VCU College of Engineering

Project 25-306 CodeRVA
Preliminary Design Report

Prepared for

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CodeRVA

By

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Executive Summary

The Richmond Pump House, once a historic structure used to supply Richmond with drinkable water, has been in a state of disrepair since its closure in 1924. For almost a century it lay in that state until Joseph Costello founded the Friends of the Pump House, an organization dedicated to restoring the Pump House to its former glory. However restoring the Pump House doesn't come cheap, and even though they have received plenty of funding the Friends of the Pump House will need plenty more if their goals of reopening the Pump House as a social gathering hub and museum are to be realized.

To help raise awareness of this effort by the Friends of the Pump House, our VCU Capstone team has partnered with a select group of CodeRVA seniors to produce a replica of the Richmond Pump House in Fortnite using the Unreal Editor for Fortnite (UEFN). By creating this replica, along with an interactive island, we aim to engage and educate a younger generation, particularly ages 18-24, on the Pump House in an effort to excite them for the Pump House's revival and even get them to aid in any way they can.

In order to achieve this goal we aim to have a fully functioning Fortnite Island, similar to the one created by the TIMES in order of Martin Luther King Jr, of the Richmond Pump House by April 23rd, 2025. This island will include a fully realized reaction of the Richmond Pump House's exterior, the land and rivers that surround it, a main story quest that will educate players on the Pump House, and interactive game aspects to engage the player. We will achieve this by teaming up with CodeRVA students who will aid in coding, modeling, storytelling and polishing the island to perfection.

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Section A. Problem Statement

Pump House Park has fallen into a state of disrepair since its closure in 1924 (Schuhart, 2021). In its heyday, it was tasked with moving 12 million gallons of drinkable water into the nearby reservoir that is now Byrd Park (Friends of James River Park, 2020). Not only was the facility located on the park responsible for providing drinkable water to Richmond population (Historic Richmond, 2020), but the second floor's Ballroom hosted parties, weddings, and other events for Richmond's social elite (Joachim, 2024).

But upon its closure in 1924, the Pump House fell into disarray. Nearly avoiding destruction by the City of Richmond in the 1950s, the Pump House was left to rot and be defaced for almost a century (Friends of Pump House, n.d)! That's when, in May of 2017, Joseph Costello founded the Friends of the Pump House in order to rejuvenate this once-pristine gem of Richmond (Schuhart, 2021).

However, one of the primary concerns is the cost of the project. Twelve million dollars of funding were secured in 2022 by the James River Park Service Master Plan (Joachim, 2024), but even then, the executive director of the Friends of the James River Park, Josh Stutz, stated that the budget was "a moving target" (Joachim, 2024). Even with more recent funding from the Roller-Bottimore Foundation, spokesperson Chris Crews stated that they'd need about "$5 million [more] to properly open it for public events" (Peifer, 2023). That means that until then, the Pump House won't be able to generate its own revenue and will still require funding.

With this problem at hand, we have set our sights on helping to advertise the Richmond Pump House through the creation of a Fortnite Island using Unreal Editor for Fortnite (UEFN). We decided on creating a virtualized version of the Richmond Pump House in Fortnite for two main reasons.

Our primary reason for creating Fortnite Island is to expand the reach of a younger, wider demographic and not only educate them on the Richmond Pump House but to also get them both excited and motivated to support its restoration.

Fortnite, released to the public in 2017, has been one of the most popular video games of all time. For reference, Fortnite reported an all-time peak of 44.7 million players on November 5, 2023, in response to the company releasing their limited-time game mode "Fortnite OG" (Davis, 2023). This puts it leaps and bounds beyond its previous rival in the Battle Royale sphere, PUBG Battleground, which had an all-time peak of 3,257,248 players (steamdb, n.d.). Within the millions of active Fortnite players, an article from Esports.net claims that 62.7% of players are between the ages of 18-24, which is just about the age range we are looking to capture with this project (Ashley, 2024).

Educational islands also aren't something new to the endless expanse of Fortnite. In 2021, Fortnite partnered with the Times to produce "March Through Time," a Fortnite recreation of Washington D.C. during Martin Luther King Jr.'s famous "I Have a Dream" speech (Epic Games, n.d.). The island allows players to travel to places such as the "Lincoln Memorial and

United States National Mall" (Epic Games, n.d.), along with "museum-inspired points of interest" where players can further learn about Martin Luther King Jr. (Epic Games, n.d.). Players can also participate in "quests" and "mini-games" (Epic Games, n.d.). This map was advertised as an educational experience for anyone, including teachers who could use it to teach their students (Epic Games, n.d.).

