CHAPTER A-1

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SITE DEVELOPMENT,
INCLUDING WATER AND SEWER

INDEX

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SITE DEVELOPMENT, INCLUDING WATER AND SEWER

1.1 GENERAL

This chapter presents general requirements for the preparation of plans, specifications, and design analysis.

1.1.1 Scope.

This chapter states criteria requirements and guidance for site development design, including water and sewer (see the appropriate chapters for electrical and mechanical requirements). Specific submittal requirements in this chapter supplement the requirements in Volume 1.

1.1.2 Site Development Quality.

It is the objective of the Savannah District to obtain an efficient, economical, and sustainable site layout.

1.1.3 Water Supply System.

Water supply systems include sources, pumping, treatment, storage, and distribution of water used for domestic, industrial, irrigation, and fire protection. Many military installations have privatized their water supply distribution system. A-E shall coordinate their water supply system design with the privatized utilities to the demarcation line.

1.1.4 Wastewater Collection System.

Wastewater systems include collection, pumping, treatment, and disposal of domestic and industrial wastes. Many military installations have privatized their wastewater collection system. A-E shall coordinate their wastewater collection system design with the privatized utilities to the demarcation line.

1.1.5 Sustainable Design.

The U.S. Army Corps of Engineers has a policy to support the design, construction, operation and reuse/removal of the built environment (infrastructure and buildings) in an environmentally and energy efficient manner. Site development contributions include salvage/reuse opportunities, waste reduction, low impact development practices for controlling (LID) rain runoff, native plant selection, and close collaboration with all team members and User to synthesize successful sustainable design solutions. Chapter 14, Sustainable Design, contains detailed requirements.

1.1.6 Antiterrorism/Force Protection.

Site layout shall be designed in accordance with UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings.

1.1.7 Site Adapting.

Site adaptations of similar project designs approved for other locations are acceptable. The site adaptation shall comply with the Installation Design Guide, state and local regulations, and referenced criteria.

1.1.8 Survey.
The A-E shall perform the topographic survey, unless otherwise instructed in the project Specific Instructions.

1.1.9 Erosion Control.
The A-E shall obtain a state approved erosion control plan prior to the final submittal, unless otherwise instructed in the project Specific Instructions. The A-E is responsible for all permitting fees.

1.1.9 Storm Water Quality.
The A-E shall obtain a state approved storm water quality permit when required by the state in which the project resides. The A-E is responsible for all permitting fees.

1.1.10 Septic Tank and Leach Field.
The A-E shall obtain a state/local county approved septic tank and leach field permit when required by the state/local county in which the project resides. The A-E is responsible for all permitting fees.

1.2 **APPLICABLE PUBLICATIONS**

The following publications form a part of this Manual to the extent indicated by the references thereto. Where a publication date is not indicated the current version at the time of contract award is applicable

1.2.1 Unified Facilities Criteria (UFC).

UFC 1-300-02	Unified Facilities Guide Specifications (UFGS) Format Standard, with Changes
UFC 1-300-07A	Design Build Technical Requirements
UFC 3-201-01	Civil Engineering
UFC 3-201-02	Landscape Architecture
UFC 3-210-10	Low Impact Development
UFC 3-230-01	Water Storage and Distribution
UFC 3-230-03	Water Treatment
UFC 3-240-01	Wastewater Collection and Treatment
UFC 3-250-01	Pavement Design for Roads and Parking Areas
UFC 3-250-03	Standard Practice Manual for Flexible Pavements
UFC 3-250-04	Standard Practice for Concrete Pavements
UFC 3-250-06	Repair of Rigid Pavements Using Epoxy Resin

	Grouts, Mortars and Concretes
UFC 3-250-07	Standard Practice for Pavement Recycling
UFC 3-250-08FA	Standard Practice for Sealing Joints and Cracks In Rigid and Flexible Pavements
UFC 3-250-09FA	Aggregate Surfaced Roads and Airfields Areas
UFC 3-250-11	Soil Stabilization for Pavements
UFC 3-260-01	Airfield and Heliport Planning and Design
UFC 3-260-02	Pavement Design for Airfields
UFC 3-260-03	Airfield Pavement Evaluation
UFC 3-260-4	Airfield and Heliport Markings
UFC 3-260-11FA	Model Design-Build (D-B) Request for Proposal (RFP) For Airfield Contracts
UFC 3-260-17	Dust Control for Roads, Airfields and Adjacent Areas
UFC 3-270-01	O&M Manual: Asphalt and Concrete Pavement Maintenance and Repair
UFC 3-270-07	O&M: Airfield Damage Repair
UFC 3-270-08	Pavement Maintenance Management
UFC 3-280-04	Army Filtration of Liquids
UFC 4-010-01	DoD Minimum Antiterrorism Standards for Buildings, including Changes
UFC 4-010-03	Security Engineering: Physical Security Measures For High-Risk Personnel
UFC 4-020-01	DoD Security Engineering Facilities Planning Manual
UFC 4-022-01	Security Engineering: Entry Control Facilities / Access Control Points
UFC 4-022-02	Selection and Application of Vehicle Barriers, with Change 1
UFC 4-022-03	Security Fences and Gates
UFC 4-214-03	Central Vehicle Wash Facilities

UFC 4-420-01 Ammunition and Explosives Storage Magazines

UFC 4-750-02N Design: Outdoors Sports and Recreational Facilities

UFC 4-860-01FA Railroad Design and Rehabilitation

NOTE: UFC are distributed in electronic media, only, and are effective upon issuance. UFC are available for downloading at www.wbdg.org.

