Northside Development
Site Analysis

Northside Development
Winchester Regional Airport (OKV)

Prepared for: The Winchester Regional Airport
Prepared by: Delta Airport Consultants, Inc.
December 2024

Site Analysis Report

For

Northside Development
Winchester Regional Airport (OKV)
Winchester, VA

Delta Project No.: 23051

Prepared for the Winchester Regional Airport

By Delta Airport Consultants, Inc.

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1. PROJECT BACKGROUND

The FAA approved Airport Layout Plan (ALP) for the Winchester Regional Airport depicts an area of airport property that is planned for future development. This area is located on the northeast side of Runway 14-32, opposite from the existing terminal area and hangar facilities. The site is also adjacent to the Frederick County Sheriff's Office facility, located along Coverstone Drive. Figure 1 depicts the general limits of the site, known as the "Northside Development Area." The recently constructed Coverstone Drive runs along the northern edge of the property. Additionally, a large commercial development project, known as "One Logistics Park," is under construction adjacent to the Northside Development Area. This multi-phased commercial development is one of many large projects in the Winchester area and is a testament to the overall growth and economic strength of the region. These local economic factors in addition to the airport's strategic proximity to the Washington D.C. area present an exciting opportunity to attract potential private development to the airport.

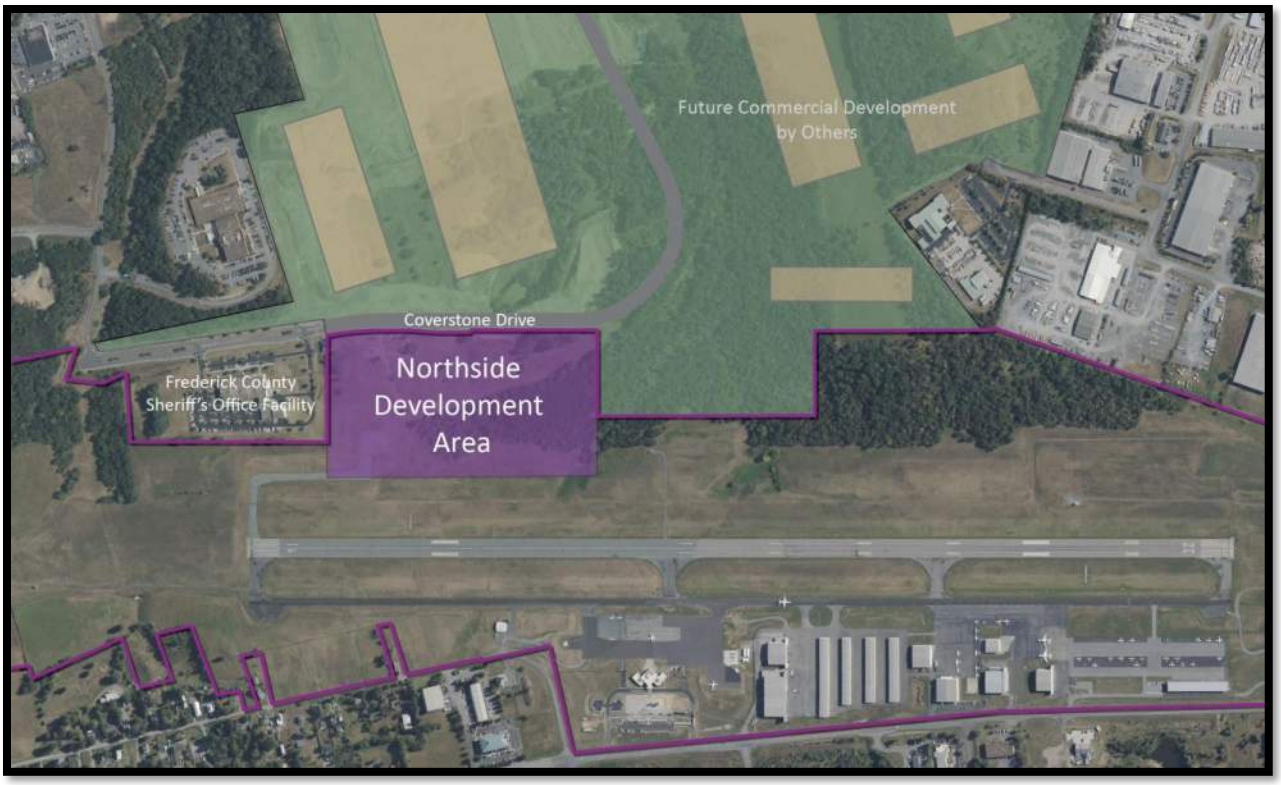


Figure 1: Northside Development Area at the Winchester Regional Airport

In order to understand the benefits and challenges associated with the Northside Development Area, the Airport has elected to proactively explore the key elements of the preliminary planning and design process. This report aims to explore and answer the basic questions that interested developers or businesses might have about the site when considering it as a viable venture.

1.1 Key Agencies

Throughout the analysis process, the following key agencies were contacted:

- Frederick County Planning & Development
- Frederick County Zoning
- Federal Aviation Administration (FAA) Office of Airports
- Federal Aviation Administration (FAA) Obstruction Evaluation/Airport Airspace Analysis (OE/AAA)
- Rappahannock Electric Cooperative
- Washington Gas

2. EXISTING SITE

The Northside Development Area is generally a greenfield site comprised of mostly grass and a large section of trees. The total developable area of the site is approximately 25 acres. Figure 2 below depicts the site looking north toward Coverstone Drive. The Frederick County Sheriff's Facility can be seen on the left side of the photograph. Aircraft access to the site from the runway environment is provided by a partial parallel taxiway that connects to the Runway 14 threshold. Auto access is provided by Coverstone Drive to the north. Figure 3 depicts Coverstone Drive looking southeast, with the Northside Development Area to the right.

Figure 2: Existing Site (Looking North)

Figure 3: Coverstone Drive (Looking Southeast)

3. DEVELOPMENT CONCEPTS OVERVIEW

To demonstrate the versatility of the site and adequately capture the range of development possibilities, three unique concept layouts were prepared and examined during the course of the project. These concepts include a manufacturing facility, an aviation airpark, and a mixed-size hangar development option. Each of these concepts represents a potential scenario of how the Northside Development Area could be developed. The concepts were developed while considering the FAA guidelines for airport geometric design as outlined in AC 150/5300-13B *Airport Design*. Full concept layouts and 3D renderings are included in **Appendix A**.

3.1 Manufacturing Facility

The first concept to be analyzed is an aviation-related manufacturing facility. To demonstrate the capabilities of the site, a concept design of a 400,000 SF facility was prepared and is depicted below in Figures 4 & 5. This facility includes a large automobile parking lot on the east side of the building with access to a main pedestrian entrance. A large box truck apron is depicted on the west side of the building with several loading bays to accommodate deliveries. Additional parking is provided on the north, road facing, side of the facility. The concept includes a large aircraft apron connecting the building to a parallel taxiway. This allows full access from the runway environment to the assembly floor of the manufacturing facility. Additionally, two charging stations for Electric Vertical Take-Off and Landing (EVTOL) aircraft are located on eastern corner of the apron.

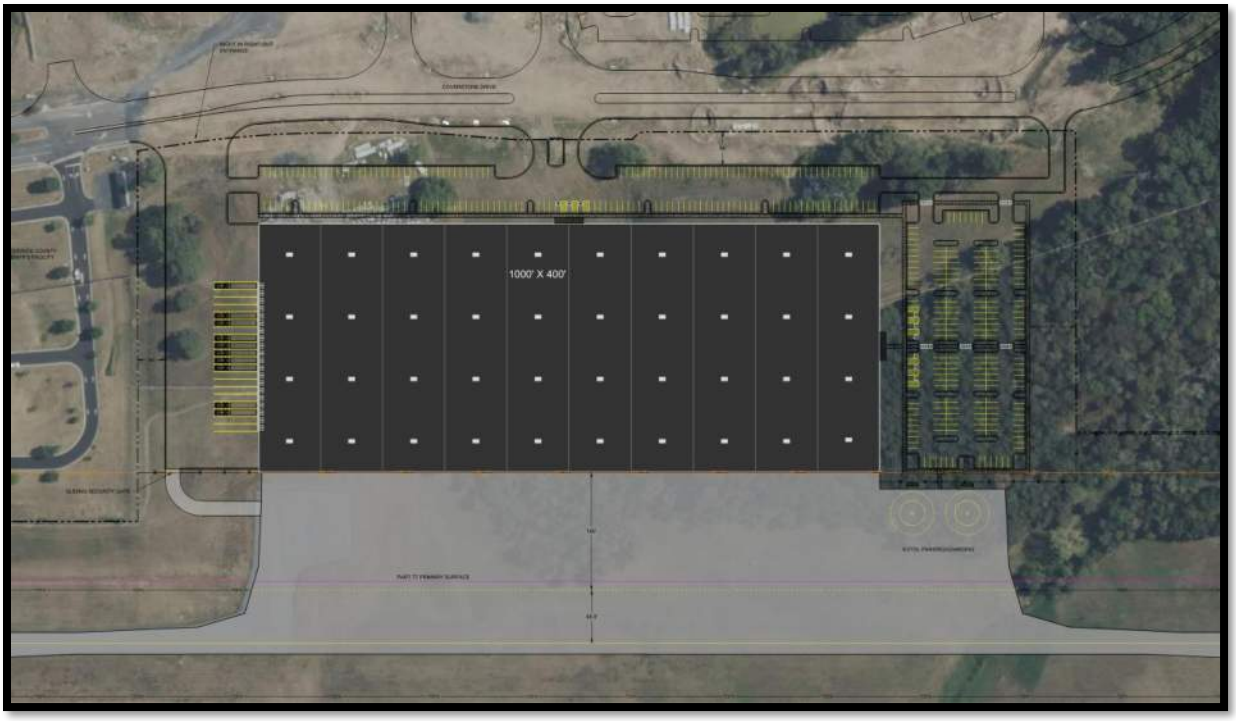


Figure 4: Development Concept: Manufacturing Facility

Figure 5: Concept Rendering: Manufacturing Facility

3.2 Airpark

The airpark concept includes the construction of a number of corporate aircraft hangars that can accommodate unique individual businesses (see Figures 6 & 7 below). Each hangar site can be customized in size and function to meet the needs of the proposed tenant. The nature of the individual hangar sites also allows for the development to occur in phases, as demand materializes. This concept includes the essential infrastructure needed to serve an array of aircraft owners and businesses. A fuel farm facility, equipped to handle fuel delivery truck maneuvers, as well as fuel storage and containment, is depicted on the west side of the property, adjacent to the Sheriff's facility. Sliding vehicle access gates are provided to allow tenant access onto the apron area. Each hangar includes apron space to allow aircraft to be pulled out of the hangars without blocking the object free area of the taxilanes.

Figure 6: Development Concept: Airpark

Figure 7: Concept Rendering: Airpark

3.3 Mixed Hangars

The mixed hangar development concept focuses on a scenario where a wide variety of aircraft users are accommodated on the site. These tenants range from large corporations with business jets to single user tenants with small single engine piston aircraft. Two variations of the mixed hangar concept have been prepared, but both share the same underlying design characteristics. Larger corporate hangars are located together in a row along a front facing apron, immediately adjacent to the parallel taxiway. The aircraft located in these hangars are more likely to be Airplane Design Group (ADG) III aircraft, with wingspans up to 188 feet, that require more space for maneuvering. Located in a similar fashion behind the corporate hangars along a rear apron, are smaller hangars that can accommodate up to ADG II size aircraft with wingspans up to 79 feet. Like the Airpark concept, the mixed hangars layout is equipped with a full fuel farm facility, vehicle access, and EVTOL charging positions.

3.3.1 Variation A

Variation A of the Mixed Hangars concept includes a row of both 80'x80' and 60'x60' box hangars along the rear apron (see Figures 8 & 9). Additional apron space is provided in front of the hangars to allow for aircraft operational movements and to avoid potential congestion situations when multiple aircraft are attempting to taxi to or from the rear apron area.

Figure 8: Development Concept: Mixed Hangars Variation A

Figure 9: Concept Rendering: Mixed Hangars Variation A

3.3.2 Variation B

In Variation B of the Mixed Hangars Concept (see Figures 10 & 11), four 10-unit t-hangar structures are located in the rear apron area to accommodate tenants with single engine piston aircraft, who are looking for a cost-effective option for aircraft storage. This area is only accessible by ADG I aircraft with wingspans up to 49 feet.

Figure 10: Development Concept: Mixed Hangars Variation B

Figure 11: Concept Rendering: Mixed Hangars Variation B

4. SITE CONSIDERATIONS

In order to understand both the advantages and challenges of the Northside Development Area, a preliminary review of the important site considerations was conducted. This review examined elements such as the availability of utilities, site geotechnical characteristics, zoning limitations, vehicle access and parking requirements, in order to provide a baseline of knowledge to potential developers. Each key element is summarized in a corresponding section below.

4.1 Earthwork, Drainage, & Stormwater Management

The existing elevation profile of the Northside Development site is comprised of varied areas of relatively flat terrain mixed with depressions and some hills. Figure 12 below depicts the elevation contours of the existing site. Additionally, Figure 13 illustrates the elevation profile using a graduated color scale. This visualization helps to paint a clear picture of the topographic characteristics of the area. In general, the site elevation is highest in the center with a general downslope toward the northern and eastern property boundaries. A significant drainage depression is located in the southern portion of the site that currently carries stormwater away from the runway environment. An existing 20ft tall stockpile of clean fill material is available near the center of the site. The total elevation relief of the project area ranges from approximately 733' MSL at the top of the stockpile, to 690' MSL near the start of the drainage depression on the east side.

The north-center of the site will primarily generate earthwork cut, while the south end and the areas around the property boundaries will generally require fill material. Preliminary grading plans with finished floor elevations ranging from 718 to 722 MSL allow for the site earthwork to be adequately balanced, with minimal cut and fill differences. However, it should be noted that the variation in development concept options, such as a large manufacturing facility vs a mixed hangar development, will have varied site earthwork needs and challenges.

In order to explore the flexibility of site grading, a FAA 7460-1 *Notice of Proposed Construction or Alteration* application was submitted for review in Spring 2024. A 7460 submission allows the FAA the opportunity to evaluate proposed development for potential impacts to airspace. This application included Points of Interest (POI) along the future parallel taxiway and expanded apron on the Northside Development Area. The points along the parallel taxiway assumed ground elevation values that were approximately 3' higher than the corresponding runway elevation. This was intentional so as to allow for flexibility in grading design for future development of the site, should higher finished floor elevation be advantageous for grading and drainage. The elevation of the parallel taxiway is likely to influence the finished floor elevations of structures on the site, as any development would need to tie in to the taxiway while conforming to FAA slope requirements outlined in FAA AC 150/5300-13B *Airport Design*. The FAA reviewed the case and returned a letter of determination, taking no objection with the proposed elevations. The 7460 determination letter and application exhibit are included in **Appendix B.**

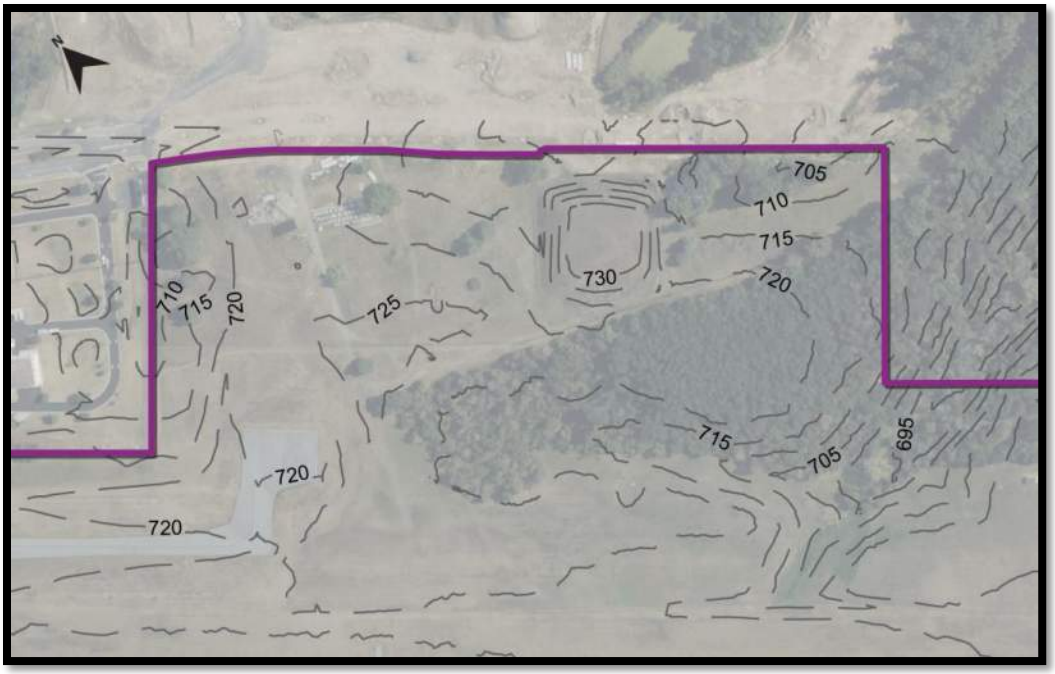


Figure 12: Existing Site Contours

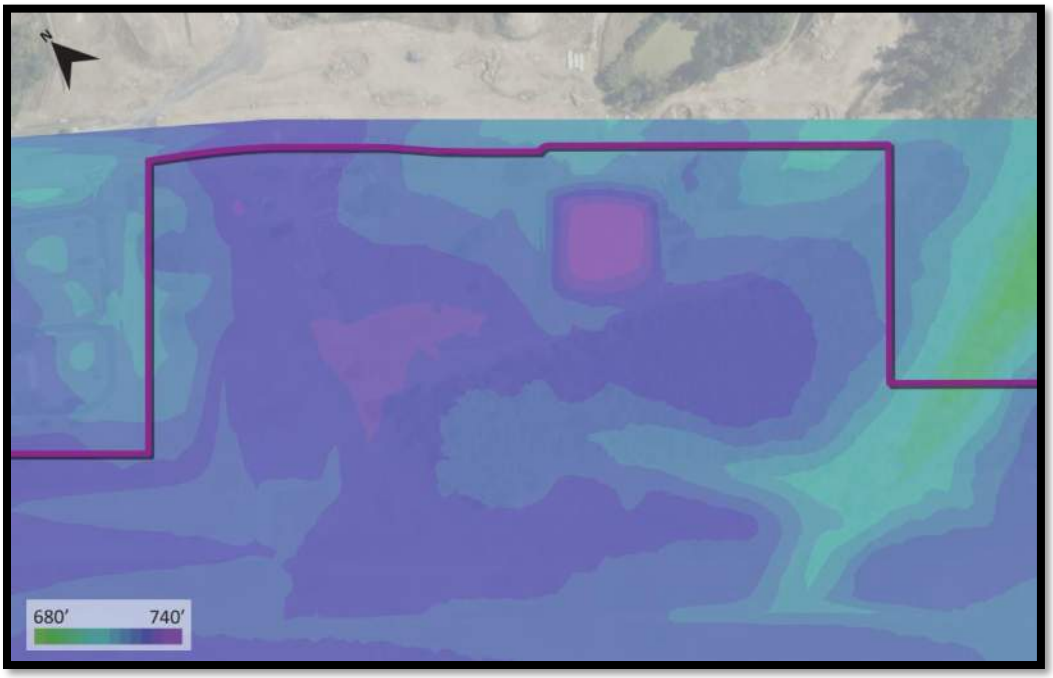


Figure 13: Elevation Visualization

Drainage and stormwater management could pose challenges given the site topography, space limitations, and development goals. It is anticipated that some stormwater will drain to the north to Coverstone Drive, while the majority of the site will drain to the south and west. There is an existing stormwater basin located on airport property, to the west of the development area (Figure 14). This basin might serve as the primary stormwater detention facility for the development, with some improvements

to size and structure. The basin has a current storage capacity of approximately 5,000 cubic yards. In order to accommodate the proposed development, the basin would likely need to be expanded to closer to 20,000 cubic yards. It is also likely that the development will need to utilize some alternative stormwater mitigation measures, such as the use of underground detention facilities, in order to meet local requirements.

Figure 14: Existing Stormwater Basin

In addition to water quantity, water quality requirements outlined in Virginia Code 9VAC25-870 will need to be addressed. The phosphorus load of a new development site is not allowed to exceed 0.26 pounds per acre per year according to the Virginia Runoff Reduction Method, Version 4.1. It is estimated that the new development on the site may produce up to approximately 20 pounds of phosphorus per year, or 0.8 pounds of phosphorus per acre per year. In order to offset this impact, the Virginia Code allows for offsite alternatives to address water quality requirements. One such method is to purchase nutrient credits through the nonpoint nutrient offset program. The Virginia Code does require development sites over 10 acres in size to handle a minimum of 75% of reduction on site. In order to address the remaining water quality impacts, the development will need to incorporate Best Management Practices (BMPs) such as grass channels, bioretention facilities, impervious landside pavement, or dry/wet swales on site.

4.2 Geotechnical/Soils

A geotechnical subsurface exploration of the site was completed in February 2024 with a summary report finalized in April 2024. Based on information gathered from borings and field exploration, existing fill and residual soils are present in much of the site. Groundwater was not encountered in any of the collected borings. Rock however was encountered in several borings, primarily consisting of weathered to hard

shale. Based on preliminary grading, the shale will require rock excavation of a depth of up to three feet in several areas of the site, with building foundation locations potentially requiring additional excavation. Ultimately, rock excavation depths and quantities will be refined at the time of more detailed grading plans. It is expected that the shale can be removed with conventional rippers, track-mounted excavators, and hoe-rams. This method was successfully employed during the construction of the existing connector taxiway in 2017. The full geotechnical investigation can be found in **Appendix C**.

4.3 Utilities

Utilities serve an important role in providing the essential infrastructure required to operate a new development, such as a manufacturing facility or airpark. These utilities include electrical power, natural gas, potable water, sanitary sewer, storm sewer, and communications lines. The extension of Coverstone Drive, in conjunction with the One Logistics Park Development, has brought many of these utilities to the doorstep of the Northside Development Area. Figure 15 below illustrates the location of the various utilities within the vicinity of the site.

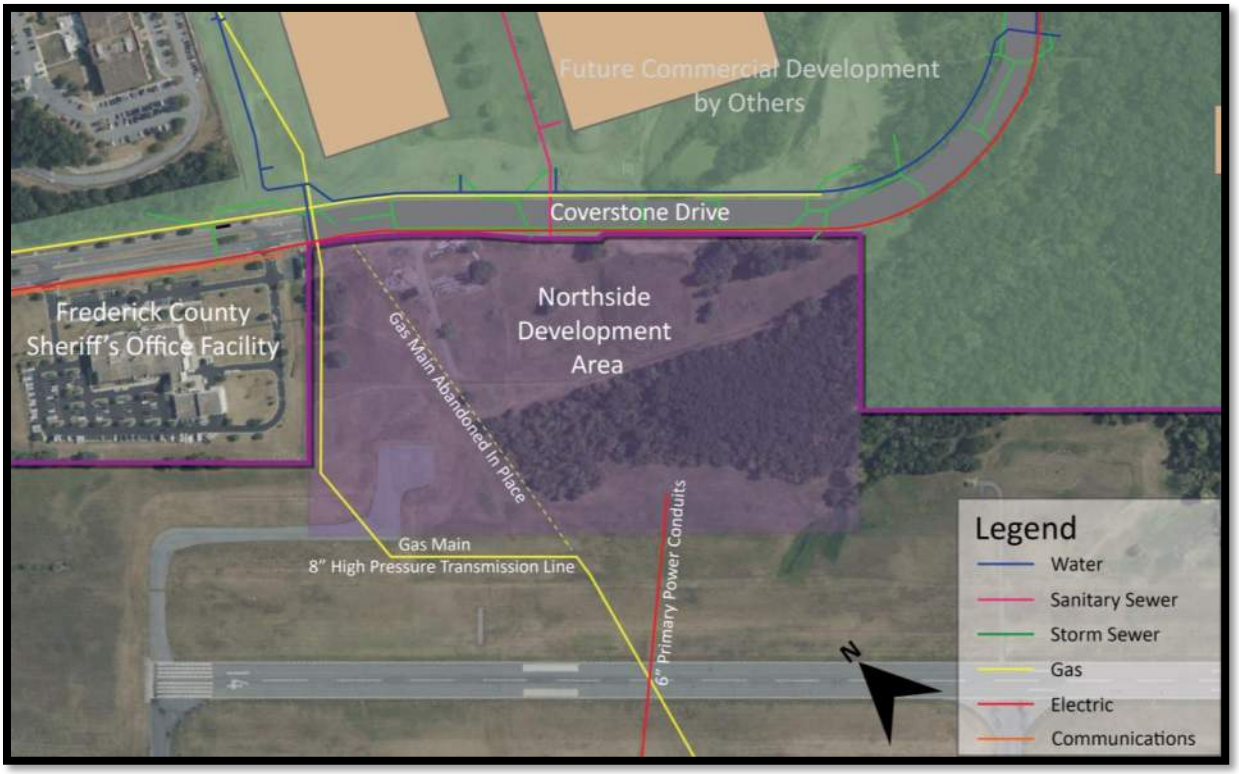


Figure 15: Utility Locations

Source: Delta Airport Consultants, Inc., Public Improvements Plan for One Logistics Park, Airport Records

4.3.1 Electric

Electrical power for the site is available from the Rappahannock Electric Cooperative. The area around the airport is currently experiencing high demand for electrical power, given the large number of commercial and residential projects located in the vicinity. Rappahannock Electric has reviewed the preliminary site concepts for the Northside Development Area and indicated that they currently have the

capacity to provide 2 to 3 MW of power. However, Rappahannock Electric treats all projects as "first ready, first served" when providing service to new development. Coordination with Rappahannock Electric should occur throughout the site design process to ensure electrical power needs can be filled. Connections to power are available along Coverstone Drive and at a point in the southern portion of the site where primary power conduits bring service under the runway, from the other side of airport property.

An option to provide additional electrical power for the manufacturing concept is to explore the installation of solar panels on the roof of the facility. Solar panels are generally permitted at airports. The renderings for the manufacturing facility option depict solar panels covering a portion of the structure, illustrating how they might look when installed. In order to get an estimate of the potential annual energy production of solar panels, the following calculations were performed.