Our secondary goal in this project is to give the Friends of the Pump House a highly detailed 3D model of the exterior of the Pump House as it looked back when it was in operation. Although the organization has a physical miniature of the Pump House and a Unity asset of the interior in the works, they don't yet have a 3D recreation of the exterior in any software our team is currently aware of. We will achieve this by using photos, floor plans, and resources found either online or provided by the Friends of the Pump House as key references in this island's creation.

With the "March Through Time" island as our main inspiration, we plan to create a fully realized model of the Richmond Pump House Park with landmarks where players can walk around and do quests to learn more about the history of the area in an exciting way. This plan will be achieved through the aid of CodeRVA students in their junior and senior years, who will help with the modeling and coding of the project in two waves.

By creating Pump House Park as an island in the hit video game Fortnite, we aim to reach a wider and younger demographic. We hope that by showing this demographic Pump House Park in an exciting and historical light, public interest in Pump House Park will increase, and additional funds might be secured to help those working to preserve this hidden gem of a landmark in Richmond.

Section B. Engineering Design Requirements

B.1 Project Goals (i.e. Client Needs)

The main objective of this project is to develop a recreation of The Richmond Pump House in Fortnite using Unreal Editor for Fortnite (UEFN) in order to create an interactive educational experience. To achieve this goal, this team is partnering with CodeRVA's junior-senior students in order to develop The Richmond Pump House. As things look, our clients needs look as such:

- To develop The Richmond Pump House in Fortnite using Unreal Editor for Fortnite

- To develop an interactable environment that will engage players in learning more about The Richmond Pump House through exploration and interaction.

B.2 Design Objectives

The extent to which goals are achieved will vary based on student performance. There are some primary goals which will be prioritized, after which additional objectives will be pursued. Our design objectives are as follows:

- The recreation of The Richmond Pump House is to be faithful to how the pump house was in operation, using the blueprints and other resources we have obtained from The Friends of the Pump House.

- The Richmond Pump House recreation in Fortnite will include not only the pump house, but also the land that makes up the Richmond Pump House Park

- The recreation will use the aspects of Fortnite's gameplay loop (besides combat) in order to create an interactive experience.

- The recreation will display accurate educational information about The Richmond Pump House.

B.3 Design Specifications and Constraints

For our Richmond Pump House Fortnite Island to be a success, the following specifications must be met:

- The Project must match the exterior of The Pump House while it was in operation.
    - Every detail from the tiles on the roof to the glass stained windows must be exactly as they were.

- The Project must also include the surrounding area of The Pump House Park

  o Including any hills, trees, and bodies of water that will have to be following need to be modeled.

- The Project will need to include at least 1 quest with at least 1 mini-game in order give players an interactive experience

  o The 1 quest should be the main story that explains the history of the Pump House throughout

  o The mini game should be used to help progress the story

  o The mini game can also NOT include any violence (gunplay, "knocking out" players or other entities, etc etc)

- The Project must display accurate information whenever speaking about the history of the Pump House or the surrounding area.

However, because of the nature of the project at hand we have found many unique constraints that will test our abilities during the timeframe of the project:

- Design must operate within the constraints of Fortnite and use the Unreal Editor for Fortnite.

  o Because of this, anyone working on the project will need a Windows computer or laptop in order to download Unreal Editor for Fortnite.

- The task of island modeling will primarily be handled by CodeRVA students, with the VCU Capstone team being available to set goals, address problems, and integrate completed tasks as needed. This means that the VCU Capstone team needs to always be more than a few steps ahead of the CodeRVA students in order to keep operations running.

- The CodeRVA students will only be available for 12 weeks, 6 during fall semester and 6 during spring semester, so time will need to be spent wisely to maximize output.

B.4 Codes and Standards

N/A

Section C. Scope of Work

C.1 Deliverables

By the end of this project our client is expecting to have a fully functioning, well researched, accurately recreated Fortnite Island based around the Richmond Pump House and the Richmond Pump House park. Alongside this, our partners at CodeRVA are expecting us to have weekly assignments for both teams to perform for the duration of the project.

In order to meet these deliverables, we will have to overcome the following obstacles:

- Hardware/Software:
  - Since this project is all digital, everyone working on it will need access to a Windows Operating System in order to run UEFN. Alongside that we will need to establish a cloud-based repository so that assets, code and other features can be implemented to the Fortnite Island

- Scheduling:
  - Between the four College seniors, CodeRVA's two representatives and CodeRVA students, we need to find times that work for in-person or remote conversations about the project.

- Students:
  - There may be difficulties creating tasks of appropriate difficulty for interns' skill levels.

