impacted during Hurricane Irene. During Hurricane Mathew, many of the impacted areas were areas that had not recovered from Irene.
- The CAT expressed concern over possible environmental impacts from propane tanks and other fuel tanks getting washed up or breaking free during storms. Additionally, there are houses that have been bought by FEMA that have not been taken down. They are concerned about debris from these homes impacting the community during storms.
- Currently, Vandemere does not have systems in place to easily warn residents of coastal hazards, keep track of who is evacuating or staying, and to provide instruction to residents on how to prepare for coastal hazards. Many of this is currently done by the mayor going door to door.
- There is only one road to access Vandemere that frequently is blocked during weather events. This prevents residents from exiting or responders from reaching the community. Additionally, powerlines along the main road frequently go out leaving the community without power after weather events.
- The CAT expressed a desire to be better prepared to face storms as a community with more automatic systems. They want residents to be better equipped to face increasing coastal hazards.

Following the formation of the vision and goals, the consulting team reviewed the next steps of the project and the CAT.

C.3.2 CAT Meeting 2 – Critical Assets and Critical Natural Infrastructure

Meeting Agenda

Location:	Microsoft Teams
Time / Date:	2:30 pm 10/6/2021
Subject:	Critical Assets and Public Engagement

Critical Assets and Infrastructure

- Review of list prepared by Tom, Judy, and Sue – additions and edits discussion

Public Engagement Strategy

- Method of communicating with residents, questionnaire, public meeting
- Public Meeting #1 agenda and schedule

Attendees

- Travis Crissman (KHA)
- Danielle Curri (KHA)
- Mackenzie Todd (DCM)
- Judy Thaanum (CAT)
- Sue Britt (CAT)
- Don Kennedy (CAT)
- Beth Bucksot (CAT)
- Tom Woodruff (CAT)

Minutes

Prior to the CAT Meeting, the consulting team met with town staff to discuss critical assets. They started a preliminary list which was reviewed with the CAT to make additions or edits. The CAT also discussed the role played by these facilities during extreme events and their role in the community.

The following key points were identified during the discussion:

- The Town Hall frequently serves as a hub during extreme events. They have set up aid stations there including food, supplies, and medical attention.
- The waterfront park has served as a community access when the main road is blocked following storms. It provides rescuers with water access to the community and potentially helicopter access if needed.
- Pamlico Packing operates a frozen storage facility in town. This should be added as a critical asset.
- Many critical facilities are outside of Vandemere which can only be exited via the main road. This includes medical services, gas stations, banks, fatality management services, hurricane shelters, and food sources. The main road is frequently blocked isolating the community. Vandemere does not have EMS within its community. EMS accesses the community via the main road.
- Camp Vandemere is a year-round camp in the community. Kids, families, and volunteer groups visit the camp throughout the year. During Irene, the camp was demolished. Additionally, it is frequently isolated by flooding.

Following the discussion of critical assets, the focus was changed to how to best reach the community for the first public meeting. It was decided the best way to reach the community would be through a mailer with the public meeting information and questionnaire. Additionally, an online option would be provided for the town to share on social media. The town agreed to collect the questionnaires via mail and in a drop box.

C.3.3 CAT Meeting 3 – Local Hazards and Calls for Action

Meeting Agenda

Location:	Microsoft Teams
Time / Date:	2:30 pm 11/3/2021
Subject:	Critical Assets and Public Engagement

- Overview of risk and vulnerability assessment
- Review and discussion of local hazards identified based on Pamlico Regional Hazard Mitigation Plan and/or other sources
- Identify additional local hazards
- Discussion of calls to action (events that trigger the need for taking action or calling for assistance)

Attendees

- Travis Crissman (KHA)
- Danielle Curri (KHA)
- Mackenzie Todd (DCM)
- Judy Thaanum (CAT)
- Sue Britt (CAT)
- Don Kennedy (CAT)
- Beth Bucksot (CAT)
- Tom Woodruff (CAT)

Minutes

To start the meeting, the consulting team gave an overview of the vulnerability assessment portion of the project. They reviewed the steps detailed by the planning guide, input needed from the CAT, and how the vulnerability assessment relates to Phase 2. Next, the consulting team shifted to discussing the objective of the meeting, to get feedback on identified local hazards and calls to action. To begin identifying hazards, the consulting team reviewed the required hazard considerations detailed in the planning guide (flooding (rainfall, tidal, and riverine), storm surge, and sea level rise). Maps of these hazards were shown using online GIS tools including the NOAA Sea Level Rise Viewer (sea level rise and tidal flooding), NC FRIS (riverine flooding), and NOAA National Storm Surge Hazard Maps (storm surge). For rainfall, local knowledge was relied on to identify hot spots. The hazards were presented to the CAT in the form of preliminary maps showing the community and the hazard extents. Members held a discussion regarding the geographic extents of the hazards and related it to their personal experience. Additionally, the hazards included in the PSRHMP were presented to the community for reference. During the CAT meeting, an emphasis was placed on discussing calls to action for the community or events that initiate a community response.

Several Key Points were identified from this discussion:

- Wind plays an important factor in the flooding experienced by the community. When the wind blows to the North, water cannot drain from Vandemere causing flooding. Wind events and Nor'easters can isolate the community for several days at a time. The community does not face daily tidal flooding, but experiences wind tides.

- Several roads flood during rainstorms and Nor'easters that isolate the community. This includes Grigg's Road, Jones Road, Griffin Road, Smith Creek Road, and Dixon Drive.
- Debris from abandoned homes, outside communities, and within Vandemere have caused issues such as clogging ditches, blocking roads, and environmental contamination. The CAT reports propane tanks frequently break loose during hurricanes and tropical storms.
- The impact of identified hazards such as rainfall flooding, storm surge, tidal flooding, and riverine flooding are heavily dependent on the wind direction and its effects on the Pamlico Sound. Additionally, the effects of storm surge are more tied to the length the hurricane sits over Vandemere rather than the category of the storm.
- Many calls to action are handled by community members or town staff as needed. The mayor currently goes door to door to prepare residents and detail who is staying in the town during hurricanes. The CAT noted Oriental's sheet on door system for residents to note if they evacuated. Community members and town staff are currently blocking off flooded roads to alert others. The town has a strong interest in creating better processes for these events to be more manageable and automated. Additionally, they are interested in processes to better alert and prepare residents for coastal hazards.

Based on the discussion wind was added as a hazard considered in this study. Following the completion of the hazard identification section, the consulting team gave an overview of the next steps for the CAT and a reminder of the upcoming public meeting.

C.3.4 CAT Meeting 4 – Vulnerability Solutions

Meeting Agenda

Location:	Microsoft Teams
Time / Date:	2 pm 3/8/2022
Subject:	Vulnerability Solutions

- Share vulnerability score results
- Discuss project portfolio
- Prioritize projects

Attendees

- Travis Crissman (KHA)
- Danielle Curri (KHA)
- Mackenzie Todd (DCM)
- Judy Thaanum (CAT)
- Sue Britt (CAT)
- Don Kennedy (CAT)
- Beth Bucksot (CAT)
- Tom Woodruff (CAT)

Minutes

To start the meeting, the consulting team gave an overview of the results of the vulnerability assessment. Next the consulting team, reviewed the identified projects in the project portfolio to gain feedback. From the discussion the following key points were identified:

- When reviewing the culvert/drainage improvements, the CAT noticed a few culverts that were missing in the drainage study. These culverts are crossing Pennsylvania Avenue and Smith Creek Road. The consulting team will add these to the mapping materials.
- The top priority for the town is culvert and drainage improvements. They want to clean out and upsize existing culverts as needed. They also want to study additional measures that could be taken such as a barrier system, French drains, or pumping systems.
- The town agrees the generator in the town hall should be improved. Currently, it is only enough to open the doors and turn on some lights. Long term, the town would like the generator to support aid distribution and community needs after a coastal event. The goal is for the generator to have a natural gas connection and to be raised.
- The town agrees that they would like to underground the utility lines along Pennsylvania Avenue. However, given the high cost and private ownership the town does not believe it is feasible in the future. They want to include it in the plan in case it becomes more feasible in the future.
- The CAT likes the idea of a resident preparedness guide and wants to combine it with the elevation guide. Beth pointed out some existing resources that could be used to create the guide. Additionally, she mentioned the guide could include some additional “tips and tricks” for flood mitigation. Specifically, she mentioned the guide

could include some low-cost options for flood mitigation for those that cannot raise their homes.

- Beth brought up that a living shoreline like the one in Oriental could help with erosion in Vandemere and to reduce wave action. Potential locations include the ballast pile and along the Vandemere waterfront by Windmill Point.
- Based on the discussion the following priorities were set:

1. Culvert/Drainage Improvements
2. Raise Road Grades
3. Easement and Maintenance Plan
4. Town Hall Improvements
5. Living Shoreline
6. Home/ Business Flood Mitigation and Preparedness Guide
7. Undergrounding Electric

D. Stakeholder Engagement Strategy

D.1 Introduction

The Resilient Coastal Communities Program (RCCP) was developed by the North Carolina Division of Coastal Management with the goal of helping to build more resilient communities through thorough planning with technical and financial assistance. As stated by the *North Carolina Resilient Coastal Communities Program Planning Handbook,*

> *"Getting from resilience planning to action requires jointly created ideas, buy-in, and commitment from a diverse group of stakeholders."*

This section outlines a stakeholder engagement strategy to ensure participation from public stakeholders in the program during the risk and vulnerability assessment and project planning, prioritization, and selection.

D.2 Engagement Approach

The engagement approach was designed with the following four goals in mind based on the *North Carolina Resilient Coastal Communities Program Planning Handbook*:

1. Promote representation and equitable outcomes for marginalized communities and vulnerable populations
2. Build trust, relationships, and partnerships
3. Gain feedback and validation during the risk and vulnerability assessment
4. Gain local assistance with the prioritization of projects

D.3 Strategies

The engagement approach includes several strategies to ensure the goals are met. The first strategy is to *inform and empower*. Resiliency is a complicated issue and solutions will vary for each community. The engagement plan will work to effectively communicate with participants regardless of their background and empower them to share their own experiences, solutions, and priorities. The engagement will highlight the importance of implementing resiliency strategies and costs of inaction.

The engagement approach is also designed to integrate *online and offline engagement*. Throughout the process, the engagement plan will work to ensure community members without internet access are given opportunities to participate and engage. The plan will also leverage online engagement tools to reach the community.

As stated in the goals, the engagement approach places an emphasis on *outreach to vulnerable and historically underrepresented community members.* Vandemere is a town of approximately 250 residents. The community is largely residential with a few churches, businesses, and a summer camp. Based on CAT feedback and the historic vulnerability of the entire community, an approach was created with the intention of reaching out to all residents.

Lastly, the engagement approach will include *measurable outreach*. For Vandemere, the intention is to reach out to all property owners and residents, therefore the measured outreach will be near 100%. Every household will have the opportunity to provide feedback both via a questionnaire (online or hard copy) and via 2 public meetings to be conducted.

D.4 Elements for Outreach

D.4.1 Community Engagement Stage A: Risk and Vulnerability Assessment

Community Engagement Stage A is focused on getting community feedback and suggestions on identified local hazards during the risk and vulnerability assessment. The Web Content and Print media will leverage *online and offline engagement* to ensure all community members are reached regardless of internet access. This will also allow for outreach to *vulnerable and historically underrepresented community members* by aiming to reach all Vandemere residents. Public meeting materials will be developed to *inform and empower* community members regardless of their knowledge of resiliency. In Stage A, a questionnaire will be used, and public meeting attendance will be tracked to allow for *measurable outreach*.

Outreach Method	Schedule	Intended Audience	Purpose	Responsibilities	
				Consultant Team	Grantee Administrator
Web Content	Mid-late October	Community Members	• Provide background information on the project • Notify the community about the upcoming public meeting • Gather information on a questionnaire	• Create content (Text, graphics, and questionnaire) • Analyze questionnaire responses	Upload content to the community's website and social media outlets.
Print Media	Mid-late October	All Property Owners	• Provide background information on the project • Notify the community about the upcoming public meeting • Gather information on a questionnaire	• Create content (Mailer and/or questionnaire) • Analyze questionnaire responses	• Distribute content. • Display flyers in Town Hall. • Collect questionnaire in Town Hall drop box or via mail.
Public Meeting #1	Early December	Community Members	• Give an overview on the program and project vision / goals • Collect community feedback on identified local hazards and suggestions on additional local hazards.	Create meeting materials, facilitate meeting, and summarize feedback.	Secure meeting location and promote / publicize the meeting.

D.4.2 Community Engagement Stage B: Project Development

Community Engagement Stage B is focused on getting community feedback and suggestions on identified potential solutions during the project prioritization. The Web Content and Print media will leverage *online and offline engagement* to ensure all community members are reached regardless of internet access. This will also allow for outreach to *vulnerable and historically underrepresented community members* by aiming to reach all Vandemere residents. Public meeting materials will be developed to *inform* community members about identified projects and *empower* them to share their own ideas and give feedback.

Outreach Method	Schedule	Intended Audience	Purpose	Responsibilities	
				Consultant Team	Grantee Administrator
Web Content	Early-mid January	Community Members	• Provide a summary of the first Public Meeting • Notify the community about the upcoming public meeting • Share results from the questionnaire	Create content (Text, graphics)	Upload content to the community's website and social media outlets.
Print Media	Early-mid January	All Property Owners	• Provide a summary of the first Public Meeting • Notify the community about the upcoming public meeting • Share results from the questionnaire	Create content (Text, graphics)	Distribute content.
Public Meeting #2	Late January	Community Members	• Share results from the first questionnaire • Collect community feedback on identified potential solutions. • Summarize the next steps of the project.	Create meeting materials, facilitate meeting, and summarize feedback.	Secure meeting location and promote / publicize the meeting.

D.5 Community Involvement Results

In Stage A, a questionnaire and public meeting were used to engage the community. The public meeting was held jointly with the Pamlico County RCCP with approximately 12 attendees. The questionnaire received 19 responses which accounts for approximately 10% of the community. Detailed questionnaire results have been provided to DCM. Overall key points from the questionnaire and public meeting are highlighted below:

- 63% of residents completing the questionnaire reported experiencing limited access to their resident during an extreme weather event. The most frequently reported causes were water on main road outside subdivision (55%), downed power lines (50%), downed trees or other debris (50%), and water on subdivision street (44%).
- 55% of residents completing the questionnaire reported limited access to a critical facility or service during an extreme weather event. The most frequent reported critical facility or service affected included cable or internet service (44%), fire department (44%), and hospital / medical (39%).
- When asked if they would donate easements to the town for drainage, 44% responded yes, 44% responded maybe, and one responded no.
- Residents reiterated that wind plays a large role in the level of flooding experienced from the sound.
- Residents expressed concern over housing bought by FEMA not being knocked down. These houses are falling apart and cause debris.
- The road in front of Camp Vandemere has an old cemetery that is eroding away and frequently floods. Residents here must leave before the shelter opens otherwise, they can’t get out.

The second public meeting was held on March 10,2022 jointly with the Pamlico RCCP with approximately 13 attendees. Notice of the public meeting was provided via the county website and an email to the questionnaire respondents. The consultants presented the proposed project portfolio and provided time for feedback from the community.

E. Review of Existing Local and Regional Efforts

E.1 Existing Local and Regional Efforts

As outlined in Step 3 of the Planning Guide, a review of existing plans, ordinances, policies, and programs was performed. During this process, existing resiliency measures in place were identified. These existing measures were built upon and gaps were identified for the completion of the vulnerability and risk assessment. The documents reviewed are listed in **Figure 4.** Summaries of the documents are enclosed in **Appendix A.**

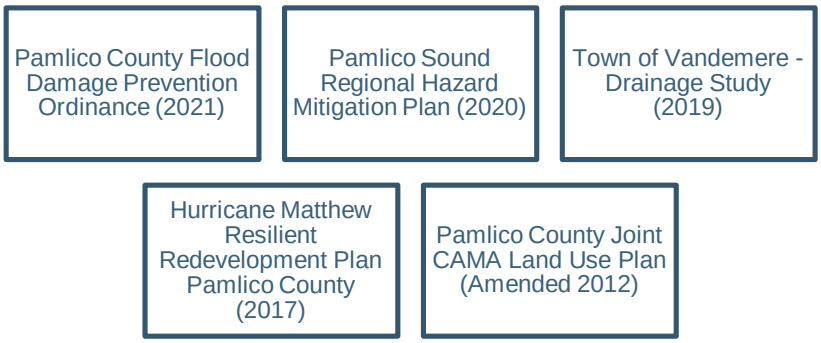


Figure 4: Reviewed documents

E.2 Identified Gaps

From the review of existing local and regional efforts, a series of gaps were identified. These gaps were considered throughout the plan. The identified gaps are shown below in **Figure 5**.

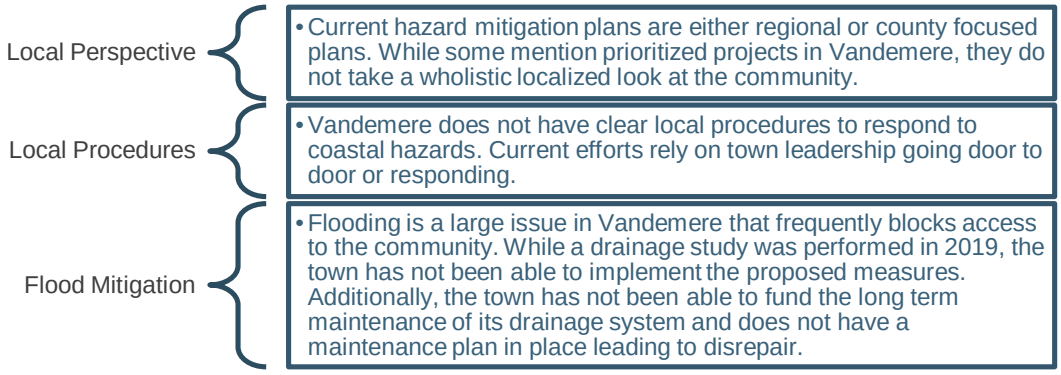


Figure 5: Identified Gaps in Current Local Efforts

F. Risk and Vulnerability Assessment Report

F.1 Introduction

The main deliverable of Phase 1 is the Risk and Vulnerability Assessment (RVA) Report. This document outlines process taken to complete the RVA and the results of the RVA. As described in the *Resilient Coastal Communities Program Planning Handbook* [3], the assessment will evaluate risks to the community's vulnerable populations and critical assets from a number of coastal and climate hazards, including flooding (rainfall, tidal, and riverine), storm surge, sea level rise, and other locally relevant hazards.

