

# Humphreys Engineer Center Area Development Plan

Alexandria, VA

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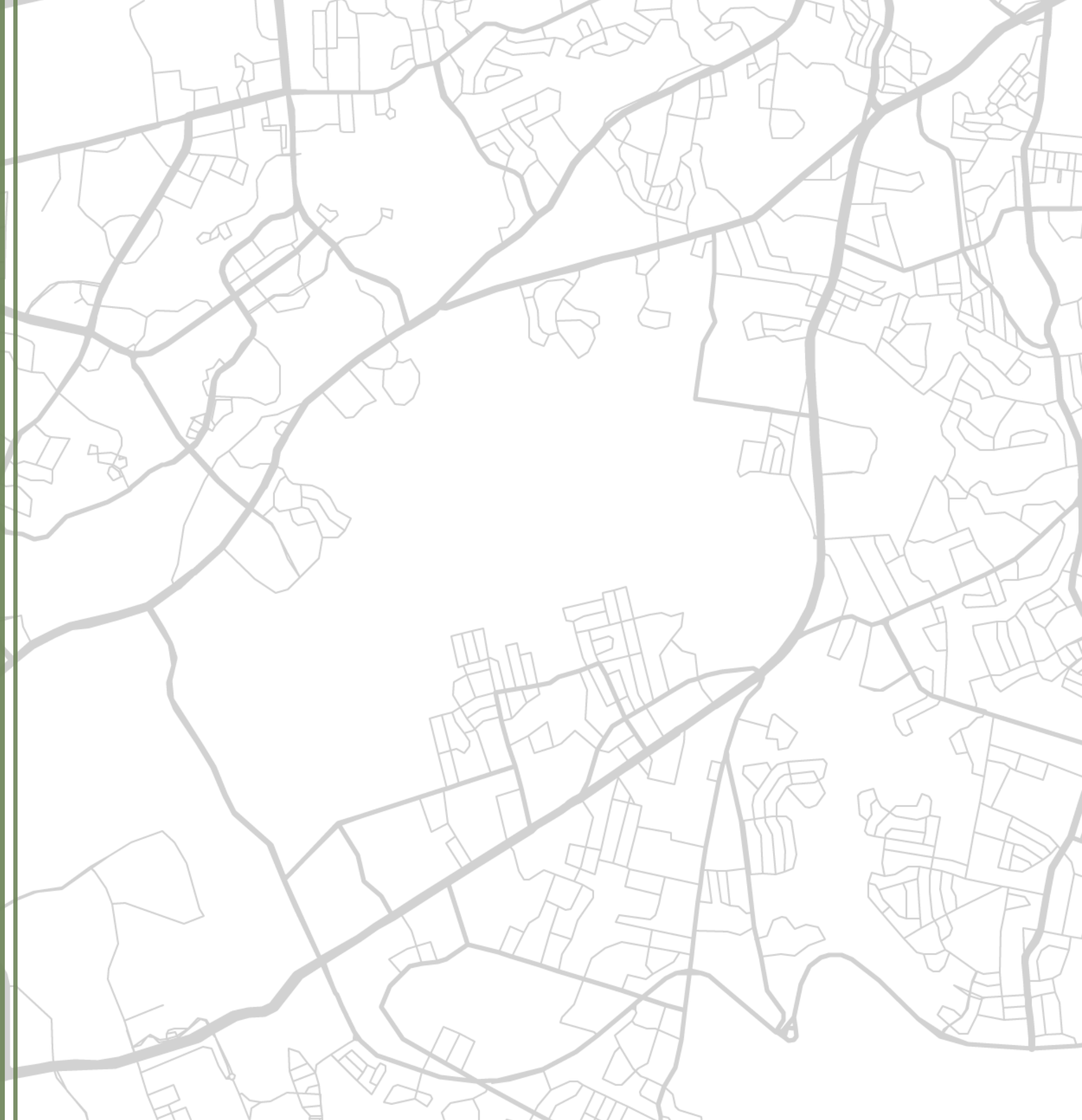
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# 1

## Purpose and Overview



# 1.1 ADP and ADEP Purpose

An Area Development Plan (ADP) is a strategic framework used in urban and regional planning to guide the growth, organization, and use of land in a specific area. Its purpose is to create a comprehensive, long-term plan that integrates land use, infrastructure, environmental sustainability, and community needs to support economic, social, and environmental goals. This ADP aims to balance the demands of future HEC (Humphreys Engineer Center) development with current resource management, ensuring that space is used efficiently while enhancing the quality of life for tenants and promoting sustainable growth.

The purpose of the Area Development Execution Plan (ADEP), which will be provided in the Prefinal Submittal after further validation of the Preferred Alternative, is to outline a phased and actionable strategy for implementing the proposed projects within this ADP. As a strategic framework, the ADP guides the growth, organization, and land use at HEC, integrating land use, infrastructure, environmental sustainability, and community needs. By addressing current resource management and anticipating future development, the ADEP ensures efficient space utilization, enhances quality of life for tenants, and supports sustainable growth. This approach balances the installation’s mission-driven priorities with long-term resilience and adaptability.



Figure 1-1. Basemap

## 1.2 Geographic Context

HEC is located in Alexandria, Virginia, situated along the western bank of the Potomac River, approximately 10 miles south of Washington, D.C. This area is part of the broader Washington Metropolitan Region, a significant urban and suburban zone characterized by its proximity to the nation’s capital and various federal installations. HEC is close to major transportation corridors, including Interstate 95 (I-95) and the Capital Beltway (I-495), which connect HEC to many urban centers in the region.

HEC’s existing campus consists of a series of research and development facilities constructed in the 1980s. HEC includes modern office buildings, research laboratories, and conference facilities equipped with the latest technology to support its mission. Existing buildings at HEC include:

- Cude Building: Completed in 1988, the Cude building serves as the central administrative hub for HECSA (Humphreys Engineer Center Support Activity). It houses offices for various USACE (United States Army Corps of Engineers) divisions and departments, including project management, planning, and administration support.

- Kingman Building: Kingman serves as an administrative center for HEC and provides offices for USACE’s civic works mission. The building also supports training programs and workshops aimed at advancing USACE’s capabilities in water resource engineering.
- Casey Building: Completed in 1981, the Casey Building has historically been used as a classroom training facility. Today, the building houses the USACE Finance Center and the Institute for Water Resources, a non-USACE tenant conducting research and development at HEC.

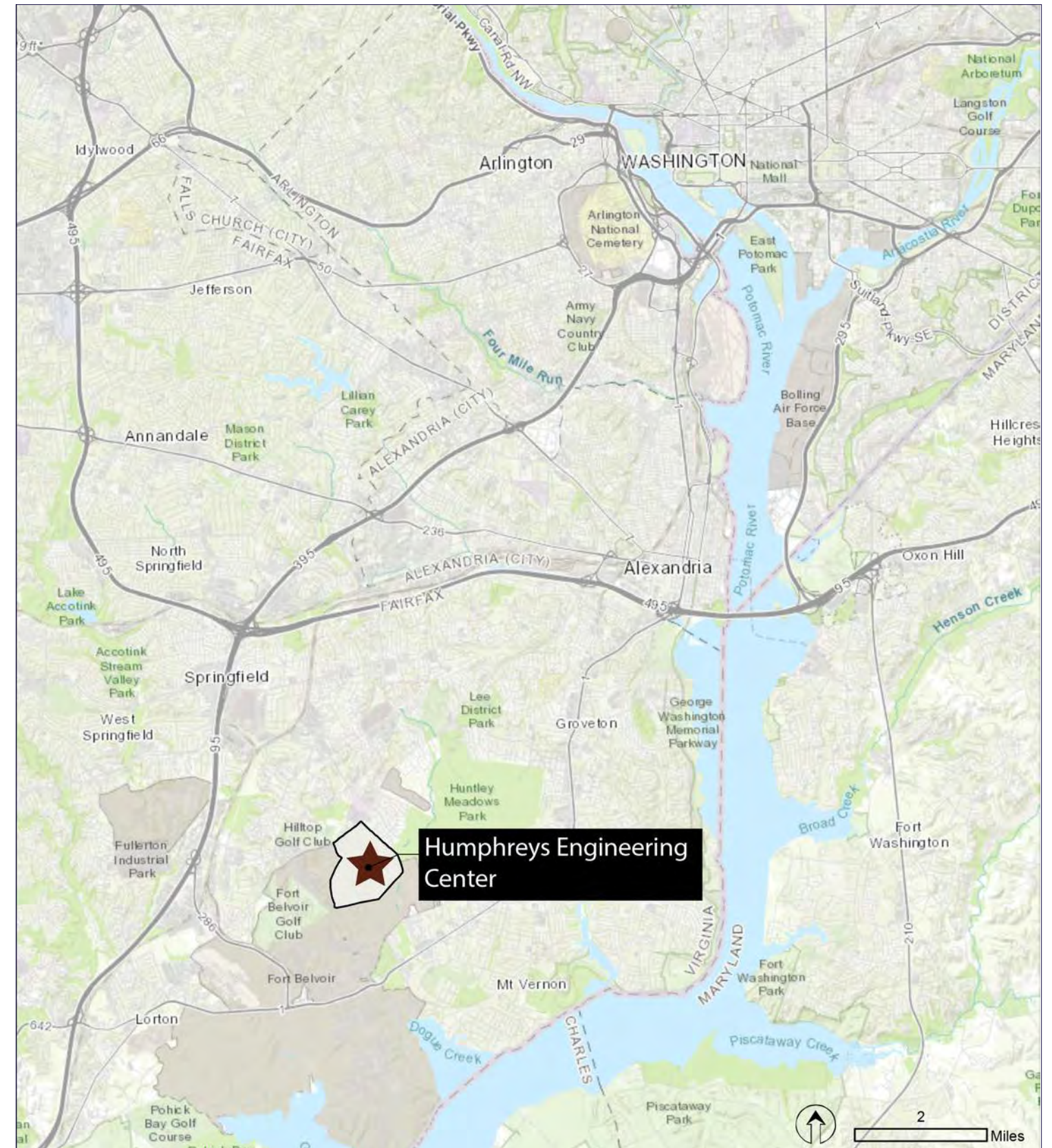


Figure 1-2. Regional Map

# HEC Planning Vision Statement

Humphreys Engineer Center (HEC) is a safe, secure, and inviting campus integrated with the natural environment.