C.2 Milestones

Due to the open-ended nature of this project, many milestones, deliverables and other information in this document is written ambiguously on purpose. We aim to work flexibly and adjust our timeline and scope based on how our collaborative work with CodeRVA students progresses. The Milestones for the project are as follows:

1. Contact Made Milestone 8/26 - 9/6

   This milestone will be complete when we have organized ourselves as a team. This includes:

   1. Meeting up and creating some form of communication between the four VCU students

      2. Completing the Team Contract

      3. Met with Dr. Leonard, our project mentor

2. Research Milestone 9/7 - 9/13

This milestone will be complete once the team feels confident that we have enough materials to use to recreate The Richmond Pump House as it looked in operation. This milestone includes:

      1. Visiting the Richmond Pump House

      2. Talking to the Friends of the Pump House and acquiring resources

      3. Getting additional resources on the Pump House and the surrounding area online

      4. Getting resources for learning UEFN

      5. Learning UEFN

3. Github Assignment: 9/13

This milestone will be complete once we finish setting up our Github repository

4. Set Up Milestone: 9/14 - 10/7

This milestone will be completed once we have a basic UEFN model of the land and the Pump House. This phase will be considered completed when we have achieved the following:

      1. Meeting with the CodeRVA representatives to set up our meetings with the students

      2. Complete the Project Proposal

      3. Have a functioning gray box model of the Pump House and basic models of the surrounding environment

5. Project Proposal Milestone: 10/1 - 10/11

This milestone will be completed once the Project Proposal is completed!

6. UEFN Fortnite Island Completely modeled Milestone: 10/8 - 11/9

This milestone will be completed once the entire pump house has been detailed and is as accurate as possible to its pre-1924 design. This milestone will be achieved once:

1. Completed the recreation of the Pump House in as much detail as the students can achieve in 6 weeks.
2. Completed as much of the landmarks within the area of the Pump House Park as the students can achieve in 6 weeks.

7. Project Poster Milestone 10/8 - 11/15:

This milestone will be completed once the Project Poster is completed!

8. Project Poster Milestone 11/1 - 11/11:

This milestone will be completed once we have our current progress on our project reviewed and received ample feedback!

9. UEFN Fortnite Island Cleaned Up Milestone: 11/10 - 12/15

This milestone will be completed once our first group of students have completed their 6 weeks of work and we have gone through and finished off any unfinished work left by the CodeRVA students. This milestone will be achieved once:

1. When the Pump House recreation is fully detailed and complete.
2. When any surrounding landmarks are fully completed.

10. Preliminary Design Report Milestone: 11/25 - 12/9

This milestone will be completed once the Preliminary Design Report is

completed!

11. Gameplay and Story Milestone: 2/11 - 3/25

This milestone will be completed once we have integrated a story and gameplay loop into the island. This milestone will be achieved once:

1. The Fortnite island has a main story quest for players to do
2. The Fortnite island has at least one mini game for players to play
3. The Fortnite island as an ending and credit scene.

12. Abstract Milestone: 3/1 - 3/22

This milestone will be completed once the Abstract for the project is completed!

13. Expo Poster Milestone: 3/15 - 3/22:

    This milestone will be completed once the Expo Poster is completed!

14. Wrapping up Milestone: 4/1 - 4/23

    This milestone will be completed once we do the following:

    1. Complete the Final Design Report
    2. The game is deployed and released for anyone to play

15. Expo Milestone: 4/24 - 4/25

    This is the final milestone with the following achievements to meet it.

    1. We survive both days of the expo

C.3 Resources

  Luckily for us our project can be done all virtual with no physical materials needed to build anything or any need to buy servers. As long as both VCU Capstone students and CodeRVA students have access to a Windows OS computer or laptop and the ability to download UEFN then the project can be conducted.

  Other resources, to be provided to the CodeRVA students by the VCU Capstone team, are as follows:

1. Floor plans of the Richmond Pump House
2. Photos of the Richmond Pump House while it was in operation
3. Photos of the area of Pump House Park
4. Research and details about the Richmond Pump House
5. Research and details about the area of the Pump House Park

Section D. Concept Generation

To address the design problem of creating an interactive educational experience for the Richmond Pump House within Fortnite, we brainstormed three primary design concepts. Each concept below shows the different approaches we had to engagement, historical accuracy, and gameplay integration along with each of their strengths, weaknesses, and potential risks.

Concept 1: Historical Tour Adventure

This concept focuses on recreating the Richmond Pump House and surrounding park in detail, integrating a guided historical tour within the game. Players would follow a linear path through the environment, learning about the history of the Pump House through narrated segments, interactive landmarks, and environmental storytelling.

Pros:
- Emphasizes historical accuracy and education.
- Simple and easy to implement with a clear structure.
- Suitable for players of all skill levels, focusing on exploration over skill-based challenges.

Cons:
- Limited replayability due to the linear gameplay.
- May not appeal to players seeking more interactive or challenging elements.

Risks:
- The historical information may become tedious if not balanced with engaging visuals or mini-games.