Assumptions
Roof Area: 400,000 sq. ft. (Total area of the roof)
Usable Roof Area (75%): 300,000 sq. ft. = 27,871 m^2 (Area of the roof available for panels)
Panel Efficiency: 20% (Typical solar panel efficiency)
Solar Irradiance: 4 kWh/m²/day (Estimate from Global Solar Atlas for Winchester, VA)
Performance Ratio: 0.8 (Typical performance ratio)

Calculate Estimated Energy Output

$$\text{Energy Output}\left(\frac{\text{kWh}}{\text{day}}\right) = \text{Usable Roof Area}\,(\text{m}^2) \times \text{Panel Efficiency} \times \text{Solar Irradiance}\left(\frac{\frac{\text{kWh}}{\text{m}^2}}{\text{day}}\right)$$

$$\text{Energy Output}\left(\frac{\text{kWh}}{\text{day}}\right) = 27{,}871\,(\text{m}^2) \times 0.2 \times 4\left(\frac{\frac{\text{kWh}}{\text{m}^2}}{\text{day}}\right) = 22{,}297\left(\frac{\text{kWh}}{\text{day}}\right)$$

Multiply by Performance Ratio

$$\text{Energy Output}\left(\frac{\text{kWh}}{\text{day}}\right) = 22{,}297\left(\frac{\text{kWh}}{\text{day}}\right) \times 0.8\,(Performance\ Ratio) = 17{,}838\left(\frac{\text{kWh}}{\text{day}}\right)$$

Convert to MWh per Day

$$\text{Energy Output}\left(\frac{\text{MWh}}{\text{day}}\right) = 17.8$$

According to data from the US Energy Information Administration, manufacturing facilities use approximately 95.1 kWh of electricity per square foot per year. This equates to 104 MWh per day for a 400,000 sq. ft. facility. This means that approximately 17% of energy consumed by the facility could potentially come from solar panels, although this is fully dependent on building size, orientation, power demands, and other variables.

4.3.2 Water and Sanitary Sewer

Potable water and sanitary sewer service to the project site is provided by Frederick Water. The extension and improvements to Coverstone Drive, as well as the development of One Logistics Park to the north, have brought water and sewer utilities to the vicinity of the Northside Development Area. Potable water lines (12" DIP) are available for connection along the north side of Coverstone Drive. A sanitary sewer line (8" PVC) has been extended under Coverstone Drive to the project site at the proposed vehicle entrance location. Coordination with Frederick Water will be required during the design phase of the project to ensure the infrastructure is adequately able to handle the demand from the proposed development.

While these are anticipated to provide adequate service for traditional aircraft hangar facilities, demands for a manufacturing facility may differ greatly and will require a demand specific assessment.

4.3.3 Natural Gas

Natural gas service in Frederick County is provided by Washington Gas. A natural gas service line runs along Coverstone Drive, below a walking path on the north side of the road. This line will serve as the connection for service to the Northside Development site. An additional 8" high pressure transmission gas main, which cannot be used for local distribution, runs along the western edge of the property. This gas line previously crossed through the center of the Northside Development Area, but was relocated to its current position in 2017 as part of an airport taxiway construction project. A section of the original gas main remains under the site, abandoned in place. National Fire Protection Association (NFPA) Standards, as well as local codes and regulations, must be consulted to ensure that the existing gas main meets minimum proximity separation requirements from any future development infrastructure, such as a fuel farm or hangar facilities.

4.3.4 Communications

Fiber optic and coaxial cables are located along Coverstone Drive in front of the Frederick County Sheriff's Office facility. These lines can be extended to the Northside Development area in the northern corner of the property.

4.3.5 Storm Sewer

Stormwater sewer infrastructure is in place under Coverstone Drive to direct rainwater from the roadway to the proper outfall or detention facility. The design of stormwater management for the development ultimately constructed on the site will need to consider integration with the existing structures as necessary. While some stormwater may drain to Coverstone Drive to the north, it is anticipated that the majority of the site will drain airside, to the south and west.

4.4 Zoning

The Airport is currently zoned as RA (Rural Areas District) in the Frederick County Zoning Code, which carries a height restriction of 35ft. A height wavier for up to 150 ft is possible from the County. Waivers have been granted in the past for other projects on airport property. An application for a letter of determination on zoning was submitted to the Zoning Administrator of Frederick County to provide clarity

on the permitted development types and the various aviation accessory uses on the site. A determination letter was received on November 26, 2024 and confirms that the aviation development types presented in this document are "allowed as accessory uses on the Winchester Regional Airport land and within the Airport Support Area." The full determination letter from the county is included in **Appendix D**.

4.5 Fire Codes

All new construction must comply with the minimum fire separation requirements determined by the local governing body, such as the fire marshal. This entity will make the ultimate determination on what is allowable with regards to the spacing of development on the Northside site. A meeting with the local governing body should take place before finalizing any development plans in order to understand these requirements.

In general, industry recognized codes can provide an idea of what may be required by the local fire marshal or other governing body. Internation Building Code (IBC) *Section 412.3.1* states that any exterior hangar walls that are less than 30 feet from a lot line or public way shall have a fire-resistance rating of at least 2 hours. The public way may include sidewalks, auto parking, driving lanes, etc. This separation may not be practical given the size constraints of the site and the development goals. If the governing body requires this separation be achieved, the inclusion of a fire resistance wall may be the most advantageous option. Additionally, the National Fire Prevention Association (NFPA) *Code 409 Standard on Aircraft Hangars* specifies a minimum of 50 feet separation between single hangars that do not have a fire resistance wall. That minimum separation can be reduced to 25 feet with a 2-hour fire resistance rating and 0 feet with a 3-hour fire resistance rating. The cost/benefits of including fire resistance walls or spacing out hangars should be evaluated prior to finalizing any future design. The Airport will collaborate with the developer to ensure that the proposed concept efficiently optimizes the use of limited airport development area.

4.6 Auto Access & Parking Requirements

4.6.1 Auto Access

Auto access to the site is provided by Coverstone Drive to the north. Coverstone Drive is classified as a 4-lane major collector road by the County of Frederick. The development concepts prepared for this analysis depict a main central entrance in the center of the site, in line across from a proposed entrance to the One Logistics Park development. Additional entrances will need to be coordinated with the County to ensure compliance. It is possible that additional entrances to the site will need to operate as right-in/right-out access only, with no split in the median of Coverstone Drive.

4.6.2 Auto Parking Requirements

The parking requirements for the Northside Development are governed by the Frederick County Zoning Administrator. The requirements are described in the Frederick County Code *Chapter 165 Zoning*.

Manufacturing Facility

For warehouse and manufacturing uses, the number of auto parking spaces required is equal to 1.5 per employee, plus additional spaces for any company vehicles or equipment. The County has indicated that they interpret the guidance as 1.5 spaces required per employee on a single shift. Ultimately, the number

of spaces required will vary depending on the employee needs of the facility. For example, consider a moderately automated manufacturing facility of 400,000 square feet that requires 800 total employees. If the facility operates with three separate shifts, that equates to 267 employees per shift. Multiplying this value by 1.5 results in a total of 401 required auto parking spaces. The concept layout for the Manufacturing facility includes 402 automobile parking spaces, 9 of which are accessible parking spaces.

For a manufacturing facility that requires a larger number of employees it is possible that the number of required spaces may be greater than the 402 depicted on the conceptual layout. In this case there are several options to satisfy the requirements of the County. The rectangular parking lot area to the east of the facility could be converted into a 3 or 4 story parking garage. This would allow for additional parking without increasing the footprint of the development. Additionally, the developer could explore a shared parking agreement with adjacent properties in order to satisfy the requirements.

Hangar Development

The Frederick County Zoning Code indicates that in situations where a specific use is not listed, the Zoning Administrator will determine which auto parking requirements shall be necessary. Hangar development is not a specific use category listed in the Code; therefore, the requirements are open to interpretation. The County has indicated that the Planning Advisory Service is often consulted in order to determine the appropriate requirements for unlisted uses.

A reasonable rule of thumb for hangar auto parking requirements is 1 space per 2,000 square feet of hangar floor space as well as 1 space per 250 square feet of office space (if applicable). The Concept layouts for the Airpark and Mixed Hangars would be able to meet these requirements. Table 1 below lists the total number of depicted spaces as well as the total number required based on this assumption.

Table 1: Hangar Development Auto Parking

	Airpark	Mixed Hangars A	Mixed Hangars B
Corporate Hangar Area (SF)	210,000	151,200	117,600
Office Space Area (SF)	-	16,200	16,200
T-Hangar Area (SF)	-	-	50,000
Total Parking Spaces Depicted	272	205	201
ADA Accessible Spaces	19	14	13
Required Spaces	105	140.4	148.6

4.7 Airspace

The proposed development area is located perpendicular to Runway 14-32, to the northeast. In this location, Federal Aviation Regulation (FAR) Part 77 serves as the airspace surface of concern for evaluation. This group of imaginary surfaces serve as a basis for the notification and analysis of potential hazards to navigable airspace. At OKV, the Part 77 Primary Surface extends outward 500 feet from the runway centerline in a flat plane equivalent to the elevation of the runway. At 500 feet, the Part 77 Transitional Surface begins and extends upward at a slope of 7:1 (H:V). The edge of the Part 77 Primary Surface is depicted on the concept layouts. All development is located outside the limits of the Primary Surface and therefore poses no impact. However, it is possible that the Part 77 Transitional surface would be penetrated by proposed hangar buildings, parked aircraft, or the manufacturing facility. In this case,

an FAA 7460-1 *Notice of Proposed Construction or Alteration* application and submission would be required to determine if these structures pose any hazards to air navigation. Objects penetrating the Part 77 Transitional Surface may require red obstruction lighting in order to mitigate their impact. Ultimately, the FAA will make the final determination on a structure's impact to airspace and required mitigation measures.

4.8 Fuel Farm

Concept layouts for the Airpark and the Mixed Hangar development include the depiction of a fuel farm facility and fuel truck parking area. The inclusion of a fuel facility would be crucial in order to serve the aircraft based on the north side of the airport. The jet aircraft would require Jet A fuel, while most smaller piston aircraft would need 100LL Avgas. Depending on the ultimate future use of the site, the facility could include several tanks with capacities of approximately 20,000 gallons each. The concepts include an entry point for fuel delivery and offload, as well as space for the truck to adequately maneuver and leave the site following delivery. The concepts also include a parking area for fuel tender trucks, which carry fuel from the tanks to the aircraft in need of re-fueling. These delivery and parking areas would be equipped with secondary containment in the event of a fuel spill.

The National Fire Protection Association (NFPA) Code 30 and 407, as well as the International Fire Code (IFC) were used as guidelines for the concept layout of the fuel facility. These codes specify recommended minimum separations for fuel tanks, trucks, structures, and other equipment. Table 2 below highlights the spacing requirements. Ultimately, it is up to the local fire marshal or other local governing body to determine which requirements to follow. A discussion with this governing body should occur prior to finalizing any fuel facility design.

Table 2: Fuel Facility Separation Requirements

Description	Spacing	Code
Fuel Tank to Property Line	20'	NFPA 30-18 Table 22.4.1.1(b)
Fuel Tank to Public Right-Of-Way or Existing Building	5'	NFPA 30-18 Table 22.4.1.1(b)
Fuel Tender Truck to Parked Aircraft or Building	50'	NFPA 407-6.2.1.1
Fuel Tender Truck Surrounding Clearance	10'	NFPA 407-6.2.1.1
Fuel Delivery Truck to Fuel Tanks During Offload	25'	IFC 2305.1.1

Note: Requirements assuming 20,000 gal tanks.

4.9 EVTOL/Electric Aircraft Charging

The Winchester Regional Airport is committed to staying on the forefront of emerging aviation technology and innovation. Included in each concept layout is the location and infrastructure required for charging Electric Vertical Take-Off and Landing (EVTOL) vehicles or other electric aircraft. This includes designated parking spaces for two aircraft as well as specialized charging cubes. Electric aircraft are considered an important emerging technology in the aviation industry and will likely play a role in the future of air travel.

4.10 Fencing/Security

An airport perimeter fence serves to deter both unauthorized individuals and wildlife from accessing the runway environment. The airport is currently equipped with a full 8-foot chain link perimeter fence, secured with barbed wire. At a minimum, any future development of the site must maintain the airport's full security fencing. Vehicle entrance gates are proposed to be automatic sliding gates, equipped with access control and siren sensors for first-responder vehicle access in the event of an emergency.

4.11 Architectural/Minimum Standards

Airport minimum standards are a set of rules and guidelines set forth by the airport owner for tenants and businesses to help ensure the safety and efficiency of airport operations. These standards can also be used to ensure a uniform design aesthetic across all airport development. The Winchester Regional Airport Authority's most recent Minimum Standards & Rules and Regulations were adopted on July 1, 2021 as Revision 8. This document includes guidelines for the design and construction of hangars, buildings, and other structures. These guidelines include requirements related to the type of building materials, the exterior colors and textures, and interior finishes. The current minimum standards dictate that hangars shall be constructed of steel, aluminum, or masonry exteriors. The latest version of the airport's minimum standards should be consulted prior to the final design of any development on the Northside site.

5. ENVIRONMENTAL ASSESSMENT SUMMARY

In 2022, the Airport Sponsor began the process of National Environmental Policy Act (NEPA) clearance for development on the site by way of an Environmental Assessment (EA). This was determined by the FAA to be the appropriate level of environmental review at the time. A preliminary engineering report was completed in 2024 in conjunction with the Environmental Assessment. Because the ultimate future use of the development site was unknown, the analysis included "worst case" scenario assumptions in order to estimate limits of disturbance, stormwater management, and other environmental impacts. A manufacturing facility concept with a footprint greater than the concept presented in this report was used as the baseline for examining the environmental impacts of the development, because it included the addition of the most impervious area.

The EA analysis determined that the project would likely disturb a wetland area (0.15 AC) and a stream located on the project site. Wetland and stream mitigation measures will be required as a part of the project.

As of November 2024, all preliminary environmental investigations are complete. If a tenant is identified for an aviation-related manufacturing facility, the assumptions and information provided in the EA regarding environmental impacts will be reevaluated before a Finding of No Significant Impact (FONSI) can be issued. Traditional aviation operations, such as those depicted elsewhere in this report, are anticipated to receive a FONSI by December 2024.

6. SITE DEVELOPMENT REVIEW & APPROVAL PROCESS

6.1 County

The site development review process at the County level typically begins with a pre-application meeting. Prior to submitting a site plan, the developer will sit down with County staff to discuss the project. This includes individuals from the Planning, Zoning, and other relevant departments. This meeting allows for initial input from key perspectives and allows for any areas of concern to be identified. The three concept layouts discussed in this report have been informally shared and discussed with the County.

As the design of the project progresses, the developer will submit site plans and other relevant documents to the County for review. The review will include an evaluation of compliance with local codes and regulations, including zoning, stormwater management, transportation, etc. The County will ultimately provide comments and input on the site design and monitor ongoing compliance. Upon ultimate approval of the site plan, the developer will be able to apply for the relevant permits to construct the project.

6.2 FAA

Given that the project site is located on federally obligated airport property, the FAA will be involved throughout the lifecycle of the project. The FAA will review the initial project site plan to ensure consistency with the Airport Layout Plan (ALP) and other land use regulations. Any updates or modifications to the ALP will occur through a “Pen & Ink” process where the document is updated with the review and approval of the FAA. This process is common and will be coordinated by the Airport early in the project to ensure FAA compliance. The proposed construction will also require a 7460 airspace review to analyze any impacts to existing airspace and outline any required mitigation measures. The FAA will continue to monitor the project through the construction phase to ensure compliance with all relevant regulations.

7. CONCEPT COMPARISON

7.1 Comparison Table

Table 3: Concept Comparison

	Manufacturing Facility	Airpark	Mixed Hangars A	Mixed Hangars B
Landside Pavement (SY)	31,000	25,000	21,000	21,000
Airside Pavement (SY)	34,000	54,000	55,000	57,000
Total Parking Spaces Depicted	402	272	205	201
ADA Accessible Spaces Depicted	9	19	14	13
Fuel Farm	No	Yes	Yes	Yes
EVTOL Charging Positions	2	2	2	2
Manufacturing Facility Area (SF)	400,000	-	-	-
Corporate Hangar Area (SF)	-	210,000	151,200	117,600
Office Space Area (SF)	-	-	16,200	16,200
T-Hangar Area (SF)	-	-	-	50,000
Mobilization	$10,000,000	$5,000,000	$5,000,000	$5,000,000
Site Work	$4,000,000	$4,000,000	$3,500,000	$3,500,000
Landside Pavement	$3,500,000	$3,000,000	$2,500,000	$2,500,000
Airside Pavement	$4,500,000	$6,500,000	$6,500,000	$7,500,000
Building Structures	$125,000,000[1]	$35,000,000	$28,000,000	$27,000,000
Fuel Farm	N/A	$3,000,000	$3,000,000	$3,000,000
Utilities	$1,000,000	$1,000,000	$500,000	$500,000
Miscellaneous	$2,000,000	$2,500,000	$1,000,000	$1,000,000
Total Construction Cost	**$150,000,000**	**$60,000,000**	**$50,000,000**	**$50,000,000**
Soft Costs[2]	$25,000,000	$10,000,000	$10,000,000	$10,000,000
Total Cost	**$175,000,000**	**$70,000,000**	**$60,000,000**	**$60,000,000**

Note: This Engineer's Opinion of Probable Cost (EOPC) is based on conceptual layouts prepared by Delta Airport Consultants dated October 2024. This EOPC is an approximation of cost based on our experience and qualifications as engineers and shall be deemed to represent our opinion and judgment. This estimate cannot and does not guarantee that proposals, bids, or actual costs will be the same as or within any specific percentage of this estimate of probable construction cost.

1. Manufacturing facility structural costs vary significantly depending on the specific use.
2. Soft costs include design fees, construction observation services, permitting, agency coordination, etc.

8. CONCLUSION

The Northside Development Site at the Winchester Regional Airport presents a unique opportunity to construct aviation-related development in a desirable and strategically advantageous location. The site has immediate access to the runway environment, adequate ground access via Coverstone Drive, and convenient utility connection points. Additionally, the site is located in close proximity to I-81, and only 60 miles from the heart of Washington D.C. The site has the capabilities to accommodate an array of development types, including an aircraft manufacturing facility or corporate hangar development.

Appendix A – Concept Layouts & Renderings

RIGHT-IN RIGHT-OUT ENTRANCE

COVERSTONE DRIVE

54'

FREDERICK COUNTY SHERIFF'S FACILITY

1000' X 400'

44'

75'

SLIDING SECURITY GATE

190'

EVTOL PARKING/CHARGING

PART 77 PRIMARY SURFACE

85.5'

TOFA

BRL(25')

BRL(35')

CONCEPUAL LAYOUT

60 0 60 120
SCALE: 1"=60' FEET

N

MANUFACTURING FACILITY

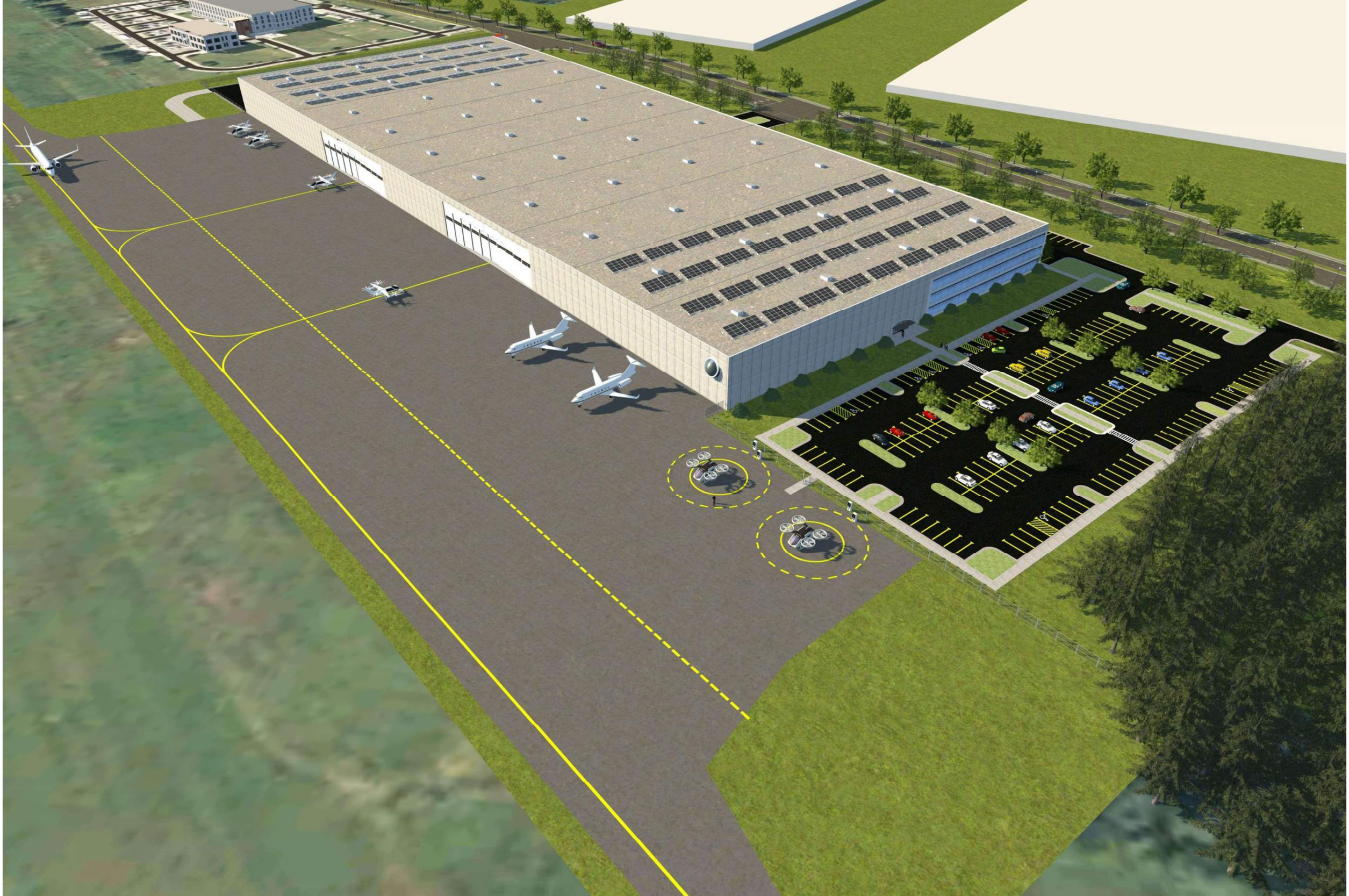
OKV
WINCHESTER, VA

DELTA AIRPORT CONSULTANTS, INC.
www.deltaairport.com

EXHIBIT 1

DRAWN BY:	DJL	SCALE:	1"=60'
CHECKED BY:	ADS	DATE:	OCTOBER 2024

DRAWING: 23051 OKV Manufacturing Facility.dwg LAYOUT: 24x36
XREFS: 23051 Firm roof.dwg IMAGES: OKV Aerial Bing .png




box-Mart

60 0 60 120
SCALE 1" 60' FEET

N

AIRPARK

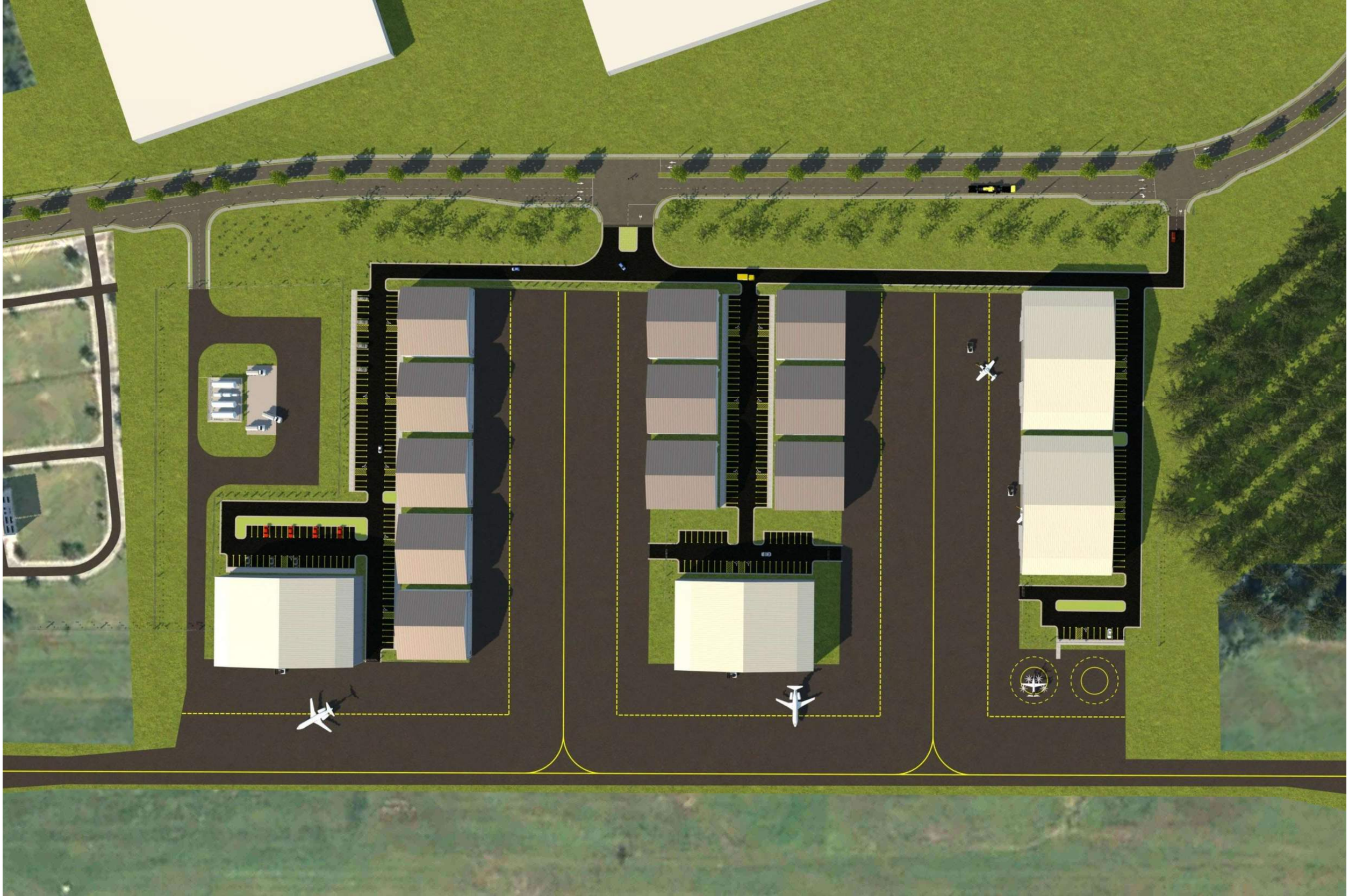
OKV
WINCHESTER, VA

DELTA AIRPORT CONSULTANTS, INC.
www.deltaairport.com

EXHIBIT 2

DRAWN BY	DJL	SCALE	1 60'
CHECKED BY	ADS	DATE	OCTOBER 2024

DRAWING: 23051 OKV Airpark.dwg LAYOUT: 24x36
XREFs: 23051 jhrs xref.dwg IMAGES: OKV Aerial Bing 4.png