## 1.3 HEC Real Property Vision

During the Vision Workshop, stakeholders collectively crafted a vision statement that encapsulates all future aspirations for HEC. This statement reflects the shared values and strategic objectives that will guide the center's development and operational strategies. The vision statement emphasizes three core aspects:

### Safety and Security

The primary commitment of HEC is to ensure a safe and secure environment for all its occupants. Safety protocols and measures should be prioritized in every aspect of planning and development. This includes infrastructure designed to withstand natural and man-made hazards, continuous monitoring of safety practices, and security policies that protect HEC occupants. Stringent security measures should incorporate advanced technologies and best practices to protect personnel, assets, and information. The goal is to create a campus of safety that adheres to Anti-Terrorism/Force Protection (AT/FP) standards.

### Inviting Atmosphere

An inviting campus fosters a sense of community and enhances productivity. HEC aims to be more than just a place of work – it strives to be a welcoming environment that promotes well-being and collaboration through thoughtful urban design principles. Future development must prioritize accessibility, aesthetic appeal, and functional spaces to ensure HEC attracts top talent and premier tenants. Recreational areas, communal spaces, and facilities that cater to the diverse needs of its occupants will be integral to the campus's layout.

### Integration with the Natural Environment

HEC's vision statement includes an emphasis on environmental stewardship and sustainability. Future development should integrate with the natural surroundings by preserving green spaces, promoting biodiversity, and minimizing ecological disturbances. HEC's campus should feature landscaping that enhances visual appeal and supports local flora and fauna. By aligning planning practices with environmental principles, new HEC development will demonstrate a commitment to sustainability and serve as a model for environmentally conscious planning.

Figure 1-3. Live Notes from Vision Workshop



Map Creation at the Vision Workshop

# Goal 1

## Modernize Facilities and Infrastructure

1.1

### Strengthen Infrastructure Resilience

Development should strengthen infrastructure resilience by incorporating designs that anticipate and adapt to changing environmental, social, and technological conditions. This includes using durable materials that withstand extreme weather, designing systems with redundancy and flexibility, and implementing smart technologies to monitor and respond to potential threats in real time.

1.2

### Improve Accessibility

Development should improve accessibility by designing spaces that accommodate all individuals, regardless of physical ability, age, or background. This involves creating barrier-free environments with ramps, wide doorways, and tactile surfaces for those with mobility or sensory challenges. It also includes intuitive signage, clear wayfinding, and accessible public transportation options.

1.3

### Develop Versatile Spaces

Development should focus on creating versatile spaces that can adapt to a range of functions and changing needs over time. This involves designing flexible layouts with movable walls, modular furniture, and multi-use areas that accommodate different activities, such as work, leisure, or community events. Incorporating infrastructure that allows for technological upgrades, sustainable features, and easy reconfiguration is essential.

1.4

### Enhance Aesthetics in Design

Development should enhance design aesthetics by prioritizing visually appealing, functional, and harmonious spaces that reflect community identity. This involves balancing form and function, incorporating natural elements, and using high-quality materials that complement the surroundings.

1.5

### Upgrade Environmental Quality

Development should upgrade environmental quality by integrating sustainable practices that reduce pollution, conserve resources, and enhance natural ecosystems. This includes utilizing renewable energy sources, promoting energy efficiency, and incorporating green infrastructure like rain gardens, green roofs, and permeable pavements to manage stormwater and reduce heat island effects.

1.6

### Ensure Regulatory Compliance

Development should adhere to typical safety standards and regional building code practices. The Unified Facilities Criteria should also be a guiding document describing specific guidelines and regulations for new development. UFC 2-100-01 provides guidance for developing a master plan for a military installation, ensuring that all planning efforts align with mission requirements and proper land use. Additionally, UFC 1-200-02 enforces that new construction is energy-efficient, environmentally sustainable, and compliant with pertinent federal mandates.

1.7

### Optimize Utility Management

Development should optimize utility management by implementing smart technologies and efficient systems that reduce resource consumption and operational costs. This includes integrating advanced metering systems for water, electricity, and gas to monitor usage in real time, allowing for data-driven decision-making and early detection of issues.

1.8

### Strengthen Infrastructure Resilience

Development should promote energy efficiency by integrating technologies and practices that reduce energy consumption while maintaining expected comfort and performance. Designing buildings with proper insulation, high-performance windows, and passive solar techniques conserve energy on heating and cooling, while energy-efficient appliances and lighting further reduce demand.

# Goal 2

## Strengthen Transportation Networks

2.1

### Foster Community Engagement in Transportation Design

Development should promote transportation planning by creating efficient, accessible, and sustainable mobility systems that connect communities and reduce traffic congestion. Designing pedestrian-friendly streets, dedicated bike lanes, and reliable public transit networks help to minimize reliance on private vehicles.

2.2

### Improve Transportation Networks

Development should provide stations and transit hubs that are clean, well-lit, and equipped with clear signage, seating, and amenities. Reducing travel times through efficient route planning, minimizing overcrowding, and ensuring smooth transitions between different modes of transport also enhance comfort, making transportation more appealing and user-friendly.

2.3

### Strengthen Public School Transit Connectivity

Development should integrate mixed-use developments with transit-oriented design that encourages people to live, work, and shop within accessible distances. Improved connectivity to schools and other public institutions helps workers at HEC to feel more comfortable and less stressed about their family members commuting every day.

2.4

### Develop Alternative Transportation Routes

Development should provide alternative transportation options to allow for greater flexibility and sustainability in their transportation network design. These options may include expanding public transit networks, creating safe and accessible bike lanes, and developing pedestrian-friendly infrastructure to encourage walking.

2.5

### Expand Bike and Pedestrian Pathways

Development should expand pedestrian walkways and bike lanes by designing safe, accessible, and interconnected pathways that encourage walking and cycling as viable transportation options. HEC can ensure pedestrian safety by creating wide, well-lit sidewalks, protected bike lanes, and crosswalks with clear signage. Green spaces and amenities like benches, bike racks, and shade trees can enhance the experience for pedestrians and cyclists.

2.6

### Upgrade Traffic Management Systems

Development should modernize the traffic management systems to provide a smoother and safer vehicle and pedestrian network. This includes upgrading traffic signals, signs, and road designs to improve flow and reduce congestion. Any upgrades to traffic systems should align with the HEC Transportation Management Plan (TMP) to ensure a cohesive approach to reducing congestion and improving overall transportation efficiency.

2.7

### Enhance Parking and Landscape Areas

Development should enhance parking areas by integrating landscaping features such as trees, green walls, and permeable pavements. These features help reduce heat islands, manage stormwater, and improve air quality. Thoughtfully designed parking areas with clear signage and pedestrian pathways ensure convenience, while landscaping adds natural beauty and promotes a more sustainable and inviting environment.

2.8

### Implement Strategies to Improve Shading

Development should provide shading along transportation routes by incorporating natural and structural elements that enhance comfort and sustainability. Planting trees and creating green canopies along sidewalks, bike lanes, and bus stops offer shade, improve air quality, and reduce heat.

# Goal 3

## Design Safety and Security Measures

3.1

### Conduct Regular Safety and Security Audits

Development should conduct regular safety audits to identify and mitigate potential hazards in public spaces and transportation systems. This includes periodic systematic evaluation of infrastructure, such as roads, bridges, and pedestrian pathways, to assess their condition and compliance with safety standards. Engaging community stakeholders in the audit process can provide valuable insights into local concerns and areas for improvement.

3.2

### Develop Emergency Egress Routes

Development should provide additional egress routes to Telegraph Road for safety, convenience, and traffic decongestion. Entry and egress gates should be outfitted with the latest technologies and safety measures for installation security.

3.3

### Enhance Safety Signage and Gathering Areas

Development should improve safety signage by ensuring clarity, visibility, and accessibility for all users in public spaces. Bold, easy-to-read fonts and high-contrast colors enhance legibility, and incorporating universally recognized symbols and multilingual text accommodates diverse populations. Positioning signs at appropriate heights and locations, such as at eye level or along pathways, ensures they are easily seen and understood.

3.4

### Install Comprehensive Lighting Improvements

Development should improve lighting in public areas to increase safety and comfort on HEC grounds. Strategic placement of lights in high-traffic areas, such as sidewalks, crosswalks, parking lots, and transit stops, ensures that all users feel safe and secure.

3.5

### Implement Speed Control Measures at Key Roads

Development should implement speed bumps, traffic circles, and raised crosswalks to physically slow down vehicles in high-pedestrian areas. Additionally, electronic speed limit signs and radar feedback signs can alert drivers to their current speed, encouraging compliance with posted limits.

3.6

### Deploy Integrated Security Enhancements

Development should enhance security and safety at HEC by providing the latest fencing designs and emergency alert technologies. Fencing should be durable and effective at personnel determent. In conjunction with security fences, installing emergency broadcast systems ensures timely communication during crises, providing clear instructions and alerts to the public.

3.7

### Establish Secure Entry and Exit Points

Development should include secure entry and exit points to enhance safety and control access to public spaces and facilities. Incorporating adequate security personnel or surveillance cameras at these locations can further deter unauthorized access and enhance overall safety.

# Goal 4

## Protect the Natural Environment

4.1

### Cultivate a Culture of Environmental Stewardship

Development should support the environment by prioritizing sustainability and minimizing ecological impact throughout the planning and construction processes. Environmentally-conscious development must conserve natural resources, protect local ecosystems, and reduce carbon emissions by integrating renewable energy sources and eco-friendly materials. Green building practices, such as energy-efficient designs, waste reduction, and water conservation systems, should be employed to ensure long-term environmental benefits.