The following process was taken to complete the RVA as shown in **Figure 6.** First, hazards were identified with the Community Action Team (CAT) based on their experience and the requirements in the planning guide. Additionally, the consulting team reviewed hazards that were included by existing plans. The consulting team then mapped the hazards and their spatial relationship to the critical assets. This information was used to assess vulnerability based on a vulnerability scoring protocol developed specifically for the RVA. Following the vulnerability assessment, risk was estimated for the critical assets.

Figure 6: Risk and Vulnerability Assessment Process

The report and maps created in the RVA will be used to complete Phase 2 of the RCCP which is focused on Planning, Project Identification, and Prioritization. Project needs will be identified based on the vulnerability and risk of the community.

F.2 Critical Assets

The Critical Assets included in the assessment were identified in conjunction with the CAT based upon FEMA's Community Lifelines Framework [4]. Minutes of this process are included in **C.3.2.** A community lifeline "enables the continuous operation of critical government and business functions and is essential to human health and safety or economic security" [4]. The critical assets identified in this study focus on the assets within the community and maintaining community accessibility to resources outside of Vandemere. For Vandemere, many critical assets such as medical resources, food sources, fuel stations, drinking water, and hurricane shelters are outside the community. There is only one ingress and egress from Vandemere which is NC 307/ Pennsylvania Avenue. The CAT reports this being blocked during extreme weather, isolating the community. The following assets were defined as critical assets for the

Vandemere Community as shown in **Figure 7**. Descriptions and geolocation are provided in **Appendix B.**

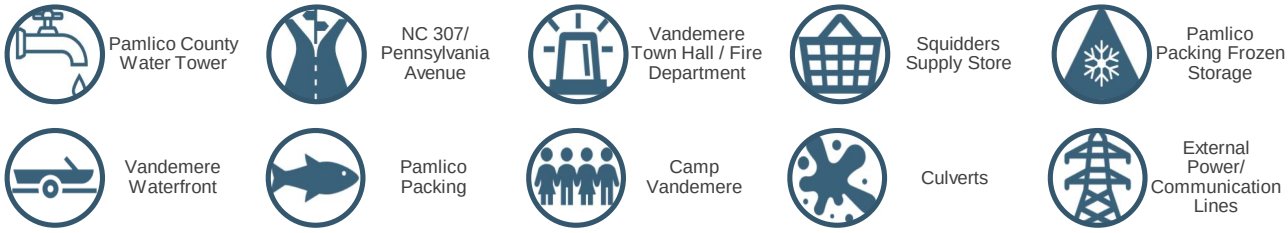


Figure 7: Vandemere Identified Critical Assets

F.3 Hazard Identification

F.3.1 Methods

To calculate vulnerability and risk for a community, the hazards faced by the community must be identified and mapped. In conjunction with the CAT, the consulting team identified a series of hazards faced by the community. Minutes of this meeting are included in **C.3.3**. Additionally, an emphasis was placed on understanding community *calls to action* or events that initiate a community response or need for assistance. To begin identifying hazards, the consulting team reviewed the required hazard considerations and located data sources. As required by the RCCP Planning Guide, the following hazards are included in this study: *flooding (rainfall, tidal, and riverine), storm surge, and sea level rise (minimum 30-year projection)* [3]. For rainfall, local knowledge was relied on to identify hot spots. The consulting team also consulted the PSRHMP [4] to review hazards identified for the community. Based on the discussion with the CAT, *wind* was added as a hazard considered in this study. The CAT indicated that flooding is often dependent on the direction of the wind which pushes water across the Pamlico Sound. When the wind blows from the North, water cannot drain from Vandemere causing flooding and high wind tides. The following hazards are considered as a part of this study and the referenced sources to quantify these hazards are shown in **Figure 8:**

Figure 8: Vandemere identified Hazards and Utilized Sources.

Hazard	*Source*
Rainfall Flooding	NC Spatial Data Download QL2 Digital Elevation Model [6] /CAT Feedback/Existing Drainage Study [7]
Tidal Flooding/ Sea Level Rise	NC Spatial Data Download QL2 Digital Elevation Model [6]
Riverine Flooding	North Carolina Flood Risk Information System [8]
Storm Surge	National Storm Surge Hazard Maps [9]
Wind	CAT Feedback

From discussions with the CAT throughout the project, the following calls to action were identified as shown in **Figure 9.** These events necessitate a response from the community or Town staff. Currently, many of these actions are performed by individuals or volunteers. The Town has expressed a strong interest in updating these responses.

Figure 9: Vandemere Calls to Action

Call to Action	*Response*
Hurricane/Tropical Storm	• Mayor goes door to door to alert residents and verify who is evacuating and who is staying. • Mayor verifies with residents that propane tanks are tied down and teaches those who need help.
Rainfall Flooding	• Community Members place warning devices out on flooded roads so drivers are alerted not to proceed.
Debris from Storm Event	• Community Members clean up debris and try to clear out drainage system.

F.3.2 Hazard Extents

The identified Hazards were mapped using GIS as shown in **Appendix D.** From the mapping of the hazards, the following trends were identified:

- Rainfall flooding, that is worsened by the state of the culverts, isolates residents from accessing NC 307 / Pennsylvania Avenue.
- Tidal flooding / sea level rise impacts properties and roadways along the shoreline and low-lying areas.
- Most of the town falls into the 1% Flood Hazard Zone or 0.2% Flood Hazard Zone.
- For Category 2 Hurricanes and greater, the entire town is impacted by storm surge.

F.4 Vulnerability Assessment

F.4.1 Introduction

The vulnerability assessment focuses on quantifying the vulnerability of critical assets and natural infrastructure to the previously identified hazards. Vulnerability is determined in relation to exposure, sensitivity, and adaptive capacity as defined by the Planning Guide [3] below:

1. *Exposure* – The probability of physical contact between an asset and a hazard.
2. *Sensitivity* – The degree to which asset is impacted by a hazard
3. *Adaptive Capacity* – The current ability of an asset to change its characteristics or behavior in response to a hazard.

Vulnerability is calculated for an asset utilizing the function shown in **Figure 10.**

Vulnerability = Exposure + Sensitivity – Adaptive Capacity

Figure 10: Vulnerability Function

Additionally, the CDC's Social Vulnerability Index (SVI) was mapped and supplemented with local insight. Ultimately, a vulnerability index was developed to score the cumulative vulnerability for the critical assets while considering social vulnerability.

F.4.2 Metrics

Based on the Planning Guide and available data sources, a vulnerability index was developed to quantify exposure, sensitivity, and adaptive capacity for each of the identified hazards. The vulnerability index was then used to score the vulnerability for each critical asset and each hazard. For exposure, sensitivity, and adaptive capacity, the scoring for each ranged from 0 to 3. Using the vulnerability equation, the vulnerability score ranged from 0 to 6. High vulnerability is demonstrated by a score greater than 4. Medium vulnerability is demonstrated by a score between 2 and 4. Low vulnerability is demonstrated by a score less than 2. To start, overall guidelines for exposure, sensitivity, and adaptive capacity were developed as shown in **Figure 11.**

Figure 11: Overall Vulnerability Guidelines

Score	*Exposure*	*Sensitivity*	*Adaptive Capacity*
0	Unlikely to occur	Asset not impacted	No implemented solutions
1	Low probability of contact	Asset minimally impacted (retains function)	Implemented solution to reduce sensitivity
2	Medium probability of contact	Asset impacted (loses some function)	Implemented solution to reduce exposure
3	High probability of contact	Asset destroyed (loses all function)	Implemented solution to reduce exposure and sensitivity

These guidelines were used to define vulnerability indices for each identified hazard to score exposure, sensitivity, and adaptive capacity. The indices were developed based on available GIS data and feedback from the CAT. Boundaries for the scoring were set for each hazard based on the guidelines and data type. The scoring metrics for each hazard are shown in **Appendix F.**

The following assumptions were made when developing the scoring indices. When quantifying adaptive capacity in Vandemere, the most frequent type of adaptive capacity was raised buildings. In these cases, the adaptive capacity was assumed to be the same for each type of flooding. It was assumed that assets could not have a vulnerability less than zero. An adjustment was provided to account for *social vulnerability* in the adaptive capacity metrics. If an asset was in a high socially vulnerable area, the adaptive capacity was reduced to represent the difficulty the community faces in recovery from social vulnerability factors. For wind, a data set of sufficient resolution was not located to allow for assessment of Vandemere. Given the small size of the community and frequency of hurricanes, tropical storms, and tropical depressions, it was assumed that all the critical assets have a high exposure to wind. For storm surge, the depth of storm surge from a Category 2 Hurricane was utilized to quantify sensitivity. The storm surge from a Category 2 Hurricane was utilized because in the last 20 years the highest category hurricanes to pass within a 60-mile radius of Vandemere were Category 2 Storms [1]. In the last 20 years, fifteen tropical storms and hurricanes have passed within a 60-mile radius of Vandemere. Four of these storms were Category 2 events.

F.4.3 Social Vulnerability Findings

The CDC's Social Vulnerability Index (SVI) quantifies factors that impact a community's ability to respond and recover from disasters [10]. There are four themes quantified to reach the SVI which include Socioeconomic Status, Household Composition, Race/Ethnicity/Language, and Housing/Transportation. Examples of these factors used to quantify the themes include household income, access to transportation, housing type, housing composition, and language barriers. The themes are mapped in GIS and displayed in quartiles compared to other areas. In the PSRHMP [5], social vulnerability was reviewed from a county level for Pamlico County. The census tract including Vandemere was shown in the highest social vulnerability quartile using data from 2016 compared to other census tracts in North Carolina.

As a part of the RCCP, the social vulnerability findings from the regional hazard mitigation plan were reviewed and supplemented using local knowledge. Additionally, updated social vulnerability data from 2018 was utilized [11]. Overall, the census tract including Vandemere continued to have high social vulnerability with the total social vulnerability being in the highest quartile. The Social Vulnerability is mapped in **Appendix C.** Given the rural nature of Pamlico County, the census tract includes multiple towns including Alliance, Bayboro, Stonewall, Vandemere, Mesic, and Hobucken. In **Figure 12**, the social vulnerability ranking variables are shown, detailing the ranking of the census tract compared to other census tracts in North Carolina. For example, for Overall Social Vulnerability the census tract including Vandemere was more socially vulnerable than 91% of other census tracts within North Carolina.

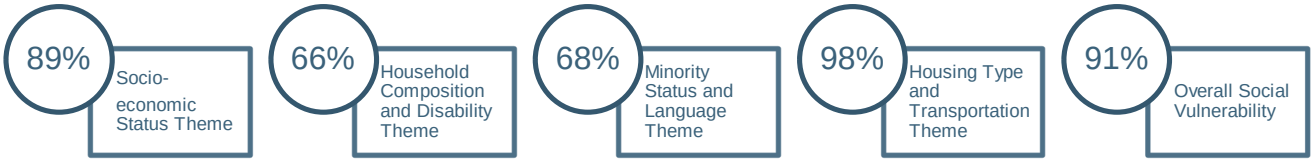


Figure 12: Census Tract including Vandemere Social Vulnerability

Some of the variables that contributed to the high social vulnerability included: unemployment, per capita income, persons aged 65 and older, population with a disability noninstitutionalized, mobile home estimate, household without a vehicle, and persons in group quarters.

As a part of the RCCP, the social vulnerability for Vandemere was reviewed and supplemented with local knowledge. Overall, Vandemere has a high social vulnerability as a community. The community has struggled with responding to coastal hazards due to several factors. The following factors have been noted throughout the planning process that hamper response: socioeconomic status, population age, transportation access, and housing conditions. The factors are described in **Figure 13.** By identifying social vulnerability within the community, officials and responders can identify which areas are more likely to require assistance during hazardous events.

Figure 13: Factors contributing to Social Vulnerability in Vandemere

Factor	*Description*
Socioeconomic Status	• Vandemere has struggled to finance repairs and maintenance of its infrastructure assets. For example, the inability to maintain the culverts and drainage systems in Vandemere make the community more vulnerable to flooding. • Residents have struggled with financing repairs of their own properties. For example, the CAT noted that many homes damaged in Hurricane Matthew had never been repaired from Hurricane Irene.
Population Age	• The population of Vandemere is aging which makes it more socially vulnerable. Elderly residents frequently need more assistance responding to hazards and are more likely to require medical attention. • Camp Vandemere serves primarily children and service groups. During coastal hazards, children are likely to need assistance.
Transportation Access	• Many roads within Vandemere serve as the single access points to residencies and critical assets. Combined with the disrepair of the culverts and drainage system, these access roadways are frequently blocked by flooding. This isolates anyone from entering or exiting. • The town has expressed a concern with assistance and medical attention not being able to reach the community. During hazardous events, the single route into Vandemere (NC-307/Pennsylvania Avenue) has been blocked which isolates the community from any outside assistance. Additionally, access points to NC-307/ Pennsylvania Avenue have been blocked by flooding. • The town noted that residents that live off Jones Street/ 3rd Street must evacuate early before the road floods otherwise they are isolated.
Housing Conditions	• Residents in mobile homes are more vulnerable to coastal hazards. • Additionally, homes that have not been repaired from past storms are more vulnerable to future storms.

F.4.4 Vulnerability Findings

Each of the critical assets was run through the scoring metrics to quantify exposure, sensitivity, and adaptive capacity. This was used to calculate the total vulnerability for the critical assets in Vandemere. The cumulative scores for vulnerability, exposure, sensitivity, and adaptive capacity are shown in **Appendix E.** The scoring, vulnerability indices, and results by hazard are shown in **Appendix F.** The cumulative vulnerability score for each critical asset is shown in **Figure 14.**

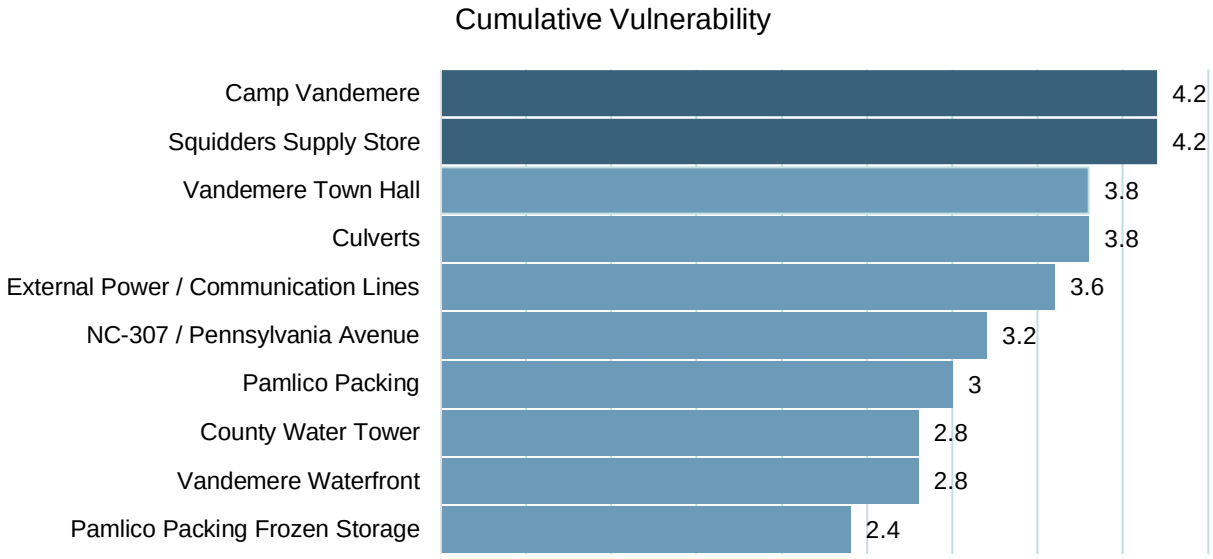


Figure 14: Cumulative Vulnerability

Overall, *every critical asset had high or medium vulnerability*. This was anticipated given the historic vulnerability of the whole community and the proximity of the critical assets to each other. Variations in the scores can be seen in the scoring of their exposure, sensitivity, and adaptive capacity as shown in **Appendix E.** *All the critical assets had low adaptive capacity except for Pamlico Packing Frozen Storage*. Few critical assets had all the buildings on the property raised or other adaptations. Additionally, the social vulnerability of the community reduced its adaptive nature given the historic difficulty in responding to hazards.

The most vulnerable critical assets were the roadway crossing Culverts and Squidders Supply Store. The vulnerability of the Culverts was anticipated given the drainage problems in Vandemere. While the scoring focused on the culverts themselves, the vulnerability of the culverts greatly increases the vulnerability of the entire Vandemere community. When the culverts flood, many residential areas are blocked from accessing NC-307/Pennsylvania Avenue. These residents are isolated from being able to exit their properties or be easily accessed by responders. This presents an increased risk scenario for the community as the culverts are highly vulnerable to rainfall flooding, riverine flooding, and storm surge. The roads sometimes blocked by culvert flooding include Jones Street, Main Street, and Griggs Road. Squidders Supply Store consistently had high exposure, high sensitivity, and low adaptive capacity. Squidders Supply Store sits at a low elevation and close to the shoreline giving it a

high exposure to flooding. Additionally, it is not raised giving it a higher sensitivity and lower adaptive capacity.

From the hazards reviewed, the *average vulnerability for all the critical assets was the highest for storm surge.* Every critical asset was highly vulnerable to storm surge. During a Category 2 event, all critical assets experience storm surge, with ranges from three to eight feet. This storm surge can be exasperated by wind driven tides experienced by Vandemere prior to the storm impacting the community. During a Category 5 storm, all of Vandemere is projected to experience greater than nine feet of storm surge [9].