Concept 2: Puzzle-Based Exploration

This concept incorporates puzzles that players must solve to progress through the game and learn more about the Pump House. For example, players might need to assemble a piece of machinery, decipher a code based on historical artifacts, or navigate a maze representing the waterworks system.

Pros:
- Engages players in a more hands-on, interactive experience.
- Encourages critical thinking and problem-solving skills.
- Aligns well with Fortnite's creative gameplay elements.

Cons:
- May require more complex coding and design efforts.
- Could frustrate players if puzzles are too challenging or unclear.

Risks:
- Balancing difficulty levels for diverse player skills could be challenging.

Concept 3: Open-World Exploration with Mini-Games

This concept creates an open-world version of the Richmond Pump House Park where players can freely explore the environment and engage in optional mini-games. The mini-games could include activities such as collecting resources to "restore" parts of the Pump House, a trivia quiz about its history, or racing along the river.

Pros:
- Offers high replayability with a variety of activities.
- Appeals to a broad audience by combining free exploration with structured mini-games.
- Allows for both individual play and collaboration among players.

Cons:
- Development could require significant resources to implement multiple gameplay elements.
- May dilute the educational focus if the mini-games overshadow the historical aspects.

Risks:
- Risk of overwhelming players with too many options or unclear objectives.

Concept	Engagement	Educational Value	Replayability	Feasibility
Historical Tour Adventure	High	High	Low	High
Puzzle-Based Exploration	Medium	Medium	Medium	Medium
Open-World Exploration	High	Medium	High	Low

Section E. Concept Evaluation and Selection

To select the most suitable design concept for recreating the Richmond Pump House in Fortnite, we evaluated three proposed concepts using a systematic decision-making process. While the Historical Tour Adventure scored highest in our Decision Matrix, elements from all three concepts were incorporated into the final design. This approach allows us to adapt to the skills and preferences of the CodeRVA students and leverage the strengths of each concept to counteract each of the weaknesses and risk.

Blended Design Approach

Through collaboration and brainstorming, we identified the two primary gameplay elements that align with both the project goals and the creative ideas of the CodeRVA students:

1. **Parkour Challenges**:
   - This gameplay mechanic blends the structured progression of the **Historical Tour Adventure** with the problem-solving aspects of **Puzzle-Based Exploration**.
   - Players will navigate obstacle courses inspired by the Pump House's architecture and operational history, integrating historical context into the challenges.
2. **Collectibles and XP Rewards**:
   - Inspired by the open-ended gameplay of the **Open-World Exploration** concept, this mechanic encourages players to explore the entire map.
   - Players can discover hidden items, earning experience points and learning historical facts tied to specific landmarks. This rewards curiosity and reinforces the educational goals.

Recognizing that CodeRVA students are part of the target demographic for this project, we asked them for their feedback during the concept evaluation process. Their input helped shape the focus on parkour and collectible-based gameplay, which also played into their technical abilities

. This collaborative approach ensures the final design is engaging for the intended audience while accommodating the skill sets of the student developers.

While the Historical Tour Adventure provided the foundation for the project, the final design incorporates elements from all three proposed concepts. By combining linear historical storytelling, interactive challenges, and open-world exploration, we aim to create a Fortnite experience that is both educational and highly engaging. This blended approach leverages the creativity and preferences of the CodeRVA students, ensuring the project remains flexible and adaptive to team contributions.

Selection Criteria and Metrics

The following selection criteria were developed based on discussions with the client and project team. Each criterion was assigned a weight to reflect its relative importance to the project. Metrics were then defined to provide a measurable basis for evaluation:

Table 1. Decision Matrix

Selection Criteria	Weight	Metric
Engagement	0.3	How well the concept captures and retains player interest (1–10 scale).
Educational Value	0.3	The depth and accuracy of historical information conveyed (1–10 scale)
Replayability	0.2	The likelihood that players will return to the experience (1–10 scale).
Feasibility	0.2	Ease of implementation given team skills, time, and resources (1–10 scale).

Section F. Design Methodology

Our plans for the product (the Fortnite island) are mostly open ended. Our overarching goals for the island are accuracy of the pump house and landscape, with additional features for engagement purposes. In order to recreate the pump house as accurately as possible we have visited the site and met with the restoration team, obtained 3D models of the site and followed it up with our own independent research. These resources can and have been used as a reference when developing the island. When possible, we will use a topographic map to create a more accurate landscape.

At this stage in the process, CodeRVA interns have primary control over specific design elements. They have been provided with the necessary resources for factual and visual accuracy as they work on the island. After the collaboration with CodeRVA is complete, the VCU capstone group will make further edits to the island as needed.