4.2

### Coexist Harmoniously with Wildlife

Development should protect existing wildlife by carefully planning projects to minimize disruption to natural habitats and biodiversity. Developers should preserve green corridors, wetlands, and other critical habitats, while incorporating wildlife-friendly design elements like underpasses or bridges to allow safe animal crossings.

4.3

### Preserve and Protect Critical Wetlands

Development should protect existing wetlands by recognizing their ecological importance and implementing strategies to preserve and restore these vital ecosystems. This includes conducting environmental assessments to understand the potential impact on wetland areas and adjusting plans to avoid direct harm. Buffer zones should be established around wetlands to protect them from pollution, runoff, and construction activities.

4.4

### Designate and Maintain Protected Development Zones

Development should be avoided in designated protected areas. These areas may be vital habitat for local wildlife or they may feature important landscape features deemed desirable by the community.

4.5

### Implement Low-Impact Development Practices

Development should implement low-impact development by using strategies that minimize environmental disruption and manage stormwater sustainably. Including permeable surfaces in the design, such as porous pavements and green roofs, reduces runoff and allows for natural water infiltration. Low-impact practices prioritize preserving natural landscapes, minimizing land disturbance, and integrating green infrastructure to filter pollutants and support local ecosystems.

4.6

### Promote Sustainable Landscaping

Development should feature sustainable landscape practices by incorporating eco-friendly design principles that enhance biodiversity, conserve resources, and promote environmental health. Sustainable landscaping should prioritize soil health through organic practices and promote habitat creation for local wildlife. Proper water management is also critical to this effort.

4.7

### Enhance Energy Efficiency Through Solar Installations

Development should also seek to improve energy efficiency and reduce energy consumption through the implementation of solar panels and sustainable parking models. Covering parking lots with solar panels is one potential solution that generates energy and reduces the heat-island effects of pavement.

4.8

### Foster a Scenic Environment with Tree-Lined Paths

Develop should cultivate a scenic natural landscape with its planting and landscaping strategies. Abundant tree coverage contributes to environmental sustainability, pedestrian comfort, and noise control. Trees also contribute to strengthening HEC campus identity. Landscaping strategies should be cohesive and multi-purpose.

# Goal 5

## Promote Campus-Style Atmosphere

5.1

### Promote Operational Efficiency

Development should promote operational efficiency by incorporating streamlined processes and innovative technologies that enhance productivity while minimizing resource consumption. This involves designing spaces that facilitate collaboration and effective communication among users, and utilizing automation and smart systems to optimize energy use and maintenance.

5.2

### Design with Recruitment and Retention in Mind

Development should be focused on promoting and marketing HEC to potential new tenant organizations. The campus design should be clean, comfortable, and inviting; quality-of-life amenities should be provided wherever possible.

5.3

### Preserve a Sense of Place

Development should promote a sense of place by creating spaces that reflect the unique identity, culture, and history of the community. HEC development should incorporate local architectural styles, art, and landscaping that resonate with the surrounding environment and community values. Engaging residents in the design process ensures that their voices are heard and that the development meets their needs and preferences.

5.4

### Design a Unified Architecture

Development should feature a unified architectural language by employing consistent design elements and styles that create visual harmony across buildings and spaces. This includes using complementary materials, colors, and architectural details that reflect the community's character and history while ensuring coherence within the development. A unified architectural approach promotes a sense of identity and belonging, making the area more inviting and navigable for workers and visitors alike.

5.5

### Incorporate Ample Green Space

Development should incorporate ample green space to enhance the quality of life for residents and promote environmental sustainability. HEC may achieve this by creating parks, gardens, and natural areas that provide recreational opportunities, improve mental well-being, and support biodiversity.

5.6

### Consider Use-Informed Siting

Development should consider location of new projects and plan to site buildings according to their size, program, and resource demand. This may be achieved by analyzing factors such as land use patterns, proximity to public transportation, and local amenities to ensure that the site supports intended activities and promotes efficient movement.

5.7

### Encourage Pedestrian Connectivity

Development should promote pedestrian connectivity by designing networks of safe, accessible pathways that encourage walking and foster a sense of community. Adequate lighting, shading, and safety features are critical to a well-functioning pedestrian network. Integrating public spaces, such as parks and plazas, along these routes enhances the walking experience and encourages social interaction.

5.8

### Encourage Perimeter Parking

Development should encourage perimeter parking by positioning parking areas around the outer edges of sites to prioritize pedestrian-friendly, vehicle-free zones in the core of the development. This approach enhances the aesthetics and accessibility of central spaces, allowing for more green space, plazas, and walkable areas. Perimeter parking also reduces traffic congestion within the development, promoting safety and ease of movement for pedestrians and cyclists.

## 1.4 Planning Assumptions

The planning team identified key planning assumptions:

- The ADP will focus on areas within the HEC boundary, ensuring that all proposed development and improvements are contained within the specified geographic limits.
- HEC relies on a funding model that is not typical compared to other U.S. military installations. Construction and other real property improvements at HEC are funded through tenant reimbursements, rather than Congressional appropriations, such as Military Construction (MILCON) funding.
- Any development or modification plans at HEC must be reviewed by the National Capital Planning Commission (NCPC). Ensuring coordination with NCPC guidelines and obtaining necessary reviews will be a critical step in the planning process.



## 1.5 Workshop Overview

The ADP Workshop, held 17–19 September 2024, is a comprehensive, three-day event designed to align stakeholders and guide the future area development efforts for HEC. The workshop is structured to systematically address various aspects of strategic planning, ensuring a holistic approach to the development process.

The workshop began with an inbrief, setting the stage and expectations for the days ahead. This includes a discussion of the ADP purpose and process. Participants engage in a discussion regarding the potential futures that should be explored for HEC. This was followed by a FCA, IPA, map, and Vision and IPS review. Stakeholders are given the opportunity to ask questions and discuss these items. Then, there was a requirements development session in which participants discuss the requirements at HEC and their feasibility and implications.

The second day of the workshop focused primarily on alternatives development. The day begins with a discussion about the problems on installations and the potential future of HEC. Next, stakeholders were divided into three groups to begin alternative development. In small groups, the participants discussed project lists for one of three categories: Quality of Life (QoL), Safety, and Security; Moderate

Development; and Capacity Planning. After the development of these lists and maps, stakeholders participated in a creative activity, in which they develop a magazine cover that highlights and summarizes the main ideas of each alternative.

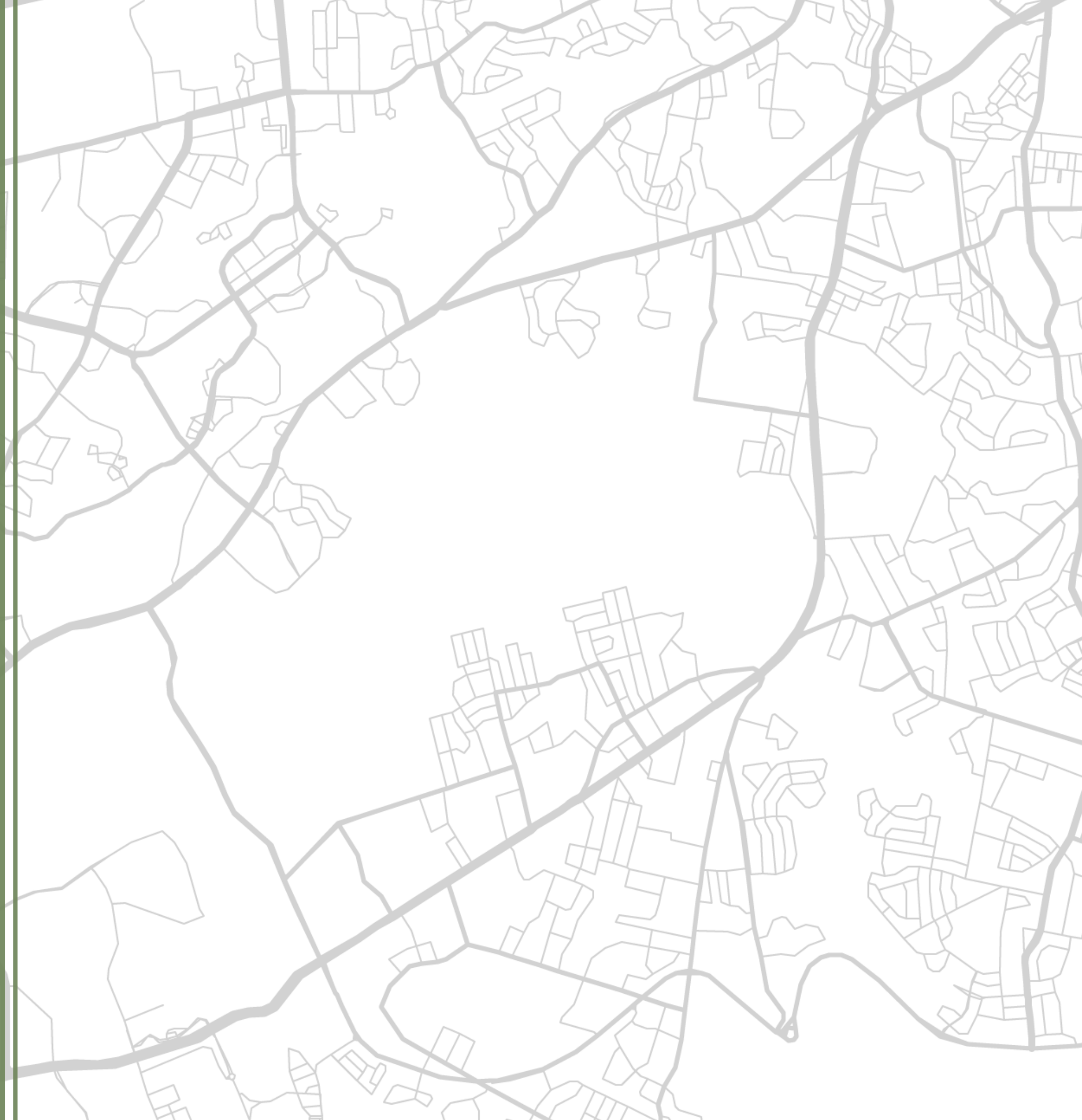
The final day of the workshop was used to evaluate the alternatives and present the outbrief. Participants reviewed the maps, project lists, magazines, and key concepts of each alternative. There was a discussion about the pros and cons of each alternative; stakeholders then cast votes for their three favorite projects from each alternative. The alternatives were then evaluated (positive, neutral, or negative) against 5 goals: safe and secure, inviting, integrated with the natural landscape, feasibility, and cost. This was followed by a discussion about common themes, top projects, and what should be included in the preferred alternative. The outbrief was then presented to leadership, with a summary of the week and the results of the activities.