In addition to the critical assets reviewed, *roads within Vandemere are highly vulnerable to flooding.* Roads impacted by culvert flooding include Jones Street, Main Street, Griffin Road, and Griggs Road. Roads impacted by 1' to 3' of sea level or tidal rise include Jones Street, Third Street, Griffin Road, Dixon Drive and Griggs Road. Roads within the 100-year floodplain include NC-307/Pennsylvania Avenue, Jones Drive, Jones Street, Third Street, Griffin Road, Dixon Drive and Griggs Road. All roads within Vandemere experience storm surge during a Category 2 Hurricane. Roads that serve as main residential access points such as Jones Road, Jones Street, Third Street, Griggs Road, and Griffin Road are modeled to experience over 5 feet of storm surge flooding. Additionally, NC-307/Pennsylvania Avenue (the only ingress and egress to Vandemere) is shown to experience up to 3 feet of storm surge. The flooding of these roads isolates many residents from entering or exiting their properties. It also blocks first responders from being able to reach residents during hazardous events.

In summary, the key findings of the overall vulnerability assessment include:

- Every critical asset had medium or high vulnerability.
- All the critical assets have low adaptive capacity except for Pamlico Packing Frozen Storage.
- The roadway crossing Culverts and Squidders Supply Store were the most vulnerable critical assets.
- The average vulnerability for all the assets was the highest for storm surge.
- Roads within Vandemere are highly vulnerable to flooding. This isolates the critical assets and residents.

F.5 Risk Assessment

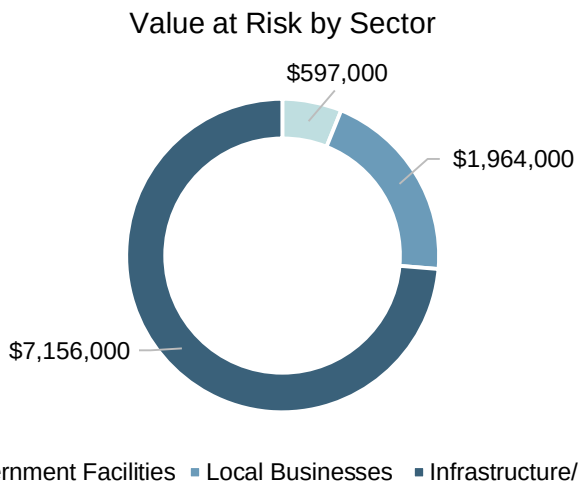
F.5.1 Metrics

After quantifying vulnerability, a risk assessment was performed. Risk is defined as "the potential for negative consequences where something of value is at stake" [2]. The estimated value of each critical asset was calculated to determine the value at risk. To quantify the value at risk, Pamlico County's Tax Record GIS data was utilized to reference building values [12]. The building data value was utilized which includes structural infrastructure assets. For example, at the Vandemere Waterfront, the docks are included as a part of the building value. For the water tower, the water tank held in the tower is included as a part of the building value. Land value was not considered as a part of the risk assessment.

For infrastructure assets, such as the culverts, powerlines, and roadway, the consulting team utilized past project data to quantify the value at risk. The critical assets were grouped into three sectors to quantify damages. The three sectors evaluated were government facilities, local businesses, and infrastructure/ utilities. The classification of each critical asset by sector is shown in **Appendix G**.

F.5.2 Risk Findings

The value at risk was quantified for each critical asset as shown in **Appendix G.** The total for each sector was then calculated and is shown in **Figure 15.**



Sector	*Number of Critical Assets at Risk*	*Asset Value*
Government Facilities	2	$ 597,000
Local Businesses	4	$ 1,964,000
Infrastructure/ Utilities	4	$ 7,156,000

Figure 15: Total Value at Risk by Sector

Overall, the sector with the highest value at risk was Infrastructure/Utilities. This sector included the External Power/ Communication Lines, County Water Tower, NC-307/ Pennsylvania Avenue, and the Culverts. The value was driven by the number and value of the culverts, which was estimated at $200,000 each. The culverts accounted for 70% of the total value of the Infrastructure/Utilities sector. NC-307/ Pennsylvania Avenue accounted for 20% of the total value of the Infrastructure/Utilities sector. These costs represent the value of the assets themselves. They do not consider the residences, critical assets, and properties impacted by flooding of the culverts or blockage of NC-307/Pennsylvania Avenue.

The Local Businesses sector had the second highest value at risk. This sector included Squidders Supply Store, Pamlico Packing Frozen Storage, Pamlico Packing, and Camp Vandemere. Camp Vandemere accounted for 70% of the total value of the Local Businesses sector. However, the value of Pamlico Packing Frozen Storage and Pamlico Packing just consider the facilities. The storage facility holds additional value due to the product inside the building. Additionally, Pamlico Packing has equipment assets not included in the value shown.

The Government Facilities sector was made of the Town Hall and Vandemere Waterfront. The total value of these assets was calculated to be $597,000. This does not include documentation, records, or equipment within the Town Hall. The docks were included in the value for the Vandemere Waterfront.

F.6 Conclusion

The RVA validated the feedback given by the community throughout the planning process. The Town is vulnerable to coastal hazards including riverine flooding, tidal flooding, storm surge, rainfall flooding, and wind. The culverts in Vandemere are highly vulnerable and have the highest value at risk. The disrepair or loss of functionality for these culverts isolates many community members within Vandemere. Roads within Vandemere are also vulnerable to coastal hazards which isolates residents. All the critical assets had medium or high vulnerability, and few had adaptive capacity. Vandemere has high social vulnerability which limits its resiliency to coastal hazards.

G. Project Portfolio

G.1 Introduction

During Phase 2, the consulting team worked with the CAT and community members to identify, plan, and prioritize projects to increase the resiliency of the community. The identified projects address vulnerabilities identified in the RVA. In addition to infrastructure actions, policy based and nature-based solutions were considered. For each of the projects, the type of solution, cost, timeline, and priority rating were defined in the ranges shown in **Figure 16**.

Figure 16: Project Portfolio Ranges

Type of Solution	*Cost*	*Projected estimated timeline*	*Priority Rating*
Infrastructure	Low ($0-$50,000)	0-6 months	Low
Plans and policies	Medium ($50,000-$200,000)	6-12 months	Medium
Ordinances	High ($200,000-$500,000)	12-24 months	High
Non-regulatory programs	Very High ($500,000+)	24+ months	

Additionally, funding opportunities were identified for each project. The following funding opportunities were reviewed. The funding program, acronym, and source are shown in **Figure 17.**

Figure 17: Reviewed Funding Opportunities

Acronym	*Funding Opportunity*	*Information*
HSGP	Homeland Security Grant Program	https://www.fema.gov/authorized-equipment-list-item/10ge-00-genr
HM	FEMA Hazard Mitigation	https://www.fema.gov/emergency-managers/risk-management/hazard-mitigation-planning
AFG	FEMA Assistance to Firefighters Grant	https://www.fema.gov/grants/preparedness/firefighters
DOECEDS	Department of Energy Cybersecurity for Energy Delivery Systems	https://www.energy.gov/ceser/office-cybersecurity-energy-security-and-emergency-response
EECBGP	Energy Efficiency and Conservation Block Grant Program	https://www.energy.gov/eere/wipo/energy-efficiency-and-conservation-block-grant-program
ECWAG	USDA Rural Development Community Water Assistance Grants	https://www.rd.usda.gov/programs-services/water-environmental-programs/emergency-community-water-assistance-grants

Acronym	Funding Opportunity	Information
NFWF	National Fish and Wildlife Federation Emergency Coastal Resilience Fund	https://www.nfwf.org/programs/emergency-coastal-resilience-fund
EHP	Environmental Planning and Historic Preservation	https://www.fema.gov/grants/mitigation/floods/when-you-apply
BRIC	Building Resilient Infrastructure and Communities	https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities
GL	Golden Leaf	https://www.goldenleaf.org/opengrants/

G.2 Identified Projects

Project Name	Culvert and Drainage Improvements	
Project Description	Enlarging of existing culverts, cleaning of roadside ditches and outfalls. All intended to better convey rainfall out to the sound or allow tidal flooding to recede more quickly.	
Natural/Nature-Based?	Yes - restores and enhances connectivity between sound and areas that were previously tidally influenced. Enhances and restores original aquatic biota as tidal water rises and falls more efficiently.	
Hazard(s) addressed by project	Flooding (rainfall/tidal/riverine)	
Type of Solution	Infrastructure	
Project Estimated Cost	High ($200,000-$500,000)	Assuming this work would be phased such that the first phase would fall within this range.
Potential Implementation Funding Sources	NFWF, EHP, GL	
Projected Estimated Timeline	12-24 months	
Priority Rating	High	
Project Map or Location	Multiple locations, see culverts shown on Critical Asset and Hazard maps in **Appendix B.**	

Project Name	*Road Elevation to 100-yr Floodplain*	
Project Description	Raise road elevations to reduce frequency of overtopping. Priority should be given to roads that serve as the singular ingress and egress into the community or residential areas such as Pennsylvania Avenue, Griggs Road, Griffin Road, and Jones Street.	
Natural/Nature-Based?	No	
Hazard(s) addressed by project	Flooding (rainfall/tidal/riverine)	Sea level rise
Type of Solution	Infrastructure	
Project Estimated Cost	Very High ($500,000+)	
Potential Implementation Funding Sources	BRIC	
Projected Estimated Timeline	24+ months	
Priority Rating	High	
Project Map or Location	Roads in **Figure 18** shaded in yellow or red. Approximately 5.3 miles.	

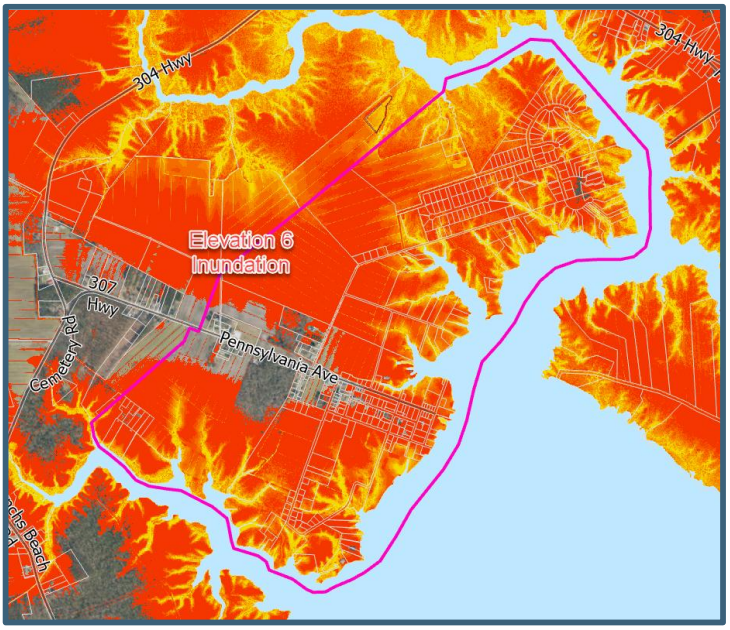


Figure 18: Vandemere Elevation Map showing roads in 100-year floodplain

Project Name	*Long term maintenance plan - ditches, pipes, and outfalls*	
Project Description	Develop a plan for long term maintenance plan and ordinance revisions to allow Town to obtain easements and right of entry to maintain critical conveyances.	
Natural/Nature-Based?	No	
Hazard(s) addressed by project	Flooding (rainfall/tidal/riverine)	
Type of Solution	Infrastructure	Ordinances
Project Estimated Cost	Medium ($50,000-$200,000)	5-year maintenance plan cost approximation.
Potential Implementation Funding Sources	None identified at this time	
Projected Estimated Timeline	24+ months	
Priority Rating	High	
Project Map or Location	Multiple locations, see culverts and ditches shown on Critical Asset and Hazard maps in **Appendix B**.	

Project Name	*Town Hall Improvements*	
Project Description	Elevate record and equipment storage, digitize records, relocate, or raise Town Hall to lower vulnerability, install raised emergency generator with natural gas connection. Resources for Emergency Generators are detailed in **Appendix H.**	
Natural/Nature-Based?	No	
Hazard(s) addressed by project	Wind	Flooding, sea level rise, wind, and storm surge
Type of Solution	Infrastructure	
Project Estimated Cost	Low ($0-$50,000)	Medium ($50,000-$200,000)
Potential Implementation Funding Sources	None identified at this time	
Projected Estimated Timeline	12-24 months	
Priority Rating	Medium	
Project Map or Location	1042 Pennsylvania Avenue, Vandemere, NC 28587	

Project Name	*Living shorelines*	
Project Description	Construct living shorelines to reduce erosion and dissipate wave energy along the coastline	
Natural/Nature-Based?	Yes	
Hazard(s) addressed by project	Storm Surge	Wind
Type of Solution	Infrastructure	
Project Estimated Cost	Very High ($500,000+)	
Potential Implementation Funding Sources	NFWF	
Projected Estimated Timeline	12-24 months	
Priority Rating	Medium	
Project Map or Location	See **Figure 19**	

Figure 19: Vandemere Living Shoreline Locations

Project Name	*Home and Business Flood Mitigation and Preparedness Guide*	
Project Description	Develop guidance document for distribution to residents and businesses. Preparing for storm, following storm, grants for home elevation, simple home improvements to reduce flood impact, hazard map illustrations, and how to report evacuation status.	
Natural/Nature-Based?	No	
Hazard(s) addressed by project	Storm Surge	Wind
Type of Solution	Plans and policies	
Project Estimated Cost	Low ($0-$50,000)	
Potential Implementation Funding Sources	Draw upon resources developed in other communities and counties to develop document.	
Projected Estimated Timeline	0-6 months	
Priority Rating	Low	
Project Map or Location	N/A	

Project Name	*Undergrounding of Electric*	
Project Description	Move electrical service lines along Pennsylvania Avenue from aerial to underground	
Natural/Nature-Based?	No	
Hazard(s) addressed by project	Wind	Flooding, sea level rise, wind, and storm surge
Type of Solution	Infrastructure	
Project Estimated Cost	Very High ($500,000+)	
Potential Implementation Funding Sources	FEMA Hazard Mitigation	
Projected Estimated Timeline	12-24 months	
Priority Rating	Low	
Project Map or Location	Top priority is along Pennsylvania Avenue coming into town.	

H. References

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[13] *Pamlico County Flood Damage Prevention Ordinance,* 2021.

[14] NCEM, "Hurricane Matthew Resilient Redevelopment Plan Pamlico County," May 2017.

[15] "Pamlico County Joint CAMA Land Use Plan," 2012.

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Appendix A – Existing Local and Regional Efforts

The following documents are the relevant documents reviewed to identify existing local and regional efforts. They represent a variety of sources from existing hazard mitigation plans, ordinances, and engineering plans.

Pamlico County Flood Damage Prevention Ordinance [13]	• The Pamlico County Flood Damage Prevention Ordinance details ordinances to minimize losses due to flooding and promote public health, safety, and general welfare. • The document includes provisions to restrict or prohibit uses dangerous to the community, requirements for new construction vulnerable to floods be protected against flood damage, control the alteration of natural floodplains, stream channels, and natural protective barriers, control development that may increase erosion or flood damage, and prevent or regulate the construction of flood barriers. • Proposed mitigation efforts in Pamlico County include a variety of government strategies to better prepare the communities and residents for coastal hazards.
Pamlico Sound Regional Hazard Mitigation Plan [5]	• The purpose of the Pamlico Sound Regional Hazard Mitigation Plan (PSRHMP) is "to identify, assess, and mitigate hazard risk to better protect the people and property within the Region from the effects of natural and human-caused hazards." • The plan includes Pamlico County and Vandemere. It completed a regionwide hazard identification and risk assessment, mitigation strategies, and mitigation action plans.
Town of Vandemere - Drainage Study [7]	• The Town of Vandemere had a consulting firm perform a Drainage Study in 2019. • The study included a survey of existing drainage systems throughout the town and a memo detailing drainage improvement recommendations. • The town has not implemented the proposed improvements since the completion of the study.
Hurricane Matthew Resilient Redevelopment Plan Pamlico County [14]	• The Hurricane Matthew Resilient Redevelopment Plan was developed as part of the North Carolina Redevelopment Planning program to provide a roadmap for community rebuilding and revitalization assistance for communities damaged by Hurricane Matthew. • The document details storm damage, storm impact, and strategies for resilient redevelopment following Hurricane Matthew.