RIGHT-IN RIGHT-OUT ENTRANCE

COVERSTONE DRIVE

SLIDING SECURITY GATE

SLIDING SECURITY GATE

78'

FREDERICK COUNTY SHERIFF'S FACILITY

34'

80' X 80' (TYP)

60' X 60' (TYP)

115'

64'

ADG II AIRCRAFT

55'

61'

FUEL DELIVERY

FUEL TANKS

FUEL TRUCK PARKING

EVTOL PARKING/CHARGING

100' X 20'

100' X 100'

100' X 20'

100' X 100'

100' X 20'

100' X 100'

100' X 20'

100' X 100'

200' X 20'

200' X 100'

120' X 35'

200' X 120'

TLOFA

SLIDING SECURITY GATE

115'

SLIDING SECURITY GATE

PART 77 PRIMARY SURFACE

85.5'

BRL(25')

TOFA

CONCEPTUAL LAYOUT

60 0 60 120

SCALE: 1" = 60' FEET

N

MIXED HANGARS VAR A

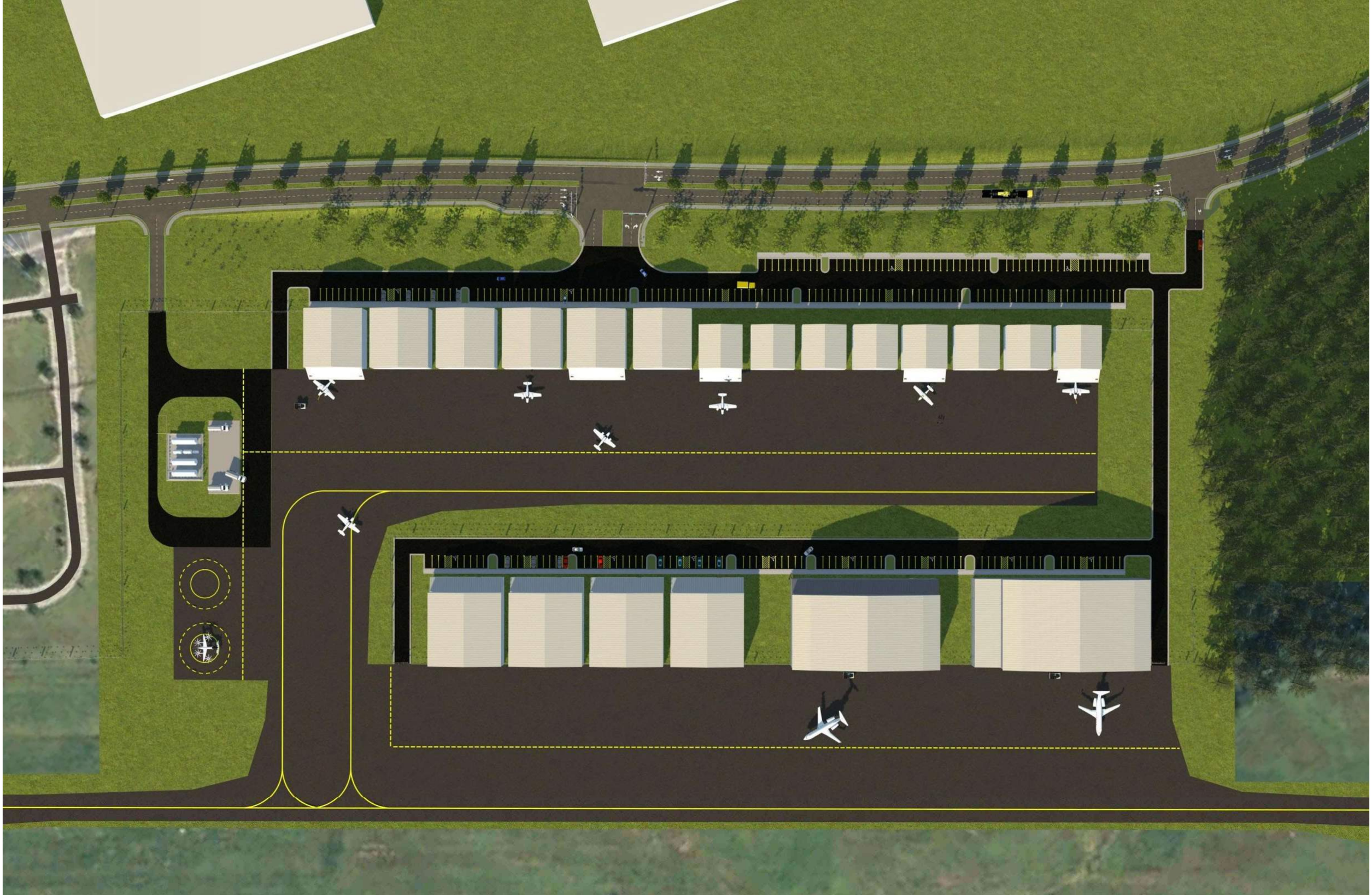
OKV
WINCHESTER, VA

DELTA AIRPORT CONSULTANTS, INC.
www.deltaairport.com

EXHIBIT 3A

DRAWN BY:	DJL	SCALE:	1" = 60'
CHECKED BY:	ADS	DATE:	OCTOBER 2024

DRAWING: 23051 OKV Mixed Hangars **All A**.dwg LAYOUT: 24x36
XREFS: 23051 Elm Xref.dwg IMAGES: OKV Aerial.jpg



RIGHT-IN RIGHT-OUT ENTRANCE

COVERSTONE DRIVE

SLIDING SECURITY GATE

SLIDING SECURITY GATE

52'

FREDERICK COUNTY SHERIFF'S FACILITY

34'

80' X 80' (TYP)

60' X 60' (TYP)

115'

ADG II AIRCRAFT

64'

55'

44.5'

10 UNIT T-HANGARS (TYP)

ADG I AIRCRAFT

61'

FUEL DELIVERY

FUEL TANKS

FUEL TRUCK PARKING

EVTOL PARKING/CHARGING

100' X 20'

100' X 100'

100' X 20'

100' X 100'

100' X 20'

100' X 100'

100' X 20'

100' X 100'

200' X 20'

200' X 100'

120' X 35'

200' X 120'

TLOFA

SLIDING SECURITY GATE

115'

PART 77 PRIMARY SURFACE

85.5'

SLIDING SECURITY GATE

BRL(25')

TOFA

CONCEPTUAL LAYOUT

60 0 60 120

SCALE: 1" = 60' FEET

N

MIXED HANGARS VAR B

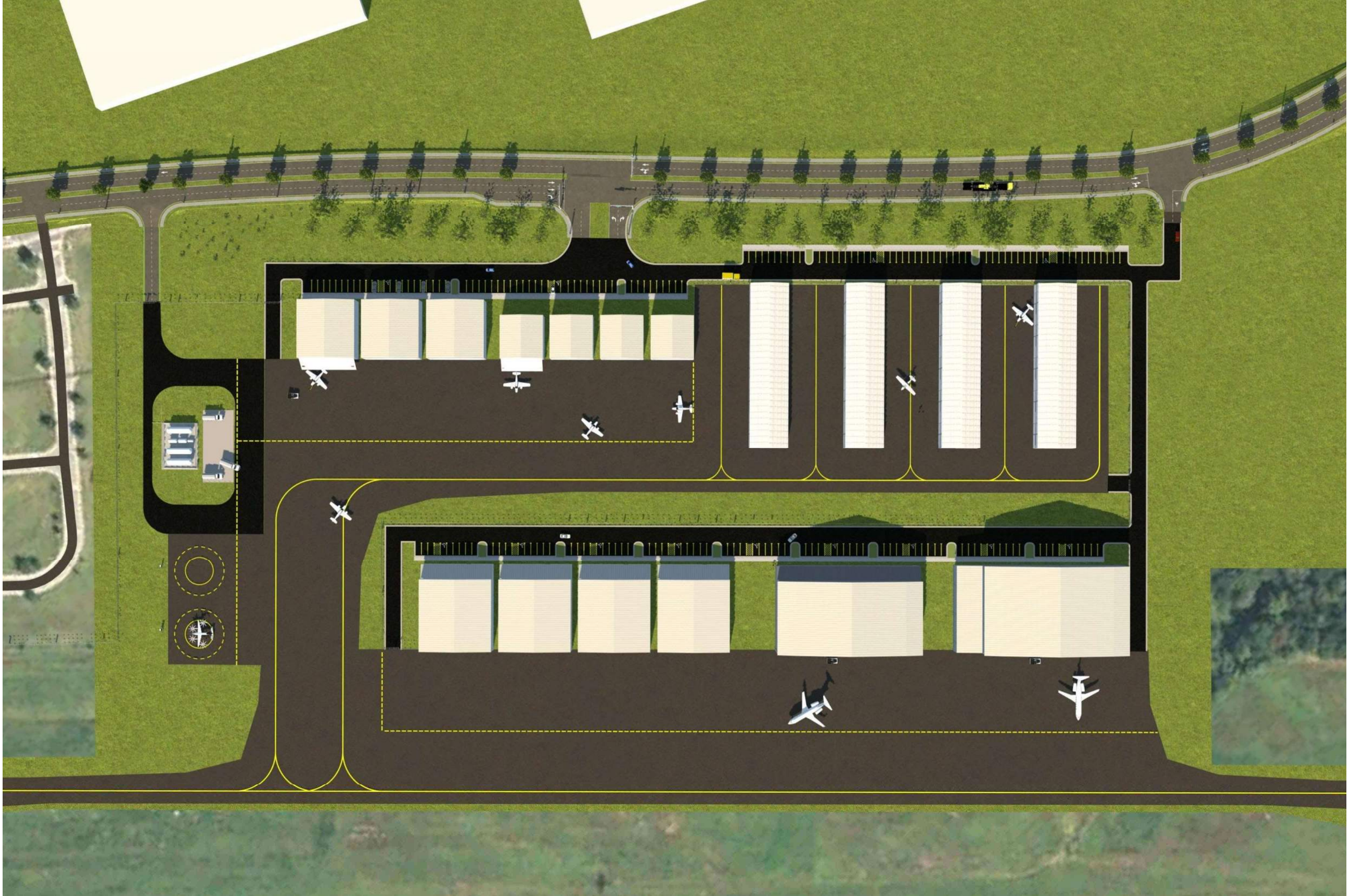
OKV
WINCHESTER, VA

DELTA AIRPORT CONSULTANTS, INC.
www.deltaairport.com

EXHIBIT 3B

DRAWN BY:	DJL	SCALE:	1" = 60'
CHECKED BY:	ADS	DATE:	OCTOBER 2024

DRAWING: 23051 OKV Mixed Hangars **A1 B**.dwg LAYOUT: 24x36
XREFS: 23051 Fem Xref.dwg IMAGES: OKV Aerial.jpg



Appendix B – 7460 Coordination

Federal Aviation Administration
13873 Park Center Road, Suite 490S
Herndon, VA 20171

Mr. Matthew J. Thys

May 20, 2024

TO:
Winchester Regional Airport
Attn: Nick Sabo
491 Airport Road
Winchester, VA 22602
okvsabo@comcast.net

CC:
Delta Airport Consultants, Inc.
Attn: Joseph Shell
2700 Polo Circle
Midlothian, VA 23113
jshell@deltaairport.com

RE: *(See attached Table 1 for referenced case(s))*
FINAL DETERMINATION

Table 1 - Letter Referenced Case(s)

ASN	Prior ASN	Location	Latitude (NAD83)	Longitude (NAD83)	AGL (Feet)	AMSL (Feet)
2024-AEA-2058-NRA		WINCHESTER,VA	39-08-50.16N	78-08-50.71W	26	752
2024-AEA-2059-NRA		WINCHESTER,VA	39-08-53.68N	78-08-55.42W	26	753
2024-AEA-2060-NRA		WINCHESTER,VA	39-08-45.95N	78-08-45.06W	26	749
2024-AEA-2061-NRA		WINCHESTER,VA	39-08-42.24N	78-08-40.10W	26	745
2024-AEA-2062-NRA		WINCHESTER,VA	39-08-39.76N	78-08-43.20W	26	741
2024-AEA-2063-NRA		WINCHESTER,VA	39-08-47.61N	78-08-42.84W	26	754
2024-AEA-2064-NRA		WINCHESTER,VA	39-08-51.78N	78-08-48.44W	26	757
2024-AEA-2065-NRA		WINCHESTER,VA	39-08-54.74N	78-08-52.41W	26	758

Description: Winchester Regional Airport - Northside Development - Extend Partial Parallel Taxiway (to 2,350 feet) - Construct Runway 14/32 Connector Taxiway (at 2,350 feet) - Construct Partial Parallel Taxilane (to 1,150 feet)

We do not object with conditions to the construction described in this proposal provided:

You comply with the requirements set forth in FAA Advisory Circular 150/5370-2, "Operational Safety on Airports During Construction."

A separate notice to the FAA is required for any construction equipment, such as temporary cranes, whose working limits would exceed the height and lateral dimensions of your proposal.

This determination does not constitute FAA approval or disapproval of the physical development involved in the proposal. It is a determination with respect to the safe and efficient use of navigable airspace by aircraft and with respect to the safety of persons and property on the ground.

In making this determination, the FAA has considered matters such as the effects the proposal would have on existing or planned traffic patterns of neighboring airports, the effects it would have on the existing airspace structure and projected programs of the FAA, the effects it would have on the safety of persons and property

on the ground, and the effects that existing or proposed manmade objects (on file with the FAA), and known natural objects within the affected area would have on the airport proposal.

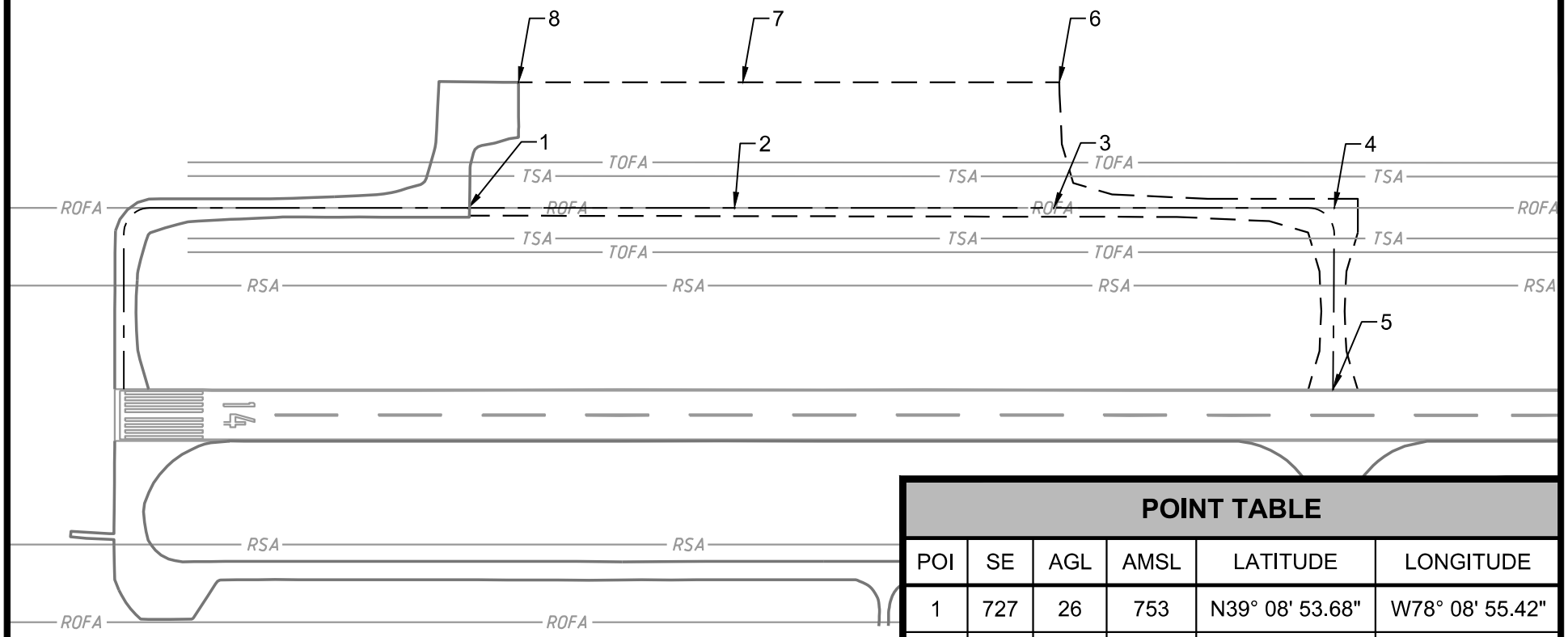
This determination expires on November 20, 2025 unless:
(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for the completion of construction, or the date the FCC denies the application.

NOTE: Request for extension of the effective period of this determination must be obtained at least 15 days prior to expiration date specified in this letter.

If you have any questions concerning this determination contact Chad Carper (703) 487-3973 chad.carper@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2024-AEA-2058-NRA.

Chad Carper
ADO
Signature Control No: 618815539-622095322

DRAWING: 23051 7460.dwg LAYOUT: L1



NOTE: THE CRITICAL AIRCRAFT USING THIS TAXIWAY HAS A TAIL HEIGHT OF 26 FEET.

300 0 300 600

SCALE: 1"=300' FEET

POINT TABLE

POI	SE	AGL	AMSL	LATITUDE	LONGITUDE
1	727	26	753	N39° 08' 53.68"	W78° 08' 55.42"
2	726	26	752	N39° 08' 50.16"	W78° 08' 50.71"
3	723	26	749	N39° 08' 45.95"	W78° 08' 45.06"
4	719	26	745	N39° 08' 42.24"	W78° 08' 40.10"
5	715	26	741	N39° 08' 39.76"	W78° 08' 43.20"
6	728	26	754	N39° 08' 47.61"	W78° 08' 42.84"
7	731	26	757	N39° 08' 51.78"	W78° 08' 48.44"
8	732	26	758	N39° 08' 54.74"	W78° 08' 52.41"

www.deltaairport.com

TAXIWAY 7460 EXHIBIT
OKV

DRAWN BY:	DJL	CHECKED BY:	ADS	SCALE:	1"=300'	DATE:	APRIL 2024

EXHIBIT
1

Appendix C – Geotechnical Investigation

REPORT OF
GEOTECHNICAL EXPLORATION

WINCHESTER REGIONAL AIRPORT
NORTHSIDE DEVELOPMENT - PHASE 1
FREDERICK COUNTY, VIRGINIA

TRIAD PROJECT NO. 07-23-0347

PREPARED FOR:

MR. ADAM SWITZER, P.E.
DELTA AIRPORT CONSULTANTS, INC.
3544 N. PROGRESS AVENUE, SUITE 200
HARRISBURG, PENNSYLVANIA 17110

PREPARED BY:

TRIAD ENGINEERING, INC.

200 AVIATION DRIVE
WINCHESTER, VIRGINIA 22602
WWW.TRIADENG.COM

APRIL 8, 2024

April 8, 2024

Mr. Adam Switzer, P.E.
Delta Airport Consultants, Inc.
3544 N. Progress Avenue, Suite 200
Harrisburg, Pennsylvania 17110

RE: Report of Geotechnical Exploration
Winchester Regional Airport
Northside Development Phase 1
Frederick County, Virginia
Triad Project No. 07-23-0347

Dear Mr. Switzer:

Triad Engineering, Inc. (Triad) has completed a geotechnical exploration at the site proposed for the new hangar structures and associated parking areas located on the northern side of the Winchester Regional Airport in Frederick County, Virginia. The scope of work for this project was completed in substantial conformance with our proposal dated August 26, 2023 and authorized by signing the Subconsultant Agreement on January 25, 2024.

The subsurface exploration was performed to evaluate the subsurface conditions encountered at the proposed hangar site for the limited purposes of preparing design and construction recommendations for geotechnical aspects of the project. It is emphasized that subsurface conditions may vary dramatically between borings, and Triad makes no representations as to subsurface conditions other than those encountered at the specific test locations.

This report has been prepared for the exclusive use of Delta Airport Consultants, Inc. for specific application to the design of the proposed hangar structures and associated paved parking areas at the Winchester Regional Airport in Frederick County, Virginia. Triad's responsibilities and liabilities are limited to our Client and apply only to their use of our report for the purposes described above. To observe compliance with design concepts and specifications, and to facilitate design changes in the event that subsurface conditions differ from those anticipated prior to construction, it is recommended that Triad be retained to provide continuous engineering and testing services during the earthwork and foundation construction phases of the work.

We appreciate the opportunity to provide our services during the design phase of the project. If you should have any questions concerning this report, or if you require any additional information, please do not hesitate to contact us.

Sincerely,

TRIAD ENGINEERING, INC.

Jed G. Ward
Staff Engineer

Mark Clippinger
Geotechnical Practice Leader

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APPENDIX A

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APPENDIX B

APPENDIX C

APPENDIX D

REPORT OF GEOTECHNICAL EXPLORATION

WINCHESTER REGIONAL AIRPORT
NORTHSIDE DEVELOPMENT PHASE 1
FREDERICK COUNTY, VIRGINIA

TRIAD PROJECT NO. 07-23-0347

FOREWORD

This report has been prepared for the exclusive use of Delta Airport Consultants, Inc. for specific application to the design of the new hangar structures and associated paved parking areas to be located on the northern side of the Winchester Regional Airport in Frederick County, Virginia. The work has been performed in accordance with generally accepted geotechnical engineering practices. No other warranty, expressed or implied, is made.

This report should not be used for estimation of construction quantities and/or costs, and contractors should conduct their own investigation of site conditions for these purposes. Please note that Triad is not responsible for any claims, damages or liability associated with any other party's interpretation of the data or re-use of this data or engineering analyses without the express written authorization of Triad. Additionally, this report must be read in its entirety. Individual sections of this report may cause the reader to draw incorrect conclusions if considered in isolation from each other.

The conclusions and recommendations contained in this report are based, in part, upon our field observations and data obtained from the borings at the site. The nature and extent of variations may not become evident until construction. If variations then appear evident, it may be necessary to re-evaluate the recommendations presented herein. Similarly, in the event that any changes in the nature, design, or location of the facilities are planned, the conclusions and recommendations contained herein shall not be considered valid unless the changes are reviewed and the conclusions are modified or verified in writing by Triad.

It is recommended that we be provided the opportunity to review the final grading plan and specifications so that earthwork recommendations may be properly interpreted and implemented. If we are not afforded the privilege of making this review, we will not assume responsibility for misinterpretation of our recommendations, as our recommendations are strictly limited to conditions represented to Triad at the time this report was issued.

SITE AND PROJECT DESCRIPTION

The site for the new hangar structures is on the northern side of Winchester Regional Airport in Frederick County, Virginia. The new structures will be located at the current eastern terminus of Coverstone Drive, immediately east of the Frederick County Sheriff's Department headquarters. The site currently includes gently to moderately

sloping and rolling terrain. The northwestern half of the site is open while the southeastern half is heavily wooded. A stockpile of clean waste, approximately 15 to 20 feet high, is located in the north-central portion of the site. The approximate site location is illustrated on Figure A-1 in Appendix A.

Based on the provided conceptual plans prepared by Delta Airport Consultants, Inc., there are three (3) options for the planned development. Two (2) of the three (3) concepts involve various sizes and configurations of hangar structures. The third option includes a large 600,000 square foot building with an undefined usage. Parking areas and aprons are planned as part of all three (3) concepts. Information provided indicated that the site will be graded to approximately 715 feet (MSL). Based on the topographic plan provided, maximum cuts of 15 feet and maximum fills of 10 feet will be needed to achieve the proposed site grading.

GEOLOGIC SETTING

According to the *Geologic Map of the Stephenson Quadrangle, Frederick and Clarke Counties, Virginia, and Jefferson County, West Virginia, 2022,* the project site is underlain by the Martinsburg Formation of the Upper Ordovician Period. The Martinsburg Formation is a fossiliferous medium to coarse-grained sandstone. Silty shale, siltstone, and medium- to coarse-grained sandstone make up the middle 3,000 to 4,500 feet of the formation. Residual soils weathered from the parent bedrock generally consist of sandy silts and silty sands with varying amounts of clay.

FIELD EXPLORATION

The scope of work included drilling sixteen (16) structure test borings at the approximate locations shown on Figure A-2 in Appendix A. Fourteen (14) of the borings were located within the area of the planned new structures, and two (2) borings were located at the northwestern corner of the airport property in a potential borrow area. The general boring locations were selected by Delta and were established in the field by Triad. Boring surface elevations were estimated using contour lines on the topographic map supplied by Delta. All the test borings included Standard Penetration Testing (SPT) and split barrel sampling (ASTM D 1586) at select intervals to refusal or termination depths.

Geotechnical personnel from our office were present during the drilling to direct the drill crew, log all recovered soil samples and observe groundwater and rock conditions. The recovered soil samples were transported to our laboratory for further testing. Detailed descriptions of materials encountered in the test borings are contained on the Test Boring Logs in Appendix B. Figure Nos. B-1 and B-2 contain descriptions of the classification system and terminology utilized.

SUBSURFACE CONDITIONS

Subsurface Strata

The materials encountered in the borings are generally described below. Stratification lines indicated on the logs represent the approximate boundaries between material types.

Topsoil: Topsoil was encountered at the surface in each of the borings. The topsoil ranged in thickness from 1 to 8 inches. The topsoil generally consisted of light to dark brown organic silt with some clay, surface root mat and organics.

Existing Fill: Existing (old) fill material was encountered below the topsoil in borings B-1, B-2, B-3, B-8, B-10, B-13, and B-14. The fill extended to depths ranging from approximately 1.5 to 5 feet below the existing grades. The fill generally consisted of silt, sand, and gravel with varying amounts of clay. Standard Penetration Test (SPT) N-values obtained within the fill ranged from 4 to 16 blows per foot which indicated soft to stiff consistencies for the fine-grained soils, and loose to medium dense relative densities for the coarse-grained soils.

Residuum: Residual soils were encountered in all the test locations beneath the topsoil and old fill (where present). Residual soils below the surficial materials in the borings consisted of silt or sand and gravel weathered from the underlying shale. SPT N-values obtained within the residual soils ranged from 3 to 47 blows per foot which indicated medium stiff to stiff consistencies and very loose to dense relative densities.

Weathered Bedrock: Weathered shale was encountered beneath the residual soils in each of the borings. SPT N-values obtained within the weathered shale were in excess of 50 blows per foot, which indicated a very dense relative density. The weathered shale was initially encountered at depths ranging from 1.5 to 8.5 feet below the existing grades.

Bedrock: Spoon/auger refusal was encountered at depths ranging from 3.2 to 14.8 feet below existing grades indicating hard shale. Upon auger refusal, rock coring was performed in borings B-4, B-5, B-11, and B-13 to extend the borings to the planned termination depths. The remaining borings were extended to planned termination depth, or near planned termination depth without coring. Spoon refusal occurred in some borings just above the termination depths. Rock core recovery ranged from 60 to 100%. Rock Quality Designations (RQD), which are a general indicator of the quality of rock, ranged from 0 to 42%. This indicates very poor to poor quality rock. Boring B-13 exhibited the lowest recovery rates.