When designing tasks for CodeRVA interns to complete, we aim for a combination of challenge and achievability. We make sure to stay in regular contact with interns, and help as needed. Additionally, task assignments are edited according to intern feedback. If tasks cannot be completed within a week, we give them more time, or give them a more reasonable task. If they request more challenging tasks, we provide additional tasks, or increase the scope of the task.

F.1 Validation Procedure

The sponsor of this project is CodeRVA, which we are providing a service to, in the form of internships for the students. For the duration of the internship periods - October 8, 2024 to January 7, 2025 - we meet with CodeRVA on a weekly basis, excepting holidays and school closure. As such, we receive feedback as needed from the teachers representing CodeRVA.

While not official sponsors, the Friends of the Pump House are also benefited by this project. In March 2025, we plan to share the island with them, and request their thoughts on its design. The Friends of the Pump House are familiar with the pump house and surrounding areas, so we hope that they will have insight to offer about possible improvements or features to add, as well as any mistakes we may have made. Since the nature of the feedback will be varied, we will ask that they provide it in the form of emailed comments.

Section G. Results and Design Details

       Deliverable results so far for the project consist of partial work on modeling and landscaping, which is explained in the section below (G.1) alongside design specifications. Work on the level itself has been primarily completed by CodeRVA interns so far (with a scaffold level developed by us). However, technical difficulties during the initial 3 weeks of interaction with CodeRVA have delayed progress considerably. Additional time will be necessary to complete the current stage of work before proceeding to technical level design requirements (such as collectibles and cutscene logic).

G.1. Final Design Details/Specifications

       Design specifications for this project (referenced from section B.3) largely consist of qualitative measures. Of the specifications listed, the following have been partially or completely fulfilled:

- The Project must match the exterior of The Pump House while it was in operation.

- ○ As part of work for the scaffold level we provided to CodeRVA students as a starting point, we modeled the basic structure of the Pump House. Textures are placeholders pending replacement to a more faithful recreation.

- - ○ We referenced Google Maps as a resource to model the Pump House and its surroundings at roughly 1:1 compared to real life scale. To do this, we downloaded images and applied them as a 2D decal over the main "floor" element in the level, using the scale indicator as a guide. The decal's visibility is toggleable.

  - The Project must also include the surrounding area of The Pump House Park

    - ○ Currently, rudimentary landscaping has been completed. We plan for the final level to extend to George Washington's Arch (east of the Pump House).

  - The Project will need to include at least 1 quest with at least 1 mini-game in order give players an interactive experience

    - ○ The parkour course (partially completed) is intended to function as a mini-game that blends platforming game elements with additional interaction and knowledge with the Pump House.

  - The Project must display accurate information whenever speaking about the history of the Pump House or the surrounding area.

    - ○ We compiled a number of information resources to be used as a resource for specific tasks assigned to CodeRVA interns (e.g. feature brainstorming, implementation of trivia "kiosks" at checkpoints in the parkour course).

Specific design details have been updated based on research and feedback from CodeRVA interns, who belong to a major age demographic for Fortnite's player base. These include the following additions and constraints to the level:

  - The Pump House must contain a social hall usable by players as a general-purpose hangout area inside its second floor.

    - ○ Specific implementation depends on the results of further correspondences with project stakeholders.

  - The level must contain destructible or hidden elements which contain rewards such as trivia and/or collectibles.

  - The level must contain an obstacle course that allows the user to view the Pump House from alternate angles.

Section H. Societal Impacts of Design

As a free-to-play interactive level in the popular video game Fortnite, the release of this project is expected to serve the purpose of increasing public awareness and knowledge of The Pump House, a historical landmark, to an audience that may not know of its existence.

However, video games often face scrutiny over its impact on the well-being and safety of its players. Epic, the parent company of Fortnite, recently faced allegations from the Federal Trade Commission for violating children's privacy laws and implementing dark patterns for in-game purchases (Federal Trade Commission, 2022). Roblox, a platform for user-created experiences similar to Fortnite, faces pervasive issues with grooming and cyberbullying due to its relaxed safeguards on user interaction (Carville & D'Anastasio, 2024).

Although many of these issues don't directly affect this project, it is pertinent to consider the resulting negative impressions imprinted on community-made maps on platforms such as Fortnite or Roblox. Care should be taken to ensure that the island's functions and design decisions solely serve to enhance the objective of raising awareness for the Pump House. Additionally, any implemented game mechanics should be reviewed to ensure there isn't any possibility for misuse.

H.1 Public Health, Safety, and Welfare

As the level exists in a virtual space, there is minimal to zero physical risk for the player. We plan for the level to be enjoyed within a short (<1 hour) timespan, mitigating the risk of addiction. Indirect social elements (e.g. inclusion of the social hall, built-in chat functions such as emotes) could encourage positive interactions amongst visitors. The release of this project could contribute to public welfare by fostering appreciation for preserving historical landmarks such as the Pump House.