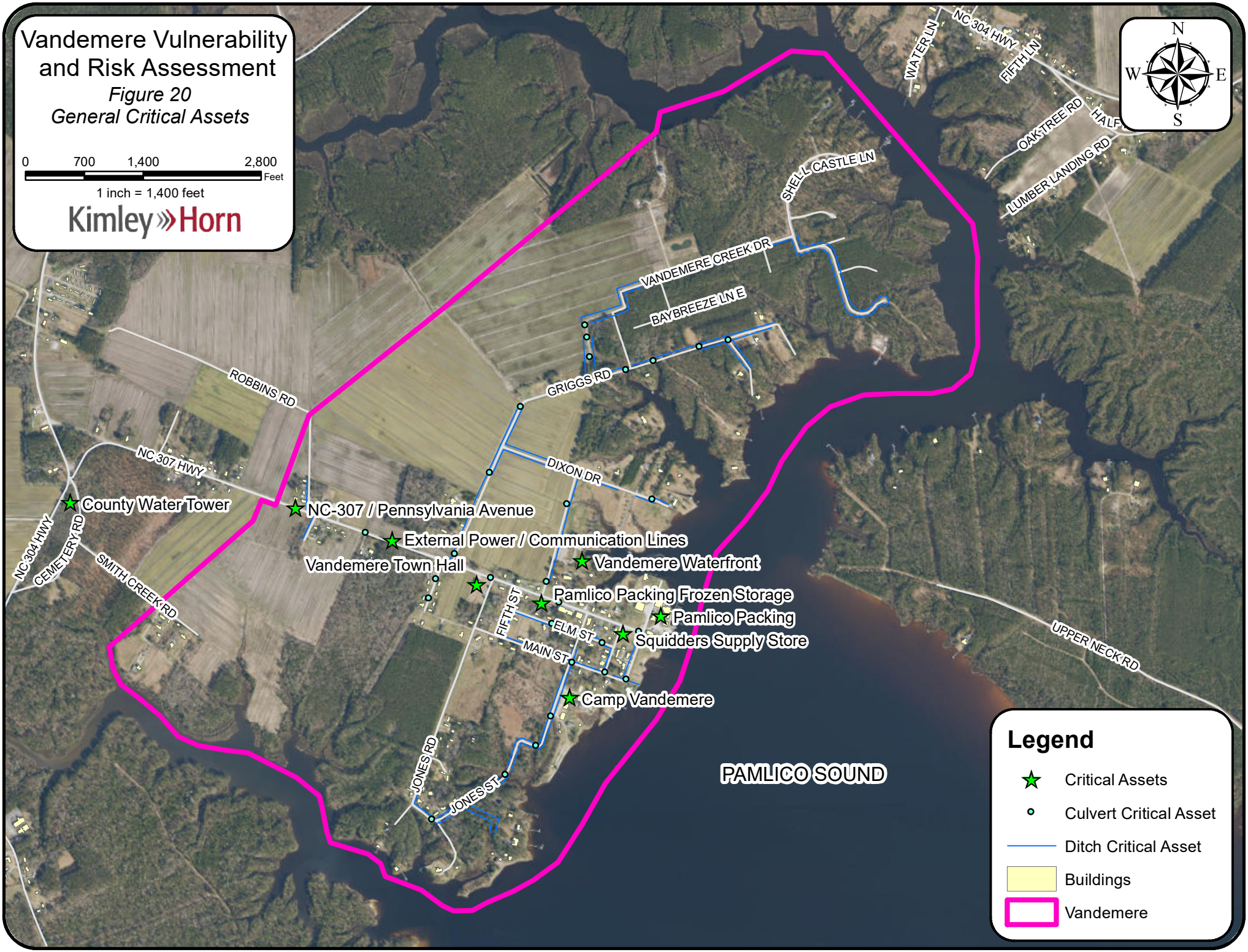
	• In the plan, the following projects were identified within Vandemere and designated as high priority: Griffin Road, Town Hall, Griggs Road, Jones Road and Pennsylvania Avenue.
Pamlico County Joint CAMA Land Use Plan [15]	• The document is the current land use plan adapted by Pamlico County, including Vandemere. • The plan helps ensure that new development and land uses are consistent with the county's goals. • Additionally, it is used by local governments to develop ordinances related to development. The county is currently looking to update this plan.

Appendix B – Critical Assets

Critical Assets Locations

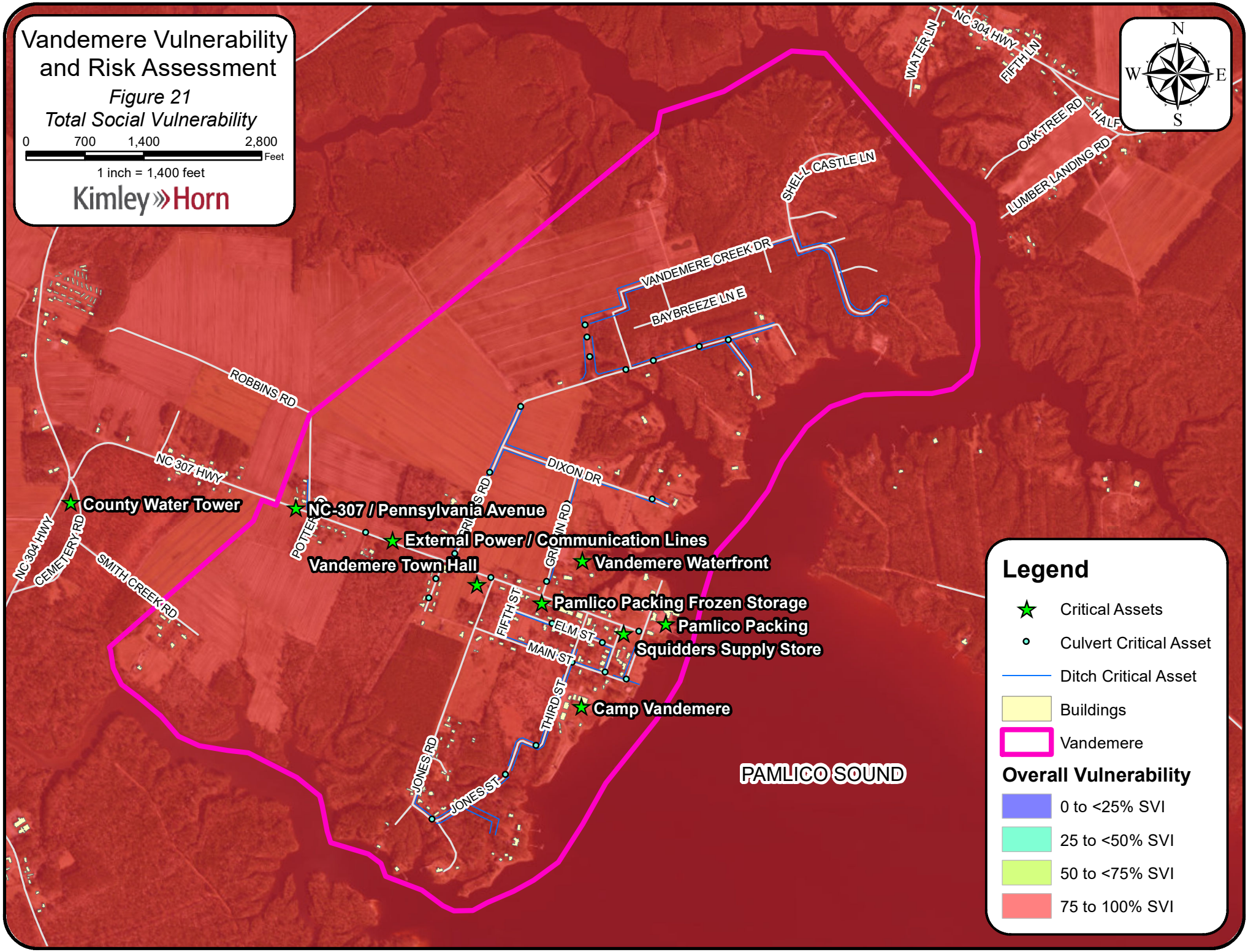
In the table below, the critical assets are listed with their current address. Additionally, a description is provided to detail the selection of the critical asset.

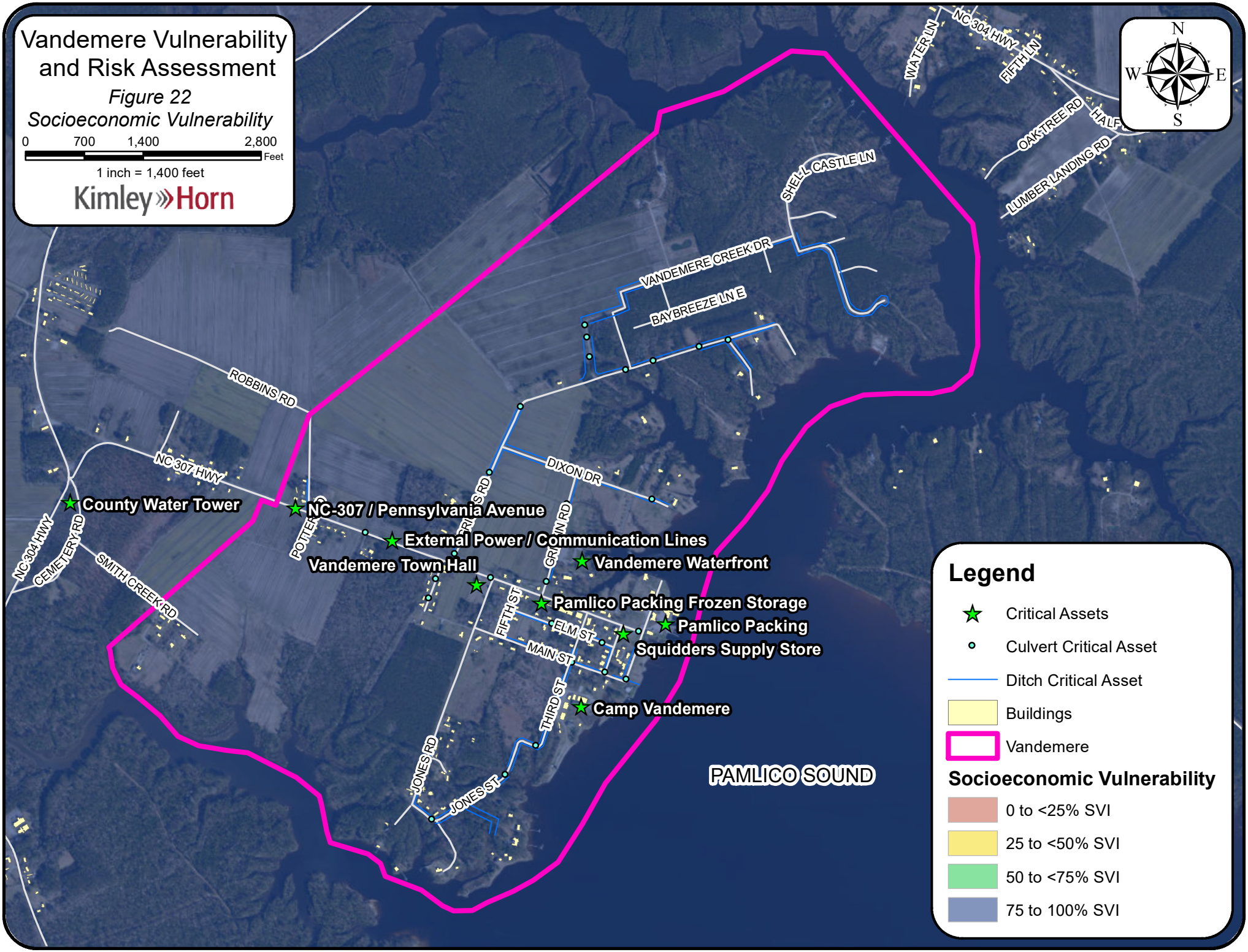
Critical Asset	*Address*	*Description*
County Water Tower	286 NC-307, Vandemere, NC	The water tower is just outside of Vandemere and is the community's water source.
NC-307/Pennsylvania Avenue	-	NC 307/Pennsylvania Avenue is the only ingress and egress to Vandemere. When it is blocked, residents are not able to enter or exit the community.
Vandemere Town Hall	1042 Pennsylvania Ave, Vandemere, NC	The Town Hall buildings contains the fire station and the town offices. During extreme weather events, the Town Hall serves as a gathering place and response hub. Additionally, it houses town documents and records.
Squidders Supply Store	1370 Pennsylvania Ave, Vandemere, NC	Squidders Supply Store is a local convenience store that offers food and basic supplies.
Pamlico Packing Frozen Storage	1192 Pennsylvania Ave, Vandemere, NC	Pamlico Packing stores their products in the frozen storage building before distribution across the state. Damage to this facility would be detrimental to Pamlico Packing.
Vandemere Waterfront	36 Griffin Rd, Vandemere, NC	The Vandemere waterfront is a community park and boat ramp. During hazards, it serves as a gathering place and as an access point for the community.
Pamlico Packing	28 1st Street, Vandemere, NC	Pamlico Packing is a local seafood business that distributes seafood across the state. It is a vital business for Vandemere.
Camp Vandemere	177 3rd St, Vandemere, NC	Camp Vandemere is a year-round camp serving children and service groups. It is vital to the Vandemere community.
Culverts	-	Culverts allow water to be carried underneath a roadway. The flooding of culverts in Vandemere isolates residents by blocking roads.
External Power / Communication Lines	NC-307/Pennsylvania Avenue	The power and communication lines along NC-307/Pennsylvania provide vital utilities to the community.

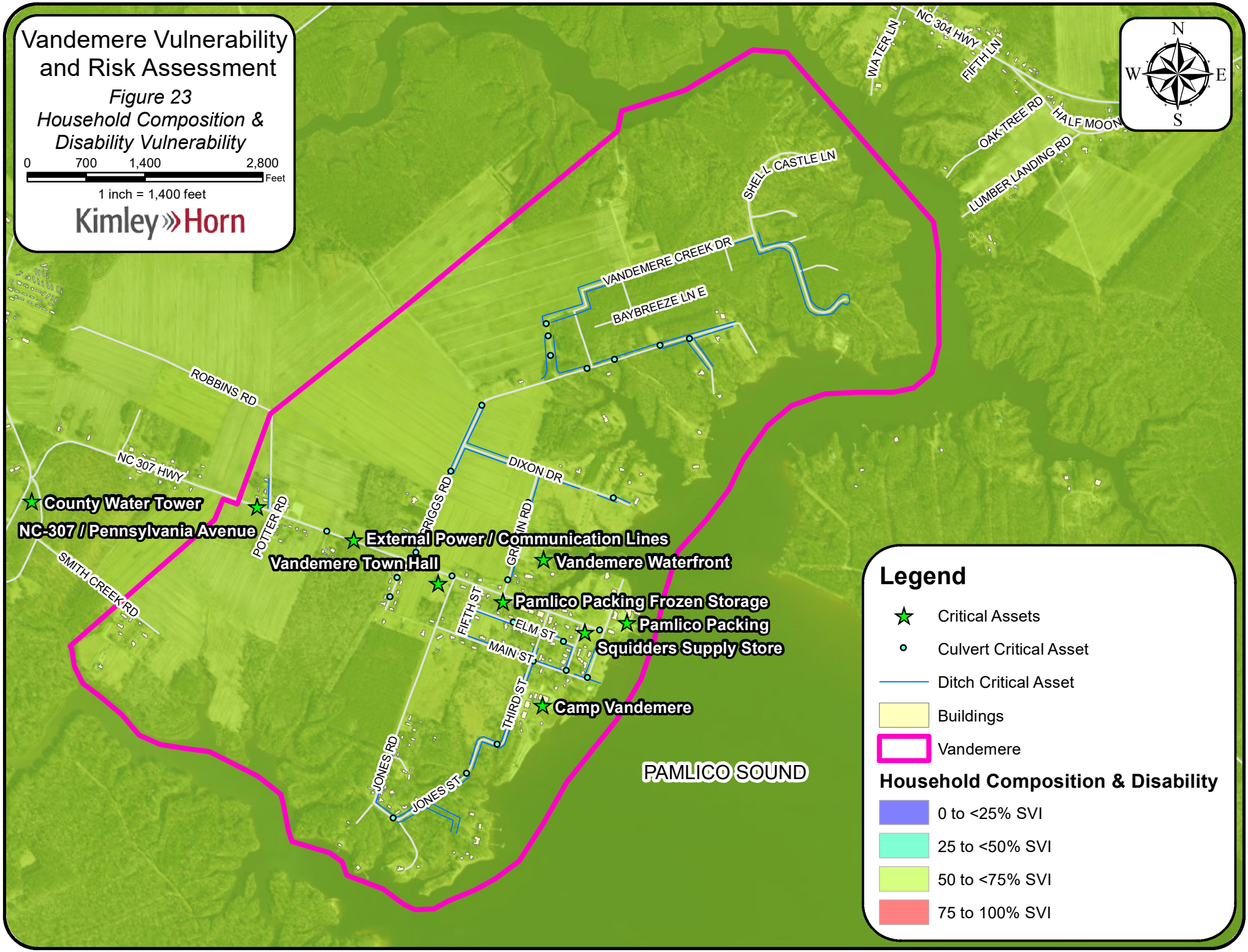

Vandemere Vulnerability and Risk Assessment
Figure 20
General Critical Assets
0 700 1,400 2,800
Feet
1 inch = 1,400 feet
Kimley»Horn
N
W
E
S
WATER LN
NC 304 HWY
FIFTH LN
OAKTREE RD
HALF
LUMBER LANDING RD
SHELL CASTLE LN
VANDEMERE CREEK DR
BAYBREEZE LN E
GRIGGS RD
ROBBINS RD
NC 307 HWY
DIXON DR
County Water Tower
NC-307 / Pennsylvania Avenue
External Power / Communication Lines
Vandemere Town Hall
Vandemere Waterfront
Pamlico Packing Frozen Storage
Pamlico Packing
Squidders Supply Store
NC-304 HWY
CEMETERY RD
SMITH CREEK RD
FIFTH ST
ELM ST
MAIN ST
UPPER NECK RD
Camp Vandemere
JONES RD
JONES ST
PAMLICO SOUND
Legend
Critical Assets
Culvert Critical Asset
Ditch Critical Asset
Buildings
Vandemere