By following this structured workshop approach, the ADP Workshop ensures a comprehensive and collaborative planning process that addresses both immediate needs and long-term objectives for HEC.



# 2

## Site Constraints and Analysis



## 2.1 Introduction

Fairfax County, Virginia, is located in the northern part of the state, forming part of the Washington, D.C. metropolitan area. The county's geography is characterized by rolling hills, numerous streams, and large rivers, most notably the Potomac River, which forms its northeastern boundary. The landscape includes both suburban developments and preserved natural areas such as parks and forests. In particular, HEC's site features an abundance of small wetland reserves and dense forestation. Because these trees fully wrap around HEC and visually shield it from the busy roadways beyond, HEC formed an identity as a quiet, reserved office park set into a tranquil clearing of the forest. Additionally, pockets of wetlands at HEC attract a wide range of wildlife, including an abundance of waterfowl. While these natural features are beautiful and worthy of preservation, they also restrict developable areas and confine potential construction sites to a few critical nodes within the existing campus.



Cude Building



Casey Building



Kingman Building

## 2.2 Framework Plan

The Framework Plan (Figure 2-1) is designed to create a detailed spatial inventory and provide valuable insights into how the physical environment can support operational efficiency at HEC. Using a key, stakeholders identified Nodes (centralized points of interest or frequently visited landmarks within the installation), Landmarks (distinctive features or viewsheds that aid in navigation and orientation), Paths (routes or channels people move along, both vehicular or pedestrian), Edges (different than paths in that they are lines that separate features), Incompatibilities (current use issues), Opportunities (future density or open space), and Desired Connections.

This mapping exercise serves as a foundational tool for guiding future development strategies and ensuring that proposed changes align with the site's overall vision and functional requirements. The Framework Plan will inform decision-making processes, enabling HEC to evolve in a manner that meets both current and future needs.

Key Elements from the Framework Plan include:

- Landmarks: 5-way intersection at Kingman Road and Leaf Road, Casey Building, and Kingman Building
- Nodes: Kingman Road turnaround, gathering spaces near parking lots, and the gymnasium
- Incompatibilities: Multiple pinch points for traffic at major intersections
- Opportunities: Developable area parcels near Cude Building
- Desired Paths: Complete pedestrian corridors

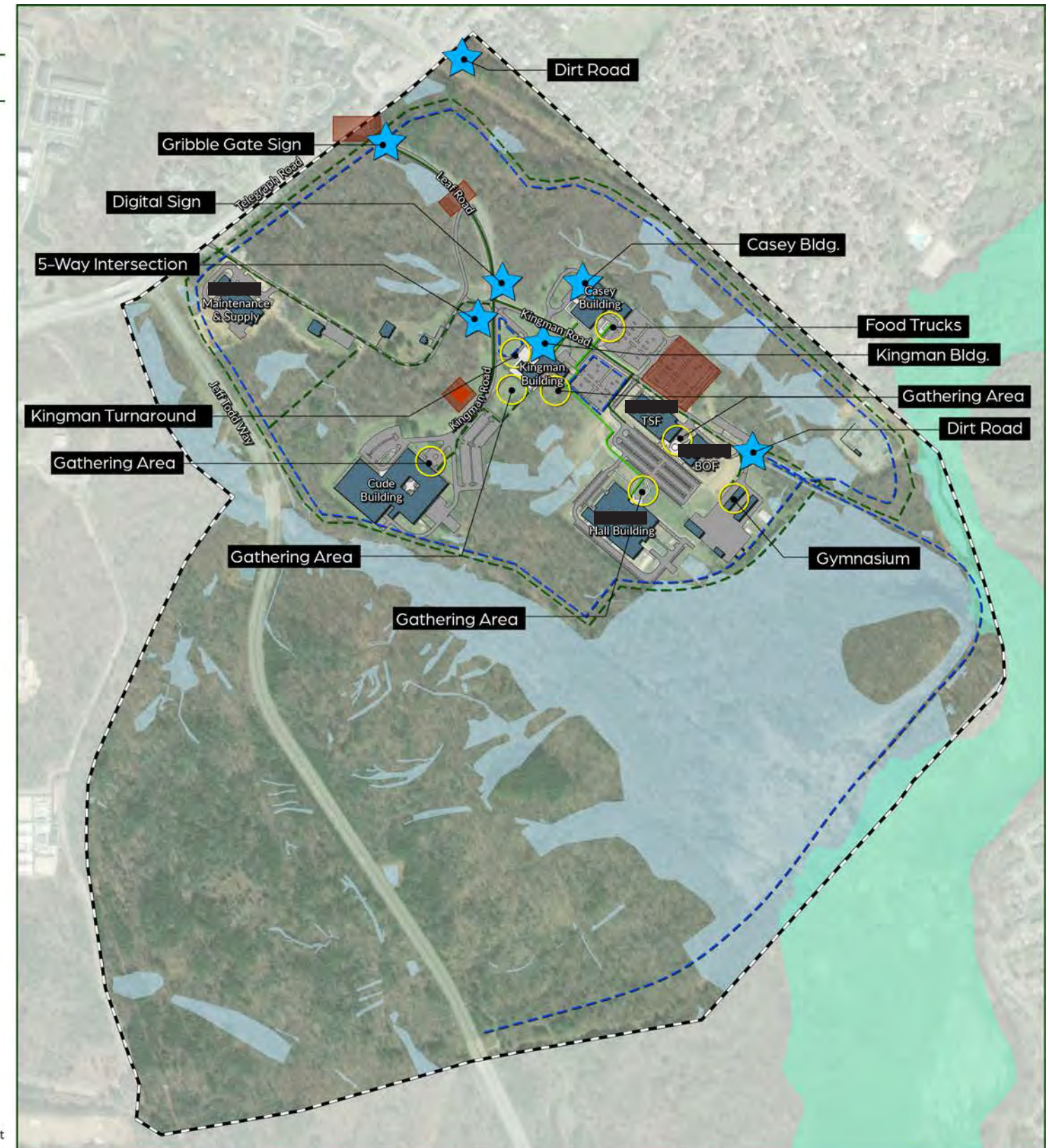
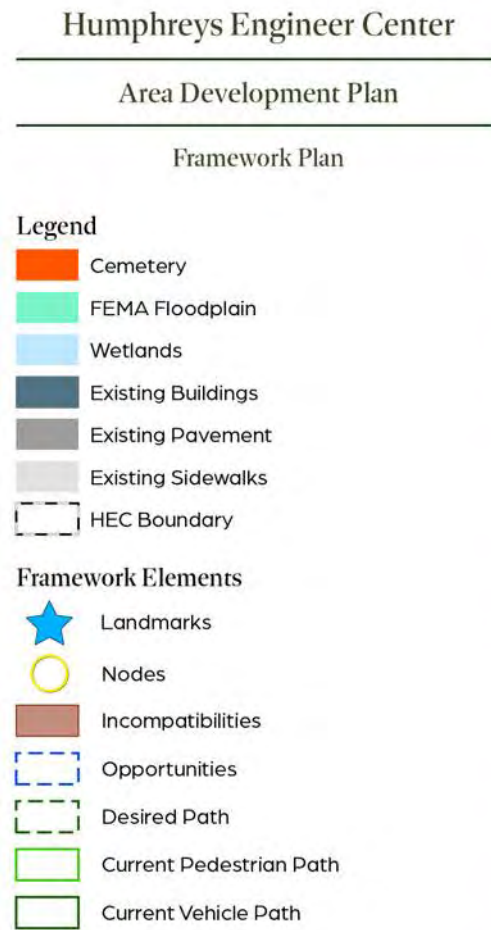


Figure 2-1. Framework Plan

## 2.3 Environmental Constraints

Incorporating environmental considerations (Figure 2-2) into the planning and development at HEC is crucial to preserving its natural resources. The presence of streams, wetlands, and floodplains means that any new construction or infrastructure projects must incorporate strategies to protect these natural resources.

The map identifies several streams within the installation boundary. These streams are ecological features that support local biodiversity and should be protected from pollution and physical disruption without proper environmental assessment.

The Riparian Protection Areas (RPAs) indicate regions that require special attention to safeguard water quality and habitat. RPAs typically include buffers around streams and wetlands, aiming to minimize the impact of development on these sensitive areas. The RPA should be a 100-foot setback from water bodies, such as creeks, streams, etc.

The Federal Emergency Management Agency (FEMA)-designated floodplain indicate regions susceptible to flooding. Development in these areas is heavily regulated to prevent property damage and ensure safety during flood events. Wetlands are vital ecosystems that provide numerous environmental benefits, including water filtration, flood control, and habitat for wildlife. These areas are protected under various environmental regulations, and any development near them must mitigate potential impacts. Significant vegetation is also depicted on the map, which plays a role in maintaining ecological balance, providing habitat, and preventing soil erosion.

For planners and developers, this map serves as a tool to identify areas where environmental protection measures are necessary. By adhering to these constraints, HEC can ensure sustainable development that respects and preserves the natural environment, ultimately contributing to the long-term resilience and ecological health of the area.