1.2.2 State

1.2.2.1 Georgia

Manual for Erosion and Sediment Control in Georgia (Green Book)

Department of Transportation State of Georgia Standard Specifications Construction of Roads and Bridges

1.2.2.2 North Carolina

North Carolina Erosion and Sediment Control Planning and Design Manual

North Carolina Department of Transportation Standard Specifications for Roads and Structures

1.2.2.3 South Carolina

South Carolina DHEC Storm Water Management BMP Field Manual

South Carolina State Highway Department Standard Specifications for Highway Construction

1.2.3 National

NFPA 22 Water Tanks for Private Fire Protection

NFPA 20 Installation of Centrifugal Fire Pumps

NFPA 24 Installation of Private Fire Service Mains

AASHTO A Policy on Geometric Design of Highways and Streets

Recommended Standards for Sewage Works (Ten States Standards)

Manual of Septic Tank Practice, U.S. Department of Health, Education, and Welfare

American Petroleum Institute (API) Publication 421 Monographs on Refinery Environmental Control-Management of Waste Water Discharges

1.3 PRECONCEPT SUBMITTAL REQUIREMENTS

1.3.1 Submittal.
Certain projects may be of such magnitude or significance that in order to select the best possible design the COE may require a study to be made prior to concept submittal. Where a pre-concept submittal is specifically called for, the designer shall submit a project site plan showing the building outline with supporting utilities.

1.3.2 Pre-Concept Drawings.
Provide the following plans. The plans shall be provided at a scale of 1" = 30', unless otherwise instructed in the project Specific Instructions. Provide one printed set and one CD of the complete site development drawing set. The drawings on the CD shall be in AutoCAD format and PDF.

1.3.2.1 Location Plan with a vicinity map.

1.3.2.2 Existing Topography Plan. Develop this drawing utilizing available site information, installation maps, existing surveys, etc. Show existing topography, scale, spot elevations, any bordering/adjacent roads and streets, existing structures, utility lines, or other site feature(s).

1.3.2.3 Site Layout Plan. Develop a site layout plan in sufficient detail so that the Savannah District, the installation, and the facility user may visualize the project and the project relationship with surrounding structures.

1.3.2.3 Site Utility Plan. Develop a site utility plan in sufficient detail so that the Savannah District, the installation, and the facility user may visualize the project's utility connections to the existing system.

1.4 CODE 3 DESIGN REQUIREMENTS

1.4.1 Submittal.
Submittal content and format shall be project specific. Code 3 design requirements will be furnished in the contract or delivery order specific instructions.

1.5 CONCEPT (35%) DESIGN SUBMITTAL REQUIREMENTS

1.5.1 Site Development Narrative.
Provide a general description of the project site. State handicapped accessibility requirements. Discuss design approach with respect to vehicular and pedestrian circulation within the site and integration with adjacent facilities. As a minimum, the narrative should address the items in the following paragraphs.

1.5.1.1 General.
a) Location of and access to the proposed project site, with brief explanation of objectives and factors influencing siting decisions.

b) General overview of major planned site features, including: building orientation; surface drainage patterns; traffic circulation; parking provisions and pedestrian access, including provisions for the handicapped; security requirements; etc.
c) Impact of new construction on existing facilities and considerations for future expansion.d) Existing site features, including: general topography, tree cover, acreage, boundaries, unusual subgrade conditions, etc.
e) Former use of the site when major removals, demolition, and salvage are required.

1.5.1.2 Demolition and Removals.
a) Specific items requiring removal, relocation, or demolition and salvage should be identified.
b) Disposition of salvaged or waste materials.
c) Waste diversion.
d) Description of trees to be removed, acreage, density, and species.

1.5.1.3 Site Geometry.
a) Rationale for locating major site elements.
b) ATFP setback requirements and installation specific clearances.
c) Areas for Low Impact Design features.

1.5.1.4 Roads.
a) Lane and shoulder widths and cross slopes.
b) Requirements for curbs, sidewalks, guardrail, traffic signs and markings, fencing, etc.
c) Intersection(s) or connection(s) to existing roads, streets or parking areas.
d) Surface drainage features, both existing and proposed.
e) Easements and rights-of-way.
f) Traffic routing during construction.

1.5.1.5 Parking and Open Storage Areas.
a) Size, type, and number of vehicles to be accommodated.
b) Number and size of individual parking spaces to be provided, including pedestrian access and number and location of handicapped parking spaces.
c) Locations of parking or storage areas, including location of entrance and exit drives.

1.5.1.6 Miscellaneous Site Features.
a) Concrete curbing and curbs and gutters.
b) Sidewalks - pedestrian circulation and width.
c) Fencing - type, height, size and gate locations.
d) Traffic signs - types and locations.
e) Pavement markings.
f) Guardrail and wheel stops.

1.5.1.7 Site Grading.
a) Rationale for grading plan.
b) Finished floor elevation (FFE).
c) Cut and fill, including estimated quantities.