H.2 Societal Impacts

The project takes the unconventional approach of promoting historical preservation through video games. If successful, its release could encourage younger generations (who form the demographic for Fortnite) to learn about these topics in an accessible way. This would ultimately enable a broader audience to engage with Richmond's heritage and foster civic pride.

H.3 Political/Regulatory Impacts

Although the project itself does not directly intertwine with political matters, the topic of a historical site undergoing renovations could stimulate discussion on the government and the community's role in funding such preservation efforts. Should the level leave a positive impression on its visitors, it could serve as an advocacy tool to influence future policy decisions on similar landmarks.

H.4. Economic Impacts

The success of this project would drive interest in visitations to the Pump House, which can be directly linked to revenue from tourism or donors to support the sustained growth of the Friends of Pump House organization. Additionally, as a showcase of intersectionality between gaming and education, interest in the project could contribute to the growing markets for education games.

Section I. Cost Analysis

To date this project has accorded no financial cost. Every aspect of the project, from the software used to recreate the pump house to the people working on it has been completely free. We do not expect to have any sort of final billing for the project nor do we wish to go commercial with it, so in order our net cost for this project will be $0.

Section J. Conclusions and Recommendations

In total, our project was quite the accomplishment for all of us to get through. Each step along the engineering design process brought us new challenges that we had to face down, but with each of those challenges came a better understanding of our own capabilities.

After being given our problem to solve we quickly moved into research, which led us to the Richmond Pump House where we got to meet the restoration team and gained insight on the property and its structure. Through this event we quickly realized the power in communication needs and direction, which would just as quickly help us as we started to come up with ideas for the project.

The long and short of it is that we had none. We had collected as much data as we could on our subject, but the project of "Rebuild the Richmond Pump House in UEFN with CodeRVA" left us all wondering what we were meant to do exactly. But then we contacted and met with Dr. Leonard, our advisor and mentor, and after a discussion on possible solutions we completely understood what we needed to do to make this project a reality.

From there we moved into planning, writing out every aspect that we wanted the CodeRVA students to work on while relegating certain pieces of the project for ourselves to complete. Finally, after working on the project for about two months we're just about to start the cycle over again after our meeting to discuss what needs improving.

As for the project goals we are about 65% through to meeting the goals we set in September. As the recreation stands now it is simply missing the rivers that flow through it and the open air ballroom, along with some other landmarks around the building. As for the engagement aspect it is coming along very well with the CodeRVA students currently working on placing up signs to give out details and finishing the parkour section.

Finally, seeing how we will be continuing this project in the Spring semester, we have decided to store the project on the UEFN cloud server it is currently on. To this date we have completed Milestones **Contact Made, Research Milestone, Github Assignment, Set Up , Project Proposal, UEFN Fortnite Island Completely modeled, Project Poster, Project Poster** and now the **Preliminary Design Report** milestone.