### Humphreys Engineer Center Area Development Plan Environmental Constraints

- Legend
-  Streams
  -  Approximate RPA
  -  FEMA Floodplain
  -  Wetlands
  -  Vegetation Area
  -  Existing Buildings
  -  Existing Pavement
  -  Existing Sidewalks
  -  Installation Boundary

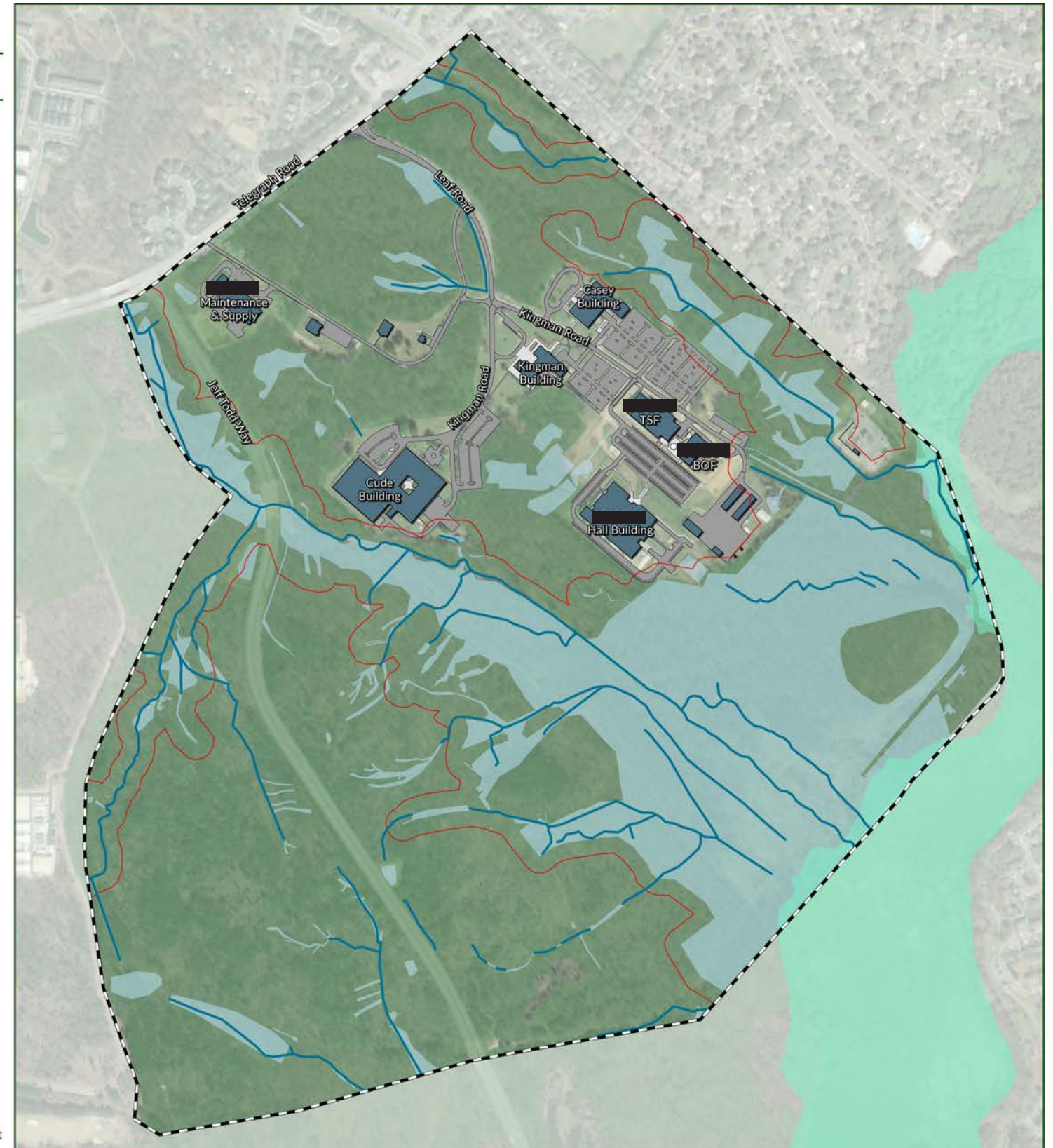


Figure 2-2. Environmental Constraints

## 2.4 Developable Areas

Within HEC’s boundary, the development potential of land is classified into three categories: unconstrained, moderately constrained, or constrained. The analysis, which was conducted during the vision plan workshop, categorizes land based on its susceptibility to environmental and built restrictions and is summarized in Figure 2-4. The “unconstrained” category comprises 213.7 acres (around 36.6 percent of HEC’s campus) and denotes land free from major constraints.

Development on land affected by environmental and built constraints that can be mitigated, rather than being outright prohibitive, necessitates advanced engineering solutions and potentially higher construction costs. These areas are classified as “Moderately Constrained” and encompass 17.6 acres, equivalent to 3 percent of HEC’s campus. Despite the presence of environmental mitigation regulations, strategic planning and adaptive measures can facilitate viable development within these zones.

No areas within HEC’s boundary are classified as “Constrained.” All evaluated portions of the campus were categorized either as developable or moderately constrained, reflecting the absence of zones where development is restricted due to environmental or built constraints. This ensures that the entirety of HEC’s campus holds potential for development, albeit with varying degrees of environmental considerations and engineering requirements.

Parcel	Area (acres)
1	22.3
2	14.0
3	15.3
4	4.3
5	3.1
6	6.7
7	3.0
8	5.7
9	2.3
10	6.6
11	58.1
12	82.8
<b>Total</b>	<b>224.2</b>

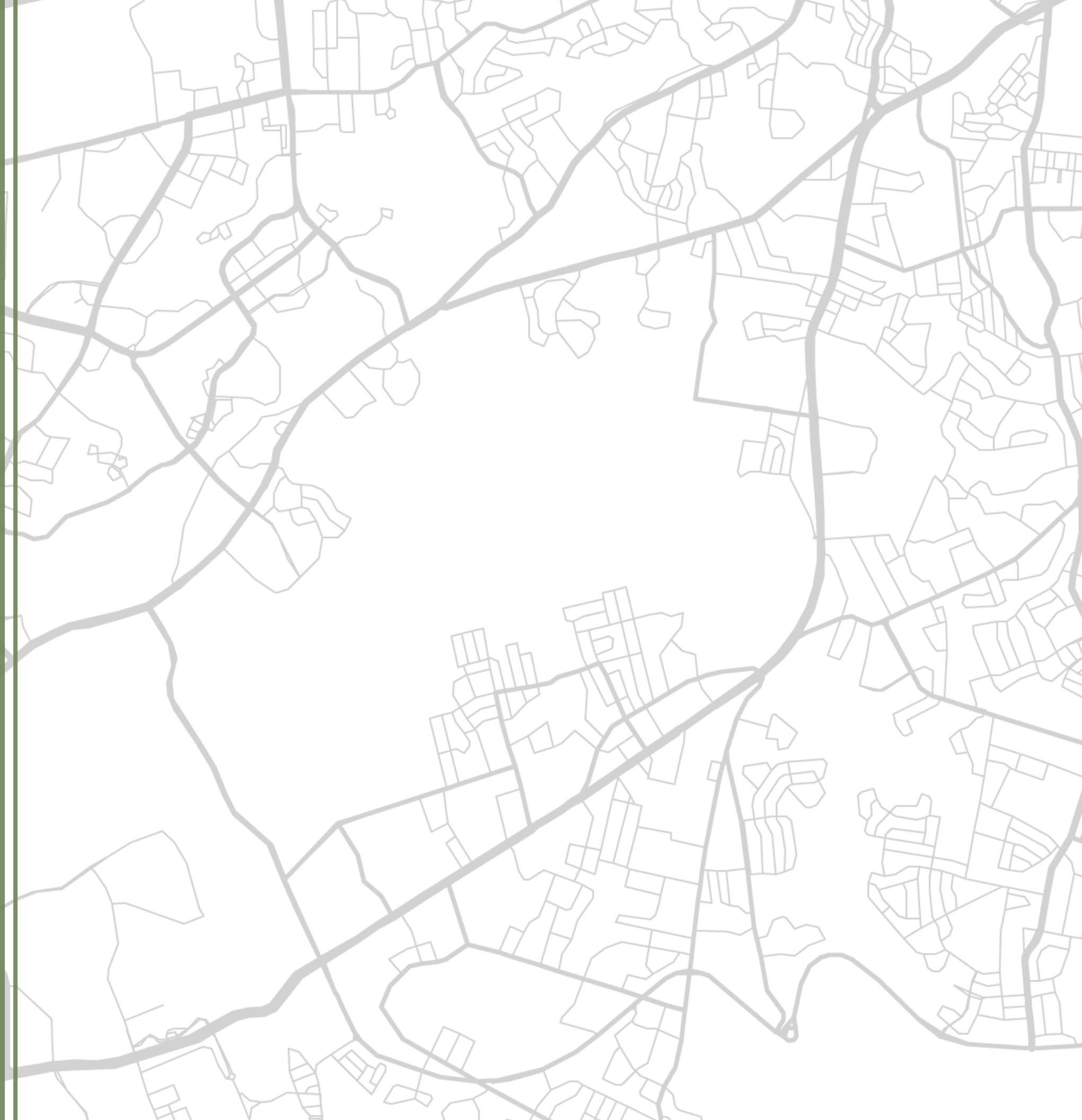
Table 2-1. Developable Areas



Figure 2-3. Developable Areas

# 3

## Capabilities Overview



# 3.1 Summary of Current Conditions

## Overview

HEC’s mission is comprised of a few key primary functions:

- Engineering and construction management for development projects
- Environmental sustainability, hazardous waste cleanup, and resource management
- Research and development in engineering
- Training and professional development

HEC operates on a unique funding model, relying on tenant reimbursements rather than Congressional appropriations.