Groundwater Observations

The test borings were checked for the presence of groundwater both during and upon completion of the drilling. All borings that did not include rock coring were dry during

and upon completion of drilling. After rock coring, water levels were noted to be at depths ranging from 1.5 to 2.8 feet below existing grades. These may not be representative of true groundwater levels since water is introduced to the boring for rock coring. It is emphasized that variations in groundwater levels are typical of the geologic region and may occur due to changes in environmental conditions, surface drainage, and other factors not evident at the time measurements were made and reported herein.

LABORATORY TESTING

Soil samples obtained from the borings were visually classified in the field by geotechnical engineering personnel from Triad. All laboratory soil tests were performed in accordance with applicable ASTM Standards. Detailed results of the laboratory tests are contained in Appendix C. The results of the tests are summarized below.

TEST TYPE	TEST RESULTS
Natural Moisture Contents	3.7 to 24.8%
Atterberg Limits: Liquid Limit Plasticity Index	 25 to 38 9 to 14
Percent Passing No. 200 Sieve	11 to 42%
USCS Soil Classification	GP-GC (1 sample), GC (2 samples), SC (3 samples)
Modified Proctor Maximum Dry Density Optimum Moisture	 126.5 to 132.5 pcf 5.5 to 8.5%
California Bearing Ratio	11.9 to 25.5%
Pyritic Sulfur Content	0.002 to 0.007%

DISCUSSION

Based on the results of the field exploration, the site is underlain by residual soils that generally consist of medium dense to dense sandy silts and gravels derived from the underlying shale. These soils rapidly grade to very dense weathered shale starting at depths ranging from 1.5 to 8.5 feet below the existing grades. Spoon/auger refusal on bedrock was encountered at depths ranging from 3.2 to 14.8 feet below existing grades indicating hard rock.

Existing (Old) Fill

Existing (old) fill material was encountered below the topsoil in borings B-1, B-2, B-3, B-8, B-10, B-13, and B-14 extending to depths ranging from 1.5 to 5 feet below the existing grades. The fill generally consisted of sand and gravel with varying amounts of clay. These materials are generally suitable materials for reuse and grading fill or structural fill. Based on the results of the test borings, it appears that some of the fill

was generally placed in a controlled manner. However, records of fill placement were not provided, and consequently, the fill is considered uncontrolled. The existing fill may extend to depths greater than those encountered in the borings. Furthermore, there is the potential for unsuitable old fill to be encountered within other areas of the hangar structures and paved areas that were not explored during field operations.

Based on the results of the field exploration, we recommend that any existing fill be removed prior to construction to achieve adequate bearing conditions. During construction, extensive, thorough proof-rolling will be required where existing fill is present to identify any areas that may require over-excavation and replacement.

The existing stockpile of clean waste located in the north-central portion of the site was not evaluated during our investigation. It is likely that the material comprising the stockpile consists of materials similar to the existing fill encountered across the site. We recommend that the materials be further evaluated during construction to verify that they are suitable for use as structural fill.

Shale

Weathered shale was initially encountered at depths ranging from 1.5 to 8.5 feet below the existing grades. Spoon/auger refusal was encountered at depths ranging from 3.2 to 14.8 feet below existing grades indicating hard shale. Upon auger refusal, rock coring was performed in borings B-4, B-5, B-11, and B-13. Rock Quality Designations (RQD), which are a general indicator of quality of rock, ranged from 0 to 42%. This indicated very poor to poor quality rock. It is our understanding that the site will be graded to approximately 715 feet MSL. At this elevation, removal of weathered to hard shale to varying depths will be required throughout most of the site. Assuming a bearing elevation of approximately 712 feet MSL for the hangar structures, foundations are expected to bear almost entirely on weathered to hard shale. The shale is poor quality rock and can likely be removed with conventional rippers and track-mounted excavators. In isolated areas, a hoe-ram may be required to remove areas of hard rock more efficiently.

Potential Borrow Area

Borings B-1 and B-2 were drilled in the potential borrow area located at the northwestern corner of the airport property. The subsurface conditions encountered in the two (2) borings consisted of existing (old) fill overlying residual soils and weathered shale. The existing fill was encountered to depths of 2.5 to 4 feet and consisted of sand and gravel with silt, similar to the residual soils below the fill. Weathered shale was encountered at depths of 4 to 8 feet below existing grades, which transitioned into hard shale at depths 14 to 15 feet. The materials are generally suitable for structural fill. We anticipate that the soils and rock will be mixed in varying proportions for grading fill.

Pyritic Shale

Representative samples of materials obtained from the test borings were tested for total sulfur form concentrations. This testing determined the amount of total sulfur in the

samples and the quantities of pyritic, sulfate and organic sulfur that comprise the total sulfur. Organic sulfur content was very low, 0.021% or less, and does not contribute to the potential for expansion. Sulfate sulfur content ranged from 0.016 to 0.022%, and this typically represents the amount of pyritic sulfur that has already gone through the oxidation reaction. Pyritic sulfur content ranged from 0.002 to 0.007%, and this is the material available for the oxidation reaction. It is our experience that materials containing pyritic sulfur in concentrations exceeding 0.5% can potentially expand to such a degree as to cause structural movement and/or damage. Concentrations exceeding 0.5% were not encountered at any of the test locations. Therefore, testing indicated that there is a low expansion potential for the material present below the planned structures or paved areas. However, there remains a chance that pyritic materials could be encountered during construction. In the event that pyritic materials are encountered, they should be placed in non-structural or non-paved areas.

The following sections of this report include recommendations for design and construction of the geotechnical elements of the project. Provided that these recommendations are followed, it is our opinion that the site is generally suitable for the proposed hangar construction.

DESIGN RECOMMENDATIONS

The subsurface information obtained from the field exploration, our experience with similar projects, and the noted design criteria were the basis for our assessment of the geotechnical issues currently existing at the site. Our geotechnical recommendations associated with the design and construction of the new taxiway are presented in the following sections of this report.

Foundations

We believe that the proposed hangar structures can be supported on conventional spread foundations bearing on approved residual materials or controlled fill at shallow depths provided the recommendations herein are strictly implemented. It is our understanding that the site will be graded to approximately 715 feet MSL. Consequently, we assume a bearing elevation of approximately 712 feet MSL for the hangar structures. Based on the data obtained from the test borings and the assumed site grading, we recommend that a maximum allowable bearing pressure of 3,000 psf be utilized for design of spread footings bearing on approved residuum, weathered shale or new controlled fill. Minimum dimensions of 2 feet and 3 feet should be observed for continuous and isolated footings, respectively. Exterior foundations should bear at least 30 inches below the final outside grade for frost protection. Footings within permanently heated areas can bear at minimum depths below the finished floor.

Based on the results of our field exploration, we anticipate that hard rock will be encountered above foundation bearing elevation throughout the footprints of the planned structures. Isolated column footings should be constructed either entirely on rock or entirely on soil, but not a combination of soil and rock. Areas which contain combined soil and rock bearing conditions should either be cleaned of all soil and backfilled with “lean-mix” concrete to achieve uniform rock bearing or should be over-

excavated a minimum of 12 inches and backfilled with compacted soil to achieve complete soil bearing. If partial rock bearing is encountered at the proposed footing levels, we recommend that the rock be undercut approximately one (1) foot and be replaced with compacted soil fill. This treatment generally reduces the magnitude of differential settlements associated with a footing bearing partially on hard rock and partially on soil. If massive hard rock is present along continuous wall footing alignments, it may be possible to construct a transition zone between the hard rock and soil bearing materials. This transition zone should include a minimum of 12 inches of rock removal at the interface of the soil and rock and taper up to the bottom of the planned bearing elevation of the footings. This transition zone should be a minimum length of 20 feet and should be backfilled with on-site soil that is placed and compacted in accordance with the specifications provided in the Controlled Fill subsection of this report.

Considering the boring results and assumed site grading, we anticipate that hard rock may be encountered during foundation construction in isolated areas. Any hard rock which is encountered above the planned bearing elevation should be over-excavated to at least 12 inches below bearing level and should be replaced with controlled soil fill. This measure typically reduces the magnitude of differential settlement resulting from partial rock and partial soil bearing.

Based on the above design recommendations and the various types and consistencies of bearing materials, it is estimated that total settlements for foundations bearing on approved materials will be on the order of one (1) inch or less. Total settlements for foundations bearing entirely on hard rock, if applicable, will be negligible. Differential settlements are anticipated to be half of the total settlements or in this case one-half (½) inch. Differential settlements could be in the same range as total settlements between interior columns bearing entirely on either soil or rock. Differential settlements along continuous wall footings are not expected to exceed an angular distortion of 0.0015 inch/inch.

Seismic Site Classification

The site soils were evaluated and classified according to the 2018 International Building Code Section 1613 - Earthquake Loads - Site Ground Motion. This building code establishes the criteria for project site evaluation. Section 1613.3.2 and 2016 ASCE-7 Standard-Table 20.3-1 defines the parameters for determining the seismic site class based on N-values. The seismic site class may be determined by calculating an average N-value of subsurface materials to a depth of 100 feet. For the determination, the N-values recorded in test borings are used for overburden soil, and then, typically, materials below the depth that auger refusal or hard rock is encountered (to a depth of 100 feet) are assigned an N-value of 100. Based on the results of the test borings, the site has an average N-value well in excess of 50. Using this information along with knowledge of the site geologic setting, the seismic site class and additional seismic information is as follows:

SEISMIC PARAMETERS	
Seismic Site Class	**C**
Soil Profile Name	**Very Dense Soil and Soft Rock**
Site Amplification Factor at 0.2 second, F_a	**1.3**
Site Amplification Factor at 1.0 second, F_v	**1.5**
$MCER_R$ Ground Motion (for 0.2 second period), S_s	**0.126**
$MCER_R$ Ground Motion (1.0 second period), S_1	**0.044**

Based on results from the test borings, published regional geologic information and the probable maximum strength of earthquake, it is our opinion that liquefaction potential for the on-site soils during seismic activity is minimal. Seismic coefficients and other seismic information to be considered for structural design of the project are provided in Appendix D of this report.

Floor Slabs

We recommend that a modulus of subgrade reaction, "k," equal to 110 pci be adopted for analysis and design of the slabs-on-grade which will bear on suitable in-situ soil or controlled fill consisting of compacted soil. If a higher subgrade modulus is necessary, we recommend utilizing a 12-inch thick layer of well graded crushed rock, such as VDOT 21B or an approved equivalent, as a final subgrade. If the 12-inch thick layer of crushed rock is utilized, a modulus of subgrade reaction, “k,” of 250 pci can be used for design. Slabs which will not receive heavy or dynamic loading, such as in office areas, should be underlain by a minimum 4-inch thick layer of open-graded aggregate such as ASTM designation No. 57 stone. Slabs which will receive heavy or dynamic loading should be underlain by a minimum six (6) inch thick layer of well-graded, crushed aggregate such as VDOT 21B aggregate or approved equivalent. Concrete slabs upon which VCT, carpeting, quarry tile, or other flooring products will be placed should be underlain by a conventional polyethylene vapor barrier. Use of a vapor barrier in other areas such as warehouse and receiving areas is considered optional since these areas will most likely not be covered.

Joints should be provided in the floor slabs in accordance with the recommendations specified by the Portland Cement Association (PCA) or American Concrete Institute (ACI). Where construction joints are required in heavy traffic areas such as storage areas, we strongly recommend the use of doweled joints rather than keyed joints. The doweled joints provide a positive transfer of shear forces and prevent movement.

Pavement

Three (3) samples for California Bearing Ratio (CBR) testing were obtained from the upper 5 feet in the borings. Bulk sample S-1 was composited from borings B-3, B-4, and B-5. Bulk sample S-2 was composited from borings B-7, B-8, and B-9, and bulk sample S-3 was composited from borings B-10, B-11, and B-12. The bulk samples consisted of both existing fill and natural soils.

The results of the testing showed CBR values ranging from 11.9 to 25.5%. For preliminary evaluation of pavement, we recommend utilizing a design CBR value of 10%. This CBR value is appropriate for the clayey sand and gravel found in the upper 5 feet within the upper 5 feet of existing grades. It is assumed the fill materials used for grading fill at this site will consist of mixtures of the upper soils and crushed rock, so the CBR values determined from our testing should be conservative. If unstable soils are identified during proof-rolling, they will require undercutting and replacement. If unstable soils remain in place, they will likely result in localized pavement failures due to the inadequate subgrade support of these materials.

The soil subgrade should be crowned or properly sloped to provide drainage of the base course aggregate. All structural fill placed as pavement subgrade shall conform to the requirements listed in the Controlled Fill section of this report. Drainage ditches, underdrains, edge drains and/or inlets should be designed for the pavement areas to maintain drainage and always divert runoff away from the pavement subgrade. The drains should either be routed to appropriate stormwater management areas or day-lighted away from the roadway subgrade. Failure to provide adequate drainage could result in a shorter pavement life and failure.

CONSTRUCTION RECOMMENDATIONS

Site Preparation

Initial site clearing and grubbing should include removal of the topsoil and any other deleterious materials within the new structure and pavement areas and extending five (5) feet beyond their perimeters. As previously indicated, we recommend that all areas be heavily proof-rolled prior to fill placement or construction with approved construction equipment similar to a 20-ton tandem axle dual wheel dump truck loaded to the legal limit and tires inflated to 150 psi. If unsuitable soils are detected, recommendations can be developed for any remedial measures of such conditions, if warranted. ***It will be extremely important that the site work contractor promote positive drainage throughout the site during construction of the project.***

After removal of the unsuitable surface materials, the subgrade soils should be heavily proof-rolled with approved construction equipment to locate isolated soft spots or areas of excessive "pumping" which are too wet to accommodate compacted fill or construction. These areas should be either scarified, air-dried to a sufficient moisture content and re-compacted prior to fill placement or excavated to the level of stable soils. The exposed subgrade should be examined and verified by a representative from our office prior to placement of compacted fill.

Excavations

In general, the residual soils and some weathered shale can be excavated with conventional earth moving equipment such as backhoes and tracked loaders. However, very dense rock with blow counts exceeding 50 blows per foot were encountered in the majority of the borings. Excavations into the dense weathered rock

may require heavy ripping or hoe-ram chipping especially within confined excavations such as deeper utility trenches. If hard bedrock is encountered, hoe ramming will be required for effective removal.

Controlled Fill

We have provided the following recommendations for any new fill that needs to be placed to meet final grades for the project.

Suitable Materials

Based on our past experience with similar soils, the on-site residual soils and weathered shale can generally be used for fill provided that compaction criteria are strictly maintained. The results of the moisture content testing ranged from 3.7 to 24.8 percent. Some of the on-site materials will have to be dried or moistened to attain a moisture content that is within a satisfactory range to obtain proper compaction. This will be very dependent upon seasonal conditions and in-situ moisture levels present at the time of earthwork construction.

Fill materials should not contain any debris, waste, or frozen materials and they should contain less than two (2) percent vegetation-organic materials by weight. Also, materials classified as CH, MH, OL, OH, or Pt are not suitable for use as fill. All proposed fill materials should be approved by a geotechnical engineer prior to placement as controlled fill, and representative samples should be submitted by the contractor one week prior to placement of that material to allow time for completion of the necessary laboratory tests.

Placement and Compaction

Before compaction, each layer should be moistened or aerated as necessary to obtain the required compaction. Each layer should be compacted to the required percentage of maximum dry density. Fill should not be placed on surfaces that are muddy or frozen or have not been approved by testing. Free water should be prevented from appearing on the surface during or subsequent to compaction operations.

Soil material which is removed because it is too dry or too wet to permit proper compaction can be spread and allowed to dry or moistened. Drying can be facilitated by discing or harrowing until the moisture content is reduced to an acceptable level. When the soil is too dry, water should be applied uniformly to the subgrade surface or to the layer to be compacted.

Controlled fill placed should be free of rock or gravel larger than four (4) inches in any dimension. We anticipate that heavy compaction equipment will be utilized to compact any new controlled fill for this project. Therefore, all new fill should be placed in maximum 8-inch loose lifts.

Fill material placed should be compacted to at least 95 percent of the laboratory maximum dry density as determined by the Modified Proctor method (ASTM D 1557-12

Method A). The moisture content of the soils should be at or within three (3) percentage points of the optimum moisture content.

Foundations

We anticipate that conventional earth excavation equipment such as a backhoe or trackhoe can be utilized to excavate the residual soils or controlled fill for foundation construction. Hard rock will require hoe-ram chipping for effective removal. We recommend that any loose materials present at the bottom of footing excavations as a result of excavation work be re-compacted or completely removed by hand in order to minimize differential settlements. In any areas where hard rock is encountered at the bottom of proposed footing levels, the recommendations presented in the Foundation Design section of this report should be strictly followed.

Foundation concrete should be placed the same day that excavations are completed to reduce the potential for softening due to precipitation and/or runoff. In areas where backfill adjacent to wall construction has not been placed prior to precipitation events, any ponded water that accumulates in these areas should be pumped out immediately to help prevent softening and deterioration of the surrounding soils. In addition, all rough grades around the structure should be sloped away from the structure both during and after construction such that water from precipitation does not build up or pond adjacent to the perimeters.

Any underground utilities which are located below or adjacent to new foundations should be backfilled with approved, compacted well-graded crushed aggregate, lean mix concrete or flowable fill grout to grades which are at or above the design bearing levels. In addition, minimal thicknesses of bedding stone should be utilized beneath the utility lines in order to help prevent significant accumulation of water from precipitation developing within the utility trench area.

Floor Slabs

Prior to placement of crushed stone for the floor slabs, the subgrade soil within the limits of the structure should be proof-rolled to detect any soft, wet "pumping" areas. Any unsuitable areas should be scarified, aerated to an approved moisture content, and re-compacted or undercut and replaced with controlled fill. The subgrade should be properly sloped to allow water from precipitation events to drain from the stone prior to slab placement. Water should not be allowed to pond within the stone prior to placement of concrete.

It is recommended that the roof of the structure be constructed prior to floor slab construction. This measure will reduce potential construction problems associated with unstable subgrade impacted by adverse weather conditions and heavy construction equipment. If the roof is not erected prior to floor slab construction, in order to reduce the potential for construction delays, we recommend that the sequence and timing of floor construction be coordinated such that slab concrete will be placed within a very short time, i.e., within a few days or less, after placement and compaction of the aggregate base course.

Utilities

Locations and invert elevations for proposed utilities were not provided at this time. In general, we anticipate that conventional excavation equipment such as a backhoe or trackhoe can be used for utility excavations in the residual soils and controlled fill. Based on the refusal depths across the site, hard rock should be anticipated in the utility alignments. Any excavations which encounter hard rock will likely require heavy ripping or hoe-ram chipping to attain scheduled invert elevations.

In areas where excavated rock and soil fill has been placed during mass earthwork construction, an acceptable substitute backfill material should be used for new utility trench backfill. This is recommended because of the inherent difficulty in re-compacting larger excavated rock materials in trenches using small, hand-operated equipment. The substitute material should comply with the maximum particle size restrictions specified for the particular utility. Trenches below pavement areas should be backfilled in accordance with the Controlled Fill section of this report.

Pavement

Any wet and/or unstable soils present at the subgrade level during grading operations should be either scarified, aerated and re-compacted or should be removed and replaced with suitable fill material. Any unsuitable subgrade soils should be corrected immediately prior to placement of base stone and pavement material. **It will be very important that the final soil subgrade be properly sloped or crowned to help remove surface water from precipitation events from the subgrade area. Also, adequate ditches should be constructed along cut sections to effectively remove surface runoff.** Both the base stone and pavement section should be placed immediately after acceptable subgrade conditions have been achieved due to the potential for subgrade softening from adverse weather conditions. In addition, heavy construction traffic should be limited from traveling across approved final subgrade areas that have been exposed to precipitation in order to help maintain a stable subgrade prior to pavement construction. If hard rock is encountered above the design subgrade level in the pavement area, it should be over-excavated to at least the level of the bottom of the pavement section (i.e., the bottom of the aggregate base material).

Construction Observations

We recommend that the geotechnical engineering firm of record, Triad, be retained to observe the construction activities to verify that the field conditions are consistent with the findings of our exploration. Construction observation services should be performed on a full-time and/or intermittent basis, as required, to:

- Observe removal of all deleterious materials and testing of original subgrade material prior to initial fill placement.

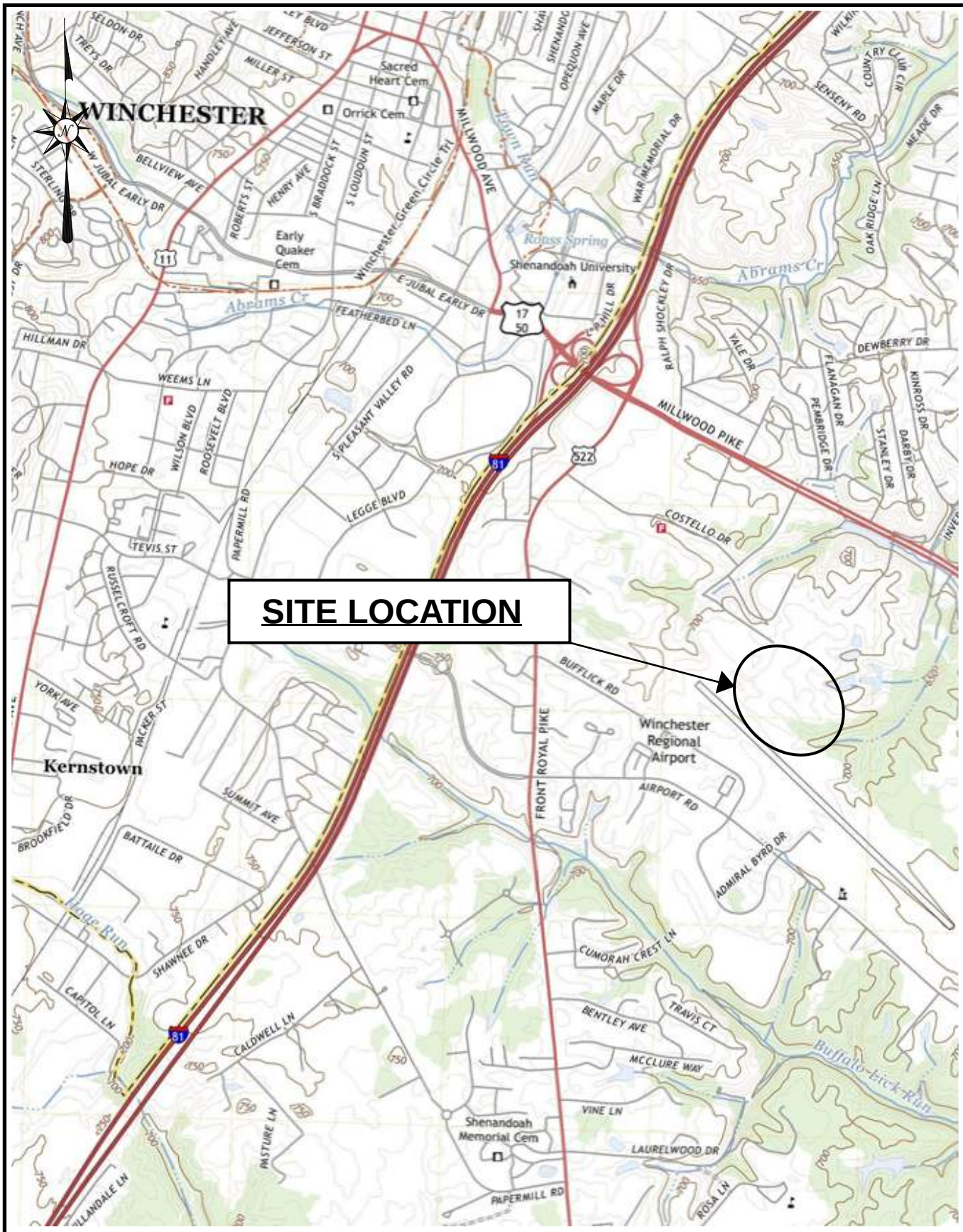
- Observe and test the construction of controlled fill. Field density tests should be performed in accordance with ASTM D 6938 (nuclear method). At least one (1)

field density test should be performed for each lift of fill placed or at a frequency determined to be sufficient by the testing agency based on the amount of fill being placed to confirm the required soil compaction.

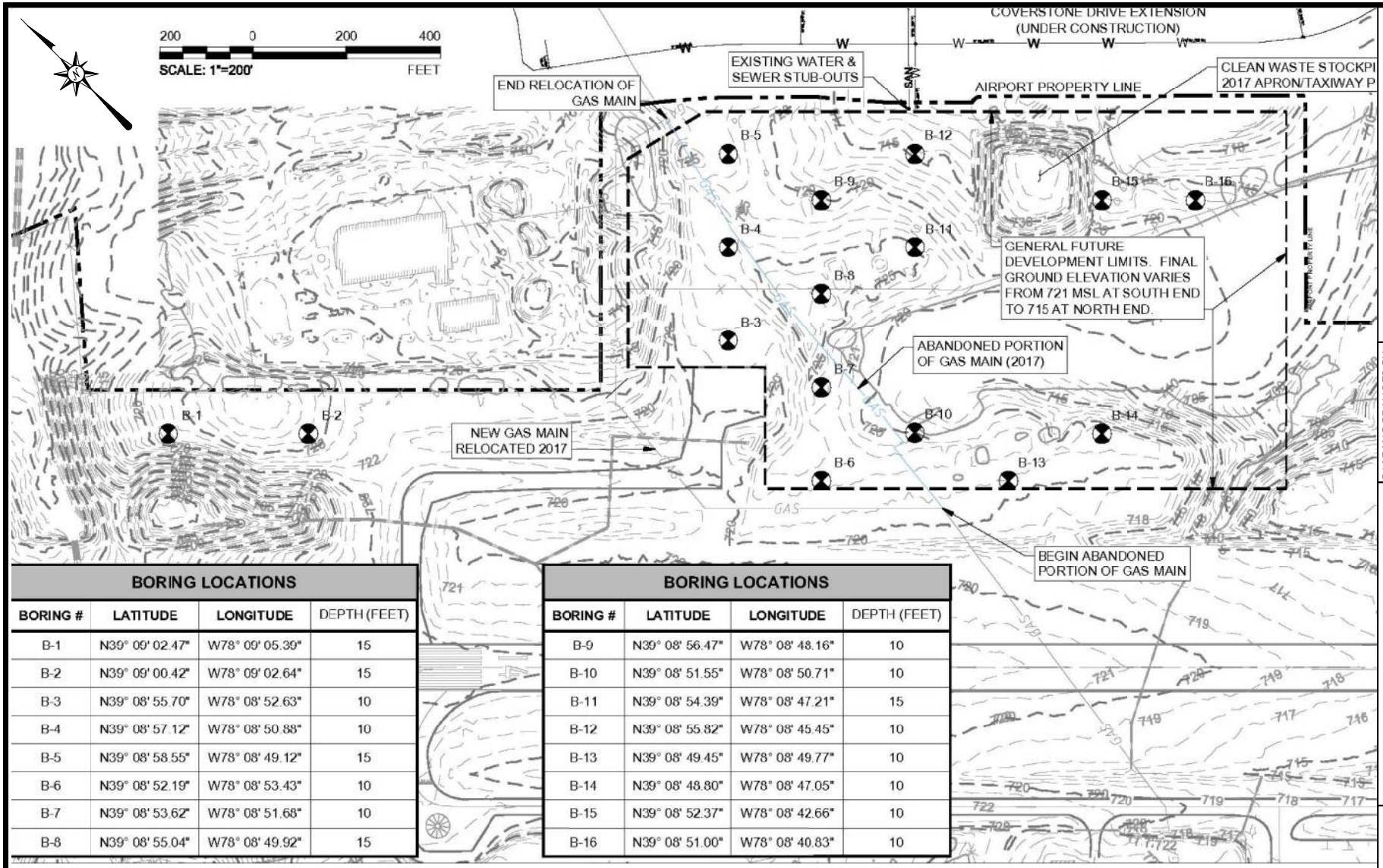
TRIAD ENGINEERING, INC.