1.5.1.8 Storm Drainage.
a) Connections and impacts to the existing storm drainage system.
b) Methodology for handling roof runoff from gutter downspouts.
c) Unique storm drainage structures.

d) Types of materials to be specified for storm drains, culverts and drainage structures.
e) Proposed features and methods to meet EISA 438 and local state water quality requirements.

1.5.1.7 Pavement.
Identify the types and locations of pavements.

1.5.1.8 Erosion Control.
Identify practices/measures proposed for the project site.

1.5.1.9 Water and Sewer.
a) Provide statement who will be designing and constructing the water and sewer utilities beyond the 5 foot line from proposed building face.
b) A-E designs shall provide a description of the system proposed for both water and sewer. Description shall include materials, unique measures needed and the rationale for the proposed layout of the water and sewer systems.

1.5.1.10 Landscape.
Provide analysis of existing site conditions, including an indication of existing plant materials that are to remain on the project site. Identify specific site problems related to proposed development and the rationale for proposed plant selection and locations. A list of suggested types and sizes of plant materials, based upon the approved plant list, should be included.

1.5.1.11 Specification List.
Provide a list of Unified Facilities Guide Specifications (UFGS) to be used for this project. UFGS are available for downloading at www.wbdg.org.

1.5.1.12 Additional Information.
Provide a tabulation of any design data not received that will impact completion of final design.

1.5.2 Design Calculations/Analyses.

1.5.2.1 Pavements.
Pavements shall be designed in accordance with the technical requirements in paragraph 1.10 of this chapter. Provide the PCASE design printouts.

1.5.2.2 Storm Drainage.
Provide methodology for calculating storm drainage pipe sizes and other storm water structures. Identify design storm and frequency. Include initial computer printout or calculation spreadsheets analyses.

1.5.2.3 Water Distribution Mains.
If the installation water system is not privatized, the analysis for exterior building water service lines shall show flow, velocity and pressure drop between the water main and building, and pipe sizes. Provide a Hardy Cross, or other approved methods, flow analysis, if new water distribution mains are required. This shall consist of a flow analysis of the proposed new mains using fire demands developed from criteria. The flow around all loops shall be balanced by use of the Hardy Cross system of analysis or other approved means. In developed areas where the existing distribution mains appear adequate, indicate the required fire demand and verify the adequacy of the existing system by a fire-flow test at a nearby hydrant. Frictional losses from test point to the site tie on should be included in the analysis. If the existing system is proved to

be inadequate to supply the fire demand, augmentation of the system will be required. The A-E shall determine whether fire pump station/ground storage reservoirs are required.

1.5.2.4 Sewer System.
If the installation sewer system is not privatized, no design analysis of gravity house sewers will be required unless the sewage flow exceeds the capacity of a 6-inch pipe on a 0.6 percent slope. A design analysis is required for pneumatic ejectors, sewage pumps, sump pumps, and hydro-pneumatic systems. The analysis shall show sewage flows, velocities, pipe sizes, elevations, and pipe capacities. Where new sewage collection systems are to be connected to the existing system, the existing sewage collection system will be checked downstream for five or more existing manholes to see if it is adequate for the added flow. New sewage flow will be added to the existing flow to determine the impact of the increased flow. Design analysis shall be furnished for sewage lift stations and force mains showing flows, velocities, component capacities, head requirements, detention periods, etc. Design analysis will be required for septic tanks and tile fields. The A-E shall determine the feasibility of a septic tank and tile field where buildings are remotely located and it is uneconomical to make normal house connections into an existing main. Soil percolation tests will be conducted by the A-E, unless otherwise specified. Oil/water separators shall be designed in accordance with API criteria and be capable of removing free and effluent oil globules greater than 15 mg/L and provide no greater than 15 mg/L free oil concentration effluent.

1.5.3 Concept Drawings.
Submit the following drawings. Drawing scale shall be 1”=30’, unless otherwise instructed in the project Specific Instructions. Provide one printed set and one CD of the complete site development drawing set. The drawings on the CD shall be in AutoCAD format and PDFs.

1.5.3.1 Location Plan (GI).
Indicate the location of project site, the Contractor's designated access and haul routes to the site, access control point, borrow and disposal areas, and the Resident Engineer and DPW offices with addresses and telephone numbers. Add any installation specific notes.

1.5.3.2 Existing Topography Plan (VF).
Include existing utilities with the site topography and all information from project survey. Survey information shall follow the AEC standards except as follows:
Existing topographic contours line style shall be dashed in lieu of continuous.

1.5.3.3 Civil Drawings (C).
Include general civil notes and legends.

1.5.3.3.1 Removal and Demolition Plan (CD).
Include all items to be demolished and removed by the contractor including clearing and grubbing. Items to be removed shall be hatched. If removal is extensive and drawings will become cluttered, break removal and demolition into site features and the other as utilities.

1.5.3.3.2 Site Layout Plan (CS).
Include all proposed site elements per DD1391, dimensions, coordinates and notes specific to this sheet. Do not show items removed. Provide site details if available.

1.5.3.3.3 Grading and Storm Drainage Plan (CG).

Include proposed site grading scheme with locations of proposed LID features, storm drainage pipe routing with proposed structures and notes specific to this sheet. Do not show items removed. Provide grading and storm drainage details if available.