## Environmental and Built Constraints

The RPA and FEMA–designated floodplains indicate regions requiring special attention to safeguard water quality and habitat. Environmental protection measures ensure sustainable development and resilience.

## Topography and Utilities

HEC’s topography and utility infrastructure are crucial for future development. Most land is suitable for development, though some areas

have restrictions due to slopes and existing infrastructure. Utility capacity is adequate but may require expansion for high-intensity development.

## Transportation Network

HEC’s transportation network includes primary and secondary roads, pedestrian pathways, and connectivity to external highways and public transport, supporting efficient movement and connectivity within the installation.

## Green Infrastructure

HEC integrates green infrastructure with built environments, preserving natural features like forests, streams, wetlands, and floodplains. This approach supports sustainability and ecological health.

## Development Potential

Land within HEC is categorized as unconstrained or moderately constrained, with no areas deemed entirely constrained. This assessment ensures potential for development with varying environmental and engineering considerations.



Cude Building



Typical HEC Parking Lot

## 3.2 Opportunities

Stakeholders identified six key groups of opportunities at HEC. Exploring these opportunities can lead to strategic advantages and enhanced capabilities that support long-term growth and goals.

### Nature

Leveraging the natural surroundings can enhance the aesthetic appeal of the site, promote eco-friendly practices, and improve employee well-being.

### Land Development

Developing unused or underutilized land can expand facilities, accommodate growth, and enhance the overall campus layout.

### Access

Improving access can attract talent, streamline operations, and enhance customer and employee satisfaction.

### Utilities

Upgrading utility infrastructure can reduce operating costs and support sustainability goals.

### Funding

Securing additional funding or grants can enable investments in infrastructure upgrades.

### Security

Strengthening security measures can enhance safety, protect valuable assets, and improve the overall reputation and trustworthiness of the organization.



Mixed Transportation Street



Typical Native VA Wildlife

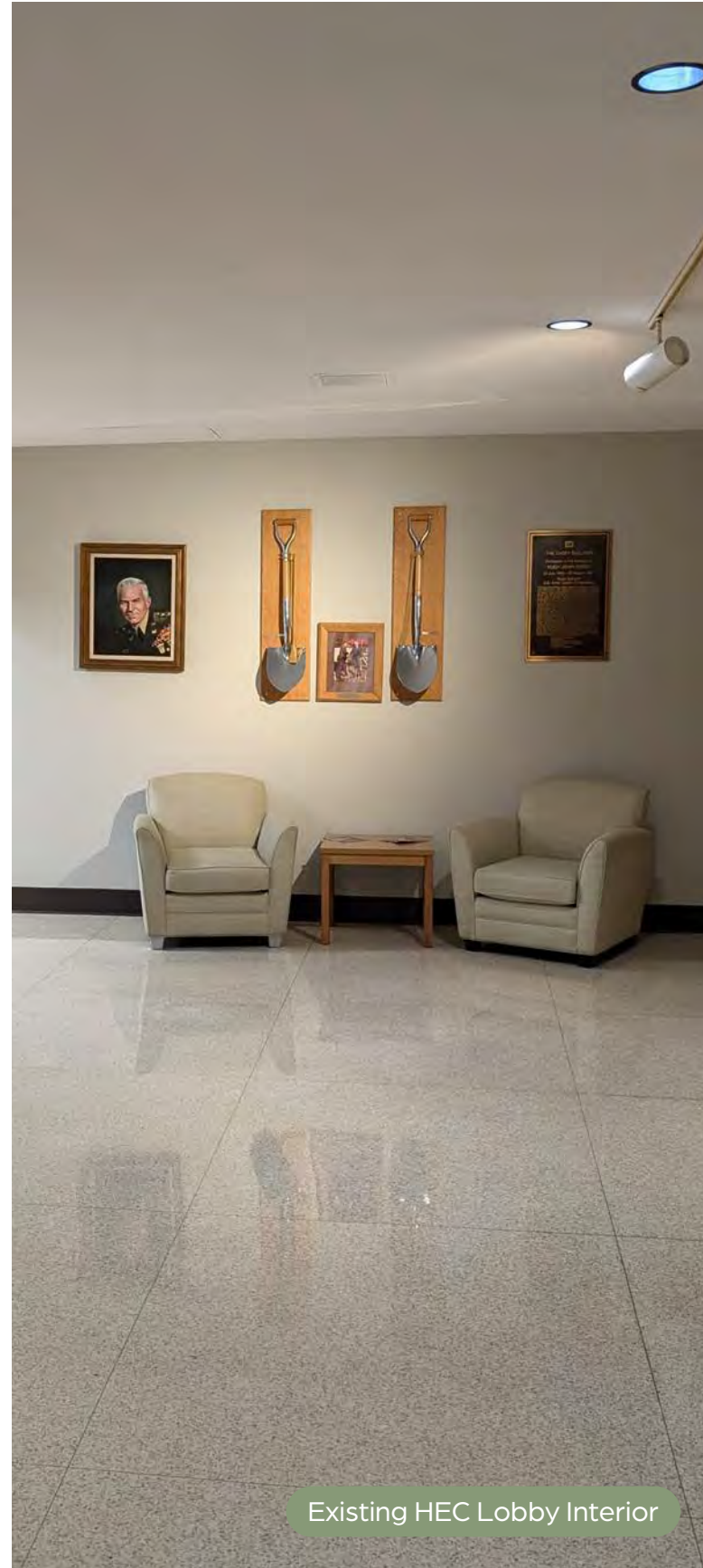


Map Creation at the Vision Workshop

## 3.3 Potential Projects

Stakeholders also identified a wide range of potential projects as opportunities for improving quality of life and mission capability at HEC. These projects were carefully considered and analyzed during the development of the alternatives and preferred alternative for feasibility and effectiveness.

- Building renovations at major existing facilities (Casey, Cude, and Kingman)
- Infrastructure/utility upgrades
- Secondary ingress/egress
- Secure campus, facilities
- Overall QoL improvements, including a fitness center, sports fields, and food truck plazas
- Overall campus improvements to wayfinding, landscaping, and sense of place
- Security improvements, including a full perimeter fence
- Safety improvements to transportation networks, including speed tables, lighting, and crosswalks at major intersections



Existing HEC Lobby Interior



Typical HEC Street Design



Existing HEC Green Space

# 4

## Alternatives



# 4.1 Alternatives Development

Stakeholders at the HEC ADP workshop collaborated to develop three distinct alternative plans for future development, each with varying levels of investment and growth potential. These alternatives were driven by the HEC Vision Statement and a discussion of site constraints, known projects, and mission requirements.

## Low-Investment Plan

This alternative prioritizes quality of life improvements with minimal new construction or expansion. It focuses on enhancing existing infrastructure, improving public services, and promoting green spaces and community amenities. The goal is to maintain a balanced, sustainable environment with a focus on livability rather than rapid growth.

## Moderate-Investment Plan

This option allows for some new construction and development, aiming to accommodate gradual HEC expansion while still maintaining the character of the community. It includes infrastructure upgrades, significant renovations to existing facilities, and new construction projects to support moderate expansion.

## High-Investment Plan

The most ambitious option, this plan opens the door to large growth and development on the other side of Jeff Todd Way. It encourages large-scale construction, high-density urban expansion, and significant infrastructure investments. The focus is on maximizing economic opportunities and transforming the area into a premier modern office facility, with few restrictions on future expansion.

Each plan reflects different priorities and investment levels, allowing stakeholders to weigh the benefits and trade-offs of growth, sustainability, community impact, and cost. Stakeholders analyzed the strengths, weaknesses, and feasibility of each option, ultimately informing the preferred alternative discussed in the next chapter.

### Humphreys Engineer Center Area Development Plan Basemap

- Legend
- Existing Buildings
  - Existing Pavement
  - Existing Sidewalks
  - Installation Boundary

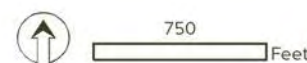


Figure 4-1. Basemap

## 4.2 Alternative 1

Alternative 1 (Figure 4-2) is characterized by quality-of-life improvements that utilize existing infrastructure and don't require new building construction. This alternative proposes several projects aimed at enhancing functionality, safety, and quality of life across the installation and assumes a strict budgetary restriction. Key improvements include the addition of covered outdoor pavilions and meeting spaces near the Kingman and Casey buildings, providing versatile areas for gatherings. A more connected campus is envisioned with an extended sidewalk network, particularly linking the main campus to the warehouse area. Enhanced wayfinding and navigation will be supported through additional signage throughout the installation. Facility upgrades include the renovation of the gym and mail room, while sustainability efforts are addressed with the installation of EV charging stations for privately owned vehicles in parking lots. To improve safety and security, a perimeter fence is proposed, accompanied by a walking trail to offer recreational opportunities along the installation's boundary. Aesthetic and environmental enhancements will be achieved by planting additional trees along roadways and placing benches and tables throughout the site, creating inviting spaces for relaxation and socialization.

### Humphreys Engineer Center

#### Area Development Plan

##### Alternative 1

##### Legend

-  Proposed Fenceline
-  Riparian Protection Area
-  Proposed Renovation
-  Proposed New Buildings
-  Proposed Pavement
-  Proposed Greenspace
-  Existing Buildings
-  Existing Pavement
-  Existing Sidewalks
-  Installation Boundary

##### Project List

- A** Covered Pavilion/ Outdoor Meeting Space
- B** Extended Sidewalks to Warehouse
- C** Wayfinding/ Signage
- D** Gym/ Mailroom Renovation
- E** POV EV Charging Stations
- F** Perimeter Fence
- G** Walking Trail Along Perimeter
- H** Additional Trees Along Walkways (Throughout)
- I** Benches/ Tables



Figure 4-2. Alternative 1

## 4.3 Alternative 2

Alternative 2 (Figure 4-3) is characterized by significant renovations to existing facilities – and a few key construction projects – aimed at meeting all of HEC’s current mission capability gaps. First, Kingman, Casey, and Cude buildings all receive infrastructural overhaul and modernization of their office and conference spaces. HVAC, electrical, plumbing, and mechanical systems are each outfitted with modern technologies. These renovations also include the reorganization of pedestrian spaces and improved outdoor green spaces adjacent to offices. The most notable project is the new Conference and Activities building at the center of the campus, featuring new amenities and new tenant space for HEC development. A new egress route is also paved, along with adequate perimeter fencing around the entire HEC facility. Lastly, an overhaul to roadway systems and pedestrian networks reconfigures vehicular traffic across the campus to accommodate aforementioned development.