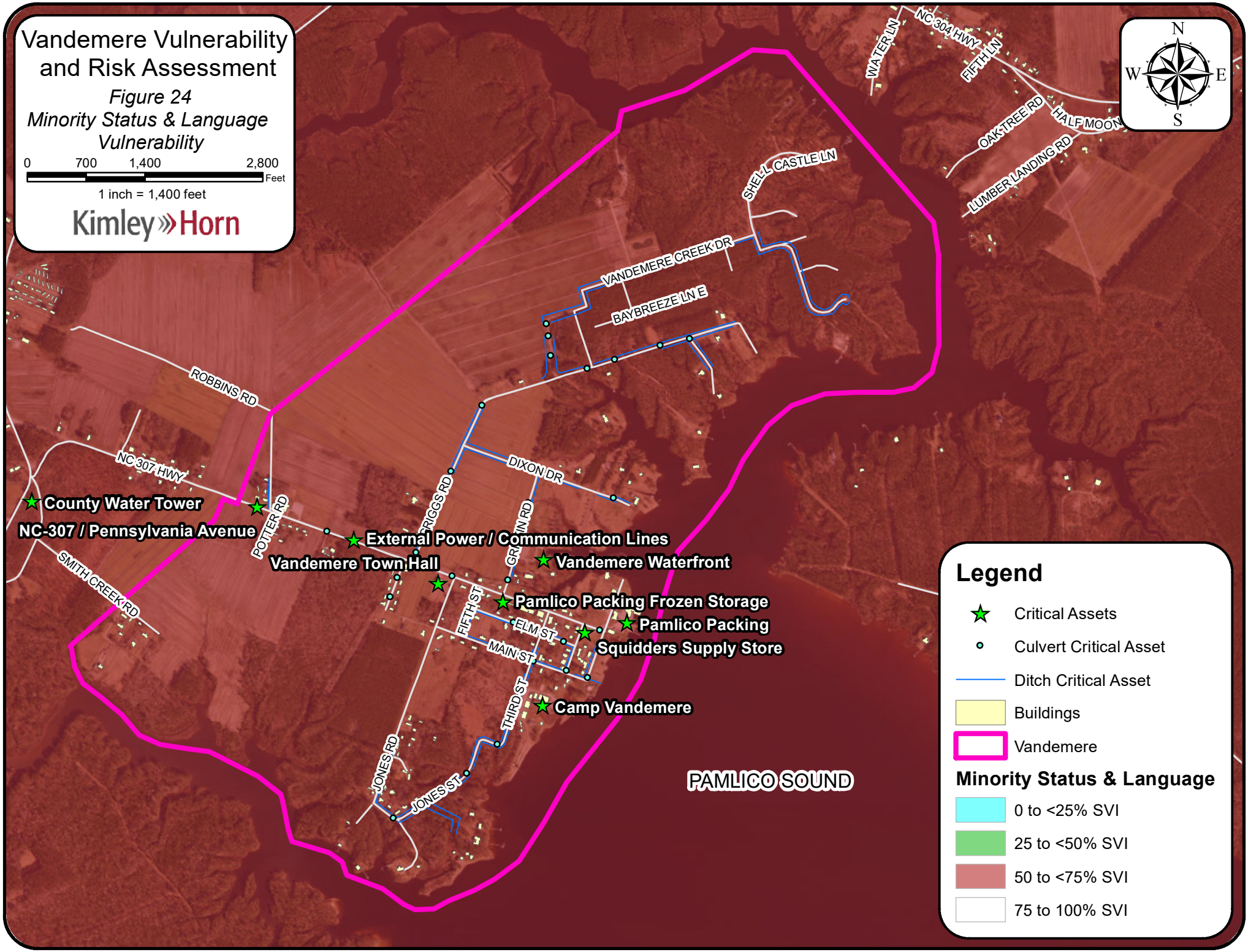
Appendix C – Social Vulnerability Maps

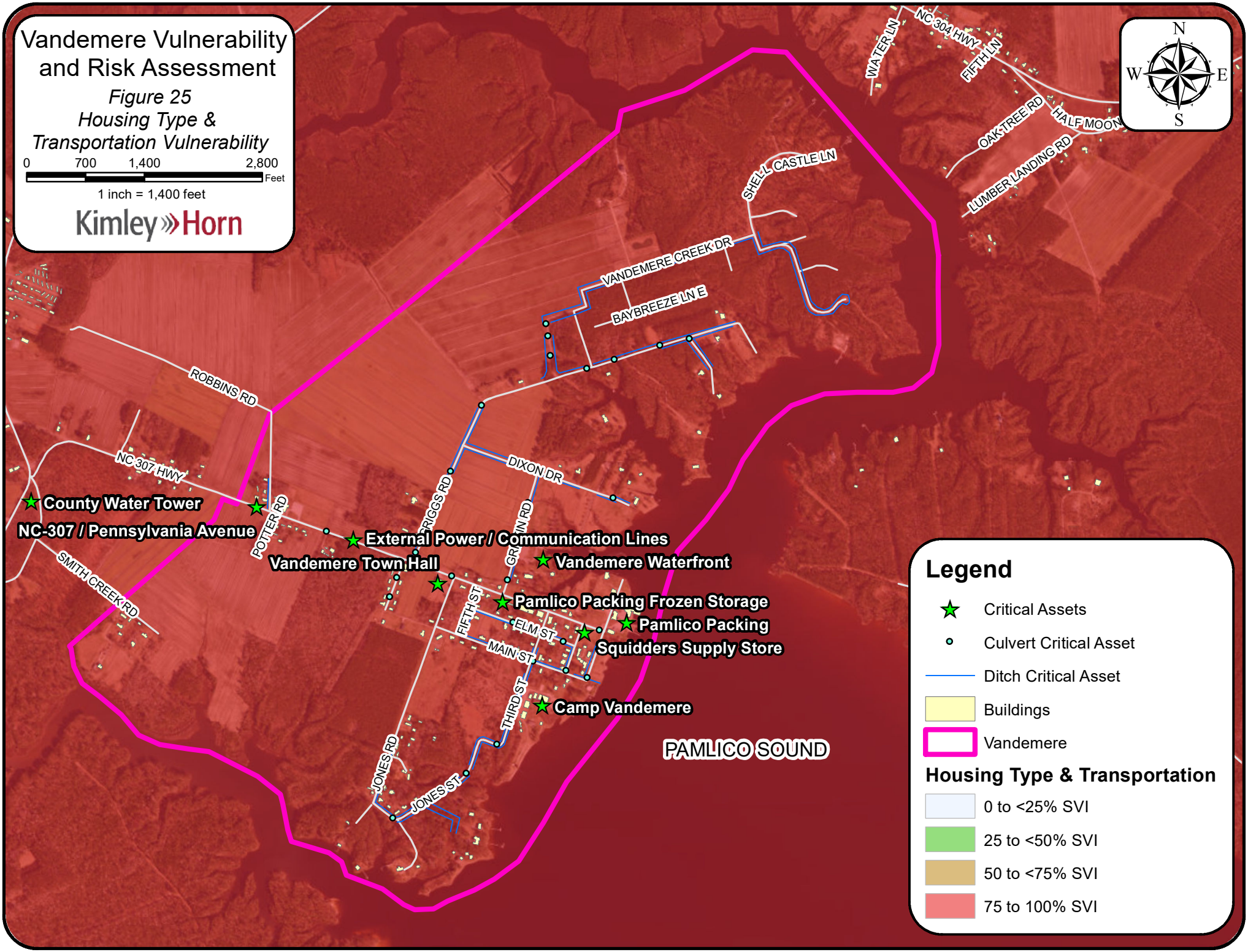
The following maps detail the overall social vulnerability for Vandemere when compared to other census tracts within North Carolina. Additionally, the maps are broken into the four social vulnerability themes: Socioeconomic Vulnerability, Household Composition and Disability Vulnerability, Minority Status and Language Vulnerability, and Housing Type and Transportation Vulnerability.


Vandemere Vulnerability and Risk Assessment
Figure 21
Total Social Vulnerability
0 700 1,400 2,800
Feet
1 inch = 1,400 feet
Kimley»Horn
N
W
E
S
WATER LN
NC 304 HWY
FIFTH LN
OAK TREE RD
HALF
LUMBER LANDING RD
SHELL CASTLE LN
VANDEMERE CREEK DR
BAYBREEZE LN E
ROBBINS RD
NC 307 HWY
DIXON DR
County Water Tower
NC-307 / Pennsylvania Avenue
External Power / Communication Lines
Vandemere Town Hall
Vandemere Waterfront
Pamlico Packing Frozen Storage
Pamlico Packing
Squidders Supply Store
Camp Vandemere
NC 304 HWY
CEMETERY RD
SMITH CREEK RD
POTTERS RD
GRIFFIN RD
FIFTH ST
ELM ST
MAIN ST
THIRD ST
JONES RD
JONES ST
PAMLICO SOUND
Legend
Critical Assets
Culvert Critical Asset
Ditch Critical Asset
Buildings
Vandemere
Overall Vulnerability
0 to <25% SVI
25 to <50% SVI
50 to <75% SVI
75 to 100% SVI


Vandemere Vulnerability and Risk Assessment
Figure 22
Socioeconomic Vulnerability
0 700 1,400 2,800
Feet
1 inch = 1,400 feet
Kimley»Horn
N
W
E
S
WATER LN
NC 304 HWY
FIFTH LN
OAKTREE RD
HALF
LUMBER LANDING RD
SHELL CASTLE LN
VANDEMERE CREEK DR
BAYBREEZE LN E
ROBBINS RD
NC 307 HWY
DIXON DR
County Water Tower
NC-307 / Pennsylvania Avenue
External Power / Communication Lines
Vandemere Town Hall
Vandemere Waterfront
Pamlico Packing Frozen Storage
Pamlico Packing
Squidders Supply Store
Camp Vandemere
NC 304 HWY
CEMETERY RD
SMITH CREEK RD
POTTERS RD
GRIN RD
FIFTH ST
ELM ST
MAIN ST
THIRD ST
JONES RD
JONES ST
PAMLICO SOUND
Legend
Critical Assets
Culvert Critical Asset
Ditch Critical Asset
Buildings
Vandemere
Socioeconomic Vulnerability
0 to <25% SVI
25 to <50% SVI
50 to <75% SVI
75 to 100% SVI

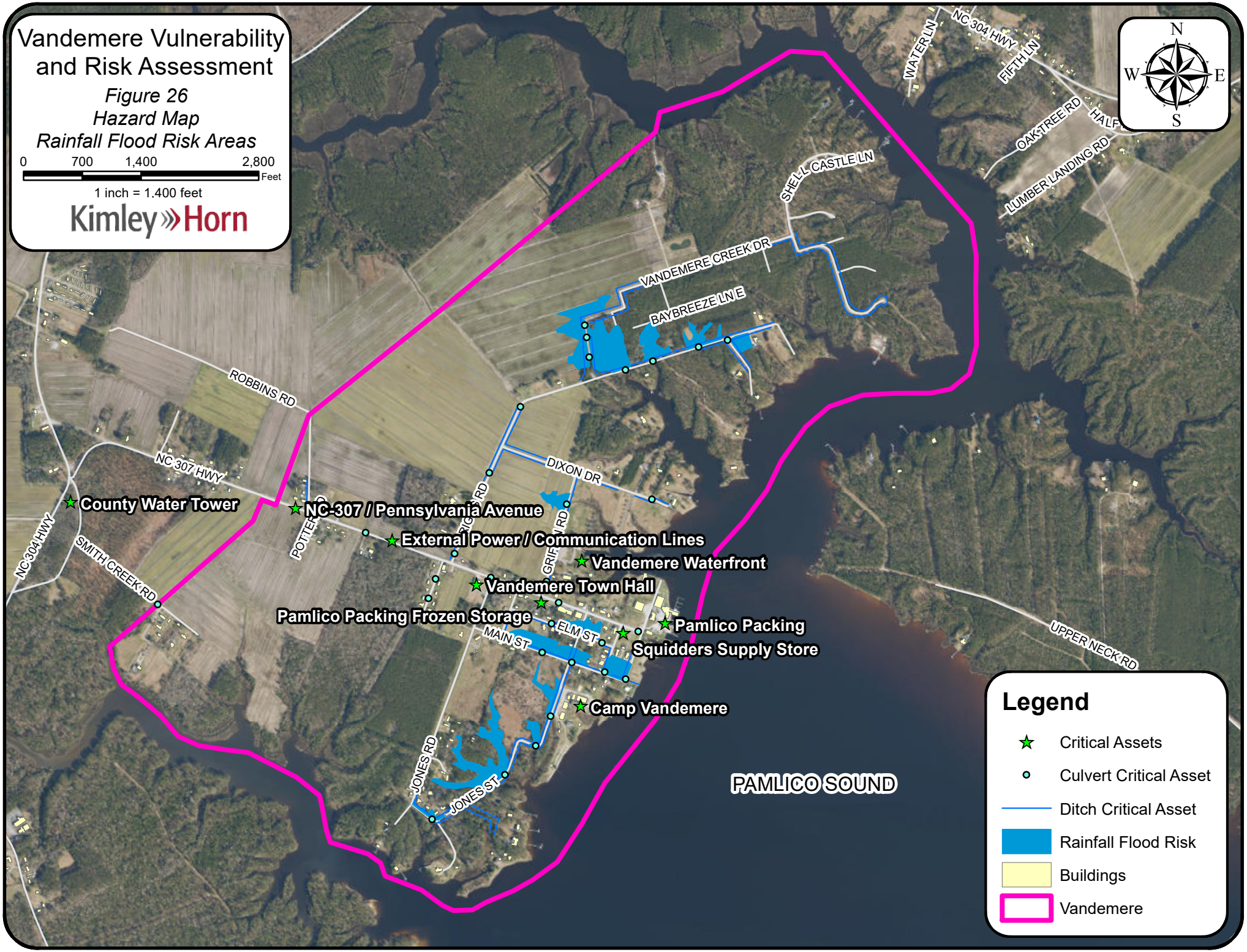

Vandemere Vulnerability and Risk Assessment
Figure 23
Household Composition & Disability Vulnerability
0 700 1,400 2,800
Feet
1 inch = 1,400 feet
Kimley»Horn
N
W
E
S
WATER LN
NC 304 HWY
FIFTH LN
OAK TREE RD
HALF MOON
LUMBER LANDING RD
SHELL CASTLE LN
VANDEMERE CREEK DR
BAYBREEZE LN E
ROBBINS RD
NC 307 HWY
DIXON DR
RIGGS RD
POTTER RD
SMITH CREEK RD
County Water Tower
NC-307 / Pennsylvania Avenue
External Power / Communication Lines
Vandemere Town Hall
Vandemere Waterfront
Pamlico Packing Frozen Storage
Pamlico Packing
Squidders Supply Store
FIFTH ST
ELM ST
MAIN ST
THIRD ST
Camp Vandemere
JONES RD
JONES ST
PAMLICO SOUND
Legend
Critical Assets
Culvert Critical Asset
Ditch Critical Asset
Buildings
Vandemere
Household Composition & Disability
0 to <25% SVI
25 to <50% SVI
50 to <75% SVI
75 to 100% SVI

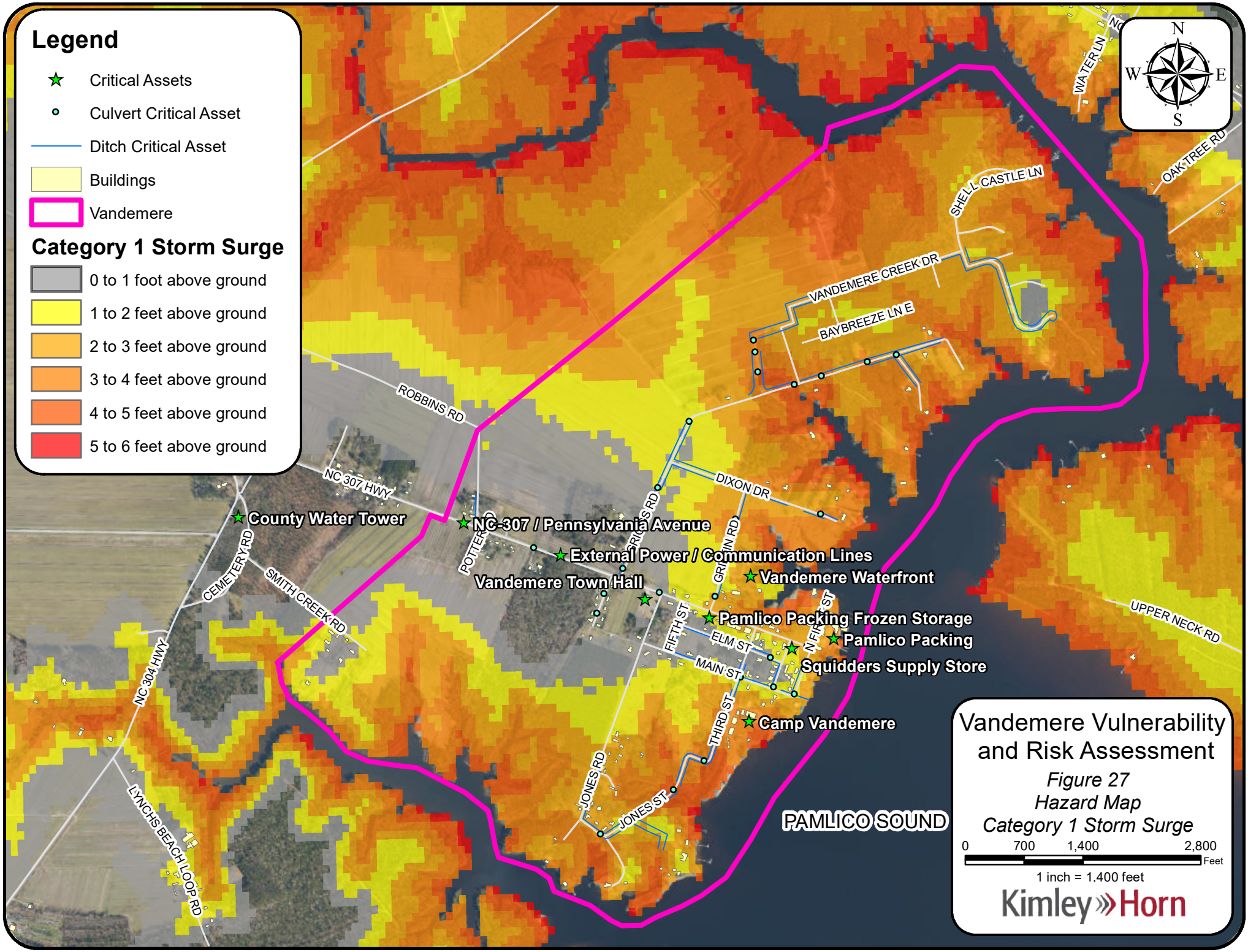

Vandemere Vulnerability and Risk Assessment
Figure 24
Minority Status & Language Vulnerability
0 700 1,400 2,800
Feet
1 inch = 1,400 feet
Kimley»Horn
N
W
E
S
WATER LN
NC 304 HWY
FIFTH LN
OAK TREE RD
HALF MOON
LUMBER LANDING RD
SHELL CASTLE LN
VANDEMERE CREEK DR
BAYBREEZE LN E
ROBBINS RD
NC 307 HWY
DIXON DR
RIGGS RD
GRIFFIN RD
POTTER RD
SMITH CREEK RD
FIFTH ST
ELM ST
MAIN ST
THIRD ST
JONES RD
JONES ST
County Water Tower
NC-307 / Pennsylvania Avenue
External Power / Communication Lines
Vandemere Town Hall
Vandemere Waterfront
Pamlico Packing Frozen Storage
Pamlico Packing
Squidders Supply Store
Camp Vandemere
PAMLICO SOUND
Legend
Critical Assets
Culvert Critical Asset
Ditch Critical Asset
Buildings
Vandemere
Minority Status & Language
0 to <25% SVI
25 to <50% SVI
50 to <75% SVI
75 to 100% SVI