1.5.3.3.4 Utility Plan (CU).
Include proposed water and sewer routing with proposed structures and valves and notes specific to this sheet. Show other utilities (existing and proposed). Do not show items removed. Provide utility details if available.

1.5.3.3.5 Erosion Control Plan (CE).
Included conceptual location of proposed erosion control measures for the proposed site layout in alignment with state nomenclature and notes specific to this sheet. Provide erosion control details if available.

1.5.3.3.6 Landscape Plan (LS).
Not required for concept drawings.

1.5.4 Comment Annotations.
All pre-concept comments inserted into ProjNet shall be incorporated into the drawings and/or addressed within ProjNet.

1.6 **PRELIMINARY (OVER THE SHOULDER) DESIGN SUBMITTAL REQUIREMENTS**

1.6.1 Purpose.
The purpose of this submittal is to check design progress at the Preliminary (60%) stage. Design should be at the preliminary stage but without the formal submittal and conference. Design does not stop at this submittal.

1.6.2 Comment Incorporation.
All concept comments inserted into ProjNet shall be incorporated into the drawings and/or addressed within ProjNet.

1.6.3 Drawings.
Concept submittal plans updated to the preliminary design stage.

1.7 **PRELIMINARY (60%) DESIGN SUBMITTAL REQUIREMENTS**

1.7.1 Comment Incorporation.
Incorporate concept submittal review comments and approved value engineering (VE) suggestions. All comments inserted into ProjNet shall be incorporated into the drawings and/or addressed within ProjNet.

1.7.2 Site Development Narrative.
Provide as indicated for Concept submittal; updated for design submittal with more detailed/finalized design information.

1.7.3 Design Calculations/Analyses.

1.7.3.1 Civil Calculations/Analyses

Submit complete calculations for pavement and storm drainage.

1.7.3.2 Water System Calculations/Analyses
Submit complete calculations for water design if installation water and sewer system is not privatized. As a minimum calculations shall indicate available supply and pressure versus required supply, calculations to support selection of all equipment, pipe materials, pipe sizes and detailed hydraulic calculations for each system including the worst fire situation for the water distribution system.

1.7.3.3 Sewer System Calculations/Analyses
Submit complete calculations for sewer design if installation water and sewer system is not privatized. As a minimum calculations shall support selection of all equipment and pipe sizes, discussion of pollution control authority requirements and design compliance with authority requirements, pipe materials and hydraulic profiles.

1.7.4 Specifications.
The concept submitted Unified Facilities Guide Specifications (UFGS) list shall be updated to include any new specifications based on the refined preliminary design. All specifications from the list shall be tentatively marked up, with major edits, and submitted as part of the preliminary (60 percent) submittal. Specifications shall comply with the requirements of Chapter A-11, SPECIFICATIONS. Specifications shall be submitted with red-line edits indicating all deleted/modified text.

1.7.5 Preliminary Drawings.
Provide one printed set and one CD of the complete site development drawing set. The drawings on the CD shall be in AutoCAD format and PDFs. Preliminary drawings shall be the Concept submittal drawings expanded to 60% completion. All civil drawing sections shall include all of their appropriate details, profiles and tables based on calculations and what is to be built. All utilities structures shall include all invert elevations, top of structures, type of structure, etc.

1.7.5.1 Landscape Plan (LS).
Provide landscape plans. Plans shall include trees and shrubs planting details, planting schedules and other details as required. Irrigation plans if authorized shall be part of this preliminary (60%) submittal requirements. Irrigation plans shall irrigation zones, sprinkler head details, pipe material and sizes.

1.7.6 Erosion Control Permit Package
Initial erosion control permit package shall be submitted to reviewing authority. Erosion control permit package shall be per the installation's permit procedure in accordance with the state requirements. Package includes all required drawings and analyses.

1.8 **FINAL (100%) DESIGN SUBMITTAL REQUIREMENTS**

1.8.1 Comment Incorporation.
Incorporate Concept and Preliminary review comments. All comments inserted into ProjNet shall be incorporated into the drawings and/or addressed within ProjNet. Final design submittal is a complete design with approved permits with minor aesthetic changes.

1.8.2 Site Development Narrative.

Provide as indicated for Concept submittal; updated for design submittal with finalized design information.

1.8.3 Design Calculations/Analysis.
Submit design analyses, updated based on the final design. No additional analyses are required, if acceptable analyses were furnished with either the Concept or Preliminary Design Submittal.

1.8.4 Specification.
Submit completed edited Unified Facilities Guide Specifications (UFGS) to be used for this project.

1.8.5 Final Drawings.
Submit one printed set and one CD of the final drawings. The drawings on the CD shall be in AutoCAD format and PDFs. Final drawings shall be at a "ready for construction" design level with only grammatical errors.

1.8.6 Erosion Control Permit Package.
Erosion control permit package shall already be approved or at the state office for approval two (2) weeks prior to the submittal of the Final (100%) submittal.

1.9 **CORRECTED FINAL DESIGN SUBMITTAL REQUIREMENTS**

In the Corrected Final Design Submittal, the designer of record finalizes the construction documents. This includes the incorporation of approved comments from the previous design submittal reviews. The Corrected Final Design Submittal requirements shall be the same as the Final Design Submittal requirements. Unless indicated otherwise in the project Specific Instructions, this submittal will not be another review in ProjNet and is only for final backcheck of all comments.