APPENDIX A

Illustrations



SOURCE: USGS 7.5 WINCHESTER (VA) 2022; Topographic Maps		WINCHESTER REGIONAL AIRPORT - NORTHSIDE DEV PHASE 1 FREDERICK COUNTY, VIRGINIA	TRIAD ENGINEERING, INC. www.triadeng.com
DRAWN BY: JGW	CHECKED BY: RAS	SITE LOCATION PLAN	
DATE: 01-26-2024	SCALE: 1"=2000'	TRIAD PROJECT NO: 07-23-0347	FIGURE NO.: A-1



BORING LOCATIONS			
BORING #	LATITUDE	LONGITUDE	DEPTH (FEET)
B-1	N39° 09' 02.47"	W78° 09' 05.39"	15
B-2	N39° 09' 00.42"	W78° 09' 02.64"	15
B-3	N39° 08' 55.70"	W78° 08' 52.63"	10
B-4	N39° 08' 57.12"	W78° 08' 50.88"	10
B-5	N39° 08' 58.55"	W78° 08' 49.12"	15
B-6	N39° 08' 52.19"	W78° 08' 53.43"	10
B-7	N39° 08' 53.62"	W78° 08' 51.68"	10
B-8	N39° 08' 55.04"	W78° 08' 49.92"	15

BORING LOCATIONS			
BORING #	LATITUDE	LONGITUDE	DEPTH (FEET)
B-9	N39° 08' 56.47"	W78° 08' 48.16"	10
B-10	N39° 08' 51.55"	W78° 08' 50.71"	10
B-11	N39° 08' 54.39"	W78° 08' 47.21"	15
B-12	N39° 08' 55.82"	W78° 08' 45.45"	10
B-13	N39° 08' 49.45"	W78° 08' 49.77"	10
B-14	N39° 08' 48.80"	W78° 08' 47.05"	10
B-15	N39° 08' 52.37"	W78° 08' 42.66"	10
B-16	N39° 08' 51.00"	W78° 08' 40.83"	10

⊕ - Approximate Boring Location

Location plan is approximate.
For reference purposes only.

TRIAD ENGINEERING, INC.
200 AVIATION DRIVE
WINCHESTER, VA 22602
PH: 540.667.9300 FAX: 540.667.2260
OFFICE LOCATIONS:
MARYLAND - OHIO - PENNSYLVANIA
VIRGINIA - WEST VIRGINIA

BASE MAP PROVIDED BY: DELTA AIRPORT CONSULTANTS INC.
PROJECT NO: 07-23-0347
DRAWN BY: JGW
CHECKED BY: MEC
SCALE: 1"=200'
DATE: 01-26-2024

WINCHESTER REGIONAL AIRPORT - NORTHSIDE DEV PHASE 1
FREDERICK COUNTY, VA

BORING LOCATION PLAN

TRIAD ENGINEERING, INC.
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FIGURE NUMBER:
A-2
PROJECT NO: 07-23-0347

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APPENDIX B

Field Exploration

FIELD EXPLORATION

The subsurface conditions at the site were explored by drilling sixteen (16) test borings with Standard Penetration Tests (SPT) and sampling. The borings were drilled by Connelly & Associates Drilling Services utilizing an Acker Rebel XL rotary auger drill rig and hollow stem augers to advance the holes. The field exploration was supervised by geotechnical engineering personnel from our office.

SPT and sampling was performed in accordance with ASTM D 1586. The SPTs were performed to depths indicated on the attached boring logs using a split barrel sampler with an outside diameter of two (2) inches and an inside diameter of one and three-eighths (1-3/8) inches. The split barrel sampler was driven eighteen (18) inches with a hammer weighing approximately 140 pounds and falling thirty (30) inches. The number of blows required to drive the split barrel sampler at six (6) inch increments was recorded on the boring logs. The method utilized to classify the soils is defined in Figure B-1, Key to Identification of Soils and Weathered Rock Samples.

KEY TO IDENTIFICATION OF SOIL AND WEATHERED BEDROCK SAMPLES

Descriptor Sequence	
1	Color
2	Primary Component
3	Fractions
4	Moisture
5	Descriptors
6	Plasticity
7	Consistency/ Relative Density
8	Deposition Type

1. Color	
Gray	Tan
Brown	Black
Orange	Red
Green	Yellow
Purple	Blue
Modifiers	
Light	Lighter side of color range
Dark	Darker side of color range
Mottled	Irregularly marked with spots of different colors
Banded	Alternating shades or colors

2. Primary Component	
Component	Grain Size (USCS)
Boulders	≥ 12 inches
Cobbles	3 to 12 inches
Gravel	#4 to 3 inches
Sand	#200 to #4
Silt/Clay	≤ #200

3. Fractions	
And	≥ 35%
Some	20 to 35%
Little	10 to 20%
Trace	< 10%

4. Moisture	
Dry	Dry to touch
Damp	Slightly moist
Moist	No visible free water
Wet	Visible free water

5. Descriptors	
Fissile	Splits easily along closely spaced parallel planes (breaks into plates)
Hackly	Jagged or irregular fracture planes
Slickensided	Polished and striated surfaces that result from friction along a fault plane
Laminated	Alternating thin layers of varying material or colors less than ¼" thick
Lensed	Inclusion of small pockets of different soils
Saprolitic	Completely weathered rock that retains the appearance of the original rock structure but has only a trace of the original bond strength
Micaceous	Containing mica minerals
Varved	Laminated sediment consisting of alternating layers of fine sand and silt or clay deposited in still water

6. Plasticity of Fine-Grained Soils

Fine-Grained Component	Plasticity	Estimated Plasticity Index (PI)	Smallest Thread Diameter	Thread Characteristics	Dilatancy
Primarily Silt	Non-Plastic	0 - 2%	Ball cracks	Dries rapidly; a 1/8-inch thread cannot be rolled at any water content	Moist ball sheds water when shaken giving a glossy appearance
Primarily Clay	Low Plasticity	3 - 10%	$^1/_8$ to $^1/_4$ inch	Feels powdery when drying out during rolling; thread can barely be rolled	Moist ball retains water or sheds water slowly when shaken
	Medium Plasticity	> 10 - 20%	$^1/_{16}$ inch	Thread cannot be rerolled after reaching plastic limit	
	High Plasticity	> 20%	$^1/_{32}$ inch	Thread can be rerolled after reaching plastic limit	Moist ball retains water when shaken

7a. Relative Density of Granular Coarse-Grained Soils

Descriptor	N-Value
Very Loose	≤ 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

7b. Consistency of Fine-Grained Soils

Descriptor	Pocket Penetrometer (tons/ft^2)	N-Value
Very Soft	≤ 0.25	≤ 2
Soft	≥ 0.25 - 0.5	3 - 4
Medium Stiff	> 0.5 - 1.0	5 - 8
Stiff	> 1.0 - 2.0	9 - 15
Very Stiff	> 2.0 - 4.0	16 - 30
Hard	> 4	≥ 31

8. Type of Deposit	
Alluvium	Sediment deposited by moving water
Colluvium	Sediment deposited by gravity
Fill	Manmade deposit
Fluviomarine	Stratified materials formed by the combined action of river and sea processes
Glacial Outwash	Sediment deposited by glacial meltwater; commonly sand and gravel
Glacial Till	Unsorted sediment deposited by glacier
Glacial Drift	Collective term for all sediment transported and deposited by a glacier or glacial meltwater
Residuum	Insoluble material remaining from weathered rock
Weathered Bedrock	Bedrock that has been weathered

FIGURE B-1

KEY TO IDENTIFICATION OF HARD BEDROCK SAMPLES

Descriptor Sequence	
1	Color
2	Rock Type
3	Interbedding
4	Descriptors
5	Weathering
6	Fracturing
7	Fracture Angle
8	Hardness

1. Color	
Gray	Tan
Brown	Black
Orange	Red
Green	Yellow
Purple	Blue
Modifiers	
Light	Lighter side of color range
Dark	Darker side of color range
Mottled	Irregularly marked with spots of different colors
Banded	Alternating shades or colors

2. Rock Type	
Common Regional Rocks	
Sandstone	Siltstone
Mudstone	Shale
Coal	Claystone
Limestone	Dolostone

3. Interbedding/Fractions	
And	≥ 50%
Some	15 to 40%
Few	0 to 15%

4. Descriptors	
Arenaceous	Sedimentary rock containing sand sized particles
Argillaceous	Pertaining to a sedimentary rock which contains an appreciable amount of clay
Calcareous	Containing calcium carbonate; when applied to a rock name, it implies that as much as 50% of the rock is calcium carbonate
Carbonaceous	A rock rich in carbon
Cross Bedded	Original depositional layering is inclined
Ferruginous	A rock having a red or rusty color due to the presence of ferric oxide
Fissile	Splits easily along closely spaced parallel planes
Fossiliferous	Containing fossils
Hackly	Jagged or irregular fracture planes
Micaceous	Containing mica minerals
Nodule	A small rounded mass of a mineral or mineral aggregate different in composition from the enclosing rock
Pyritic	Containing the mineral pyrite
Slickenside	Polished and striated surface that results from friction along a fault plane
Vein	An epigenetic mineral filling of a fault or other fracture
Vuggy	Containing voids usually lined with crystals of a different mineral composition from the enclosing rock

5. Degree of Weathering	
Descriptor	**Criteria**
Fresh	No visible sign of weathering, discoloration, or oxidation
Slightly Weathered	Slight weathering, discoloration, or oxidation **impacting <20% of rock mass**
Weathered	Significant weathering, discoloration, or oxidation **impacting 20 to 60% of rock mass**
Highly Weathered	Major weathering, discoloration, or oxidation **impacting >60% of rock mass**

6. Degree of Fracturing	
Descriptor	**Spacing**
Very Broken	≤ 2 inches
Broken	2 to 8 inches
Blocky	8 inches to 2 feet
Slightly Fractured	2 to 6 feet

7. Angle of Fracture Planes	
Fracture Planes	**Degrees**
Flat	< 5°
Shallow	5 to 15°
Moderate	15 to 30°
Steep	30 to 45°
Very Steep	45 to 60°
Sheer	60 to 90°
Vertical	90°

8. Rock Hardness	
Descriptor	**Test Criteria for Hand Specimen**
Very Soft	Indented with thumb or scratched by fingernail
Soft	Gouged deeply or carved with a knife blade
Medium Hard	Readily scratched by knife blade, scratch leaves heavy trace of dust
Hard	Scratched by knife blade with difficulty, scratch produces little powder and is faintly visible
Very Hard	Not scratched by a knife blade

FIGURE B-2

TEST BORING LOG

Project Number: **07-23-0347** Project Name: **Winchester Airport Hangar** Boring No.: **B-1**

Inspector: DJM Boring Location: See Figure No. A-2

Date Started: 2/21/24 Drill/Method: ACKER REBEL XL

Date Completed: 2/21/24 Driller: CONNELLY Ground Elev.: 722

Shelby Tube | Standard Split Spoon | Core Sample | Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1		WOH-2-2	56%			2" TOPSOIL Tan-brown sandy **SILT**, little gravel, moist, loose, **fill**				
						2.5					719.5
	S-2		4-12-23	100%			Tan-red-brown **SAND and GRAVEL**, little to some silt, moist, dense, **residuum**				
						4.0					718.0
5.0							Tan-brown weathered **SHALE**, little silt, damp, very dense, **weathered rock**				
	S-3		20-34-42	100%							
	S-4		14-40-50/2"	100%			-very dense				
10.0							- very difficult drilling starting at 11'				
	S-5		50/3"	100%		13.8					708.2
15.0							-SPOON REFUSAL AT 13.8 FEET-				
20.0											

TRIAD_C 07-23-0347 LOGS.GPJ TRIAD 3.GDT 3/21/24

TRIAD ENGINEERING, INC.
200 Aviation Drive
Winchester, VA 22602
P: 540.667.9300
F: 540.667.2260

Remarks: No groundwater encountered during or upon completion of drilling.

TEST BORING LOG

Project Number: **07-23-0347** Project Name: **Winchester Airport Hangar** Boring No.: **B-2**

Inspector: DJM Boring Location: See Figure No. A-2

Date Started: 2/21/24 Drill/Method: ACKER REBEL XL

Date Completed: 2/21/24 Driller: CONNELLY Ground Elev.: 726

Shelby Tube | Standard Split Spoon | Core Sample | Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1		WOH-3-3	67%			1" TOPSOIL Tan-brown **SAND and GRAVEL**, little to some silt, moist to damp, loose, **fill**				
	S-2		4-4-12	61%			-some silt, moist, medium dense				
						4.0					722.0
5.0	S-3		17-19-18	100%			Tan-orange-brown **SAND and GRAVEL**, little to some silt, damp, dense, **residuum**				
						8.0					718.0
	S-4		27-50/6"	100%			Tan-orange-brown weathered **SHALE**, little silt, damp, very dense, **weathered rock**				
10.0											
	S-5		13-32-50/4"	100%			-very dense				
						14.8					711.2
15.0							-SPOON REFUSAL AT 14.8 FEET-				
20.0											

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Remarks: No groundwater encountered during or upon completion of drilling.

TEST BORING LOG

Project Number: **07-23-0347** Project Name: **Winchester Airport Hangar** Boring No.: **B-3**

Inspector: DJM Boring Location: See Figure No. A-2

Date Started: 2/20/24 Drill/Method: ACKER REBEL XL

Date Completed: 2/20/24 Driller: CONNELLY Ground Elev.: 721

Shelby Tube | Standard Split Spoon | Core Sample | Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1		2-5-10	67%		1.5	1" TOPSOIL Tan-gray-brown **SAND and GRAVEL**, little silt, damp, medium dense, **fill**				719.5
	S-2		50/5"	100%			Tan-gray-brown weathered **SHALE**, little silt, damp, very dense, **weathered rock**				
5.0	S-3		50/5"	100%			-very dense				
	S-4		50/2"	100%		8.7	-gray, very dense -SPOON REFUSAL AT 8.7 FEET-				712.3
10.0											
15.0											
20.0											

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Remarks: No groundwater encountered during or upon completion of drilling.
Bucket Sample Collected (S-1) from 0'-5'

TEST BORING LOG

Sheet 1 of 1

Project Number: **07-23-0347** Project Name: **Winchester Airport Hangar** Boring No.: **B-4**
Inspector: DJM Boring Location: See Figure No. A-2
Date Started: 2/19/24 Drill/Method: ACKER REBEL XL
Date Completed: 2/19/24 Driller: CONNELLY Ground Elev.: 724

Shelby Tube | Standard Split Spoon | Water Level First Noted 2.5 ft. | Core Sample | Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1		WOH-3-6	94%			5" TOPSOIL Tan-gray-brown **SAND and GRAVEL**, little silt and clay, moist, loose, **residuum**				
						2.5			▽		721.5
	S-2		40-20-50/5"	100%			Tan-black-gray-brown weathered **SHALE**, little silt, damp, very dense, **weathered rock**				
5.0	S-3		50/4"	100%		5.5	-very dense -AUGER REFUSAL AT 5.5 FEET-				718.5
	RC-1			100%	28%		Tan-gray-black **SHALE**, few seams, slightly weathered, very broken to blocky, shallow to moderate fractures and beds, medium hard				
10.0						10.0					714.0
							-BORING TERMINATED AT 10.0 FEET-				
15.0											
20.0											

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Remarks: No groundwater encountered during or upon completion of drilling. Water observed at a depth of 2.5 feet after coring. Auger refusal at 6.5'. Bucket Sample Collected (S-1) from 0'-5'

TEST BORING LOG

Project Number: **07-23-0347** Project Name: **Winchester Airport Hangar** Boring No.: **B-5**
Inspector: DJM Boring Location: See Figure No. A-2
Date Started: 2/19/24 Drill/Method: ACKER REBEL XL
Date Completed: 2/19/24 Driller: CONNELLY Ground Elev.: 724

Shelby Tube | Standard Split Spoon | Core Sample | Auger Probe | Water Level Upon Completion 2.4 ft.

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1		2-6-17	89%		2.5	2" TOPSOIL Tan-brown **SAND and GRAVEL**, little clay, moist, medium dense, **residuum**				721.5
	S-2		50/5"	100%		6.5	Tan-brown weathered **SHALE**, little silt, damp, very dense, **weathered rock**				717.5
5.0	S-3		50/6"	100%			-very dense -AUGER REFUSAL AT 6.5 FEET-				
	RC-1			100%	81%	10.0	Tan-gray **SHALE**, few seams, slightly weathered, very broken to broken, shallow to moderate fractures and beds, medium hard				714.0
10.0	RC-2			96%	28%	15.0	Tan-gray **SHALE**, few seams, slightly weathered, very broken to blocky, shallow to moderate fractures and beds, medium hard				709.0
15.0							-BORING TERMINATED AT 15.0 FEET-				
20.0											

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Remarks: No groundwater encountered during or upon completion of drilling. Water at a depth of 2.4 feet after coring
Bucket Sample Collected (S-1) from 0'-5'

TEST BORING LOG

Project Number: **07-23-0347** Project Name: **Winchester Airport Hangar** Boring No.: **B-6**
Inspector: DJM Boring Location: See Figure No. A-2
Date Started: 2/20/24 Drill/Method: ACKER REBEL XL
Date Completed: 2/20/24 Driller: CONNELLY Ground Elev.: 722

Shelby Tube | Standard Split Spoon | Core Sample | Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1		1-2-4	89%		1.5	1" TOPSOIL Tan-orange-brown **SILT**, little to some sand, little gravel, moist, medium stiff, **residuum**				720.5
	S-2		12-18-20	100%		5.0	Tan-orange-brown **SAND and GRAVEL**, little to some silt, damp to moist, dense, **residuum**				717.0
5.0	S-3		17-33-50/6"	100%			Tan-gray-brown weathered **SHALE**, little silt, damp, very dense, **weathered rock**				
	S-4		18-27-39	100%		10.0	-tan-gray-black-brown, very dense				712.0
10.0							-BORING TERMINATED AT 10.0 FEET-				
15.0											
20.0											

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Remarks: No groundwater encountered during or upon completion of drilling.

TEST BORING LOG

Sheet 1 of 1

Project Number: **07-23-0347** Project Name: **Winchester Airport Hangar** Boring No.: **B-7**
Inspector: DJM Boring Location: See Figure No. A-2
Date Started: 2/20/24 Drill/Method: ACKER REBEL XL
Date Completed: 2/20/24 Driller: CONNELLY Ground Elev.: 724

Shelby Tube | Standard Split Spoon | Core Sample | Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1		WOH-5-5	67%			1" TOPSOIL Tan-orange-brown **SAND and GRAVEL**, little to some silt, moist, medium dense, **residuum**				
	S-2		8-12-26	72%			-tan-gray-brown, damp, dense				
5.0						5.0					719.0
	S-3		32-50/4"	100%			Tan-gray-brown weathered **SHALE**, little silt, damp, very dense, **weathered rock**				
	S-4		20-32-31	100%			-very dense				
10.0						10.0					714.0
							-BORING TERMINATED AT 10.0 FEET-				
15.0											
20.0											

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Remarks: No groundwater encountered during or upon completion of drilling.
Bucket Sample Collected (S-2) from 0'-5'

TEST BORING LOG

Project Number: **07-23-0347** Project Name: **Winchester Airport Hangar** Boring No.: **B-8**
Inspector: DJM Boring Location: See Figure No. A-2
Date Started: 2/20/24 Drill/Method: ACKER REBEL XL
Date Completed: 2/20/24 Driller: CONNELLY Ground Elev.: 725

Shelby Tube | Standard Split Spoon | Core Sample | Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1		WOH-1-3	83%		1.5	5" TOPSOIL Tan-brown **SILT**, little sand and gravel, moist, soft, **fill**				723.5
	S-2		11-25-50/6"	100%			Tan-brown weathered **SHALE**, little silt, damp, very dense, **weathered rock**				
5.0	S-3		21-34-44	100%			-tan-gray-brown, very dense				
	S-4		50/3"	100%			-very dense				
10.0	S-5		44-50/3"	100%		14.3	-tan-gray-black-brown, very dense				710.7
15.0							-SPOON REFUSAL AT 14.3 FEET-				
20.0											

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Remarks: No groundwater encountered during or upon completion of drilling.
Bucket Sample Collected (S-2) from 0'-5'

TEST BORING LOG

Project Number: **07-23-0347** Project Name: **Winchester Airport Hangar** Boring No.: **B-9**
Inspector: DJM Boring Location: See Figure No. A-2
Date Started: 2/19/24 Drill/Method: ACKER REBEL XL
Date Completed: 2/19/24 Driller: CONNELLY Ground Elev.: 720

Shelby Tube | Standard Split Spoon | Core Sample | Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1		WOH-1-7	89%			6" TOPSOIL Tan-gray-brown **SAND and GRAVEL**, little silt, moist, loose, **residuum**				
						2.5					717.5
	S-2		5-23-50/5"	71%			Tan-gray-brown weathered **SHALE**, little silt, damp, very dense, **weathered rock**				
5.0	S-3		50/2"	100%			-very dense -difficult drilling 6'-10'				
	S-4		50/3"	100%			-very dense				
10.0						10.0					710.0
							-BORING TERMINATED AT 10.0 FEET-				
15.0											
20.0											

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Remarks: No groundwater encountered during or upon completion of drilling.
Bucket Sample Collected (S-2) from 0'-5'

TEST BORING LOG

Project Number: **07-23-0347** Project Name: **Winchester Airport Hangar** Boring No.: **B-10**
Inspector: DJM Boring Location: See Figure No. A-2
Date Started: 2/20/24 Drill/Method: ACKER REBEL XL
Date Completed: 2/20/24 Driller: CONNELLY Ground Elev.: 720

Shelby Tube | Standard Split Spoon | Core Sample | Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1		WOH-1-4	72%		1.5	3" TOPSOIL Red-brown **SAND and GRAVEL**, little to some silt, moist, loose, **fill**				718.5
	S-2		26-19-18	100%		5.0	Tan-red-brown **SAND and GRAVEL**, little to some silt, moist, dense, **residuum**				715.0
5.0	S-3		44-50/2"	100%		8.9	Tan-gray-brown weathered **SHALE**, little silt, damp, very dense, **weathered rock**				711.1
	S-4		50/5"	100%			-very dense -SPOON REFUSAL AT 8.9 FEET-				
10.0											
15.0											
20.0											

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Remarks: No groundwater encountered during or upon completion of drilling.
Bucket Sample Collected (S-3) from 0'-5'

TEST BORING LOG

Project Number: **07-23-0347** Project Name: **Winchester Airport Hangar** Boring No.: **B-11**
Inspector: DJM Boring Location: See Figure No. A-2
Date Started: 2/19/24 Drill/Method: ACKER REBEL XL
Date Completed: 2/20/24 Driller: CONNELLY Ground Elev.: 725

Shelby Tube | Standard Split Spoon | Water Level First Noted 2.8 ft. | Core Sample | Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1		1-1-2	67%			5" TOPSOIL Tan-brown clayey **GRAVEL**, some sand, moist, very loose, **residuum**				
	S-2		7-5-6	83%			-medium dense				
5.0						5.0					720.0
	S-3		17-16-26	100%			Tan-gray-brown **SAND and GRAVEL**, little silt, moist to damp, dense, **residuum** -AUGER REFUSAL AT 8.0 FEET-				
						8.0					717.0
	RC-1			92%	15%		Tan-gray **SHALE**, few seams, slightly weathered to weathered, very broken to broken, shallow to moderate fractures and beds, medium hard				
10.0						10.0					715.0
	RC-2			100%	42%		Tan-gray **SHALE**, few seams, slightly weathered to weathered, very broken to broken, shallow to moderate fractures and beds, medium hard				
15.0						15.0					710.0
							-BORING TERMINATED AT 15.0 FEET-				
20.0											

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Remarks: No groundwater encountered during or upon completion of drilling. Water at a depth of 2.8 feet after coring. Auger refusal at 8.0'.
Bucket Sample Collected (S-3) from 0'-5'

TEST BORING LOG

Project Number: **07-23-0347** Project Name: **Winchester Airport Hangar** Boring No.: **B-12**
Inspector: DJM Boring Location: See Figure No. A-2
Date Started: 2/19/24 Drill/Method: ACKER REBEL XL
Date Completed: 2/19/24 Driller: CONNELLY Ground Elev.: 715

Shelby Tube | Standard Split Spoon | Core Sample | Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1		WOH-3-6	100%			8" TOPSOIL Tan-gray-brown **SAND and GRAVEL**, little silt, moist, loose, **residuum**				
	S-2		12-23-24	89%			-damp, dense				
5.0	S-3		20-16-15	94%			-dense				
	S-4		50/3"	100%		8.5	Tan-gray-brown weathered **SHALE**, little silt, damp, very dense, **weathered rock**				706.5
10.0						10.0	-BORING TERMINATED AT 10.0 FEET-				705.0
15.0											
20.0											

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Remarks: No groundwater encountered during or upon completion of drilling.
Bucket Sample Collected (S-3) from 0'-5'

TEST BORING LOG

Sheet 1 of 1

Project Number: **07-23-0347** Project Name: **Winchester Airport Hangar** Boring No.: **B-13**

Inspector: DJM Boring Location: See Figure No. A-2

Date Started: 2/20/24 Drill/Method: ACKER REBEL XL

Date Completed: 2/20/24 Driller: CONNELLY Ground Elev.: 721

Shelby Tube | Standard Split Spoon | Water Level First Noted 1.5 ft. | Core Sample | Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1		WOH-2-6	78%		1.5	4" TOPSOIL Tan-brown **SAND and GRAVEL**, little to some silt, moist, loose, **fill**		▽		719.5
	S-2		50/4"	100%		3.2	Tan-gray-brown weathered **SHALE**, little silt, damp, very dense, **weathered rock** -AUGER REFUSAL AT 3.2 FEET-				717.8
5.0	RC-1			77%	0%	5.0	Tan-gray-brown **SHALE**, few seams, slightly weathered to weathered, very broken to broken, shallow to moderate fractures and beds, medium hard				716.0
	RC-2			60%	0%		Tan-gray-brown **SHALE**, some seams, weathered, very broken to broken, shallow to steep fractures and beds, medium hard				
10.0						10.0					711.0
							-BORING TERMINATED AT 10.0 FEET-				
15.0											
20.0											

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Remarks: No groundwater was encountered during or upon completion of drilling. Water observed at a depth of 1.5 feet after coring. Auger refusal at 3.2'.