Figure 4-3. Alternative 2

## 4.4 Alternative 3

Alternative 3 (Figure 4-4) represents the farthest-reaching and most ambitious development goals for the long-term future of the facility. In addition to completely renovating and reconstructing the existing campus, Alternative 3 proposes a new secure area on the other side of Jeff Todd Way. This secondary campus includes offices, amenities, and green space within its own perimeter fence to provide a safe, secure, and comfortable place to work. Other proposed projects include the addition of a secondary ingress/egress gate for enhanced access and security, a perimeter fence for safety, and improved sidewalk connectivity throughout the installation. Recreational and open space enhancements are addressed through picnic and break areas and solar-covered parking for sustainability. Facility upgrades include the replacement of the Kingman building with a data center, the renovation of the Casey and Cude buildings, and the addition of a fitness center and mission support facility. Other notable features include an auditorium, a library, and shuttle services to improve accessibility.



Figure 4-4. Alternative 3

## 4.5 Alternative Evaluation

The alternatives were each weighed against five goals: safe and secure, inviting, integrated with natural landscape, feasibility, and cost. The results can be seen in Table 4-1. Additionally, stakeholders discussed the pros and cons, key concepts, and voted on their top three projects from each alternative.

### Alternative 1

The key projects Alternative 1 provides are the outdoor spaces and walking trail, improved sidewalk circulation and wayfinding/signage, tree shading and benches, and an improved perimeter fence. These projects would provide the installation with great walkability and general outdoor comfort as well as security and safety improvements. Additionally, the cost of implementing these projects is relatively low. Stakeholder voting indicated high approval for these key projects, including the perimeter fence, extended sidewalk network, Privately owned vehicles (POV) electric vehicle (EV) charging stations, and the perimeter walking trail. Overall, while Alternative 1 may not provide HEC with the most ambitious solutions to long-term development issues, these quality-of-life improvements and renovations excel at addressing current capability gaps at HEC within a reasonable budget.

### Alternative 2

Alternative 2 meets (and exceeds) expectations for modernizing facility infrastructure across the entire campus. New construction projects are highly effective at consolidating and reorganizing existing facilities into more convenient locations and configurations. Additionally, the new Conference and Activities building is both exciting and appealing to new potential tenants. However, although the additional fence is safe and secure, its presence weighs on the inviting campus atmosphere and will be a hinderance to traffic.

### Alternative 3

Alternative 3 provides HEC with the greatest footprint to grow into for decades to come. Safety and security concerns are fully addressed through the construction of a full perimeter fence and additional security measures around the new second campus. However, these security measures also negatively affect HEC's goal to promote an inviting atmosphere. Furthermore, such widespread development consumes much of the available green space and diminishes many of the natural qualities HEC's users expect and enjoy. When factoring in the cost and feasibility of constructing Alternative 3, this option appears less viable than Alternatives 1 or 2.

Goal	Alt. 1	Alt. 2	Alt. 3
Safe and Secure	+	+	+
Inviting	+	+	✓
Integrated with Natural Landscape	+	+	✓
Feasibility	+	✓	✓
Cost	✓	✓	—

Table 4-1. Alternative Analysis



Map Creation at the Vision Workshop

# 5

Preferred  
Alternative



# 5.1 Preferred Alternative

The Preferred Alternative (Figure 5-1) for HEC integrates elements from multiple options considered during the planning process, resulting in a cohesive vision for campus development. It emphasizes renovations, new construction, infrastructure improvements, and enhanced connectivity, while maintaining environmental stewardship and preserving the installation's unique setting. This alternative balances operational effectiveness, environmental preservation, and infrastructure modernization while addressing both current and anticipated future needs. This alternative reflects a holistic approach to campus planning, integrating functional, security, and sustainability goals. By addressing immediate needs while anticipating future demands, the Preferred Alternative supports the long-term success and resiliency of HEC.

Project A involves the renovation of the Kingman, Casey, and Cude buildings to update aging infrastructure and optimize their functionality for modern operational demands. Project B proposes the construction of a Conference and Activities Center, addressing gaps in HEC's ability to host larger gatherings and collaborative events. Project C introduces a secondary egress, enhancing traffic flow and emergency access for the installation. Project E involves the installation of a new perimeter fence, ensuring compliance with AT/FP standards, while bolstering overall security. Project F addresses installation-wide sidewalk improvements, creating safer and more accessible pedestrian pathways to connect key areas. Project G adds new capacity buildings, supporting expanded mission requirements and providing additional operational space. Project H calls for the demolition of aging bunkers to clear space for safer and more efficient land use. Project I designates areas for future capacity development, ensuring HEC remains adaptable to evolving mission requirements. By reserving land for long-term growth, the plan accommodates potential changes in operational focus and resource needs.

Goal	Preferred
Safe and Secure	+
Inviting	+
Integrated with Natural Landscape	+
Feasibility	✓
Cost	✓

Table 5-1. Preferred Analysis

### Humphreys Engineer Center

#### Area Development Plan

Preferred Alternative

**Legend**

- Proposed Fenceline
- Riparian Protection Area
- Proposed Renovation
- Proposed New Buildings
- Proposed Demolition
- Proposed Pavement
- Proposed Greenspace
- Existing Forested Area
- Existing Buildings
- Existing Pavement
- Existing Sidewalks
- Installation Boundary

**Project List**

- A** Renovate Kingman, Casey & Cude bldgs.
- B** Construct Conference + Activities center
- C** Secondary Egress
- D** HEC Warehouse - HPTC
- E** Perimeter Fence
- F** Installation-wide Sidewalk Improvements (Throughout)
- G** Implement Pedestrian Spaces
- H** Demolition of Bunkers- Relocate Customers
- I** Auditorium



Figure 5-1. Preferred Alternative

## 5.2 Capacity Plan

The Capacity Plan (Figure 5-2) serves as a roadmap for HEC’s future development, ensuring HEC is equipped to handle its current responsibilities and prepared to adapt to future demands. By integrating elements from all alternatives, the Preferred Alternative provides a thoughtful and balanced vision that aligns with HEC’s mission and long-term goals.

Capacity planning is the process of assessing and determining the resources—such as personnel, facilities, infrastructure, and technology—necessary to meet future operational demands at HEC. This process involves forecasting mission requirements, ensuring adequate resource allocation, and maintaining the flexibility needed to adapt to evolving priorities. To achieve this, planners develop a Capacity Plan, which provides a vision for a functional and future-ready installation based on anticipated or potential mission requirements. The Capacity Plan identifies areas where infrastructure, facilities, and support functions may be insufficient and outlines opportunities for development to address gaps and prepare for changes in mission demands. It serves as a strategic tool for guiding investment and ensuring the installation remains resilient and mission-capable.

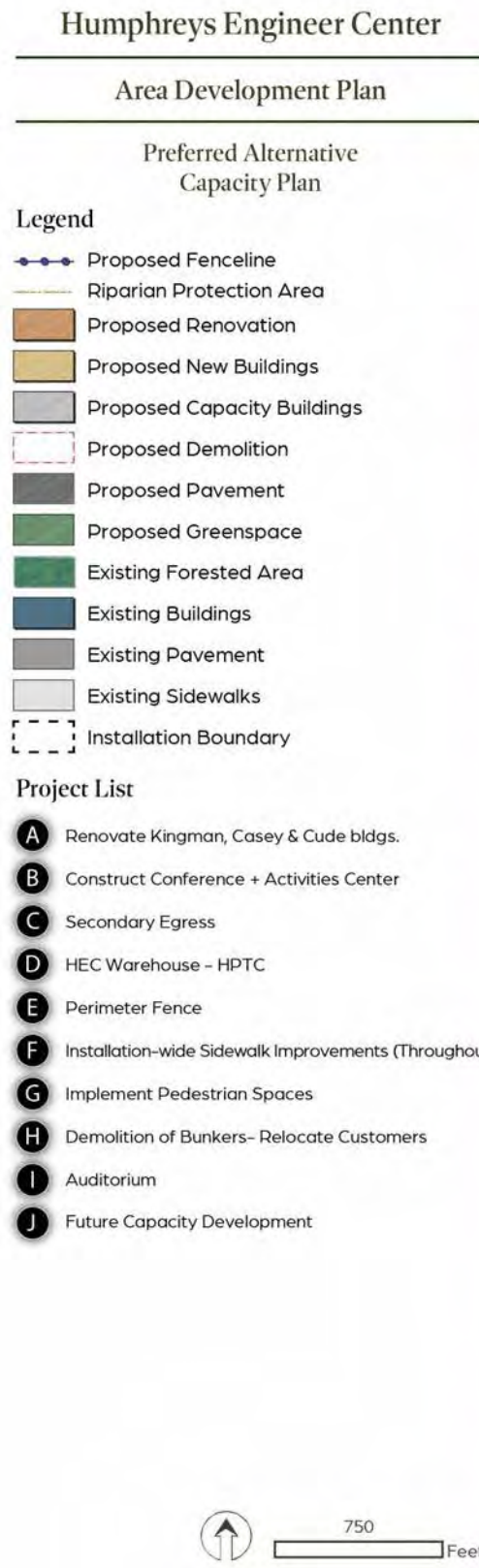


Figure 5-2. Capacity Plan

# 5.3 Regulating Plan

The Regulating Plan (Figure 5-3) determines parameters for development, including minimum and maximum building heights and permitted functions. The Regulating Plan is a tool to guide the development of a district as requirements change or new requirements arise over time. The Regulating Plan ensures development meets the long-term goals of mission sustainment, environmental stewardship, and efficient development.