1.9.1 Design Check.
Verify consistency between plans, specifications and final corrections.

1.10 **TECHNICAL REQUIREMENTS**

1.10.1 Topographic Survey
The survey of the project site is intended to furnish complete information and data for design purposes. A topographic map of the estimated project area is usually furnished to the A-E by the District Project Manager. When the A-E is instructed to make the site survey, or to extend the survey due to site relocations, the work shall be performed under the supervision of a registered land surveyor, preferably registered in the State in which the project site is located.

1.10.1.1 General.
Topographic surveys will be at a scale of 1" = 30 ft with 1 ft contours unless otherwise directed. All elevations taken in the field shall be spaced no more than 30ft apart. Units shall be US Survey Feet. Intermediate elevations shall be provided as necessary to show breaks in grade or changes in terrain or surfaces. Surveying and Mapping shall be in strict compliance with the pertinent sections of EM-1110-1-1003 NAVSTAR Global Positioning System Surveying, EM-1110-1-1005 Engineering and Design: Control and Topographic Surveying, EM-1110-1-2909 Geospatial Data and Systems, and Tri-Services A/E/C CADD Standards. The following is an

exception to the A/E/C CADD standard, existing topography contour line style shall be dashed. All text and dimensions shall be annotative.

1.10.1.2 Control

Establish 2 permanent aluminum standard USACE monuments per topographic survey site, designations to be consistent with existing base monument designations, unless directed otherwise. Monuments shall be stamped with designator and year set. Temporary bench marks will be established on a grid of 500 feet so a minimum of two (2) appear for each final survey sheet. All of the control points recovered and/or established shall be plotted at the appropriate coordinate point in the drawing file and shall be identified by designation and elevation. The U-SMART form will be submitted for all permanent survey monuments established on this project.

1.10.1.2.1 Horizontal

All of the control points recovered and/or established at the site shall be plotted at the appropriate coordinate point in the AutoCAD files and shall be identified by name (or number) and elevation. Horizontal control for surveys will be based on localized datum(s) unless otherwise directed. The survey monuments shall be set within the topo limits, but in an area where the best protection from construction is afforded. All of the horizontal control shall be referenced to local State Plane System, unit of US survey feet, with no less than third order accuracy and procedures. Contractor must indicate on the mapping what Coordinate System was used for the mapping.

1.10.1.2.1 Vertical

Vertical control shall be referenced to NAVD 88, with no less than third order accuracy and procedures. All control leveling shall start from two previously established marks whose elevations agree with the limits of third order accuracy and should be tied to a mark of the same or a higher degree of accuracy. Side shots shall not be used in any control leveling. Contractor must indicate on the mapping what Coordinate System was used for the mapping.

1.10.1.3 Required Data.

1.10.1.3.1 Survey of area, show property lines and ownership, and BMs/TBMs (locations, elevation(s), description(s)).

1.10.1.3.2 Finished floor elevations (FFE) of existing building(s).

1.10.1.3.3 Type and characteristics of all existing structures within survey limits, including building numbers.

1.10.1.3.4 Roads, streets, and trails; sidewalks; and paved areas, include the following information:

(a) Type of construction (gravel, asphalt, etc.).
(b) Condition of surface (cracked, potholed, etc.).
(c) Street names.
(d) Culverts: size, type, invert elevations, and condition.
(e) Bridges: size, type, material, and condition.
(f) Guardrail: location, and type of material.
(g) Distance from storm drain inlets to trunk line.

(h) Curbs: type, spot elevations along gutter line, face of curb, back of curb and edge along pavement.
(i) Joint layout of "existing" airfield/hardstand pavements, with spot elevations at eachjoints intersection.

1.10.1.3.5 Railroads, include the following information:
(a) Alignment of track and location of road crossings.
(b) Number of tracks and weight of steel rail.
(c) Elevations along base of rail.
(d) Locations of turnouts and sidings (station point of switch and turnout number).
(e) Drainage structures: size, type, invert elevation and condition.
(f) Name of serving company (CSX, etc.).

1.10.1.3.6 Utilities.
Surveyor shall coordinate with local base authorities to determine location of existing lines. The field survey party will accurately locate all surface utilities within the mapping limits of the project. The use of as-built drawings, personnel on the site familiar with the area, local utility companies, electronic devices (pipe locator), and digging as required, will be utilized to prove the location and elevation of the utilities. Unless indicated otherwise, utilities shall be to Subsurface Utility Exploration (SUE) Level B. Survey shall capture and include the following information:

1.10.1.3.6.1 Water.
(a) Alignment of pipeline(s) within the project area.
(b) Type (CI, PVC, etc.) and size of pipe.
(c) Depth below existing ground line.
(d) Storage capacity of tank(s).
(e) Location of fire hydrants with top pipe elevation and pipe size, valve and valve boxes. Show all connections between valves and/or hydrants.
(f) Valve locations.

1.10.1.3.6.2 Sanitary Sewer Collection.
(a) Alignment of pipeline(s) within the project area.
(b) Type (RCP, DIP, etc.) and size of pipe.
(c) Depth below existing ground line.
(d) Manholes: size and top and invert elevations. Show a minimum of two connecting manholes. Extend sewer pipe survey outside the survey limits to the next downstream/upstream manhole. Show azimuth and distance to next manhole outside the project limit and the manhole’s data.