TEST BORING LOG

Project Number: **07-23-0347** Project Name: **Winchester Airport Hangar** Boring No.: **B-14**
Inspector: DJM Boring Location: See Figure No. A-2
Date Started: 2/20/24 Drill/Method: ACKER REBEL XL
Date Completed: 2/20/24 Driller: CONNELLY Ground Elev.: 721

Shelby Tube | Standard Split Spoon | Core Sample | Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1		1-2-4	83%			4" TOPSOIL Tan-brown **SAND and GRAVEL**, little to some silt, moist, loose, **fill**				
	S-2		17-6-7	89%		3.0	Tan-brown **SILT**, little to some sand, some gravel, moist, stiff, **fill**				718.0
5.0	S-3		7-9-9	100%		5.0	Tan-gray-brown **SAND and GRAVEL**, little to some silt, moist to damp, medium dense, **residuum**				716.0
	S-4		50/5"	40%		7.0	Tan-gray-brown weathered **SHALE**, little silt, damp, very dense, **weathered rock**				714.0
10.0						8.9	-SPOON REFUSAL AT 8.9 FEET-				712.1
15.0											
20.0											

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Remarks: No groundwater encountered during or upon completion of drilling.

TEST BORING LOG

Project Number: **07-23-0347** Project Name: **Winchester Airport Hangar** Boring No.: **B-15**
Inspector: DJM Boring Location: See Figure No. A-2
Date Started: 2/20/24 Drill/Method: ACKER REBEL XL
Date Completed: 2/20/24 Driller: CONNELLY Ground Elev.: 717

Shelby Tube | Standard Split Spoon | Core Sample | Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1		2-3-4	89%		1.5	3" TOPSOIL Tan-orange-brown **SILT**, little to some sand, trace gravel, moist, medium stiff, **residuum**				715.5
	S-2		3-7-8	83%		5.0	Tan-orange-brown **SAND and GRAVEL**, little to some silt, moist to damp, medium dense, **residuum**				712.0
5.0	S-3		19-23-30	100%			Tan-gray-brown weathered **SHALE**, little silt, damp, very dense, **weathered rock**				
	S-4		13-20-26	100%		10.0	-dense				707.0
10.0							-BORING TERMINATED AT 10.0 FEET-				
15.0											
20.0											

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Remarks: No groundwater encountered during or upon completion of drilling.

TEST BORING LOG

Project Number: **07-23-0347** Project Name: **Winchester Airport Hangar** Boring No.: **B-16**
Inspector: DJM Boring Location: See Figure No. A-2
Date Started: 2/20/24 Drill/Method: ACKER REBEL XL
Date Completed: 2/20/24 Driller: CONNELLY Ground Elev.: 718

Shelby Tube | Standard Split Spoon | Core Sample | Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1		2-3-6	89%		1.5	4" TOPSOIL(DISTURBED) Tan-brown **SILT**, little to some sand, little gravel, moist, stiff, **residuum**				716.5
	S-2		5-10-14	100%			Tan-orange-brown clayey **GRAVEL**, some sand, damp, medium dense, **residuum**				
5.0	S-3		11-15-22	100%			-damp, dense				
						8.0					710.0
	S-4		19-34-50/5"	100%		9.9	Tan-gray-brown weathered **SHALE**, little silt, damp, very dense, **weathered rock**				708.1
10.0							-SPOON REFUSAL AT 9.9 FEET-				
15.0											
20.0											

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Remarks: No groundwater encountered during or upon completion of drilling.

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APPENDIX C

Laboratory Testing

LABORATORY TESTING

The soil samples obtained during the field exploration were visually classified in the field by geotechnical engineering personnel from Triad. The recovered soils were further evaluated by laboratory testing. Laboratory soil tests were conducted in accordance with applicable ASTM Standards as listed below:

1) Moisture content tests were performed in accordance with ASTM D 2216.

2) Atterberg Limits tests, consisting of the liquid limit, plastic limit, and plasticity index, were performed in accordance with ASTM D 4318.

3) Sieve analyses with washed No. 200 sieve tests were performed in accordance with ASTM D 422.

4) Modified Proctor tests were performed in accordance with ASTM D 1557-12 Method A.

5) California Bearing Ratio (CBR) tests were performed in accordance with ASTM D 1883-14.

6) Total Sulfur Concentration testing was performed in accordance with ASTM 2492.

A summary and details of the laboratory tests are included on the following pages of this appendix.

TRIAD ENGINEERING, INC.

SOIL DATA SUMMARY

SAMPLE NO.	SAMPLE DEPTH (ft)	SAMPLE TYPE	NATURAL MOISTURE (%)	ATTERBERG LIMITS			GRADATION			USCS SOIL CLASS.	PROCTOR		ADDITIONAL TESTS CONDUCTED
				LL	PL	PI	% GRAVEL	% SAND	% FINES		MAX. DD (pcf)	OPT. M (%)	
B-1	0-1.5	SS	19.7										
B-1	5-6.5	SS	10.2										
B-1	8.5-10	SS	14.5										
B-1	13.5-15	SS	15.0										
B-2	2.5-4	SS	12.5										
B-2	5-6.5	SS	21.8										
B-3	0-1.5	SS	3.7										
B-3	2.5-4	SS	6.1										
B-3	5-6.5	SS	6.5										
B-4	0-1.5	SS	13.2										
B-4	5-6.5	SS	4.1										
B-5	0-1.5	SS	7.5	29	17	12	49	40	11	GP-GC			
B-5	2.5-4	SS	4.6										
B-6	0-1.5	SS	16.6										
B-6	2.5-4	SS	13.9	Comnined with B-5 (0.0-1.5 ft.) for classification testing.									
B-6	5-6.5	SS	10.8										
B-7	2.5-4	SS	8.9										
B-8	0-1.5	SS	17.4										

TRIAD ENGINEERING, INC.

Notes: 1) Soil tests performed in accordance with recognized ASTM testing standards.
2) SS = Split Spoon; BULK = Bulk Sample

PROJECT NUMBER: 07-23-0347
PROJECT NAME: Winchester Regional Airport - Northside Dev. Phase 1
LOCATION: Winchester, VA

FIGURE C-1

TRIAD ENGINEERING, INC.

SOIL DATA SUMMARY

SAMPLE NO.	SAMPLE DEPTH (ft)	SAMPLE TYPE	NATURAL MOISTURE (%)	ATTERBERG LIMITS			GRADATION			USCS SOIL CLASS.	PROCTOR		ADDITIONAL TESTS CONDUCTED
				LL	PL	PI	% GRAVEL	% SAND	% FINES		MAX. DD (pcf)	OPT. M (%)	
B-8	5-6.5	SS	7.5										
B-8	8.5-10	SS	14.3										
B-9	0-1.5	SS	13.7										
B-9	2.5-4	SS	7.8										
B-10	0-1.5	SS	13.9										
B-10	2.5-4	SS	9.2										
B-11	0-1.5	SS	18.2	31	20	11	36	23	41	GC			
B-11	2.5-4	SS	24.8										
B-11	5-6.5	SS	16.9										
B-12	0-1.5	SS	8.6										
B-12	2.5-4	SS	7.0										
B-13	0-1.5	SS	19.0										
B-14	0-1.5	SS	12.7										
B-14	2.5-4	SS	22.3										
B-14	5-6.5	SS	15.2										
B-14	8.5-10	SS	4.7										
B-15	0-1.5	SS	18.3										
B-15	2.5-4	SS	20.0										

TRIAD ENGINEERING, INC.

Notes: 1) Soil tests performed in accordance with recognized ASTM testing standards.
2) SS = Split Spoon; BULK = Bulk Sample

PROJECT NUMBER: 07-23-0347
PROJECT NAME: Winchester Regional Airport - Northside Dev. Phase 1
LOCATION: Winchester, VA

FIGURE C-2

TRIAD ENGINEERING, INC.

SOIL DATA SUMMARY

SAMPLE NO.	SAMPLE DEPTH (ft)	SAMPLE TYPE	NATURAL MOISTURE (%)	ATTERBERG LIMITS			GRADATION			USCS SOIL CLASS.	PROCTOR		ADDITIONAL TESTS CONDUCTED
				LL	PL	PI	% GRAVEL	% SAND	% FINES		MAX. DD (pcf)	OPT. M (%)	
B-15	5-6.5	SS	10.2										
B-16	0-1.5	SS	15.8										
B-16	2.5-4	SS	14.2	38	24	14	37	32	31	GC			
B-16	5-6.5	SS	15.2										
S-1	0-5	BULK	6.5	25	15	10	27	43	30	SC	132.5	8.5	ASTM D1883 CBR
S-2	0-5	BULK	8.3	25	16	9	18	41	41	SC	126.5	5.5	ASTM D1883 CBR
S-3	0-5	BULK	9.4	30	16	14	19	39	42	SC	129.0	8.5	ASTM D1883 CBR

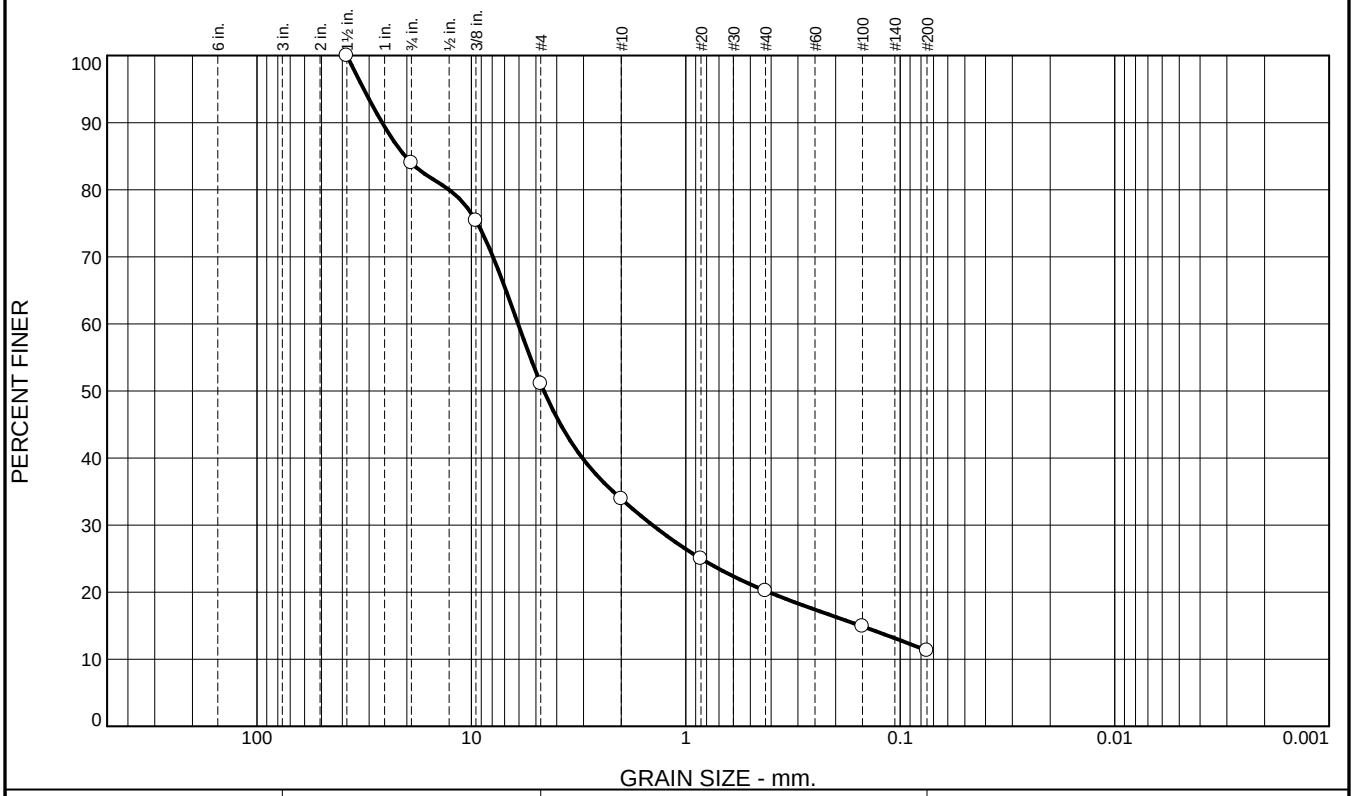
TRIAD ENGINEERING, INC.

Notes: 1) Soil tests performed in accordance with recognized ASTM testing standards.
2) SS = Split Spoon; BULK = Bulk Sample

PROJECT NUMBER: 07-23-0347
PROJECT NAME: Winchester Regional Airport - Northside Dev. Phase 1
LOCATION: Winchester, VA

FIGURE C-3

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	16.0	32.9	17.2	13.7	8.9	11.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100.0		
3/4"	84.0		
3/8"	75.4		
#4	51.1		
#10	33.9		
#20	25.0		
#40	20.2		
#100	14.9		
#200	11.3		

* (no specification provided)

Material Description

Tan-brown poorly graded GRAVEL, little clay and sand

Atterberg Limits

PL= 17 LL= 29 PI= 12

Coefficients

D_{90}= 26.0716 D_{85}= 20.3605 D_{60}= 6.0565
D_{50}= 4.5907 D_{30}= 1.4297 D_{15}= 0.1530
D_{10}= C_u= C_c=

Classification

USCS= GP-GC AASHTO= A-2-6(0)

Remarks

Source of Sample: B-5 & B-6 **Depth:** 0.0' - 4.0'

Date: 3-18-2024

Triad Engineering, Inc.

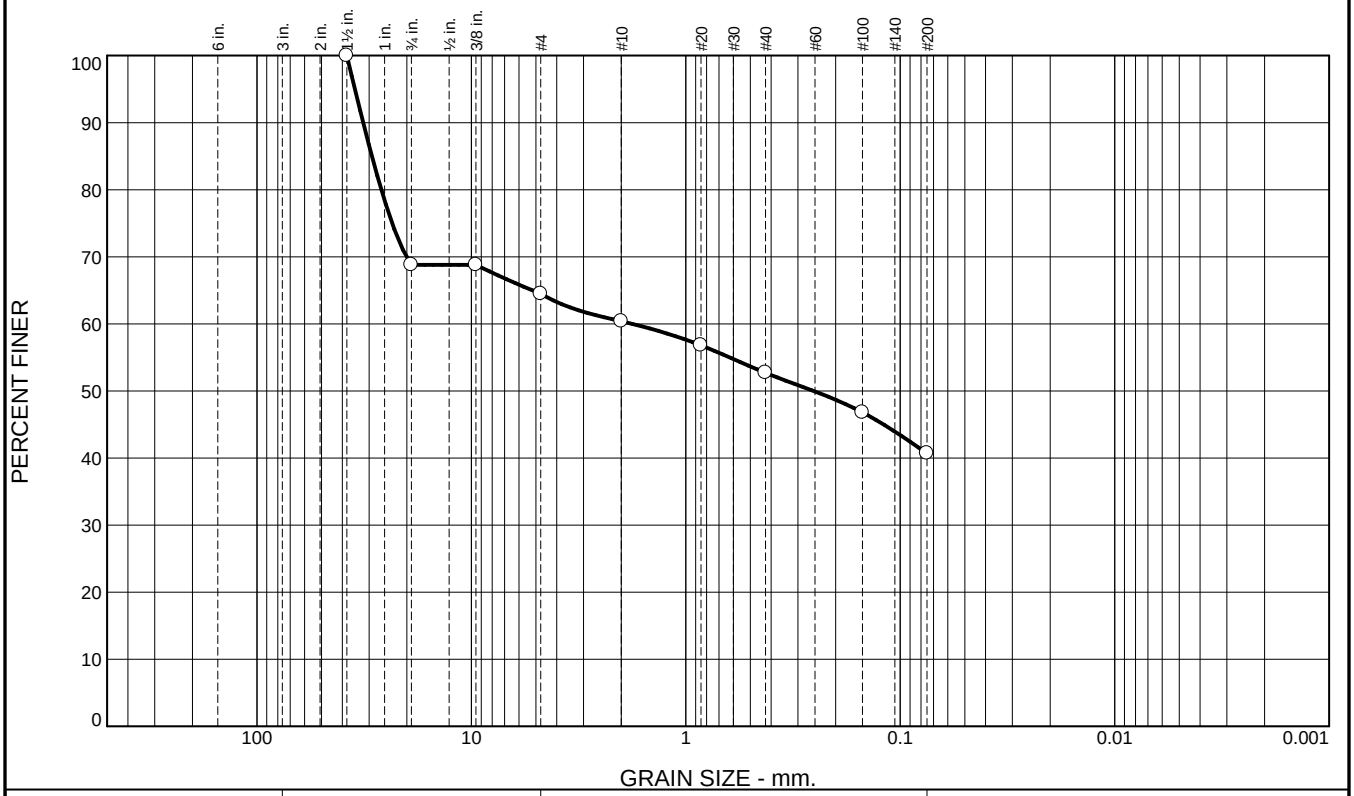
Client: Delta Airport Consultants, Inc.

Project: Winchester Regional Airport - Northside Dev. Phase 1
Winchester, VA

Project No: 07-23-0347 **Figure** C-4

Tested By: EAA **Checked By:** KBA

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	31.2	4.3	4.1	7.7	12.0	40.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100.0		
3/4"	68.8		
3/8"	68.8		
#4	64.5		
#10	60.4		
#20	56.8		
#40	52.7		
#100	46.8		
#200	40.7		

* (no specification provided)

Material Description

Tan-brown clayey GRAVEL, some sand

Atterberg Limits

PL= 20 LL= 31 PI= 11

Coefficients

D_{90}= 31.9411 D_{85}= 29.0954 D_{60}= 1.7768
D_{50}= 0.2538 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= GC AASHTO= A-6(1)

Remarks

Source of Sample: B-11 **Depth:** 0.0' - 4.0'

Date: 3-18-2024

Triad Engineering, Inc.

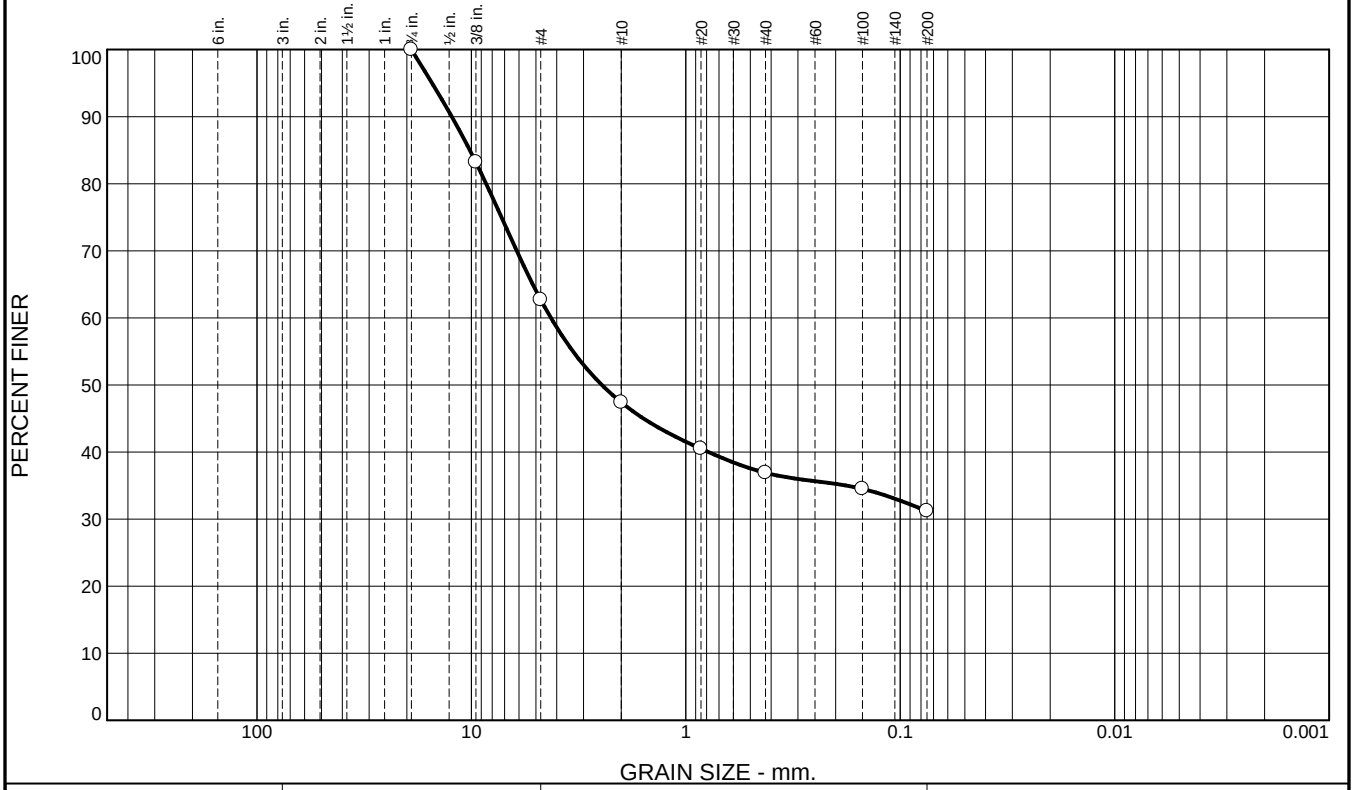
Client: Delta Airport Consultants, Inc.

Project: Winchester Regional Airport - Northside Dev. Phase 1
Winchester, VA

Project No: 07-23-0347 **Figure** C-5

Tested By: EAA **Checked By:** KBA

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	37.3	15.3	10.5	5.7	31.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
3/8"	83.2		
#4	62.7		
#10	47.4		
#20	40.5		
#40	36.9		
#100	34.5		
#200	31.2		

* (no specification provided)

Material Description

Brown clayey GRAVEL, some sand

Atterberg Limits

PL= 24 LL= 38 PI= 14

Coefficients

D_{90}= 12.3403 D_{85}= 10.1653 D_{60}= 4.2590
D_{50}= 2.4642 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= GC AASHTO= A-2-6(1)

Remarks

Source of Sample: B-16 **Depth:** 2.5' - 6.5'

Date: 3-18-2024

Triad Engineering, Inc.

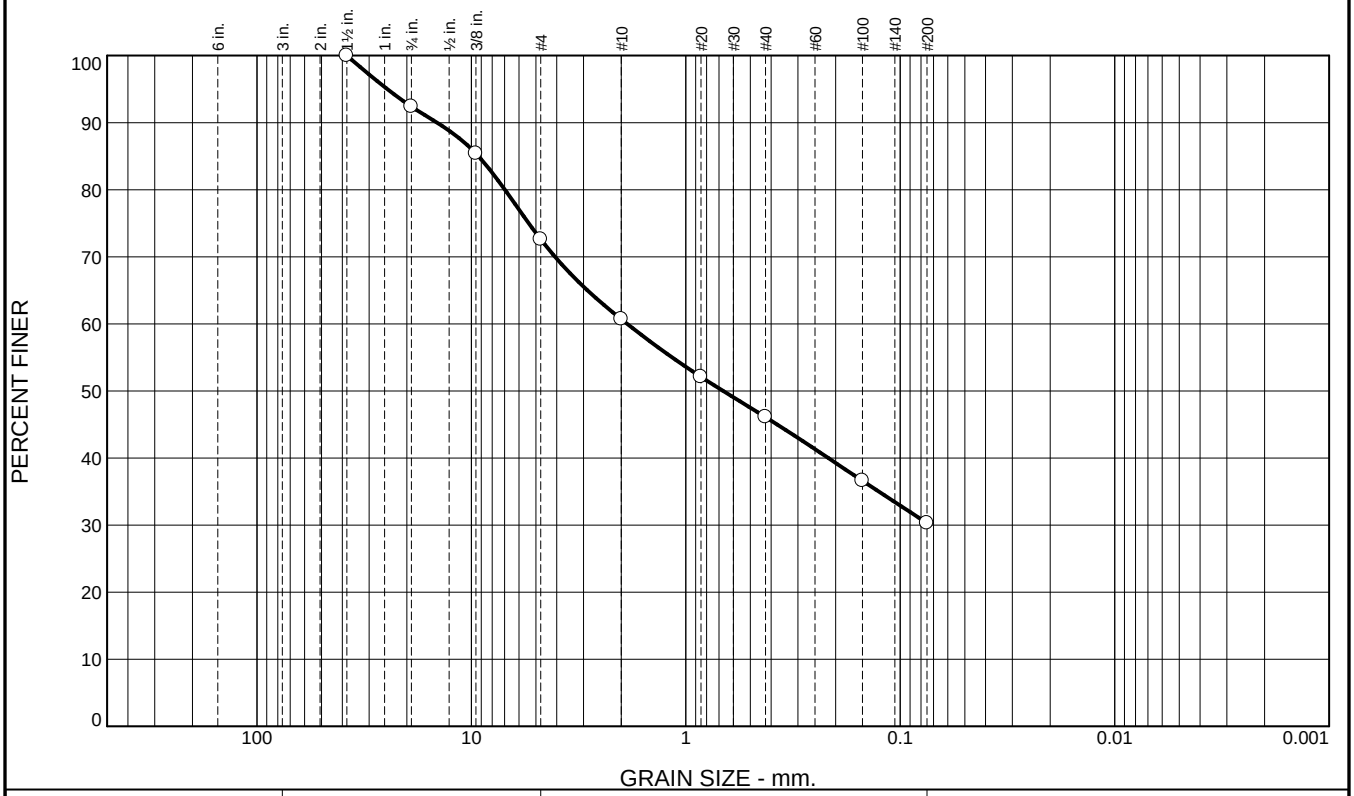
Client: Delta Airport Consultants, Inc.