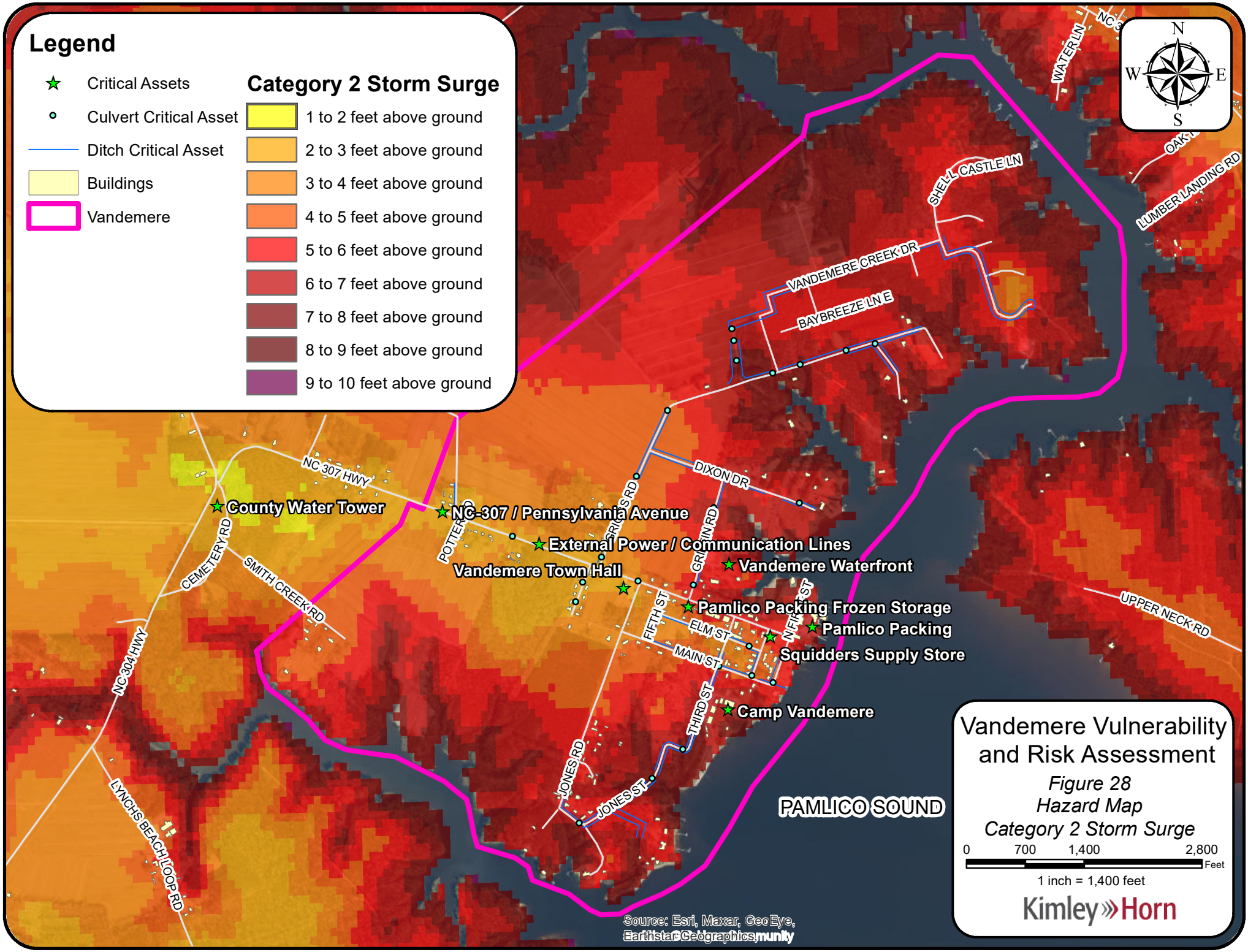

Vandemere Vulnerability and Risk Assessment
Figure 25
Housing Type & Transportation Vulnerability
0 700 1,400 2,800
Feet
1 inch = 1,400 feet
Kimley»Horn
N
W
E
S
WATER LN
NC 304 HWY
FIFTH LN
OAK TREE RD
HALF MOON
LUMBER LANDING RD
SHELL CASTLE LN
VANDEMERE CREEK DR
BAYBREEZE LN E
ROBBINS RD
NC 307 HWY
DIXON DR
RIGGS RD
GRIFFIN RD
POTTER RD
SMITH CREEK RD
County Water Tower
NC-307 / Pennsylvania Avenue
External Power / Communication Lines
Vandemere Town Hall
Vandemere Waterfront
Pamlico Packing Frozen Storage
Pamlico Packing
Squidders Supply Store
FIFTH ST
ELM ST
MAIN ST
THIRD ST
Camp Vandemere
JONES RD
JONES ST
PAMLICO SOUND
Legend
Critical Assets
Culvert Critical Asset
Ditch Critical Asset
Buildings
Vandemere
Housing Type & Transportation
0 to <25% SVI
25 to <50% SVI
50 to <75% SVI
75 to 100% SVI

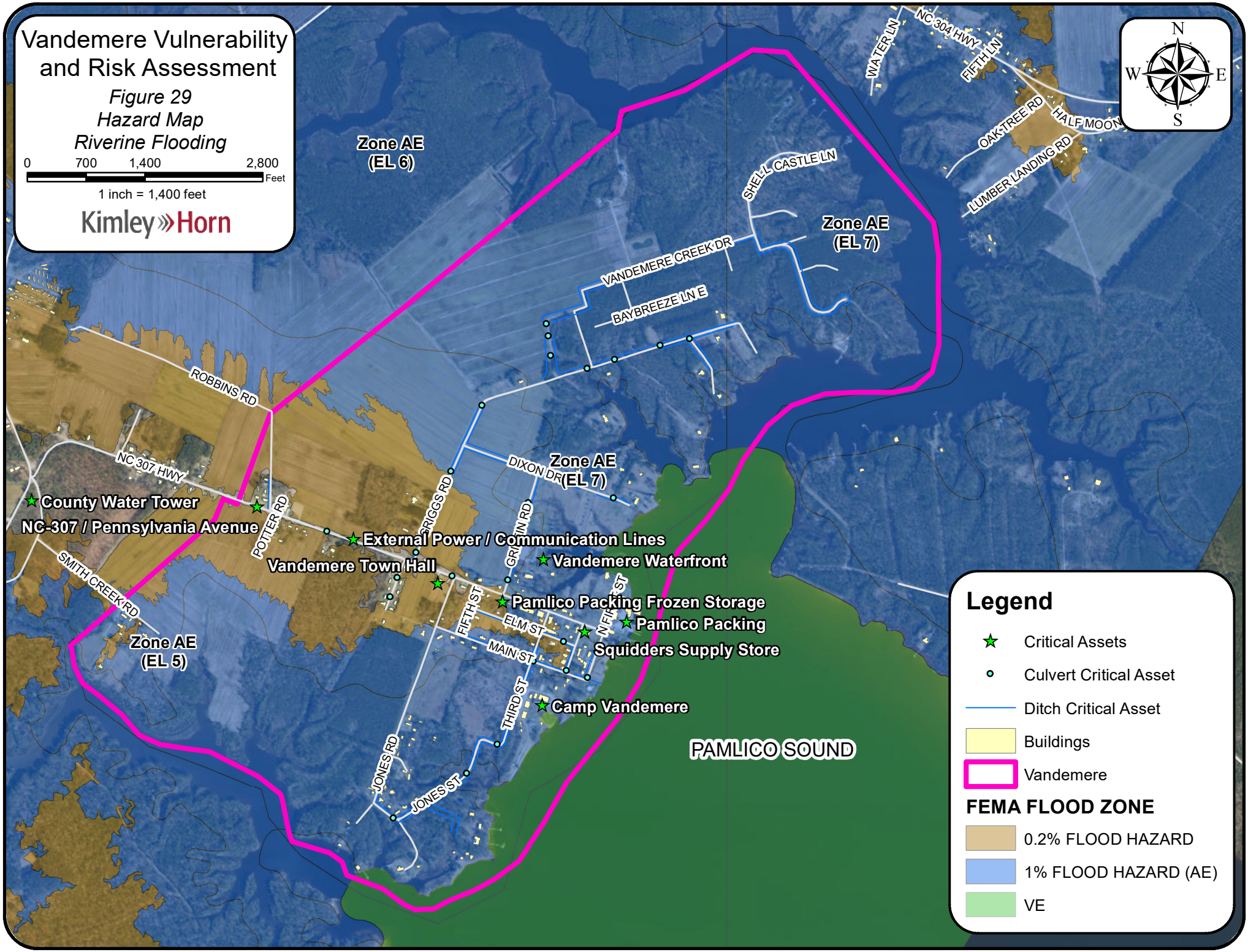
Appendix D – Hazard Maps

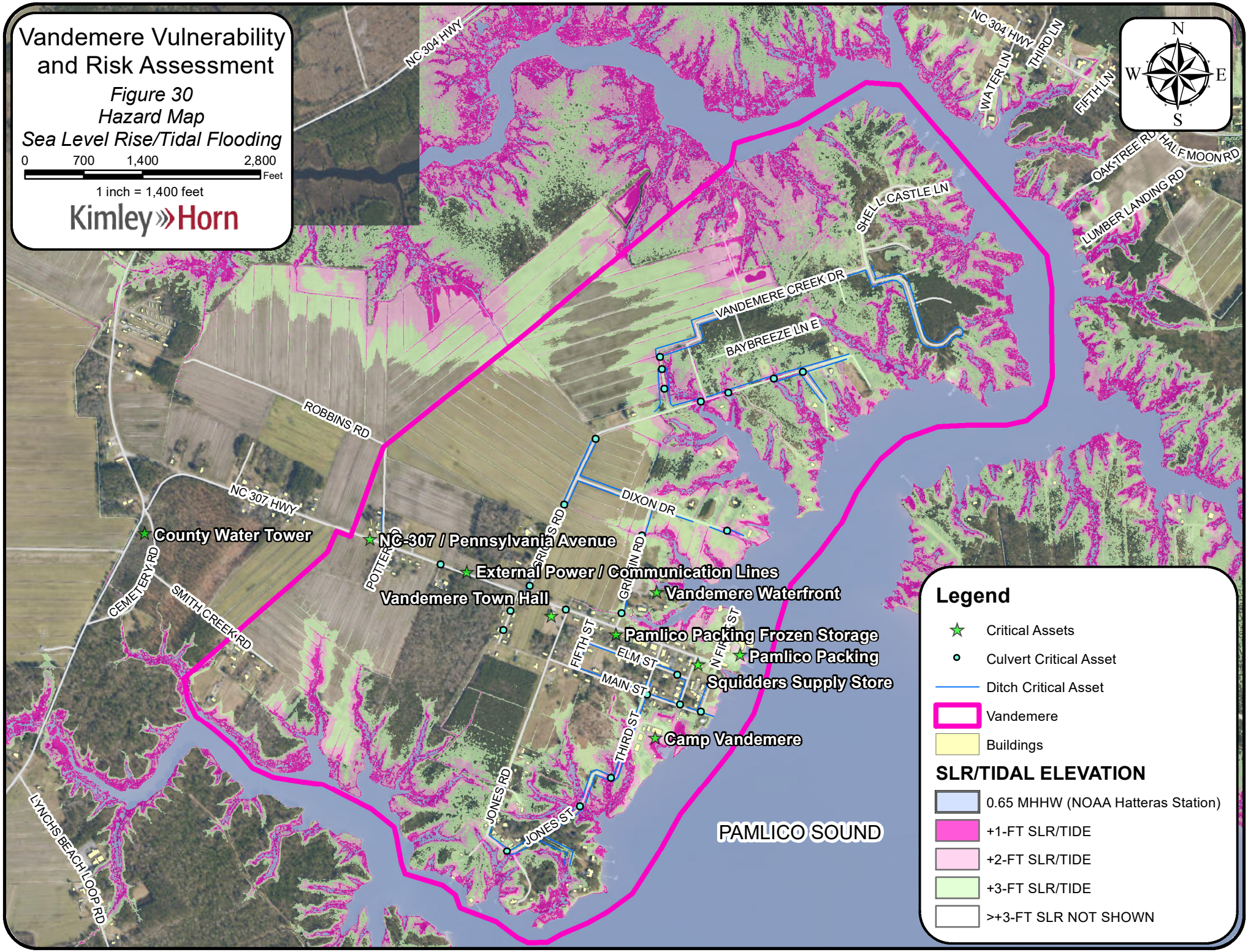
The following maps show the identified hazards in relation to the critical assets for Vandemere. The hazards mapped include Rainfall Flooding, Category 1 Storm Surge, Category 2 Storm Surge, Riverine Flooding, and Sea Level Rise / Tidal Flooding.


Vandemere Vulnerability and Risk Assessment
Figure 26
Hazard Map
Rainfall Flood Risk Areas
0 700 1,400 2,800
Feet
1 inch = 1,400 feet
Kimley»Horn
N
W
E
S
WATER LN
NC 304 HWY
FIFTH LN
OAKTREE RD
HALF
LUMBER LANDING RD
SHELL CASTLE LN
VANDEMERE CREEK DR
BAYBREEZE LN E
ROBBINS RD
NC 307 HWY
DIXON DR
County Water Tower
NC-307 / Pennsylvania Avenue
External Power / Communication Lines
Vandemere Waterfront
Vandemere Town Hall
Pamlico Packing Frozen Storage
Pamlico Packing
Squidders Supply Store
ELM ST
MAIN ST
NC 304 HWY
SMITH CREEK RD
POTTER RD
GRIFFIN RD
UPPER NECK RD
Camp Vandemere
JONES RD
JONES ST
PAMLICO SOUND
Legend
Critical Assets
Culvert Critical Asset
Ditch Critical Asset
Rainfall Flood Risk
Buildings
Vandemere


Legend
Critical Assets
Culvert Critical Asset
Ditch Critical Asset
Buildings
Vandemere
Category 1 Storm Surge
0 to 1 foot above ground
1 to 2 feet above ground
2 to 3 feet above ground
3 to 4 feet above ground
4 to 5 feet above ground
5 to 6 feet above ground
N
W
E
S
WATER LN
OAK TREE RD
SHELL CASTLE LN
VANDEMERE CREEK DR
BAYBREEZE LN E
ROBBINS RD
NC 307 HWY
DIXON DR
GRIMES RD
GRIFFIN RD
POTTER RD
CEMETERY RD
SMITH CREEK RD
NC 304 HWY
LYNCHS BEACH LOOP RD
FIFTH ST
NINTH ST
ELM ST
MAIN ST
THIRD ST
JONES RD
JONES ST
UPPER NECK RD
County Water Tower
NC-307 / Pennsylvania Avenue
External Power / Communication Lines
Vandemere Town Hall
Vandemere Waterfront
Pamlico Packing Frozen Storage
Pamlico Packing
Squidders Supply Store
Camp Vandemere
PAMLICO SOUND
Vandemere Vulnerability and Risk Assessment
Figure 27
Hazard Map
Category 1 Storm Surge
0
700
1,400
2,800
Feet
1 inch = 1,400 feet
Kimley»Horn


Legend
Critical Assets
Culvert Critical Asset
Ditch Critical Asset
Buildings
Vandemere
Category 2 Storm Surge
1 to 2 feet above ground
2 to 3 feet above ground
3 to 4 feet above ground
4 to 5 feet above ground
5 to 6 feet above ground
6 to 7 feet above ground
7 to 8 feet above ground
8 to 9 feet above ground
9 to 10 feet above ground
N
W
E
S
WATER LN
NC 3
OAK
LUMBER LANDING RD
SHELL CASTLE LN
VANDEMERE CREEK DR
BAYBREEZE LN E
DIXON DR
GRIGGS RD
GRIFFIN RD
NC 307 HWY
POTTER RD
CEMETERY RD
SMITH CREEK RD
NC 304 HWY
LYNCHS BEACH LOOP RD
FIFTH ST
N FIRST ST
ELM ST
MAIN ST
THIRD ST
JONES RD
JONES ST
UPPER NECK RD
County Water Tower
NC-307 / Pennsylvania Avenue
External Power / Communication Lines
Vandemere Town Hall
Vandemere Waterfront
Pamlico Packing Frozen Storage
Pamlico Packing
Squidders Supply Store
Camp Vandemere
PAMLICO SOUND
Source: Esri, Maxar, GeoEye, Earthstar Geographics, munity
Vandemere Vulnerability and Risk Assessment
Figure 28
Hazard Map
Category 2 Storm Surge
0
700
1,400
2,800
Feet
1 inch = 1,400 feet
Kimley»Horn