1.10.1.3.6.3 Storm Drainage.
(a) Alignment of pipe lines within the project area.
(b) Type (CMP, RCP, etc.) and size of pipe.
(c) Depth below existing ground line.
(d) Manholes: size and top and invert elevations.
(d) Profile of open ditches above and below culverts and surface inlets.
(e) Inlets: top and invert elevations, and number and size of grates. For curb type inlets with no grate, give length of opening, invert elevation at throat (gutter line), and top elevation of structure directly over the opening.
(f) Dimensions of inlet structure(s).

(g) Headwalls: give type, dimensions, pipe diameter(s) and invert elevation(s) at end(s) of pipe.
(h) Where pipe terminates in ditch without a headwall, indicate if flared end section (FES) or end of pipe is in good condition or damaged. Also, if ditch is stabilized or eroded.
(i) Where storm drainage pipe extends beyond survey limits, secure length and invert elevation of pipe at next structure upstream or downstream to determine percent slope of pipe.

(j) Where storm drainage pipe extends beyond survey limits, secure length and invert elevation of pipe at next structure upstream or downstream to determine percent slope of pipe.

1.10.1.3.6.4 Electrical Power.
(a) Alignment of powerlines (aerial or underground) within the project area.
(b) Pole locations and heights.
(c) Transformers: Number and size.
(d) Service lines: Number of wires, size and material; voltage and phase; height of line above existing ground line.
(e) Name of serving company.

1.10.1.3.6.5 Communication.
(a) Alignment of lines, (aerial or underground) within the project area.
(b) Pole locations and heights.
(c) Number of wires, size and material; height above existing ground line at pole.
(d) Manholes, hand holds , duct bank or direct bury
(e) Name of serving company.

1.10.1.3.6.7 Gas and Fuel Service.
(a) Alignment of pipe lines within the project area.
(b) Type (Steel, Plastic, etc.) and size of pipe
(c) Meters, valves, tank size and material, etc

1.10.1.3.6.7 Central Heating and Cooling.
(a) Type of pipes and system
(b) Alignment and elevations of distribution lines, locations, anchors, manholes, traps, valves, and expansion loops
(c) Concrete trench or direct bury

1.10.1.3.7 Vegetation.
(a) Groundcover
(b) Brush.
(d) Trees: species, diameter, height, condition, location of trees 4 inches and larger in diameter on the project site.

1.10.1.3.8 Fencing.
(a) Type and location (alignment), including location(s) and size of gates.
(b) Number of barbed wires on extension arm, where applicable.
(c) Height and type of fabric.
(d) Kind of posts and condition.

(e) General condition of fence as a whole.

1.10.1.3.9 Endangered Species Habitat.

(a) Show location(s) of nesting or den trees.
(b) Prominently mark/identify trees for Contractor's ease in preserving same during construction operations.

1.10.1.3.10 Wetlands

(a) Show locations of any delineated wetlands.
(b) Where required, survey shall obtain services to identify, mark limits, and obtain certification of wetlands delineated.

1.10.1.4 Additional requirements for Boundary and Easement Surveys.

(a) Install iron pins for horizontal control, showing locations and coordinates.
(b) Indicate ties to existing base lines, land corners, and either the installation's or state plane coordinate system, when applicable.
(c) Show property line locations with distances and bearings, when applicable.

1.10.1.5 Digital Data

The survey data shall be placed into an AutoCAD (Civil 3D version 2018) file. All text shall be annotative text. Use the specifications as described in the latest release of the A/E/C CADD Standards latest version. The standards can be downloaded on the CADD/GIS Technology Center web site at https://cadbimcenter.erdc.dren.mil/.

1.10.1.6 Deliverable Products

(a) The contractor shall provide the government with the digital (native) files by email or by other digital file transfer means acceptable to government.
(b) An ASCII text file of all points collected.
(c) A triangular interpolated network (TIN) file and a surface or DTM created from topographic data.
(d) U-SMART form. Contactor shall submit evidence (field notes, OPUS solutions, NGS datasheets etc.) to show that control monumentation was set to the required Order.
(e) A bound copy of all field notes, picture, etc. gathered to create topographic survey.
(f) Surveyor signed and sealed PDF – full size survey.
(g) The contractor shall keep a copy of the digital data for a period of one year from the date of final government acceptance. The digital data shall be made available to the government upon request, at no additional cost.

1.10.2 Special Requirements.

The chief of the survey party shall coordinate with the installation concerning all existing utility lines to be shown on the survey to ensure that every effort has been made to obtain correct and complete information regarding utility locations.

1.10.2.1 Special Ft. Bragg, N.C. Layout Plan Requirements.

(a) A single model file or map of the entire site indicating the location of all existing and proposed utilities and other constructions to include the footprint of structures, paving (including curbing), sidewalks, and other relevant planimetric features at the completion of the project. Provide a separate file for base bid and options.
(b) Due North on the map will be as viewed from the bottom of the map.

