CHAPTER 9

General Site Planning

9-1. Introduction. This chapter describes the general site planning process and how it is accomplished (see Figure 9-1). The goal of this process is to organize requirements and site conditions into a documented plan that supports the base camp's mission. This is accomplished by producing a written record of the general site planning process, a base camp development site plan (BDSP) that portrays the physical layout of the required facilities and infrastructure, and an action plan that establishes the priority and the sequence of base camp development. (See Appendix G, Table G-1 [pages G-1 through G-3], for an example BDSP checklist.) Like all the other components of the BCDP process, general site planning is a process based on an analysis of alternatives or COAs.

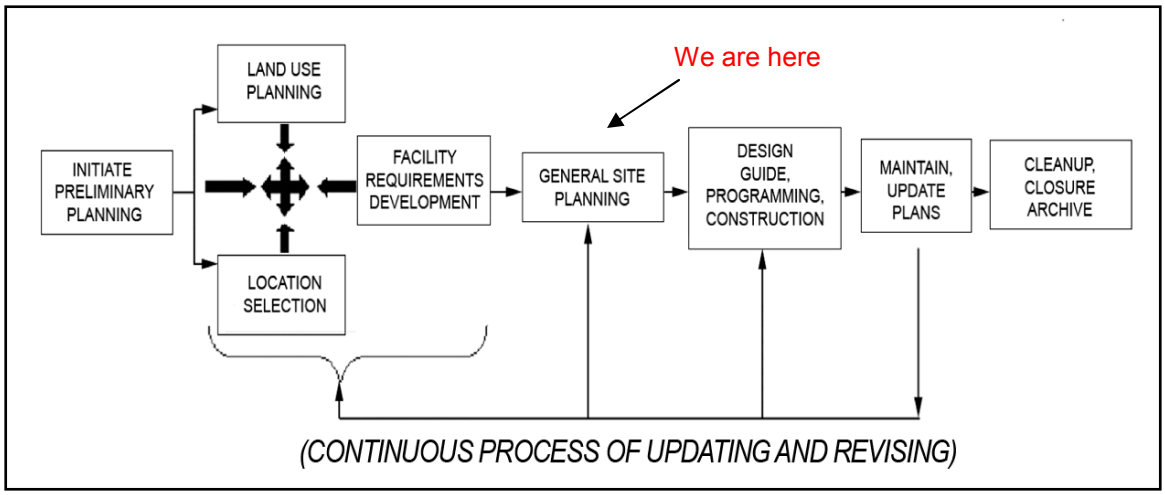

Figure 9-1. The base camp development planning process

a. General site planning, as it applies to base camp development planning, is described as a team effort that includes the selection and layout of site locations for the areas, facilities, and infrastructure required for a specific base camp. It requires multidisciplinary expertise in that it is a process that links together architecture, engineering, military operations planning, AT/FP, the environment, social science, and community planning. Furthermore, throughout the general site planning process, operational, functional, aesthetic, environmental, and health and safety issues are addressed in detail. Finally, the user's interaction with planners and the user's review of the base camp planning effort are indispensable components of a multidisciplinary general site planning process.

b. Oftentimes, planners and engineers define site planning differently. Engineers consider site planning to mean the engineering designs for clearing a single construction site, performing drainage tasks, and stabilizing the surface and subsurface conditions to prepare a worksite for a subsequent project. *General site planning*, the term that is used

in this chapter and in the Army facility planning community, means finding and plotting, to scale, a logical location for every aboveground area, facility, and infrastructure requirement, along with the portrayal of the various, often invisible, major utility corridors, safety clearance zones, and various boundaries that influence and support the plan.

c. The primary "tools" used in general site planning are the land use plan (see Chapter 6), the environmental overlay (see Chapter 6), and the TAB (see Chapter 7).

9-2. The Base Camp Development Site Plan. The BDSP is the overlay of a topographic map or CADD base-plus-features layer that shows the location of future development sites. It contains dimensioned-to-scale, plan-view outlines, called “footprints” of the proposed buildings and site improvements such as roads, hardstands, and parking areas, identified in the TAB. (See Appendix G, Figures G-1 and G-2 [pages G-4 and G-5], for sample footprints.) Once a layout is established and approved by the local commander and, as required, by higher headquarters, the BDSP becomes the basis for the utility system overlays or layers that subsequently become utility system plans and other supplemental plans as required for effective operation of the base camp.

9-3. How to Prepare the Base Camp Development Site Plan. General site planning for a base camp requires a multidisciplinary team approach founded on technical, tactical, and operational considerations. No individual, profession, or discipline has all the knowledge and skills needed to successfully prepare the layout of a base camp. In addition to the many technical experts, it behooves the team to include a base camp user representative.

a. There is no "one right answer.” While there may be dozens of ground rules and “rules of thumb” that increase the chances of preparing a successful BDSP, there is no unanimously ideal BDSP. Each plan will be unique, and each one will be shaped by the mission, the unit(s) it will support; the land upon which it is to be developed; and the respective backgrounds, skills, and contributions of the planning team members.

b. Usually, no more than three or four alternate general site plans are sketched out to depict the proposed development of a base camp. Each alternative approach or COA should support the environmental overlay and the land use plan, and will consist of logical arrangements of the proposed facilities and infrastructure. Each will be derived from the diagramming of ideal affinity relationships, tempered by the reality of existing facility locations and the off-base and on-base environment. Each COA may be based on a theme or point of emphasis to allow comparisons and tradeoffs as the COAs are compared.

c. Base camp development planners have a solid point of reference from which to begin the preparation of the BDSP. The suggested layouts found in the TCMS, site plans from base camps from recent deployments, and plans contained in the various TO facility criteria are examples of quality references. It is important to realize that these layouts are intended only as a starting point, designed to help a planner envision how an array of

facilities might look when arranged on a piece of ground and to see what belongs next to what. Consulting these layouts reduces the chance of major planning mistakes or omissions. Additionally, if there is no opportunity to execute the BCDP process in its entirety, the planning team may be forced to use the criteria-suggested layouts almost exactly as they appear in these sources.

d. There are four essential steps in the preparation of the BDSP. These steps are—

(1) Assemble and review reference documents. When preparing the BDSP, the planning team should assemble and make maximum use of topographic and existing facility maps (or CADD layers) and plans, and any other special studies. Maps that portray existing conditions, especially the environmental overlay and the buildable areas analysis, provide detailed information about the base camp location. This includes information relating to existing buildings and permanent development constraints such as floodplains and cultural features. The land use plan, as discussed in Chapter 6, will serve as the foundation of the BDSP.