Appendix 1: Project Timeline

UEFN VCU Capstone Milestone Timeline
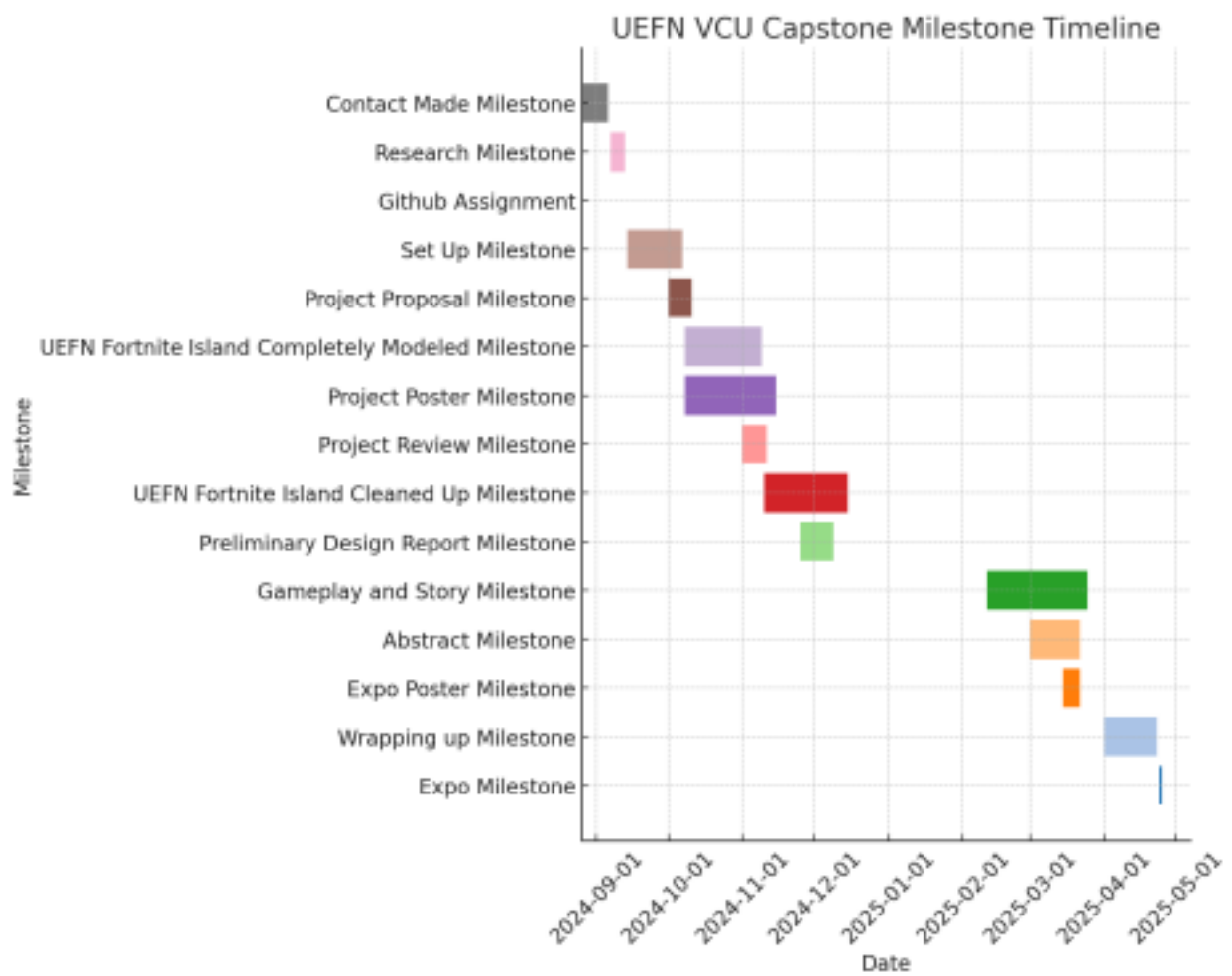
Appendix 2: Team Contract (i.e. Team Organization)

Step 1: Get to Know One Another. Gather Basic Information.

Task: This initial time together is important to form a strong team dynamic and get to know each other more as people outside of class time. Consider ways to develop positive working relationships with others, while remaining open and personal. Learn each other's strengths and discuss good/bad team experiences. This is also a good opportunity to start to better understand each other's communication and working styles.

Team Member Name	Strengths each member bring to the group	Other Info	Contact Info
Kel Raphael	Organized, hard-working, proactive, creative	I have worked on 3d modeling in the past, and enjoyed it	raphaelke@vcu.edu 703-488-8023
Kibria Malik	Communication, hard worker, open minded	I enjoy being a part of a team and meeting new people. I am not the most technically advanced but am willing to learn and work very hard for my team.	Malikkz@vcu.edu 571-397-6428

Ken Mikawa	Communication, problem-solving, creativity	Willing to learn the necessary skills on-the-fly for the project. I've recently played a lot of Fortnite (the game) but haven't really enjoyed the new season, so I'm excited to approach the platform from a different angle	mikawakc@vcu.edu 804-937-8561
Bryce Strobel	Hardworking, creative, solution orientation	Alongside enjoying being a part of a team I also have some minor experience in unreal engines.	strobelb2@vcu.edu 804-307-1567

Other Stakeholders	Notes Contact Info
John Leonard	*VCU Capstone Mentor* Jdleonard@vcu.edu
Kume Goranson	*Club organizer for CodeRVA* kume.goranson@coderva.org

Step 2: Team Culture. Clarify the Group's Purpose and Culture Goals.

Task: Discuss how each team member wants to be treated to encourage them to make valuable contributions to the group and how each team member would like to feel recognized for their efforts. Discuss how the team will foster an environment where each team member feels they are accountable for their actions and the way they contribute to the project. These are your Culture Goals (left column). How do the students demonstrate these culture goals? These are your Actions (middle column). Finally, how do students deviate from the team's culture goals? What are ways that other team members can notice

when that culture goal is no longer being honored in team dynamics? These are your Warning Signs (right column).