Project: Winchester Regional Airport - Northside Dev. Phase 1
Winchester, VA

Project No: 07-23-0347 **Figure** C-6

Tested By: EAA **Checked By:** KBA

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	7.6	19.8	11.9	14.6	15.8	30.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100.0		
3/4"	92.4		
3/8"	85.4		
#4	72.6		
#10	60.7		
#20	52.1		
#40	46.1		
#100	36.6		
#200	30.3		

* (no specification provided)

Material Description

Brown-gray clayey SAND, some gravel

Atterberg Limits

PL= 15 LL= 25 PI= 10

Coefficients

D_{90}= 14.4568 D_{85}= 9.2723 D_{60}= 1.8769
D_{50}= 0.6696 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-2-4(0)

Remarks

S-1 is a composite sample obtained from B-3, B-4 & B-5.

Source of Sample: S-1 **Depth:** 0.0' - 5.0'

Date: 3-18-2024

Triad Engineering, Inc.

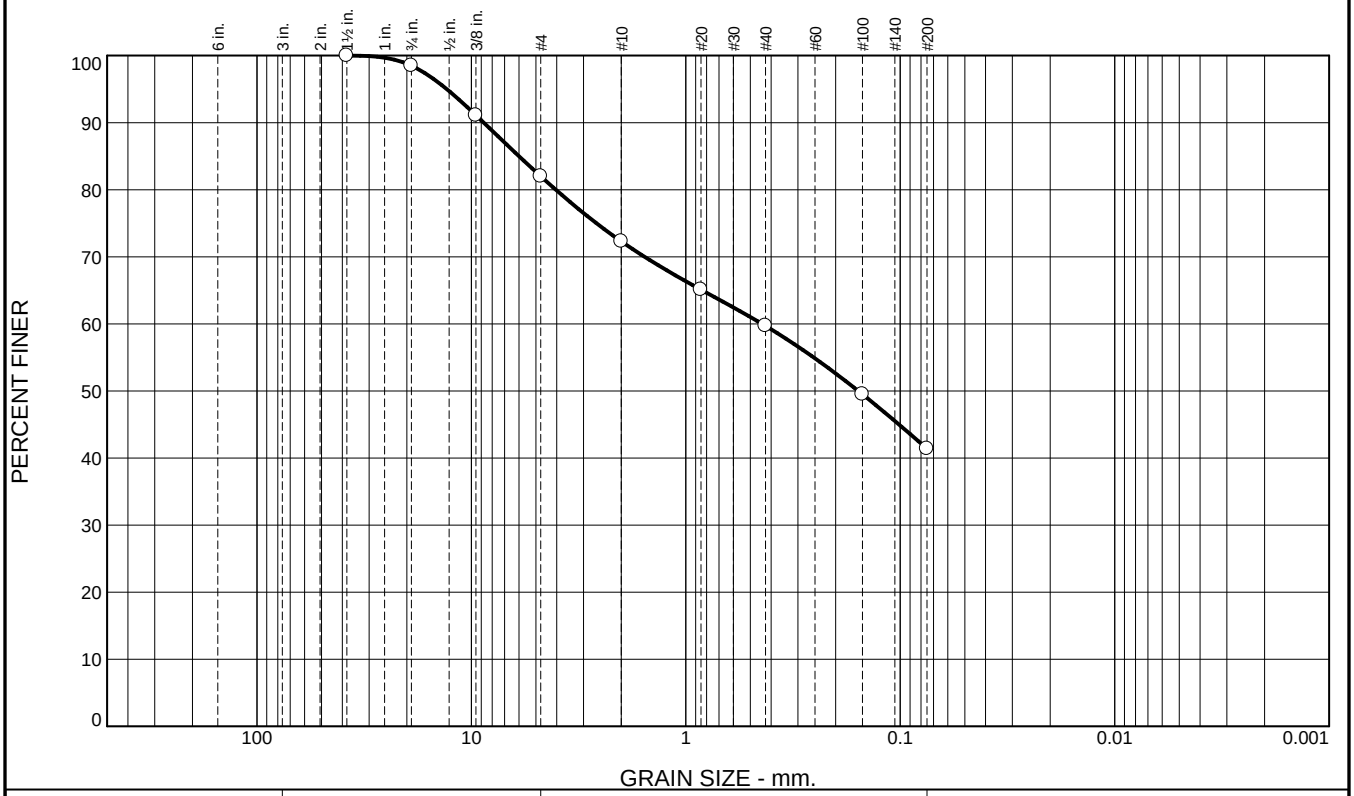
Client: Delta Airport Consultants, Inc.

Project: Winchester Regional Airport - Northside Dev. Phase 1
Winchester, VA

Project No: 07-23-0347 **Figure** C-7

Tested By: EAA **Checked By:** KBA

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	1.5	16.5	9.7	12.6	18.3	41.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100.0		
3/4"	98.5		
3/8"	91.1		
#4	82.0		
#10	72.3		
#20	65.1		
#40	59.7		
#100	49.5		
#200	41.4		

* (no specification provided)

Material Description

Tan-gray clayey SAND, little gravel

Atterberg Limits

PL= 16 LL= 25 PI= 9

Coefficients

D_{90}= 8.7597 D_{85}= 5.9976 D_{60}= 0.4406
D_{50}= 0.1569 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-4(0)

Remarks

S-2 is a composite sample obtained from B-7, B-8 & B-9.

Source of Sample: S-2 **Depth:** 0.0' - 5.0'

Date: 3-18-2024

Triad Engineering, Inc.

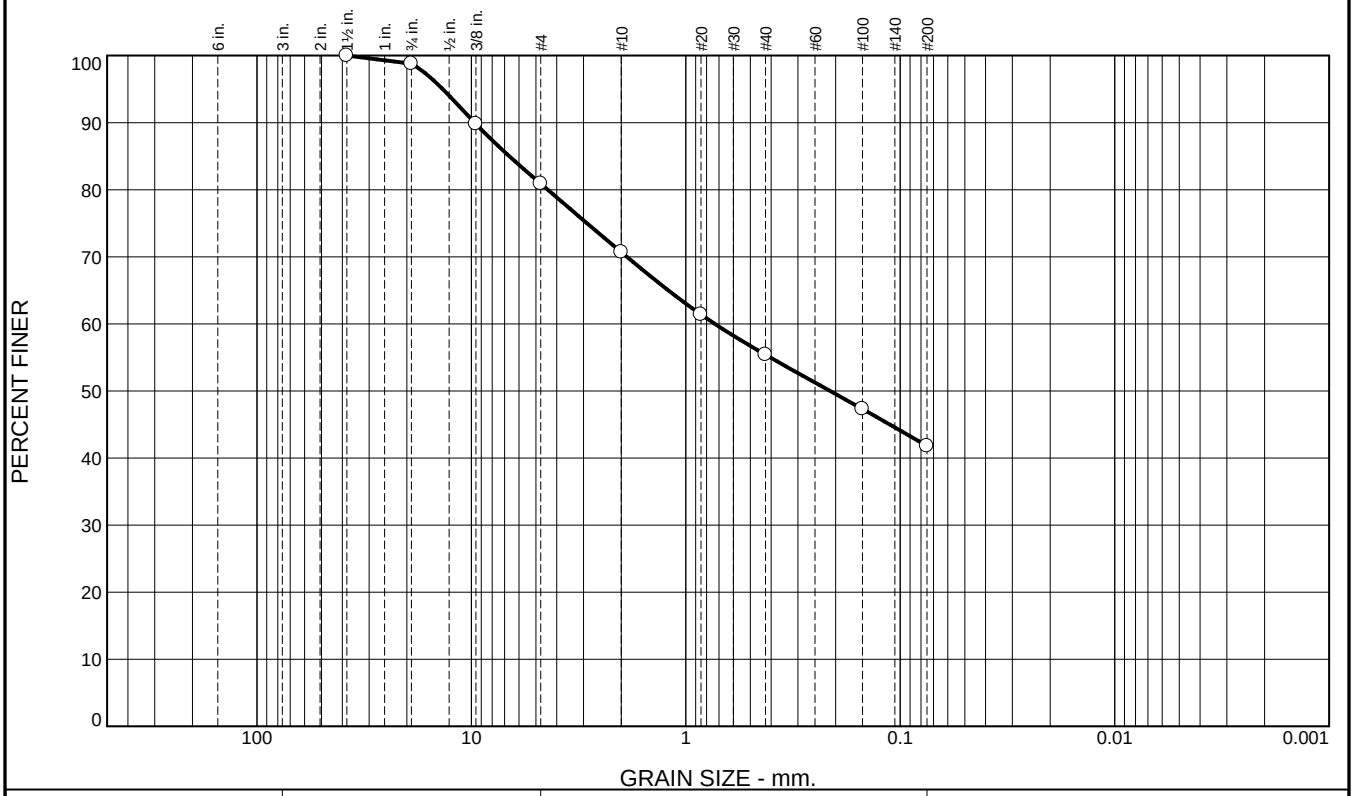
Client: Delta Airport Consultants, Inc.

Project: Winchester Regional Airport - Northside Dev. Phase 1
Winchester, VA

Project No: 07-23-0347 **Figure** C-8

Tested By: EAA **Checked By:** KBA

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	1.2	17.9	10.2	15.3	13.6	41.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100.0		
3/4"	98.8		
3/8"	89.8		
#4	80.9		
#10	70.7		
#20	61.4		
#40	55.4		
#100	47.3		
#200	41.8		

* (no specification provided)

Material Description

Tan clayey SAND, little gravel

Atterberg Limits

PL= 16 LL= 30 PI= 14

Coefficients

D_{90}= 9.6577 D_{85}= 6.6544 D_{60}= 0.7323
D_{50}= 0.2126 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-6(2)

Remarks

S-3 is a composite sample obtained from B-10, B-11 & B-12.

Source of Sample: S-3 **Depth:** 0.0' - 5.0'

Date: 3-18-2024

Triad Engineering, Inc.

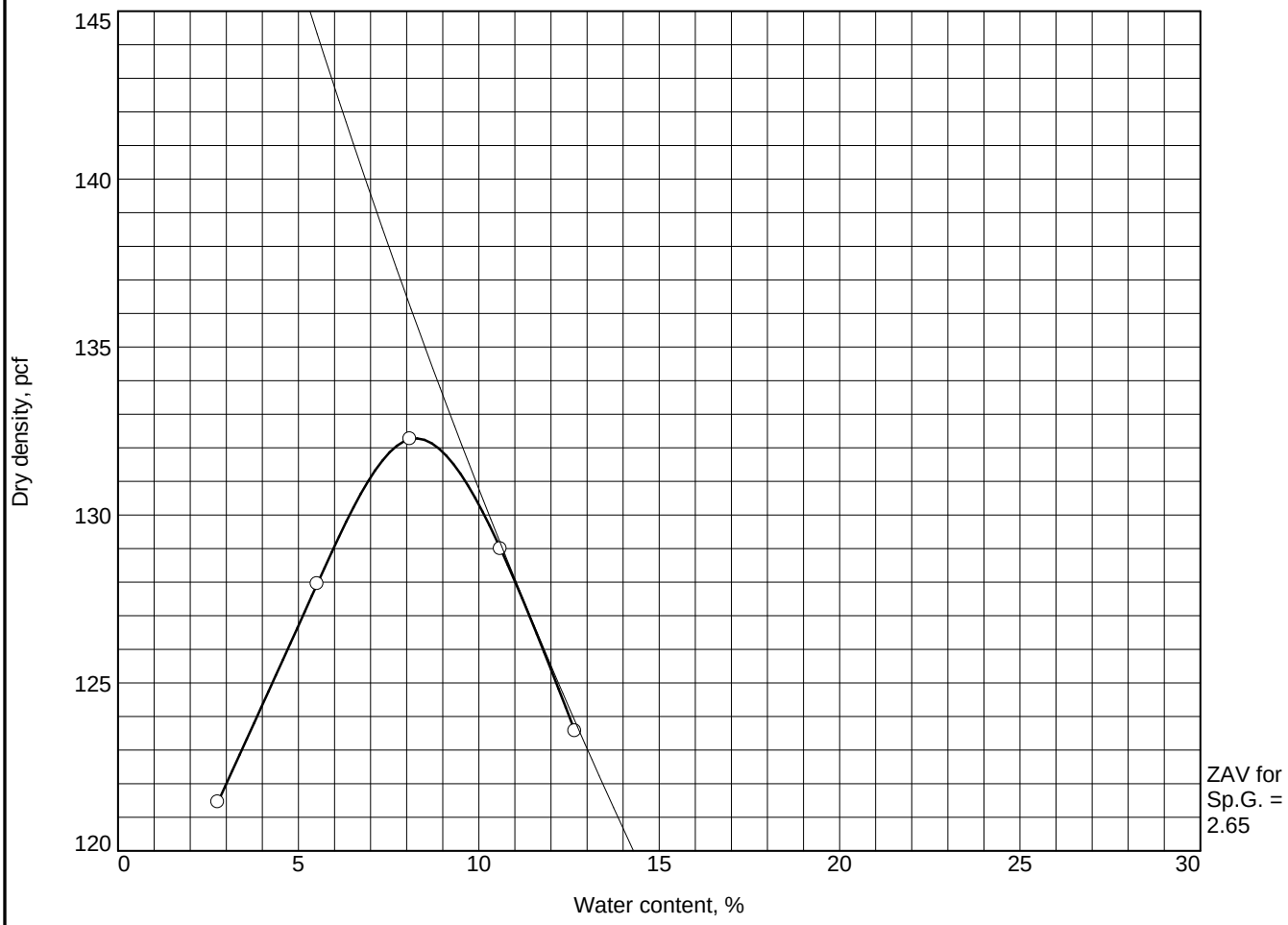
Client: Delta Airport Consultants, Inc.

Project: Winchester Regional Airport - Northside Dev. Phase 1
Winchester, VA

Project No: 07-23-0347 **Figure** C-9

Tested By: EAA **Checked By:** KBA

COMPACTION TEST REPORT



Test specification: ASTM D 1557-07 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
0.0' - 5.0'	SC	A-2-4(0)	6.5		25	10	27.4	30.3

TEST RESULTS

Maximum dry density = 132.5 pcf

Optimum moisture = 8.5 %

MATERIAL DESCRIPTION

Brown-gray clayey SAND, some gravel

Project No. 07-23-0347 **Client:** Delta Airport Consultants, Inc.

Project: Winchester Regional Airport - Northside Dev. Phase 1

Winchester, VA

○**Source of Sample:** S-1

Remarks:

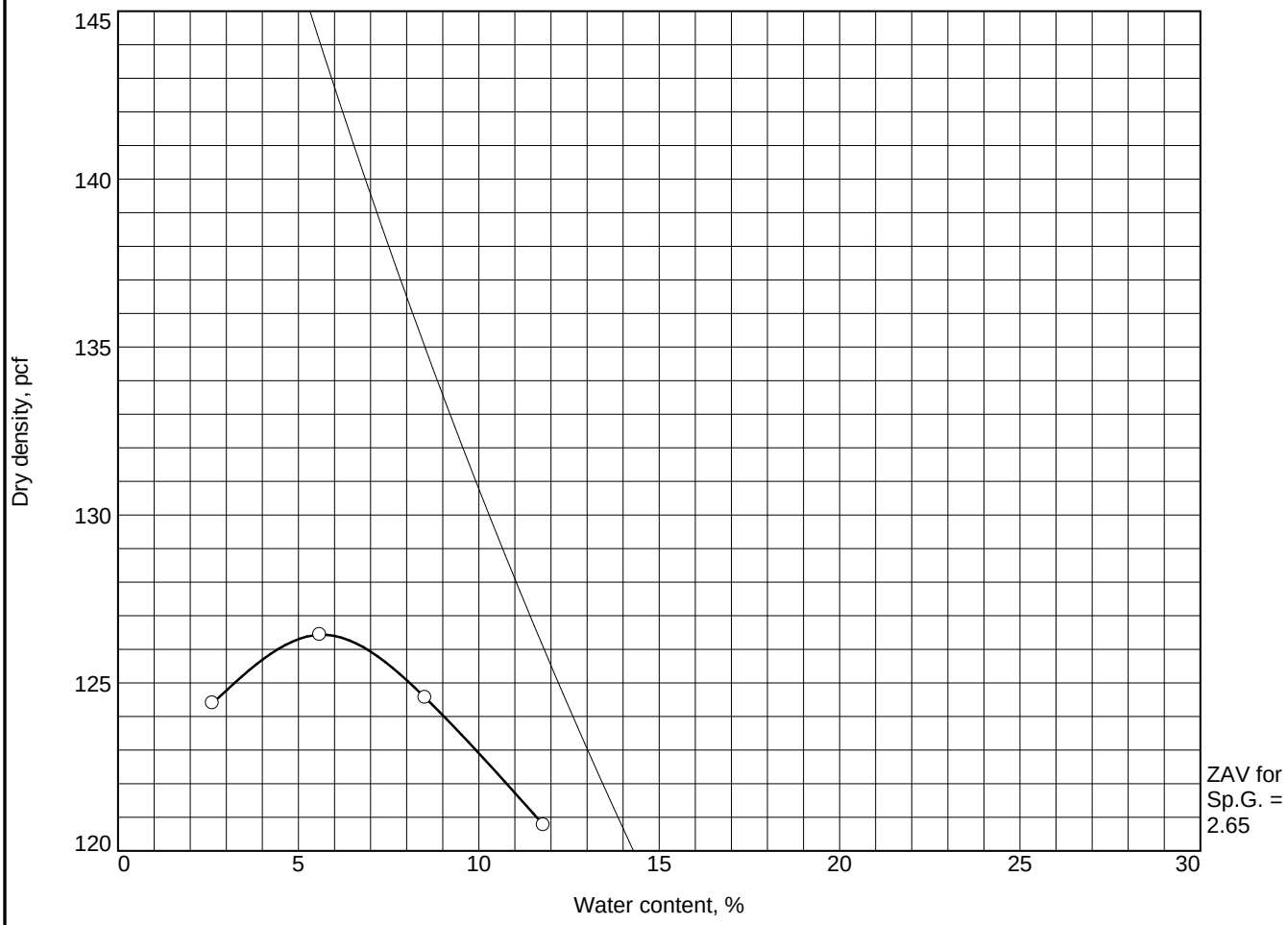
S-1 is a composite sample obtained from B-3, B-4 & B-5.

Triad Engineering, Inc.

Figure C-10

Tested By: TJW **Checked By:** KBA

COMPACTION TEST REPORT



Test specification: ASTM D 1557-07 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
0.0' - 5.0'	SC	A-4(0)	8.3		25	9	18.0	41.4

TEST RESULTS

Maximum dry density = 126.5 pcf

Optimum moisture = 5.5 %

MATERIAL DESCRIPTION

Tan-gray clayey SAND, little gravel

Project No. 07-23-0347 **Client:** Delta Airport Consultants, Inc.

Project: Winchester Regional Airport - Northside Dev. Phase 1

Winchester, VA

○**Source of Sample:** S-2

Remarks:

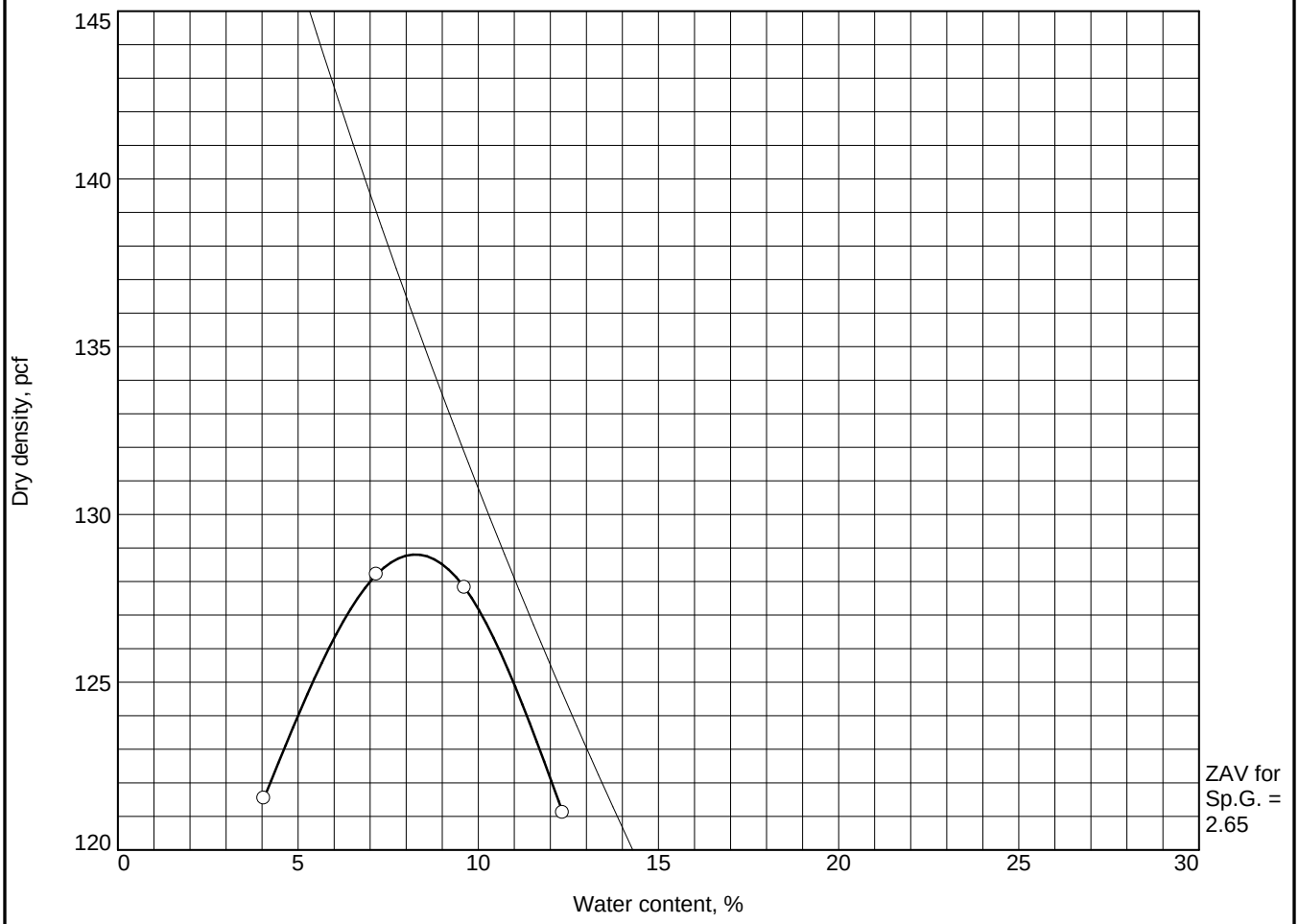
S-2 is a composite sample obtained from B-7, B-8 & B-9.

Triad Engineering, Inc.

Figure C-11

Tested By: TJW **Checked By:** KBA

COMPACTION TEST REPORT



Test specification: ASTM D 1557-07 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
0.0' - 5.0'	SC	A-6(2)	9.4		30	14	19.1	41.8

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 129.0 pcf Optimum moisture = 8.5 %	Tan clayey SAND, little gravel

Project No. 07-23-0347 **Client:** Delta Airport Consultants, Inc.
Project: Winchester Regional Airport - Northside Dev. Phase 1
Winchester, VA
○**Source of Sample:** S-3

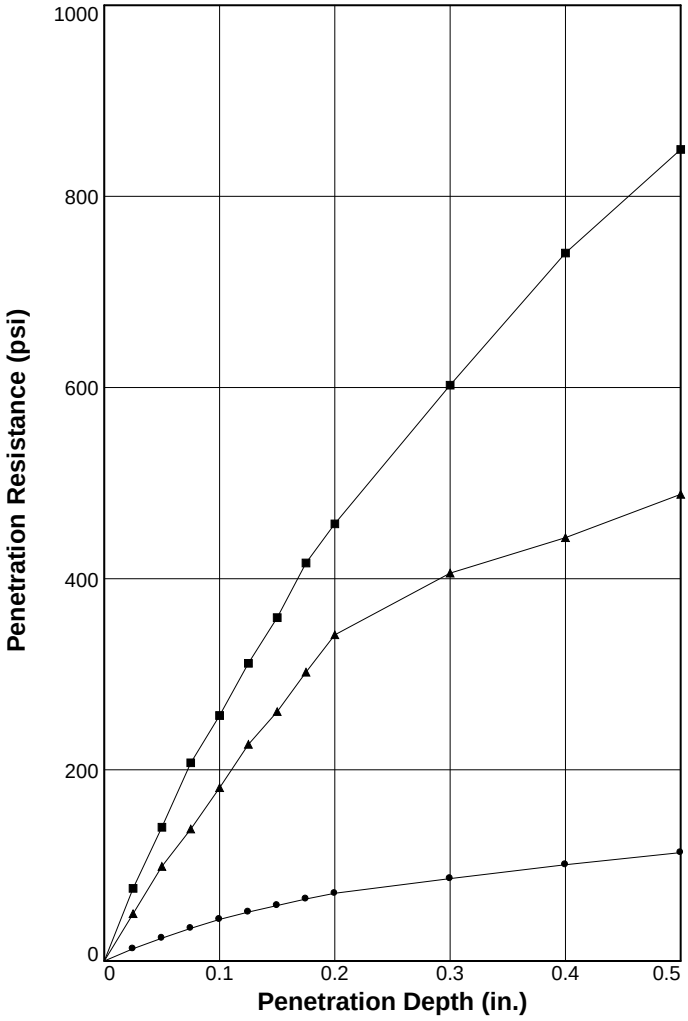
Remarks:
S-3 is a composite sample obtained from B-10, B-11 & B-12.

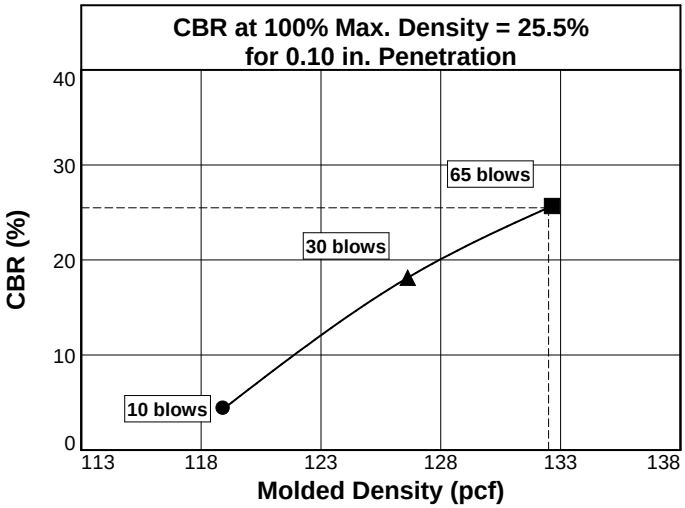
Triad Engineering, Inc.