The Regulating Plan defines the types of development permitted in each parcel, ensuring facilities, open spaces, parking, and other uses are in alignment with the overall HEC Vision, Goals, and Objectives presented in Chapter 1. Table 5-2 assigns permitted functional uses to each regulating parcel identified in the Regulating Plan and indicates the minimum and maximum building height (in levels/stories). These recommendations aim to prevent structures from being built without consideration for density and land-form planning. Building taller (where applicable in the district) will allow HEC to make the most efficient use of available space, preserve green space, and increase density.

**Humphreys Engineer Center**  
**Area Development Plan**  
**Preferred Alternative Regulating Plan**

**Legend**

- Proposed Fenceline
- - - RPA Constraint Boundary
- Proposed Renovation
- Proposed New Buildings
- Proposed Capacity Buildings
- Proposed Demolition
- Proposed Pavement
- Proposed Greenspace
- Existing Forested Area
- Existing Buildings
- Existing Pavement
- Existing Sidewalks
- - - Installation Boundary
- Regulating Plan
- Parcels



Figure 5-3. Regulating Plan

## 5.4 Functional Categories

The Functional Categories shown in Table 5-2 are meant to indicate groups of parcels that share common land use characteristics. Guidance for each functional category is provided in the table, defining which uses are “Permitted” or “Prohibited” in each category, and consequently, for each parcel.

### Light Industrial

Light Industrial consists of the production of smaller goods, a manufacturing service that uses moderate amounts of processed materials, maintenance, and storage. Light Industrial functions are prohibited in parcels 2, 7, 8, and 9 at HEC.

### Administrative

Administrative refers to a non-retail facility that provides executive, management, administrative, and other services within the installation. Administrative uses are permitted everywhere besides parcels 5 and 14 at HEC.

### Community Commercial

Community Commercial indicates the central location for shopping, services, and day-to-day support needs of installation personnel, their families, and military retirees within the area. Community Commercial functions are permitted in all parcels except 5 and 14 at HEC.

### Community Service

Community Services is similar to community commercial but adheres more to facilities that support family and personal needs such as schools, education facilities, post office, libraries, and religious centers. Community Services are permitted everywhere besides parcels 5 and 14 at HEC.

### Outdoor Recreation

Outdoor Recreation includes outdoor courts, sports fields, and facilities that enhance quality of life. Outdoor Recreation is permitted in all parcels besides 5 and 14 at HEC.

### Open Space

Open Space creates the natural setting for all facilities and may be undeveloped for buffer space between incompatible uses or required for safety or security clearances. Open Space functions are permitted in all parcels at HEC.



Table 5-2. Permitted Functions

Parcel	Min. Level	Max. Level	Light Industrial	Administrative	Community Commercial	Community Service	Outdoor Recreation	Open Space
1	1	4	x	x	x	x	x	x
2	1	4	N	x	x	x	x	x
3	1	4	x	x	x	x	x	x
4	1	4	x	x	x	x	x	x
5	1	4	N	N	N	N	N	x
6	1	4	x	x	x	x	x	x
7	1	4	N	x	x	x	x	x
8	1	4	N	x	x	x	x	x
9	1	4	N	x	x	x	x	x
10	1	4	x	x	x	x	x	x
11	1	4	x	x	x	x	x	x
12	1	4	x	x	x	x	x	x
13	1	4	x	x	x	x	x	x
14	1	4	N	N	N	N	N	x
15	1	4	x	x	x	x	x	x
16	1	4	x	x	x	x	x	x

## 5.5 Project Execution

Detailed plans for project execution, phasing, and Rough Order of Magnitude (ROM) cost estimates will be developed following further validation of the Preferred Alternative. These plans will outline a clear and systematic approach for implementing the projects identified in the ADP. A phased approach will be developed to minimize disruption to ongoing operations while addressing key infrastructure and facility improvements in a logical sequence.

ROM cost estimates provide a high-level financial framework for planning and decision-making, helping to identify funding requirements and align with budgeting processes. These estimates will be refined as additional data becomes available and will serve as a critical component of the Prefinal Submittal, offering a comprehensive overview of the implementation strategy for the Preferred Alternative.

ROM Cost Notes:

- Fairfax County, Virginia ACF (Area Cost Factor)  $\approx$  1.14
- Soft costs generally include Design, PM, Contingency, Sitework, Security Infrastructure, etc.
- Escalation assumed + 5 % annually

Table 5-3. ROM Cost

Project	Phase	Scope Description	Unit of Measure	Quantity	Square Footage (SF)	2025 ROM Cost (M USD)	2025 Unit Cost (\$/SF)	Escalated Cost (M USD)	Notes	Reference
A. Renovate Kingman, Casey & Cude Buildings	Mid-Term	Full interior + MEP system renovations	SF	150000	150000	22	146.67	24.26	Includes HVAC, electrical, plumbing, interior modernization, energy upgrades	Based on RSMeans 2024 and UFC 3-530-01 renovation costs, avg. \$140-\$160/SF
B. Construct Conference + Activities Center	Mid-Term	New construction	SF	30000	30000	18	600	19.84	Multi-purpose facility with conference rooms, breakout space, and collaboration zones	New facility costs from RSMeans 2024, mid-range federal construction: \$550-\$650/SF
C. Secondary Egress	Mid-Term	Access road and control gate infrastructure	LF	2000	10000	3.5	350	3.86	Includes new pavement, security checkpoint, gatehouse	USACE access control point cost models, est. \$1,500-\$2,000/LF with security features
D. HEC Warehouse – HPTC	Mid-Term	New secure warehouse/storage facility	SF	40000	40000	12	300	13.23	Storage, mail handling, logistics; standard UFC warehouse design	UFC 4-171-05A warehouse standards, est. \$300-\$350/SF (secure)
E. Perimeter Fence	Short-Term	AT/FP-compliant fencing	LF	8000	0	6		6.3	Includes crash-rated fencing and limited access control points	UFC 4-022-03 and RSMeans, AT/FP perimeter fencing: \$600-\$800/LF
F. Sidewalk Improvements (Throughout)	Short-Term	Sidewalk and pedestrian connectivity	LF	10000	50000	2.5	50	2.62	Network-wide resurfacing, new segments, ADA improvements	UFC 3-201-02 and local bid history, est. \$200-\$300/LF including ADA upgrades
G. Implement Pedestrian Spaces	Short-Term	Plazas, crosswalks, shade structures	SF	20000	20000	3	150	3.15	Includes site furniture, landscaping, lighting	Landscape and hardscape cost guides, est. \$120-\$180/SF
H. Demolition of Bunkers – Relocate Customers	Short-Term	Demo and site prep	Each	3	0	2		2.1	Includes disposal, hazardous materials handling, minor relocation costs	DoD demolition rates, est. \$500K-\$800K/bunker with hazmat
I. Auditorium	Long-Term	New auditorium construction	SF	25000	25000	15	600	18.23	Flexible seating, stage area, AV infrastructure	Federal auditorium benchmarks from RSMeans 2024, \$500-\$600/SF for AV-equipped facilities
J. BOF Facility	Mid-Term	New SCIF facility for training and support	SF	43100	43100	43.1	1000	47.52	Three-story SCIF built to UFC 4-010-05 and ICD/ICS 705 standards; high-security infrastructure	Based on SCIF construction benchmarks from RSMeans 2024 and UFC 4-010-05: \$950-\$1,100/SF

## 5.6 Energy, Water, Waste Strategies

The Preferred Alternative also includes several improvement strategies to the energy, water, and waste systems throughout the facility.

### Water-Efficient Fixtures

- Retrofit existing facilities with low-flow water fixtures and touchless faucets to conserve water.
- Incorporate water-efficient systems in the design of the new Conference and Activities Center (Project B) and other new buildings.

### Construction Waste Reduction

- Require contractors to implement construction and demolition waste diversion plans during the renovation of existing buildings (Project A) and demolition of bunkers (Project H).
- Salvage and reuse materials like steel and concrete wherever feasible.

### Greywater Reuse

- Explore greywater recycling systems in newly constructed buildings to reduce potable water consumption for landscaping and other secondary uses.

### Composting Facilities

- Establish a small-scale composting facility to manage organic waste generated on-site, reducing landfill contributions and producing compost for landscaping use.

### Sustainable Procurement Policies

- Prioritize purchasing products with minimal packaging, recyclable materials, and lower environmental impacts to reduce overall waste generation.

### Stormwater Management Enhancements

- Expand and improve Riparian protection areas to increase stormwater infiltration and reduce runoff impacts.
- Install bioretention areas, permeable pavements, and green roofs on key buildings to enhance stormwater control.



# 6

## Appendix



## 6.1 Acronyms

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ADP – Area Development Plan

ADEP – Area Development Execution Plan

ATFP – Antiterrorism/Force Protection

FEMA – Federal Emergency Management Agency

HEC – Humphreys Engineer Center

HECSA – Humphreys Engineer Center Support Activity

IPS – Installation Planning Standards

MILCON – Military Construction

NCPC – National Capital Planning Commission

POV – Privately Owned Vehicle

QoL – Quality of Life

RPA – Riparian Protection Areas

ROM – Rough Order of Magnitude

USACE – United States Army Corps of Engineers

## 6.2 Acknowledgements

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## 6.4 References

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UFC 2-100-01 installation Master Planning (September 2020)

1st Capabilities Integration Group HEC Real Property Master Plan (September 2020)

1st Capabilities Integration Group Space Utilization Plan (September 2020)

Humphreys Engineer Center Master Plan (October 2021)

Fort Belvoir Main Post Installation Design Guide (November 2008)

Humphreys Engineer Center Tree Replacement Plan (May 2021)