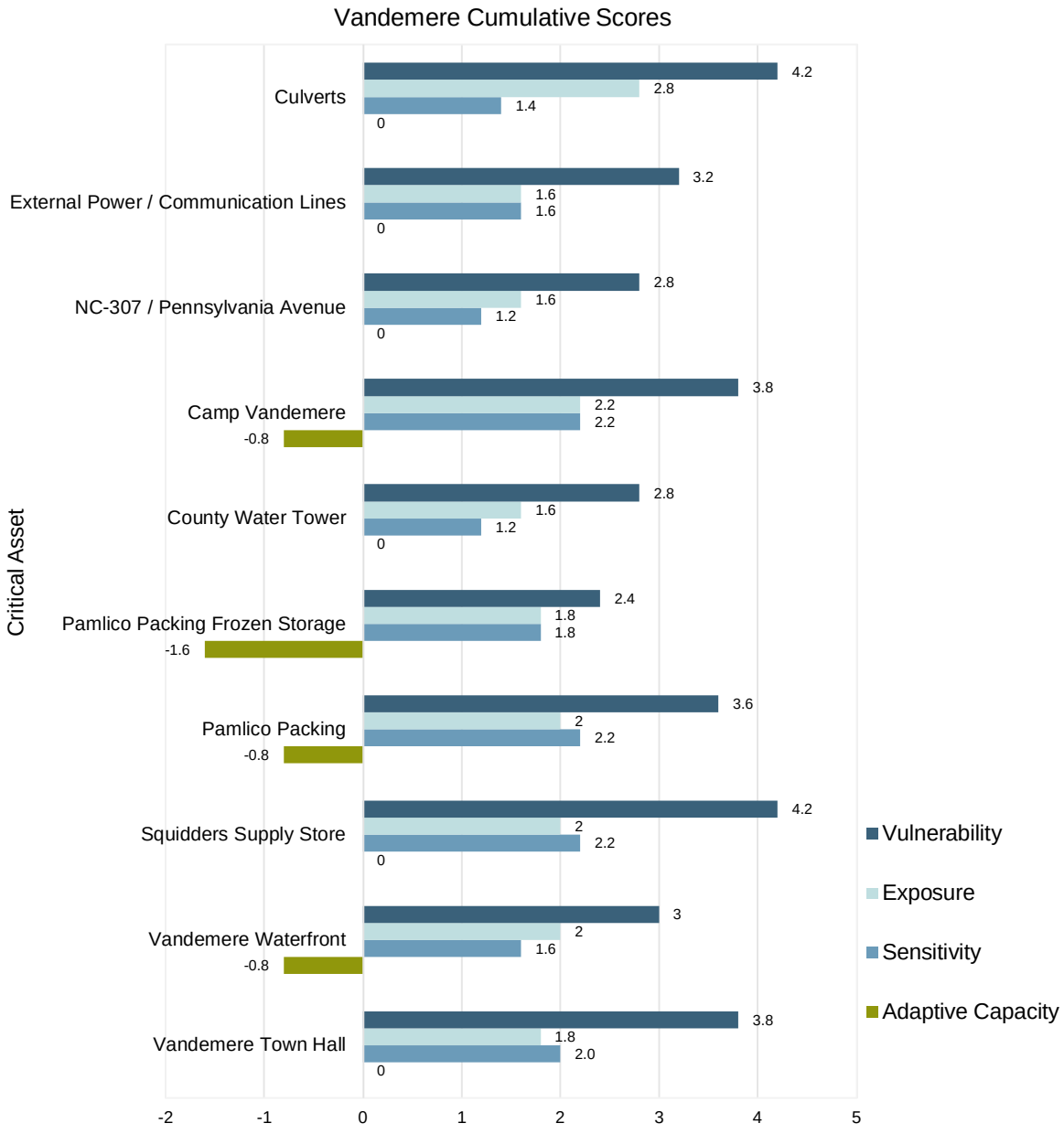

Vandemere Vulnerability and Risk Assessment
Figure 29
Hazard Map
Riverine Flooding
0 700 1,400 2,800
Feet
1 inch = 1,400 feet
Kimley»Horn
N
W
E
S
Zone AE (EL 6)
Zone AE (EL 7)
Zone AE (EL 7)
Zone AE (EL 5)
WATER LN
NC 304 HWY
FIFTH LN
OAK TREE RD
HALF MOON
LUMBER LANDING RD
SHELL CASTLE LN
VANDEMERE CREEK DR
BAYBREEZE LN E
ROBBINS RD
NC 307 HWY
DIXON DR
GRIGGS RD
GRIFFIN RD
POTTER RD
SMITH CREEK RD
FIFTH ST
ELM ST
MAIN ST
NFIRST ST
THIRD ST
JONES RD
JONES ST
County Water Tower
NC-307 / Pennsylvania Avenue
External Power / Communication Lines
Vandemere Town Hall
Vandemere Waterfront
Pamlico Packing Frozen Storage
Pamlico Packing
Squidders Supply Store
Camp Vandemere
PAMLICO SOUND
Legend
Critical Assets
Culvert Critical Asset
Ditch Critical Asset
Buildings
Vandemere
FEMA FLOOD ZONE
0.2% FLOOD HAZARD
1% FLOOD HAZARD (AE)
VE


Vandemere Vulnerability and Risk Assessment
Figure 30
Hazard Map
Sea Level Rise/Tidal Flooding
0 700 1,400 2,800
Feet
1 inch = 1,400 feet
Kimley»Horn
N
W
E
S
NC 304 HWY
WATER LN
THIRD LN
FIFTH LN
OAK TREE RD
HALF MOON RD
LUMBER LANDING RD
SHELL CASTLE LN
VANDEMERE CREEK DR
BAYBREEZE LN E
ROBBINS RD
NC 307 HWY
DIXON DR
GRIFFIN RD
POTTER RD
CEMETERY RD
SMITH CREEK RD
County Water Tower
NC-307 / Pennsylvania Avenue
External Power / Communication Lines
Vandemere Town Hall
Vandemere Waterfront
Pamlico Packing Frozen Storage
Pamlico Packing
Squidders Supply Store
Camp Vandemere
FIFTH ST
ELM ST
MAIN ST
THIRD ST
JONES RD
JONES ST
LYNCHS BEACH LOOP RD
PAMLICO SOUND
Legend
Critical Assets
Culvert Critical Asset
Ditch Critical Asset
Vandemere
Buildings
SLR/TIDAL ELEVATION
0.65 MHHW (NOAA Hatteras Station)
+1-FT SLR/TIDE
+2-FT SLR/TIDE
+3-FT SLR/TIDE
>+3-FT SLR NOT SHOWN

Appendix E – Cumulative Vulnerability

Results

The graph below displays the cumulative vulnerability of the critical assets in relation to exposure, sensitivity, and adaptive capacity. Adaptative capacity is shown as a negative value given that it reduces vulnerability.



Vulnerability Index

In the table below, the developed vulnerability index is shown with the total scores for each critical asset.

Critical Asset	*Exposure (0-3)*	*Sensitivity (0-3)*	*Adaptive Capacity (0-3)*	*Vulnerability (0-6)*
Squidders Supply Store	2	2.2	0	4.2
Culverts	2.8	1.4	0	4.2
Vandemere Town Hall	1.8	2	0	3.8
Camp Vandemere	2.2	2.2	0.8	3.8
Pamlico Packing	2	2.2	0.8	3.6
External Power / Communication Lines	1.6	1.6	0	3.2
Vandemere Waterfront	2	1.6	0.8	3
NC-307 / Pennsylvania Avenue	1.6	1.2	0	2.8
County Water Tower	1.6	1.2	0	2.8
Pamlico Packing Frozen Storage	1.8	1.8	1.6	2.4

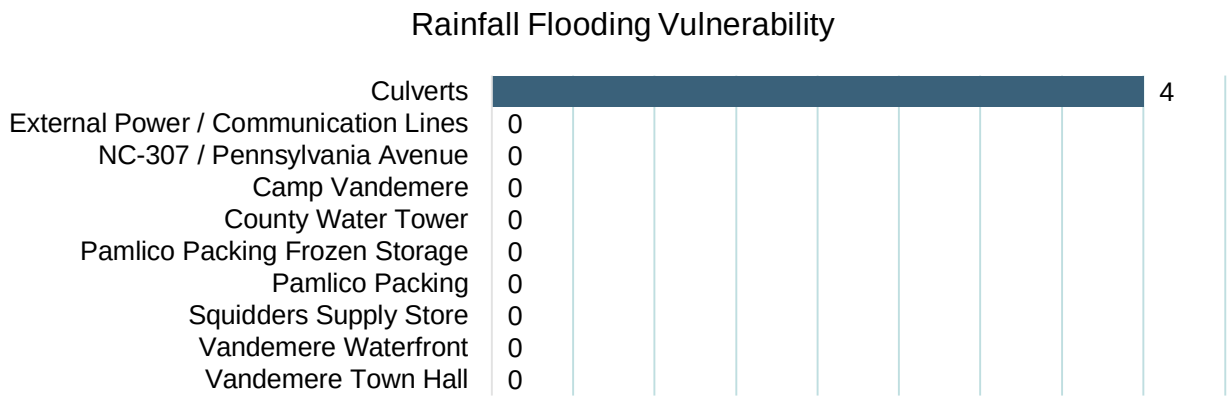
Appendix F – Vulnerability by Hazard

Rainfall Flooding

Scoring Metrics

	Exposure	*Sensitivity*	*Adaptive Capacity*
0	Not Exposed to Culvert Flooding	Not impacted by Culvert Flooding	No implemented solutions
1	-	Exposed to Culvert Flooding	Implemented solution to reduce sensitivity
2	-	-	Implemented solution to reduce exposure
3	Exposed to Culvert Flooding	-	Implemented solution that reduces both exposure and sensitivity

Results



Highly Vulnerable Critical Assets:

Key Findings:

- Culverts are the most vulnerable to rainfall flooding due to their high exposure.
- Other critical assets are not directly exposed to culvert flooding but may lose access due to rainfall flooding. The scoring was determined by overlaying the rainfall flooding map with the critical assets. If the asset was not directly impacted by rainfall flooding, the vulnerability score was a zero. However, these assets may be isolated due to roads being impacted by culvert flooding.
- Roads impacted by culvert flooding include Jones Street, Main Street, Griffin Road, and Griggs Road. This can isolate critical assets including Camp Vandemere and many residents.

Scores:

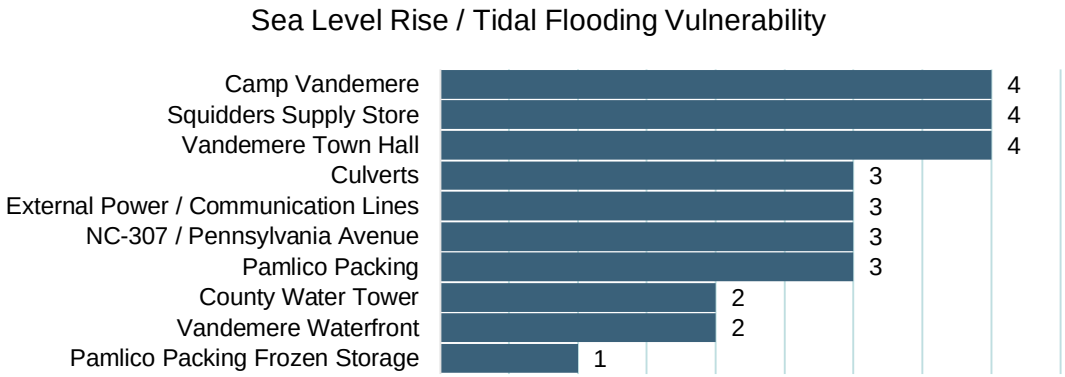
Critical Asset	*Exposure*	*Sensitivity*	*Adaptive Capacity*	*Vulnerability*
Vandemere Town Hall	0	0	0	0
Vandemere Waterfront	0	0	1	0
Squidders Supply Store	0	0	0	0
Pamlico Packing	0	0	1	0
Pamlico Packing Frozen Storage	0	0	2	0
County Water Tower	0	0	0	0
Camp Vandemere	0	0	1	0
NC-307 / Pennsylvania Avenue	0	0	0	0
External Power / Communication Lines	0	0	0	0
Culverts	3	1	0	4

Tidal Flooding / Sea Level Rise

Scoring Metrics

	Exposure	*Sensitivity*	*Adaptive Capacity*
0	Mean Higher High Water	-	No implemented solutions
1	Greater than +3 water level increase	Culverts	Implemented solution to reduce sensitivity
2	+3 to +1 water level increase	Powerline, Roads impacted or Buildings (raised)	Implemented solution to reduce exposure
3	Less than or equal to +1 water level increase	Buildings (not raised), road cutoff	Implemented solution that reduces both exposure and sensitivity

Results



Highly Vulnerable Critical Assets:

Key Findings:

- Camp Vandemere and the Culverts have the highest exposure to sea level rise.
- The most sensitive assets are properties that contain unraised buildings, including the Town Hall, Squidders Supply Store, Camp Vandemere, and Pamlico Packing.
- The analysis focused on the functional centers such as the main building or infrastructure of the critical assets. However, the surrounding property of critical assets may be more impacted by sea level rise and high tides for critical assets such as Camp Vandemere, Pamlico Packing, and the Vandemere Waterfront. This is shown in **Appendix D.**
- Roads impacted by 1' to 3' of sea level rise include Jones Street, Third Street, Griffin Road, Dixon Drive and Griggs Road. Flooding of these access points reduce access to critical assets including Camp Vandemere, the Vandemere Waterfront, and Pamlico Packing. Additionally, many residential areas may be isolated by the projected seal level rise and tidal flooding. This is shown in **Appendix D.**

Scores:

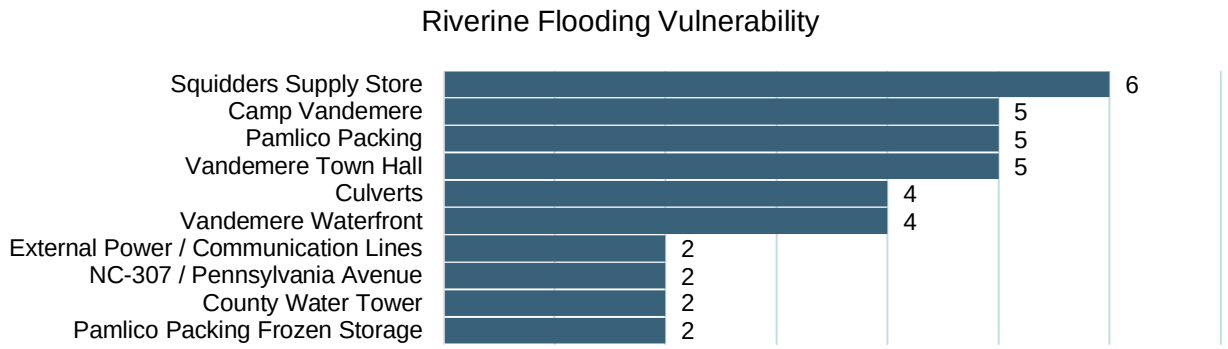
Critical Asset	*Exposure*	*Sensitivity*	*Adaptive Capacity*	*Vulnerability*
Vandemere Town Hall	1	3	0	4
Vandemere Waterfront	1	2	1	2
Squidders Supply Store	1	3	0	4
Pamlico Packing	1	3	1	3
Pamlico Packing Frozen Storage	1	2	2	1
County Water Tower	1	1	0	2
Camp Vandemere	2	3	1	4
NC-307 / Pennsylvania Avenue	1	2	0	3
External Power / Communication Lines	1	2	0	3
Culverts	2	1	0	3

Riverine Flooding

Scoring Metrics

	Exposure	*Sensitivity*	*Adaptive Capacity*
0	No Exposure	Minimal Impact	No implemented solutions
1	Zone X	Low Impact (Culverts, Drainage, Roads, Powerlines)	Implemented solution to reduce sensitivity
2	.2% Flood Hazard	Medium Impact (Buildings all raised)	Implemented solution to reduce exposure
3	1% Flood Hazard (AE)	High Impact (Buildings not raised or some raised)	Implemented solution that reduces both exposure and sensitivity

Results



Highly Vulnerable Critical Assets:

Key Findings:

- Overall, the assets ranked highly for exposure to riverine flooding. 50% of the Critical Assets are within the 100-year floodplain (AE). 70% of the Critical Assets are in either the 100-year or 200-year floodplain.
- The most sensitive assets are properties that contain unraised buildings, including the Town Hall, Squidders Supply Store, Camp Vandemere, and Pamlico Packing.
- The culverts have high exposure to riverine flooding. While the culvert itself is not highly sensitive, the temporary flooding of a culvert can lead to roadway flooding.
- Roads within the 100-year floodplain include NC-307/Pennsylvania Avenue, Jones Drive, Jones Street, Third Street, Griffin Road, Dixon Drive and Griggs Road. Flooding of these access points reduce access to critical assets including Camp Vandemere, the Vandemere Waterfront, and Pamlico Packing. Additionally, many residential areas may be isolated by the projected seal level rise and tidal flooding. This is shown in **Appendix D.**

Scores:

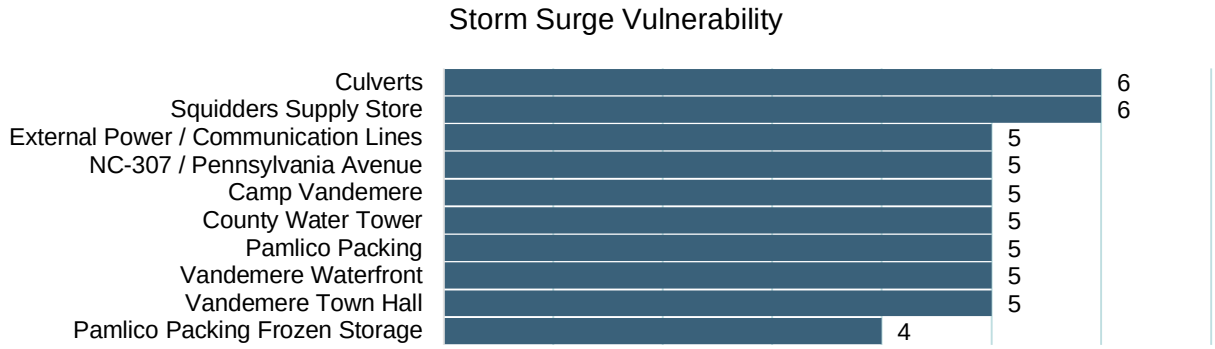
Critical Asset	*Exposure*	*Sensitivity*	*Adaptive Capacity*	*Vulnerability*
Vandemere Town Hall	2	3	0	5
Vandemere Waterfront	3	2	1	4
Squidders Supply Store	3	3	0	6
Pamlico Packing	3	3	1	5
Pamlico Packing Frozen Storage	2	2	2	2
County Water Tower	1	1	0	2
Camp Vandemere	3	3	1	5
NC-307 / Pennsylvania Avenue	1	1	0	2
External Power / Communication Lines	1	1	0	2
Culverts	3	1	0	4