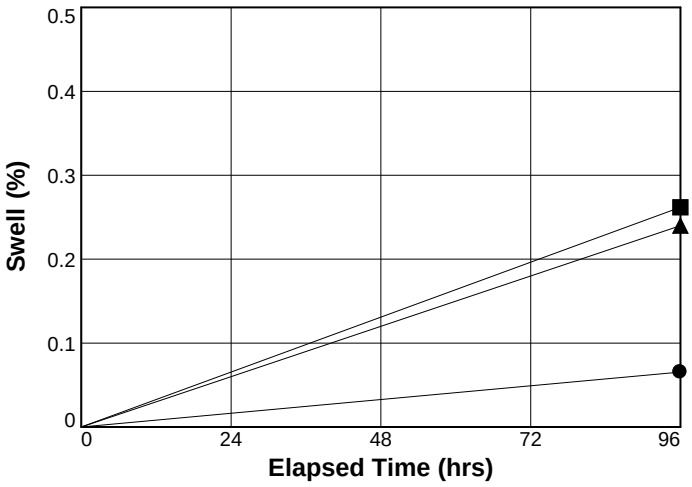
Figure C-12

Tested By: TJW **Checked By:** KBA

BEARING RATIO TEST REPORT
ASTM D1883-16







	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ○	118.9	89.7	8.5	118.9	89.7	14.6	4.4	4.7	0.000	10	0.1
2 △	126.6	95.5	8.5	126.3	95.3	13.3	18.1	22.8	0.000	10	0.2
3 □	132.6	100.1	8.5	132.3	99.8	11.7	25.7	30.5	0.000	10	0.3

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Brown-gray clayey SAND, some gravel	SC	132.5	8.5	25	10

Project No: 07-23-0347

Project: Winchester Regional Airport - Northside Dev. Phase 1 Winchester, VA

Source of Sample: S-1 **Depth:** 0.0' - 5.0'

Date: 3-18-2024

Test Description/Remarks:

Modified Proctor Effort

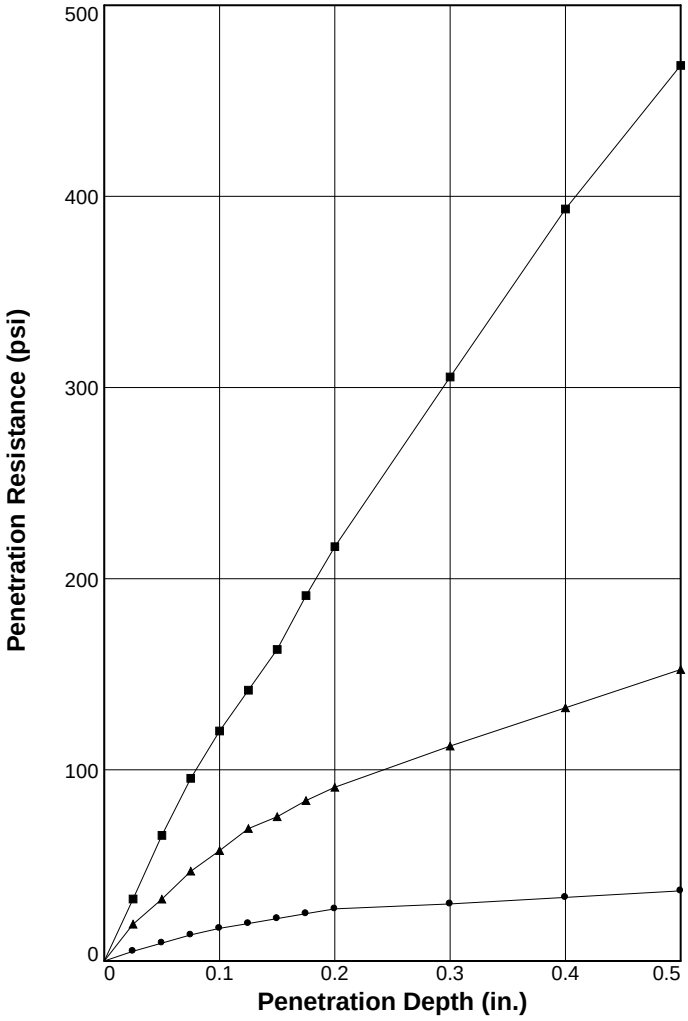
S-1 is a composite sample obtained from B-3, B-4 & B-5.

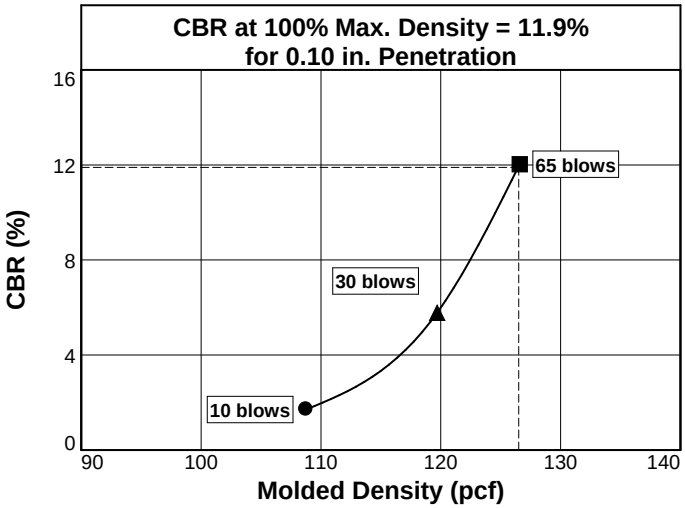
BEARING RATIO TEST REPORT

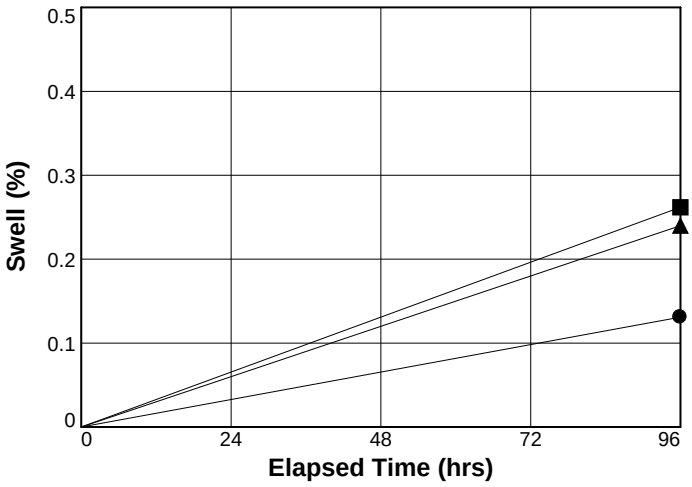
Triad Engineering, Inc.

Figure C-13

BEARING RATIO TEST REPORT
ASTM D1883-16







	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ○	108.8	86	5.5	108.6	85.9	19.5	1.7	1.8	0.000	10	0.1
2 △	119.7	94.6	5.5	119.4	94.4	11.4	5.8	6.1	0.000	10	0.2
3 □	126.6	100.1	5.5	126.3	99.8	7.6	12.0	14.4	0.000	10	0.3

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Tan-gray clayey SAND, little gravel	SC	126.5	5.5	25	9

Project No: 07-23-0347

Project: Winchester Regional Airport - Northside Dev. Phase 1 Winchester, VA

Source of Sample: S-2 **Depth:** 0.0' - 5.0'

Date: 3-18-2024

Test Description/Remarks:

Modified Proctor Effort

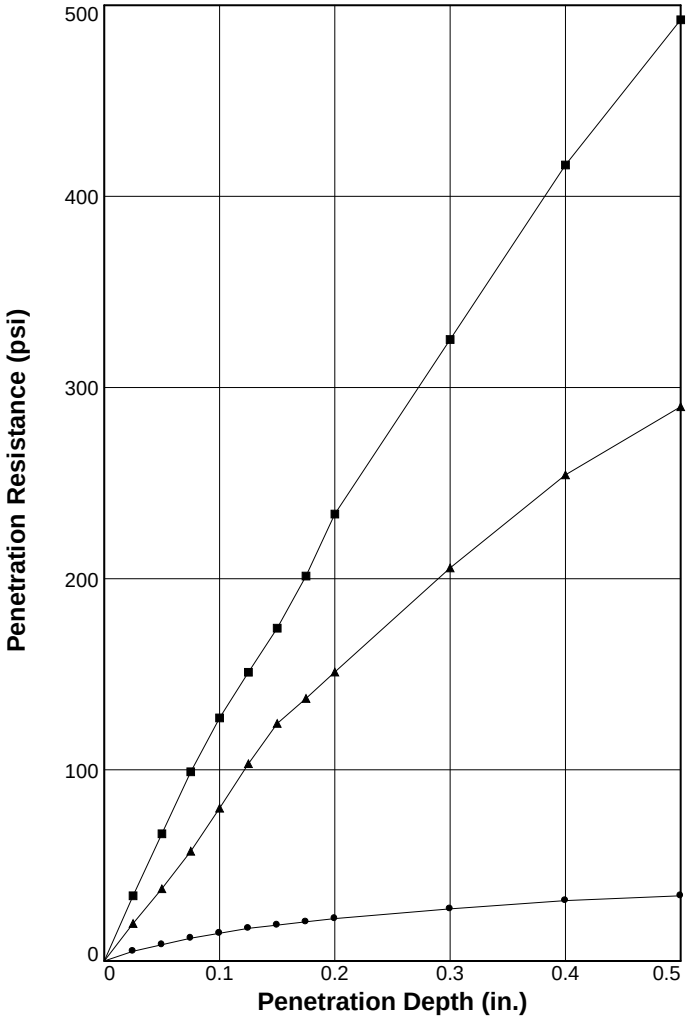
S-2 is a composite sample obtained from B-7, B-8 & B-9.

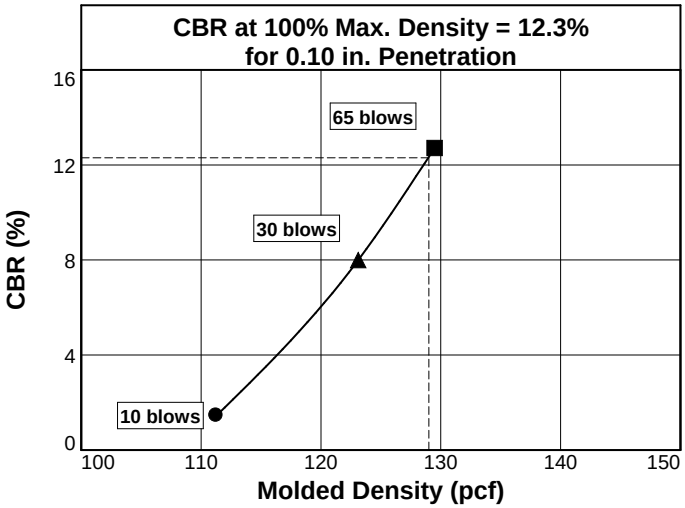
BEARING RATIO TEST REPORT

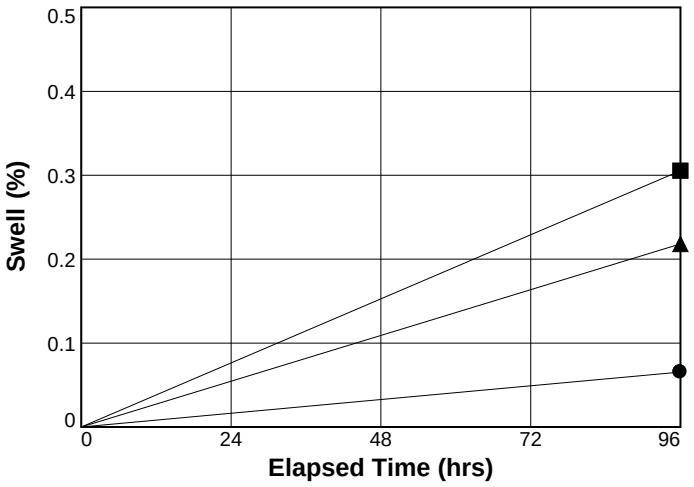
Triad Engineering, Inc.

Figure C-14

BEARING RATIO TEST REPORT
ASTM D1883-16







	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ○	111.3	86.3	8.7	111.2	86.2	17.8	1.5	1.5	0.000	10	0.1
2 △	123.1	95.4	8.7	122.8	95.2	14.7	8.0	10.1	0.000	10	0.2
3 □	129.5	100.4	8.7	129.1	100.1	10.9	12.7	15.6	0.000	10	0.3

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Tan clayey SAND, little gravel	SC	129.0	8.5	30	14

Project No: 07-23-0347

Project: Winchester Regional Airport - Northside Dev. Phase 1 Winchester, VA

Source of Sample: S-3 **Depth:** 0.0' - 5.0'

Date: 3-18-2024

Test Description/Remarks:

Modified Proctor Effort

S-3 is a composite sample obtained from B-10, B-11 & B-12.

BEARING RATIO TEST REPORT

Triad Engineering, Inc.

Figure C-15

Sturm Environmental Services

VICTORIA L. HOOPS, PRESIDENT

COMPANY: TRIAD ENGINEERING, INC.

PROJECT NAME: WINCHESTER REGIONAL AIRPORT

DATE RECEIVED: 3/1/2024 14:45

SAMPLED BY: J. WARD

LAB# TRI 2024-0301

SULFUR FORMS

Sample Number	Total Sulfur %	Pyritic Sulfur %	Sulfate Sulfur %	Organic Sulfur %
B-2/S-4	-.039	-.002	-.016	-.021
B-2/S-5	-.041	-.007	-.022	-.012

METHOD
ASTM D2492

APPROVED: Kim Kriehel

TRIAD ENGINEERING, INC.

APPENDIX D

Seismic Information

USGS web services were down for some period of time and as a result this tool wasn't operational, resulting in *timeout* error.
USGS web services are now operational so this tool should work as expected.

Winchester Regional Airport - Northside Development Phase 1

1080 Coverstone Dr, Winchester, VA 22602, USA

Latitude, Longitude: 39.1499693, -78.14918349999999

Date	1/26/2024, 3:07:19 PM
Design Code Reference Document	ASCE7-16
Risk Category	IV
Site Class	C - Very Dense Soil and Soft Rock

Type	Value	Description
S_S	0.126	MCE_R ground motion. (for 0.2 second period)
S_1	0.044	MCE_R ground motion. (for 1.0s period)
S_{MS}	0.164	Site-modified spectral acceleration value
S_{M1}	0.066	Site-modified spectral acceleration value
S_{DS}	0.109	Numeric seismic design value at 0.2 second SA
S_{D1}	0.044	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	A	Seismic design category
F_a	1.3	Site amplification factor at 0.2 second
F_v	1.5	Site amplification factor at 1.0 second
PGA	0.064	MCE_G peak ground acceleration
F_{PGA}	1.3	Site amplification factor at PGA
PGA_M	0.083	Site modified peak ground acceleration
T_L	12	Long-period transition period in seconds
SsRT	0.126	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	0.134	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.044	Probabilistic risk-targeted ground motion. (1.0 second)

Type	Value	Description
S1UH	0.048	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.5	Factored deterministic acceleration value. (Peak Ground Acceleration)
PGA_{UH}	0.064	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C_{RS}	0.94	Mapped value of the risk coefficient at short periods
C_{R1}	0.926	Mapped value of the risk coefficient at a period of 1 s
C_V	0.7	Vertical coefficient

DISCLAIMER

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Appendix D – Zoning Determination Letter

COUNTY of FREDERICK

Department of Planning and Development
540/ 665-5651

November 26, 2024

Delta Airport Consultants, Inc.
Attn: David Leech, Project Manager
2700 Polo Parkway
Midlothian, VA 23113

RE: Zoning Determination Winchester Regional Airport (Northside Development Area)
Property Identification Number (PIN): 64-A-79
Zoning District: RA (Rural Areas)

Dear Mr. Leech:

This letter is in response to your correspondence dated November 12, 2024, to the Zoning Administrator requesting a zoning determination as the development of the "Northside Development Area "of the airport.

In your correspondence you included four (4) concepts for development on the airport property:

1. **Manufacturing Facility:** This proposed facility will be for production of electric aircraft or other similar activity. The facility will have parking for aircraft and automobiles.

2. **Airpark**: The development of large corporate-style hangers with or without office spaces attached. Also, an aviation fuel farm and electric aircraft charging stations.

3. **Mixed Hangars A**: A variety of conventional hangar sizes to accommodate a range of aircraft and aircraft owners.

4. **Mixed Hangars B:** Like the previous concept but with the inclusion of t-hangar buildings for small, single engine aircraft storage.

The above referenced property is currently zoned RA (Rural Areas) Zoning District. Section 165-401.02 of the Frederick County Zoning Ordinance lists the permitted uses that are allowed within RA Zoning District on this property, and more specifically letter J. of that section states "Winchester Airport".

The Frederick County Comprehensive provides guidance for land use action and future development within Frederick County. The Public Facilities section of the Frederick County Comprehensive Plan recognizes the Winchester Regional Airport as an important component of Frederick County's Business Development efforts. The Comprehensive Plan designates an Airport Support Area for the airport.

The intent of the Airport Support Area is to protect the airport from future land development encroachment on the airport. The Airport Support Area calls for future commercial and industrial use. Therefore, the above-referenced aviation uses would be allowed as accessory uses on the Winchester Regional Airport land and within the Airport Support Area.

You have a right to appeal the decision not to proceed with a zoning determination within thirty (30) days of the date of this letter in accordance with Section 15.2-2311 of the Code of Virginia. This decision shall be final and unappealable if it is not appealed within thirty (30) days. Should you choose to appeal, the appeal must be filed with the Zoning Administrator and the Board of Zoning Appeals (BZA) in accordance with Article X, Section 165-1001.02 of the Frederick County Zoning Ordinance. This provision requires the submission of an application form, a written statement setting forth the decision being appealed, date of decision, the grounds for the appeal, how the appellant is an aggrieved party, any other information you may want to submit and a $250.00 filing fee. Once the appeal application is accepted, it will be scheduled for public hearing and decision before the BZA.

If you have any questions, please contact me.

Sincerely,

Mark R. Cheran
Zoning Administrator

Enclosures

CC: Winchester Regional Airport Authority, Attn: Nick Sabo, Airport Manager
491 Airport Rd., Winchester, VA 22602

§ 165-401.02. Permitted uses.

Structures and land shall be used for one of the following uses:

A. Agriculture, farming, dairies, animal husbandry, and forestry. **[Amended 12-9-2009]**

B. Orchards, horticulture and the production of nursery stock and products.

C. Single-family dwellings.

D. Mobile homes.

E. Schools (without residential component). **[Amended 10-27-1999]**

F. Public parks and playgrounds.

G. Churches and places of worship. **[Amended 7-10-2024]**

H. Home occupations (as defined). **[Amended 12-9-2009]**

I. Natural conservation areas.

J. Winchester Airport.

K. Group homes.

L. Fire stations, companies and rescue squads.

M. Frederick County sanitary landfill.

N. Commercial and institutional cemeteries with or without funeral homes or cemetery office complexes.

O. Post offices.

P. Radio and television towers and their accessory buildings.

Q. Public utilities, except utility-scale solar power generating facilities. **[Amended 1-8-2020]**

R. Required off-street parking.

S. Oil and natural gas exploration, provided that the following requirements are met:

(1) All requirements of the Code of Virginia, as amended, and all applicable federal, state and local regulations shall be met.

(2) A site plan shall be reviewed and approved meeting all requirements of the Frederick County Code.

(3) Approval of the site plan and use shall be for 90 days, with subsequent renewals being approved by the Board of Supervisors. **[Amended 9-26-2012]**

(4) In order to begin extraction of the resource, a rezoning to the EM Extractive Manufacturing Zoning District will be required.

T. Museums, parks or historic sites used for educational or historic preservation purposes.

U. (Reserved)[1]

V. (Reserved)[2]

W. [3]Accessory uses.

X. Poultry farms and hatcheries and egg production. **[Added 4-26-1995]**

Y. Fish hatcheries and fish production. **[Added 4-26-1995]**

Z. Hog farming. It shall be unlawful for any person to have or maintain or to permit to be erected, in the County, any hog pen that is located closer than 200 feet to a residence or an adjoining property that is used for human habitation. **[Added 4-26-1995]**

AA. Government services office. **[Added 11-10-2004; amended 9-14-2005]**

BB. Residential subdivision identification signs. **[Added 2-13-2008]**

CC. Farm wineries. **[Added 12-9-2009]**

DD. Temporary family health care structure. **[Added 8-14-2013]**

EE. Farm breweries. **[Added 8-12-2015]**

FF. Farm distilleries. **[Added 8-12-2015]**

GG. Agritourism. **[Added 5-24-2017]**

HH. Commercial stables, equestrian facilities and commercial riding facilities. **[Added 5-24-2017]**

II. Cut-your-own Christmas tree and evergreen tree. **[Added 5-24-2017]**

JJ. On-premises wayside stand, roadside stand, or wayside market, accessory to a bona fide operating farm. **[Added 5-24-2017]**

KK. Blacksmith shops. **[Added 11-13-2019; amended 12-13-2023]**

LL. Farriers. **[Added 11-13-2019]**

MM. Horseshoeing. **[Added 11-13-2019]**

NN. Taxidermists. **[Added 11-13-2019]**

OO. Short-term lodging. **[Added 9-28-2022]**

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1. **Editor's Note: Former Subsection U, Business signs, was repealed 5-10-2023.**
2. **Editor's Note: Former Subsection V, Signs allowed in § 165-201.06B, amended 2-13-2008, was repealed 5-10-2023.**
3. **Editor's Note: Former Subsection W, Cottage occupation signs, was repealed 12-9-2009. This ordinance also redesignated former Subsections X through CC as Subsections W through BB, respectively.**

WINCHESTER REGIONAL AIRPORT

CURRENT CONDITIONS

The Winchester Regional Airport is recognized as an important component of the County's Business Development efforts. Therefore, the Plan designates an Airport Support Area for the Winchester Regional Airport. Commercial, and industrial uses should be the primary land uses in the Airport Support Area; these planned land uses are further outlined in Appendix I.

The Airport Support Area is an area in which further residential rezonings will be prohibited. Conflicts between airports and residential development can be significant in growing communities. Residents of areas in the vicinity of the airport tend to oppose airport operations and the expansion of such operations because of concern for noise increased aircraft activity. The Airport Support Area was also established to ensure the continued operational viability of the airport support future airport expansion and facilitate implementation of the Comprehensive Plan and Airport Master Plan.

FOCUS FOR THE FUTURE

There is a need to continue to implement the Airport Support Area expectations. Commercial and industrial uses should be the primary uses in the airport support area; residential rezoning's will be prohibited.

The Capital Improvement Plan will continue to be a key tool that will facilitate the growth and development of the airport. Key capital projects include the acquisition property and easements necessary to protect the approach and departure surfaces of the runway and future growth, relocation of the primary parallel taxiway, replacement of the main aircraft parking apron, development of the north side of the runway, and replacement of the terminal building.

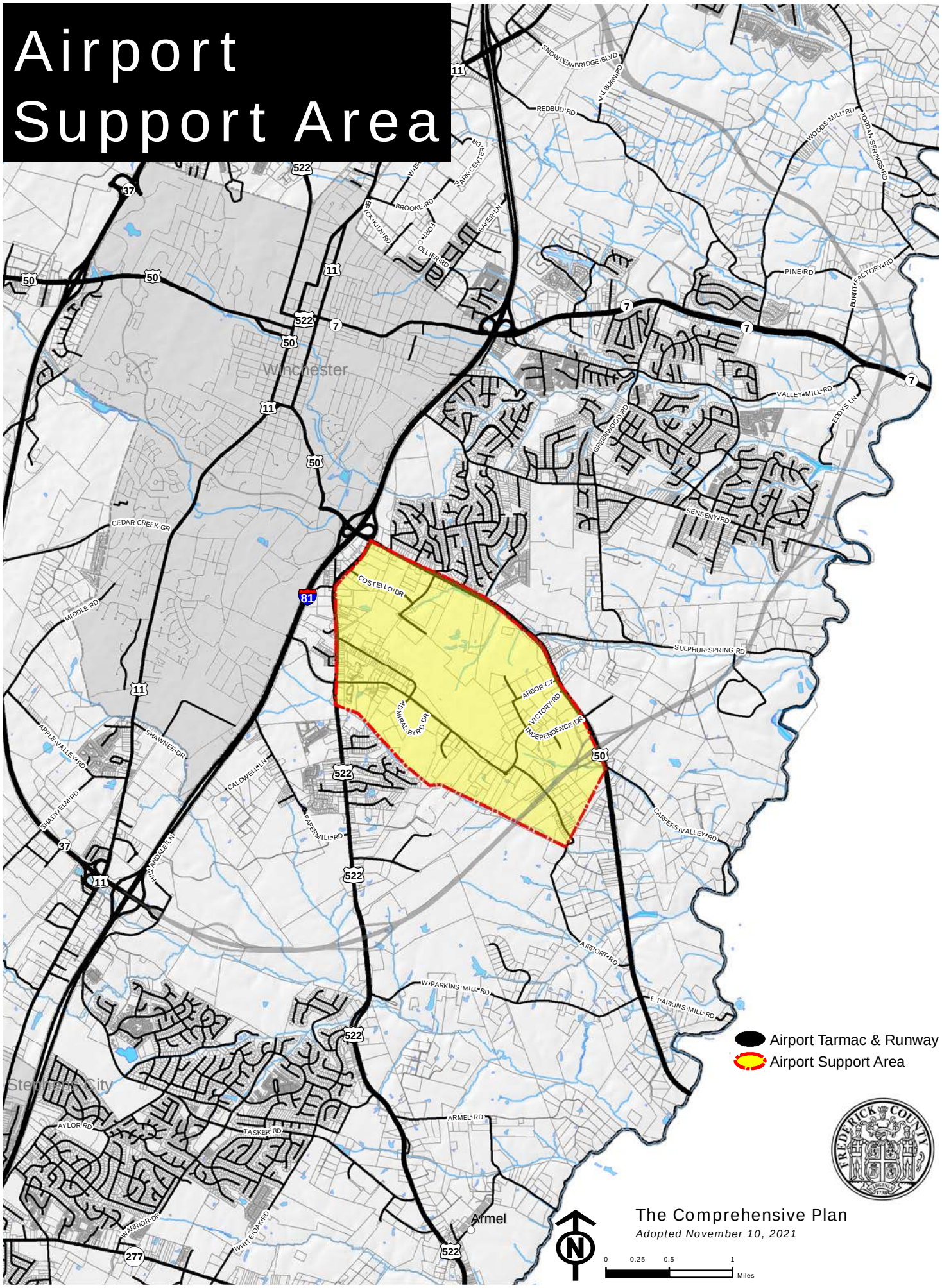
COMMUNITY BENEFITS

Through the support of the Winchester Regional Airport Authority's member jurisdictions, the Airport will continue to be a modern, first-class air transportation facility that accommodates a multitude of aeronautical functions that serve the public good, supports local employers, and attracts new businesses to the region.

GOALS/STRATEGIES

Specific Goals and Strategies relating to the Winchester Regional Airport are contained in Chapter 4 – Business Development.

Airport Support Area



The Comprehensive Plan

Adopted November 10, 2021