(c) The map will contain a labeled coordinate grid with spacing appropriate to the map extents. For instance, a map scale of 1"=30' will have coordinates labeled at 100' intervals north/south and east/west.
(d) A minimum of four tie-in points will be labeled on the map located near the four corners of the map. The tie-in points will show a symbol at the location of the point and a label indicating the Northing and Easting of each point.
(e) All utilities on the map will be clearly labeled as to size and material. Where utilities are to be enclosed in conduits or duct work, a section of the duct will be shown clearly indicating the dimensions and material of the duct, the contents of the duct such as wire size and type of conductor, whether conductor is primary or neutral, number of conductors, hotwater supply or return, pipe size, insulation type and thickness, etc.
(f) The map will show the invert elevation of all manholes as well as the invert of each pipe joining a manhole as well as the invert and character of all outfalls.

1.10.3 Storm Drainage Design.
The design storm shall be per EISA 438 and/or the applicable state criteria for erosion and sediment control and/or state criteria for water quality. The storm drainage design shall follow to the strictest criteria.

1.10.3.1 Pipe Material Restrictions.
Due to the corrosive action of the soils, do not use aluminum pipe at Fort Stewart, Georgia, Kings Bay Naval Station, Georgia, and Sunny Point Military Ocean Terminal, North Carolina. Pipes installed beneath pavements shall be reinforced concrete pipes (RCP).

1.10.3.2 Inlets.
All inlet, grate, or weir openings must be checked for size to be certain that the opening(s) will pass the calculated storm run-off draining to each inlet.

1.10.3.3 Pipe Joints.
Provide watertight joints for storm drainage pipe.

1.10.3.4 Pipe Sizes.
Minimum pipe diameter for roof drain collector system(s) shall be 6 inches. Provide cleanout at all 90 degree bend in roof drains and where run is greater than 150 feet between cleanouts. Minimum pipe diameter for enclosed storm drain system shall be 15 inches.

1.10.3.5 Calculations and Drainage Area (DA) Map.
Complete calculations and drainage area map used for the design analysis must be submitted at same time drawings are submitted for review and comments. The DA map shall be at the same scale as the Grading Plan, unless otherwise instructed. Portions of the drainage area may lie outside the proposed project limits. If so, these off site areas must also be included in the design analysis of the storm drainage system. If not included in the topographic site survey, use USGS Quad Sheets, etc. to determine extent of off site areas. A factor of safety of 1.5 is used for paved areas. In vegetated areas where grass clippings and trash may clog the inlets, use a safety factor of 2.

1.10.3.6 Culverts.
Culverts shall be designed using the applicable state Department of Transportation culvert design criteria. The A-E designer shall also inspect the outfall channel or drainage way below

each outlet to determine if the outfall ditch capacity and slope protection should be modified for the additional flows.

1.10.4 Pavement Design.
All pavement design shall be in accordance with the latest version of the Pavement-Transportation Computer Assisted Structural Engineering (PCASE) program. The program may be downloaded from www.pcase.com.

1.10.4.1 Flexible Pavement.
Flexible pavement will usually be specified for driveways, roads, streets, parking areas, and shoulders of airfield runways and taxiways.

1.10.4.2 Rigid Pavement.
Rigid pavement is used for tactical equipment shop hardstands, aircraft parking aprons and all service areas where spillage of solvents (gasoline, oil and grease) occurs as a result of service and repair of vehicles, aircraft, and airfield runways and taxiways. The minimum flexural strength shall be 650 psi in 28 days for non-airfield pavement and 700 psi in 90 days for airfield pavement. No other strengths will be acceptable, unless otherwise specified in the Specific Instructions to the A-E.

1.10.4.3 Traffic. The A-E shall coordinate with the installation to secure an estimate of the type and size of vehicle(s) and the total number of vehicles anticipated to use the proposed pavements.

1.10.5 Grading and Surface Drainage.
Finished earth grades adjacent to buildings shall be a minimum of six (6) inches below the finish floor elevation. The earth grade shall slope away at a rate of 5 percent for 10 feet. Finished earth grades pavements shall be sloped away from the immediate area at a rate of at least 5 percent for 10 ft. Grading for roadway pavement transverse slopes shall be a minimum of 1 percent, except at transition points with intersecting roadways where the slopes must vary as a function of the roadway design grade. Surface grades in parking areas shall be held to the minimum required for drainage, but shall be not less than 1 percent, measured perpendicular to the finished grade contours. For safety reasons, the maximum cross slope grades for parking areas designed for 90-degree parking are 5 percent along the aisles through the area and 1-1/2 percent for the transverse slope. For parking areas designed for 60-degree and 45-degree parking, the maximum cross slope grades are 5 percent along the aisles through the area and 1 percent for the transverse slope. Combination curb and gutter shall usually be used around all vehicle parking area(s) and also along approach drives to control surface drainage, provide vehicle barriers and present a neat appearance. The curb and gutter shall be sloped a minimum of 0.30 percent to prevent ponding and assure positive drainage to curb inlets.

1.10.6 Erosion Control.
Erosion control plan shall be designed in accordance with the applicable state erosion and sediment control regulations. Erosion control permit package shall already be approved or at the state office for approval two (2) weeks prior to the submittal of the Final (100%) submittal. States with water quality permits shall mirror the erosion control submittal schedule.