Storm Surge

Scoring Metrics

	Exposure	*Sensitivity*	*Adaptive Capacity*
Metric	Hurricane Return Period	CAT 2 Storm Surge	
0	Greater than 50 Years	Not exposed	No implemented solutions
1	12-49 Years	Less than 3 feet above Ground	Implemented solution to reduce sensitivity
2	8-11 Years	3 feet or greater above ground	Implemented solution to reduce exposure
3	7 or less Years	6 feet or greater above ground	Implemented solution that reduces both exposure and sensitivity

Results



Most Vulnerable Critical Assets:

Key Findings:

- Overall, all the critical assets ranked highly vulnerable for storm surge. Squidders Supply Store and the Culverts reached a maximum vulnerability score of 6.
- All the assets had a high exposure to storm surge given the hurricane return period and size of Vandemere.
- The most sensitive assets were assets near the shoreline and/or in low lying areas. This includes Pamlico Packing Frozen Storage, the Vandemere Waterfront, Pamlico Packing, Camp Vandemere, Squidders Supply Store, and the Culverts.
- All roads within Vandemere are modeled to experience storm surge during a Category 2 Hurricane. Roads that serve as main residential access points such as Jones Road, Jones Street, Third Street, Griggs Road, and Griffin Road are modeled to experience over 5 feet of storm surge flooding. Additionally, NC-307/Pennsylvania Avenue (the only ingress and egress to Vandemere) is shown to experience up to 3 feet of storm surge. This flooding has the potential to isolate Vandemere residents from exiting or entering town during a Category 2 Hurricane. This is shown in **Appendix D.**

Scores:

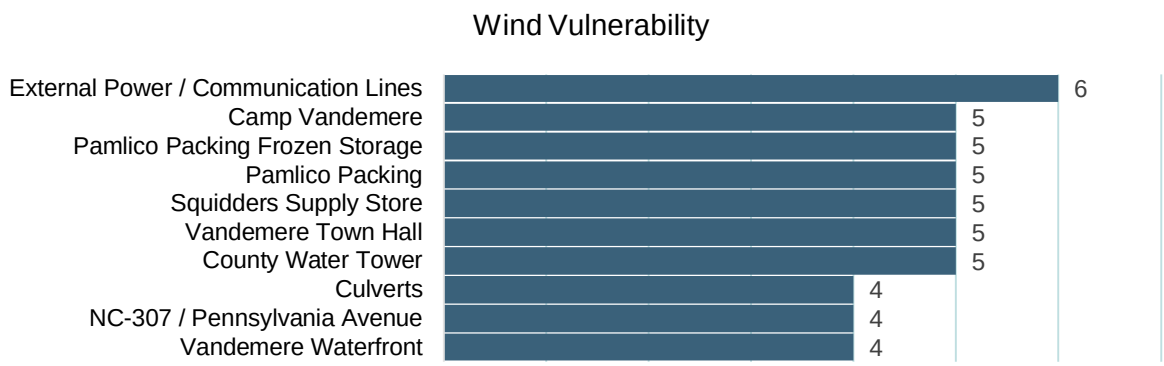
Critical Asset	*Exposure*	*Sensitivity*	*Adaptive Capacity*	*Vulnerability*
Vandemere Town Hall	3	2	0	5
Vandemere Waterfront	3	3	1	5
Squidders Supply Store	3	3	0	6
Pamlico Packing	3	3	1	5
Pamlico Packing Frozen Storage	3	3	2	4
County Water Tower	3	2	0	5
Camp Vandemere	3	3	1	5
NC-307 / Pennsylvania Avenue	3	2	0	5
External Power / Communication Lines	3	2	0	5
Culverts	3	3	0	6

Wind

Scoring Metrics

	Exposure	*Sensitivity*	*Adaptive Capacity*
0	Not Exposed	Minimal impact	No implemented solutions
1	-	low impact from wind - i.e., roads	Implemented solution to reduce sensitivity
2	-	medium impact from wind - i.e., buildings	Implemented solution to reduce exposure
3	Exposed	high impact from wind - i.e., power communication lines	Implemented solution that reduces both exposure and sensitivity

Results



Most Vulnerable Critical Asset:

Key Findings:

- Overall, all the critical assets ranked highly vulnerable for wind.
- The External Power / Communication Lines reached a maximum vulnerability score of 6.
- All the assets had a high exposure to wind given size of Vandemere.

Scores:

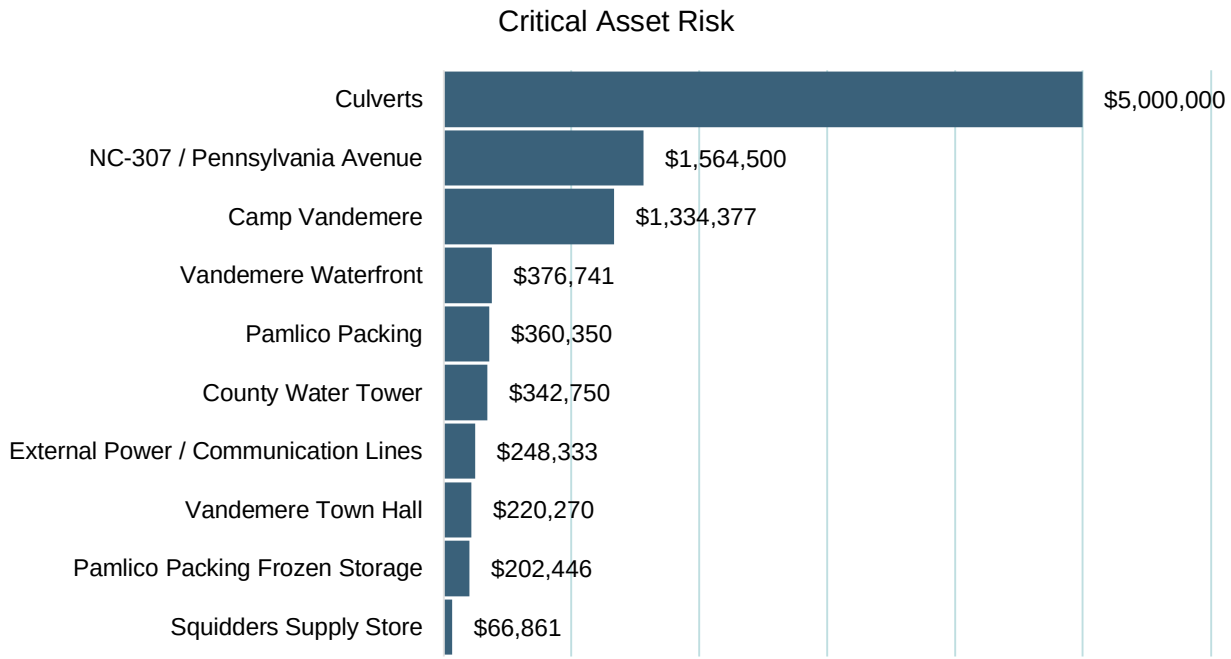
Critical Asset	*Exposure*	*Sensitivity*	*Adaptive Capacity*	*Vulnerability*
Vandemere Town Hall	3	2	0	5
Vandemere Waterfront	3	1	0	4
Squidders Supply Store	3	2	0	5
Pamlico Packing	3	2	0	5
Pamlico Packing Frozen Storage	3	2	0	5
County Water Tower	3	2	0	5
Camp Vandemere	3	2	0	5
NC-307 / Pennsylvania Avenue	3	1	0	4
External Power / Communication Lines	3	3	0	6
Culverts	3	1	0	4

Appendix G – Risk Results

The quantified value at risk for each critical asset and the defined sector is shown in the figure below.

Critical Asset	*Sector*	*Value*
Vandemere Town Hall	Government Facilities	$ 220,270
Vandemere Waterfront	Government Facilities	$ 376,741
Squidders Supply Store	Local Businesses	$ 66,861
Pamlico Packing	Local Businesses	$ 360,350
Pamlico Packing Frozen Storage	Local Businesses	$ 202,446
County Water Tower	Infrastructure/ Utilities	$ 342,750
Camp Vandemere	Local Businesses	$ 1,334,377
NC-307 / Pennsylvania Avenue	Infrastructure/ Utilities	$ 1,564,500
External Power / Communication Lines	Infrastructure/ Utilities	$ 248,333
Culverts	Infrastructure/ Utilities	$ 5,000,000

The graph below shown the quantified value at risk for each critical asset in relation to the other critical assets.



Appendix H – Additional Documents

Resources for Generators *that Support Critical Facilities*

FEMA has multiple grant programs that fund requests for generators, varying types and sizes, including, but not limited to, gasoline, diesel, propane, natural gas, alternator, and gas turbine powered devices. Applicants are able to select the program that best fits their needs and submit a request for funding. Some applicable FEMA-related grants programs include the Emergency Management Performance Grant Program, Homeland Security Grant Program, Port Security Grant Program, State Homeland Security Grant Program, and Urban Areas Security Initiative Program.
https://www.fema.gov/authorized-equipment-list-item/10ge-00-genr#

Homeland Security Grant Program (HSGP)
Provides more than $1 billion for states and urban areas to prevent, protect against, mitigate, respond to, and recover from acts of terrorism and other threats. State Homeland Security Program (SHSP)—provides $415 million to support the implementation of risk-driven, capabilities-based State Homeland Security Strategies to address capability targets. States are required to dedicate 25 percent of SHSP funds to law enforcement terrorism prevention activities.
https://www.dhs.gov/news/2019/04/12/dhs-announces-funding-opportunity-fiscal-year-2019-preparedness-grants

Hazard Mitigation
Generators are emergency equipment that provide a secondary source of power and could be potentially eligible under Hazard Mitigation Assistance (HMA): Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation (PDM) and Flood Mitigation Assistance (FMA) Programs. Generators and related equipment (e.g., hook-ups) are eligible under the HMGP and PDM if they are cost-effective, contribute to a long-term solution to the problem they are intended to address, and meet other program eligibility criteria, which include the following:

- ***PDM Program***: Generators and/or related equipment purchases (e.g., generator hookups) are eligible when the purchase and use of the generator directly relates to the hazards being mitigated and is part of a larger project.

- ***HMGP***: A permanently installed generator that is a stand-alone project can be considered under regular HMGP funding if the generator protects a **critical facility**. Portable generators are eligible if they meet all HMGP requirements as described in 44 C.F.R. § 206.434.

- **5 Percent Initiative** allows **Recipients** under the **Hazard Mitigation Grant Program** (HMGP) to use up to five percent of total HMGP grant funds for projects that are difficult to evaluate using FEMA-approved cost-effectiveness methodologies, but which otherwise meet HMGP eligibility requirements.

**For more information contact the NC Office of Emergency Management.*

Assistance to Firefighters Grant--Federal Emergency Management Agency (FEMA)
The primary goal of the Assistance to Firefighters Grant (AFG) is to meet the firefighting and emergency response needs of fire departments and nonaffiliated emergency medical service organizations. Since 2001, AFG has helped firefighters and other first responders obtain critically needed equipment, protective gear, emergency vehicles, training and other resources necessary for protecting the public and emergency personnel from fire and related hazards.
https://www.fema.gov/assistance-firefighters-grant

Generators funding availability and access will depend on the facility and service supported; some other possible resources include:

Department of Energy (DOE)
The Energy Department supports a number of grants, loan and financing programs. Learn more about these programs and how they can help you -- whether you are a startup energy business looking to launch a pilot project, a company with proven technology that needs help reaching commercial scale, or a state, local or tribal government looking for funding resources for energy projects. National Renewable Energy Laboratory - Technology Deployment, Disaster Resiliency and Recovery.

Department of Energy Announces $8 Million in Funding for Energy System Resilience - The Department of Energy (DOE) announced an $8 million investment in innovative approaches to enhance the reliability and resilience of the nation's energy infrastructure. The partnership opportunity will spur the development of next generation tools and technologies that are not available today that will become widely adopted throughout the energy sector to reduce the risk that a cyber incident could disrupt our energy system including electricity generation, transmission, and distribution as well as the production, refining, storage and distribution of oil and gas. The Office of Cybersecurity, Energy Security, and Emergency Response (CESER) is providing the opportunity on behalf of the Department through the Cybersecurity for Energy Delivery Systems (CEDS) program.
https://www.energy.gov/ceser/office-cybersecurity-energy-security-and-emergency-response

Energy Efficiency and Conservation Block Grant Program
The program provides financial and technical assistance to assist State and local governments to create and implement a variety of energy efficiency and conservation projects. The program's objectives are: to reduce fossil fuel emissions created as a result of activities within the jurisdictions of eligible entities; to reduce the total energy use of the eligible entities; and to improve energy efficiency in the transportation, building, and other sectors. State and local governments including US Territories and Possession are eligible to apply to this potential funding opportunity.
https://www.energy.gov/eere/wipo/energy-efficiency-and-conservation-block-grant-program

USDA Rural Development Emergency Community Water Assistance Grants (ECWAG)
The Department of Agriculture provides from $150,000 to $500,000 to assist a rural community that has experienced a significant decline in quantity or quality of drinking water due to an emergency. Grants cover projects to obtain or maintain adequate quantities of water that meet the standards set by the Safe Drinking Water Act. Emergencies include drought, earthquake, flood, tornado, hurricane, disease outbreak or chemical spill, leakage or seepage. Learn more about the USDA Rural Development Emergency Community Water Assistance Grants (ECWAG).
https://www.rd.usda.gov/programs-services/emergency-community-water-assistance-grants*

USDA Rural Energy for America Program Renewable Energy Systems & Energy Efficiency Improvement Guaranteed Loans & Grants

This program provides guaranteed loan financing and grant funding to agricultural producers and rural small businesses for renewable energy systems or to make energy efficiency improvements. This potential funding opportunity is open to agricultural producers with at least 50% of gross income coming from agricultural operations, and small businesses in eligible rural areas.
https://www.rd.usda.gov/programs-services/rural-energy-america-program-renewable-energy-systems-energy-efficiency

USDA Community Facilities Direct Loan & Grant Program

This program provides affordable funding to develop essential community facilities in rural areas. An essential community facility is defined as a facility that provides an essential service to the local community for the orderly development of the community in a primarily rural area, and does not include private, commercial or business undertakings.
https://www.rd.usda.gov/programs-services/community-facilities-direct-loan-grant-program

Water & Waste Disposal Loan & Grant Program in North Carolina –USDA

This program provides funding for clean and reliable drinking water systems, sanitary sewage disposal, sanitary solid waste disposal, and storm water drainage to households and businesses in eligible rural areas. This program supports the acquisition of equipment that supports the construction/improvement of water systems, e.g. obtaining generators for a constant power source. Eligible applicants for this potential funding opportunity are state and local governmental entities, private nonprofits, and federally-recognized tribes.
https://www.rd.usda.gov/programs-services/water-waste-disposal-loan-grant-program/nc

EPA's Clean Water and Drinking Water State Revolving Funds (SRFs) programs

EPA provides State Revolving Funds grants to states under both Drinking Water and Clean Water. States make low-interest loans to water systems to protect public health and ensure compliance with the Safe Drinking Water Act. States may also set aside money for technical assistance to help utilities assess damages, purchase backup generators, install physical flood barriers and relocate wells. Funds have been used in flood and drought situations. Learn more about the EPA State Revolving Fund (SRF).
https://www.epa.gov/cwsrf and https://www.epa.gov/drinkingwatersrf

HUD CDBG and Section 108 Guaranteed Loans

HUD Community Development Block Grants (CDBGs) are for entitlement communities. CDBGs may also go to states to distribute to non-entitlement communities. Communities must spend at least 70% of these funds for activities that benefit low- and moderate-income persons. Utilities have used these block grants to develop new water sources, improve treatment and replace distribution system pipes. Learn more about HUD CDBG and Section 108 Guaranteed Loans.

HUD Community Development Block Grant– Disaster Recovery (CDBG-DR)

HUD provides flexible grants to help cities, counties, and States recover from Presidentially declared disasters, especially in low-income areas, subject to availability of supplemental appropriations. In response to Presidentially declared disasters, Congress may appropriate additional funding for the Community Development Block Grant (CDBG) Program as Disaster Recovery grants to rebuild the affected areas and provide crucial seed money to start the recovery process. CDBG Disaster Recovery (CDBG-DR) assistance may fund a broad range of recovery activities. *To learn more about availability contact NCORR for North Carolina's HUD CDBG-DR program requirements.*

SBA Disaster Loans

Through its Office of Disaster Assistance, the U.S. Small Business Administration (SBA) can provide low-interest, long term loans to businesses and private nonprofits of all sizes following a disaster. This includes infrastructure assistance to private for-profit (PFP) and private nonprofit (PNP) utilities to restore them to their pre-disaster operability. Learn more about SBA Disaster Loans. https://disasterloan.sba.gov/ela/

Considerations for Non-Profit Needs and Resources:

Good Neighbor Citizenship Company Grants--State Farm

"State Farm provides grants to projects that focus on auto and roadway safety, teen driver education, home safety and fire prevention, disaster preparedness, and disaster recovery. Eligible applicants for this potential funding opportunity are educational institutions; programs conducted by municipal, county, state or federal government entities that align with the State Farm® charitable focus; 501(c)(3) charitable nonprofit organizations; 501(c)(4) volunteer fire companies; and 501(c)(6) chambers of commerce. https://www.statefarm.com/about-us/community-involvement/community-grants/good-neighbor-citizenship-grants

Golden LEAF Foundation

Golden LEAF has provided lasting impact to tobacco-dependent, economically distressed and rural areas of the state helping build both human and physical infrastructure. https://www.goldenleaf.org/grant-recipients/

Duke Energy Foundation

The Duke Energy Foundation is committed to making strategic investments to build powerful communities where nature and wildlife thrive, students can excel, and a talented workforce drives economic prosperity for all. https://www.duke-energy.com/community/duke-energy-foundation