Resources: More information and an example Team Culture can be found in the Biodesign Student Guide "Intentional Teamwork" page ([webpage](#) | [PDF](#))

Culture Goals	*Actions*	*Warning Signs*
Being on time to every meeting	*- Be in Discord meeting room on time* *- Post meetings in Discord* *- Just alert if anyone is running late*	*- Student misses first meeting – warning is granted* *- Student misses meetings afterwards – issue is brought up with faculty advisor*
Being communicative about project work	*- Stay up to date with each other's project responsibilities* *- Set reasonable deadlines and note when an extension is needed*	*- Student shows up for weekly meeting with no considerable work done*
Actively participating	*- Volunteer before being voluntold* *- Proactively contribute to the project*	*- Imbalanced group workload*

Step 3: Time Commitments, Meeting Structure, and Communication

Task: Discuss the anticipated time commitments for the group project. Consider the following questions (don't answer these questions in the box below):

● What are reasonable time commitments for everyone to invest in this project? ●

What other activities and commitments do group members have in their lives? ●
How will we communicate with each other?
● When will we meet as a team? Where will we meet? How Often?
● Who will run the meetings? Will there be an assigned team leader or scribe? Does that position rotate or will the same person take on that role for the duration of the project?

Required: How often you will meet with your faculty advisor advisor, where you will meet, and how the meetings will be conducted. Who arranges these meetings?
See examples below.

Meeting Participants	*Frequency* *Dates and Times / Locations*	*Meeting Goals* *Responsible Party*
Students Only	Thursdays at 6 p.m.	Actively work on project; discuss deadlines, communication and delegate work as necessary
Students + Faculty advisor	Thursdays at 6:30 p.m.	Update faculty advisor and get answers to our questions
Project Sponsor	Once or twice a month (or as needed); virtual or in-person depending on sponsor preference	Update project sponsor and make sure we are on the right track

Step 4: Determine Individual Roles and Responsibilities

Task: As part of the Capstone Team experience, each member will take on a leadership role, *in addition to* contributing to the overall weekly action items for the project. Some common leadership roles for Capstone projects are listed below. Other roles may be assigned with approval of your faculty advisor as deemed fit for the project. For the entirety of the project, you should communicate progress to your advisor specifically with regard to your role.

● **Before meeting with your team**, take some time to ask yourself: what is my "natural" role in this group (strengths)? How can I use this experience to help me grow and develop more? ● **As a group,** discuss the various tasks needed for the project and role preferences. Then assign roles in the table on the next page. Try to create a team dynamic that is fair and equitable, while promoting the strengths of each member.

Communication Leaders

Suggested: Assign a team member to be the primary contact for the client/sponsor. This person will schedule meetings, send updates, and ensure deliverables are met.

Suggested: Assign a team member to be the primary contact for faculty advisor. This person will schedule meetings, send updates, and ensure deliverables are met.

Common Leadership Roles for Capstone

1. **Project Manager:** Manages all tasks; develops overall schedule for project; writes agendas and runs meetings; reviews and monitors individual action items; creates an environment where team members are respected, take risks and feel safe expressing their ideas.

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   Required: On Edusourced, under the Team tab, make sure that this student is assigned the Project Manager role. This is required so that Capstone program staff can easily identify a single contact person, especially for items like Purchasing and Receiving project supplies.

2. **Logistics Manager:** coordinates all internal and external interactions; lead in establishing contact within and outside of organization, following up on communication of commitments, obtaining information for the team; documents meeting minutes; manages facility and resource usage.

3. **Financial Manager:** researches/benchmarks technical purchases and acquisitions; conducts pricing analysis and budget justifications on proposed purchases; carries out team purchase requests; monitors team budget.

4. **Systems Engineer:** analyzes Client initial design specification and leads establishment of product specifications; monitors, coordinates and manages integration of sub-systems in the prototype; develops and recommends system architecture and manages product interfaces.

5. **Test Engineer:** oversees experimental design, test plan, procedures and data analysis; acquires data acquisition equipment and any necessary software; establishes test protocols and schedules; oversees statistical analysis of results; leads presentation of experimental finding and resulting recommendations.

6. **Manufacturing Engineer:** coordinates all fabrication required to meet final prototype requirements; oversees that all engineering drawings meet the requirements of machine shop or vendor; reviews designs to ensure design for manufacturing; determines realistic timing for fabrication and quality; develops schedule for all manufacturing.

Team Member	Role(s)	Responsibilities
Kel Raphael	Project Manager	*- Develop project timeline* *- Keep project on task*
Ken Mikawa	Systems Engineer	*- Analyze client initial design specification - Communicate logistical requirements to project manager and stakeholder*
Kibria Malik Bryce Strobel	Financial Manager Test Engineer Logistics Manager	*- See what we need* *- See prices of needed items* *- Make and have consistent communication with sponsor and mentor* *- Manage resources*

Step 5: Agree to the above team contract

Team Member: Kel Raphael Signature: <u>*Kel Raphael*</u> *Team*

Member: Ken Mikawa Signature: <u>*Ken Mikawa*</u> *Team*

Member: Kibria Malik Signature: <u>*Kibria Malik*</u> *Team*

Member: Bryce Storbel Signature: <u>*Bryce Strobel*</u>

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