1.10.7 Road Design.
Plan and profile drawings are required for all road designs.

1.10.8 Water and Sewer Permits.
Water and sewer permit shall be obtained by the privatized utility with information for flow and usage projections provided by the A-E. Where privatized utility contracts are not in place for the installation, the A-E shall obtain any water and sewer permits required for the project. The A-E is responsible for all permit fees and for obtaining all permits. The designer will prepare, sign, and submit documents for all permits. Permit requirements should be ascertained by the designer at the time of the concept submittal.

1.10.9 Water System Criteria.
See extend of work required based on line of demarcation where utility is privatized.

1.10.9.1 Building Services.

1.10.9.1.1 Water Service Connections. Size the building water service connections to meet the peak building demands. Pressure drop between street mains and buildings shall not exceed 10 psi/100 feet at these rates of flow. Provide valve or curb stop with box near connection to main.

1.10.9.2 Fire Protection:

1.10.9.2.1 Distribution Mains and Fire Hydrants. The residual flow pressures at design flows shall not be less than 20 psi. The fire demand is determined by the sum of the fire flow, 50 percent of the average domestic demand rate, and any industrial demand that cannot be reduced during a fire period.

1.10.9.2.2 Fire hydrants shall be provided in accordance with NFPA 24. Each building should be within 300 feet of at least two hydrants. Fire hydrants will have gate valves on service lines. Hydrants should not be located closer than 25 feet to a building and should be located not more than 7 feet nor less than 6 feet from the edge of a paved roadway surface. Residual pressures at fire hydrants should not be less than 10 psi when flowing at the desired rate.

1.10.9.2.2 Building Sprinkler Supply Mains. Sprinkler supply mains shall be at least the size required by the National Fire Protection Association. The existing distribution system shall be augmented to provide at least a 15-pound residual pressure at the highest sprinkler heads in the building at design fire demands. Provide cutoff valves with boxes on the supply mains. These shall be located not less than 25 feet nor more than 50 feet from the face of the building which they are to serve. They may be of either the post indicator type or the rising stem and yoke type installed in a pit, as indicator valves generally in grassed areas, and use the rising stem and yoke type installed in underground pits in paved areas. Fire pumping stations shall comply with NFPA Codes 20 and 24.

1.10.10 Sewage Collection System Criteria
See extend of work required based on line of demarcation where utility is privatized.

1.10.10.1 Building Sewers (Sanitary). House sewers shall be of either the gravity type or the force main type as required by the building site conditions. Gravity type building sewers are preferred, and they shall be constructed of 6-inch minimum size pipe on at least 0.6 percent slope. Where gravity sewage connections to street collection mains cannot be provided, provide pneumatic ejectors or sewage pumps in the building. Duplex units shall be provided where ejectors or pumps are required. The capacity of each unit shall be sufficient to handle

the peak rates of flow. Operation of the pumps shall be lead-lag for single as well as combined capability.

1.10.10.2 Gravity Mains. Where more than one building is involved, use gravity type sewage collection mains. The minimum size of sewer mains (not house sewers) shall be 8 inches. The sewers will normally be laid on sufficient slope to provide a velocity of at least 2 feet per second at the average daily flow or average hourly flow rate and a minimum velocity of 2.5 - 3.5 feet per second at peak diurnal flow rate.

1.10.10.3 Force Mains and Sewage Lift Stations. Where more than one building is involved, if gravity type sewers cannot be provided, sewage pumps will be installed in a sewage lift station constructed on the lowest terrain in the vicinity. Force mains shall be constructed as straight, short, and shallow as possible. Where pumps operate in parallel or series, combined curves will be provided.

1.11 **REQUIREMENTS FOR PREPARATION OF DESIGN/BUILD RFP PACKAGES**

1.11.1 General.
Unless indicated otherwise, Army RFPs shall be prepared using the MILCON Transformation RFP template and the online RFP “wizard”. Contact the SAS Project Manager for access to the RFP “wizard”. Unless indicated otherwise, Air Force and all other RFPs shall be based upon “partial” design development as defined by UFC 1-300-07A. Survey requirements are located in paragraph 1.10.1, Technical Requirements.

1.11.2 MILCON Transformation RFP Template
Develop complete RFP using current MILCON Transformation RFP Template documents and the online “wizard”. Follow MILCON Transformation RFP Implementation Guidelines (located at the “wizard”) in developing the RFP. Incorporate the basic premises of MILCON Transformation in the RFP.

1.11.3 Project-Specific Requirements.
Coordinate with the Installation and develop SOW paragraph 6 (Project-Specific Requirements) and RFP appendices. Incorporate Installation Design Guide (IDG) to the extent that IDG compliance does not jeopardize project award within budget.

1.11.4 Installation Coordination.
Coordinate with the Installation and provide technical support for Installation requests for deviations from MILCON Transformation RFP requirements as needed.

1.11.5 Draft RFP Submittal Requirements.
Provide Statement of Work document to include project-specific requirements and appendices.

1.11.6 Final RFP Submittal Requirements.
(a) Implement draft RFP submittal review comments.
(b) Verify consistency between drawings, appendices and RFP text.
(c) Update RFP to reflect changes to MILCON Transformation RFP Template documents as needed during RFP preparation.

1.11.7 “Partial” Design Development RFP.
Prepare in accordance with UFC 1-300-07A. Unless indicated otherwise, A-E shall be furnished an electronic format sample or template for the written technical requirements portion of the RFP to be edited for the specific project.

*** End of Section ***