(2) Retrieve the requirements from the TAB. The primary source document for building and facility requirements is the TAB. As established in Chapter 7, the TAB identifies the scope of each facility requirement and what portion of the requirement will be met by existing facilities (when there are existing assets).

(3) Obtain or prepare footprints. The next step involves the translation of the various facility requirements displayed in the TAB into typical building footprints to be shown on the BDSP. A footprint is a representation of the proposed facility in plan view (looking straight down from above). The building footprint does not need to be based upon detailed facility planning or design, but should represent the size and shape of a typical facility of the type proposed. For a one-story building, the footprint will reflect the entire square footage of the required facility. For multistory buildings, the area of the footprint will be in proportion to the number of floors, relative to the total square footage of the building. A building footprint can be approximate or exact, depending on the information available. Standard building designs have been identified for certain types of structures and should be used when appropriate. Other facilities shown on the BDSP include new roads, parking lots, storm drainage retention basins, electrical substations, recreational fields, firing ranges, and such. These facilities have typical footprints which are reflective of their function and use.

(4) Place the footprints on the BDSP in the proper land use zones. The location of a facility's footprint within an appropriate land use area is based partly upon the mission and functional requirement for that facility and partly on the siting principles presented later in this chapter. The analysis involved in plotting a site will vary, depending upon the complexity and scope of the facilities being sited. The siting of a single building requires an on-the-ground site inspection and an informal functional analysis, whereas the siting of an entire complex of buildings may require the development and analysis of alternative schemes. An effective technique to develop alternative schemes or COAs is to divide the

team into multidisciplinary subteams of three or four members each and to ask each subteam to put together a buildings and facilities arrangement. A few pointers include—

(a) The largest areas and facilities and those which have the most exacting location requirements should be sited first, followed by the remaining facilities. A metaphor is "to fold the largest pieces of laundry first, then the smaller pieces will shake out more easily." Airfields, helipads, rail yards, firing ranges, POL storage facilities, water and wastewater treatment facilities, and munitions storage and handling facilities are good examples of location- and mission-sensitive facilities.

(b) It is helpful to post a land use "bubble diagram" on a wall along with the land use plan where they can be viewed as a constant reminder of the functional relationships that must be maintained as the facilities are arranged on the base map or base-plus-features CADD layer.

(c) A practical way to go about arranging the facilities is to make to-scale paper cutouts of the various facility footprints (individual facilities as well as complexes) and shift them around on the base map until satisfactory locations and arrangements are found. When using this technique, the planner should refer to AT/FP setback requirements to ensure that proper distances are maintained. Photograph the cutouts on the map and make notes regarding this COA. This becomes the basis for one of several COAs that will lead to selection of the final recommended BDSP. The process should be repeated, using the paper cutouts, to generate additional COAs. This same concept might be applied on a paperless basis with CADD or multilayer/floating object desktop graphics software, making sure to save each alternative layer and make written notes regarding each COA developed.

(d) The selection of a location for facilities should be based on achieving the most desirable functional relationships. As building locations are determined, site access, off-street parking areas, and other site-supporting features should be determined as well.

e. To locate the footprints of proposed buildings and facilities on the BDSP, the team should follow generally accepted site planning principles. Some of these principles include—

(1) The relationships between buildings.

(a) Buildings should be related in groups. Essential considerations include the provision of site access; separation of wheeled-vehicle, tracked-vehicle, pedestrian, and service traffic; the functional and visual arrangement of space between buildings; the establishment of a compatible building scale; architectural character; and provision for future growth and expansion.

(b) Facilities that serve large numbers of people should be sited for maximum visibility and exposure within a building grouping. Facilities with intensive use should be

oriented so that the points of access will be readily identifiable. Visually prominent sites should be considered for buildings of symbolic importance such as the base camp headquarters or the chapel.

(c) The open space network of a building group should be coordinated with the open space system of the entire base camp.

(d) Cluster development patterns which facilitate joint use of common areas should be considered.

(e) Proposed buildings and facilities should be sited to ensure compatibility with adjacent land uses.

(2) Roadways, site access, and parking.

(a) Before determining road networks, planners should consider the location, number, and type of ECPs. The internal road network itself should clearly reflect the service and access requirements of the proposed buildings, facilities, and occupants. Proposed facilities should provide sufficient right-of-way to accommodate possible roadway widening. Major street intersections should be arranged at right angles and with adequate width and site distances. Offset intersections less than 125 feet apart should be avoided. The number of access points to primary roadways should be minimized, and on-street parking should be prohibited on primary and secondary roadways. Access to parking areas should be coordinated so that vehicular pedestrian conflicts are avoided. Internal vehicular circulation should be coordinated to serve a group of buildings. Finally, the relationship of road networks to required standoff distances must also be considered.

(b) Parking areas able to serve several adjacent facilities should be combined when possible. Such areas should be screened and landscaped to reduce visual impact on adjacent areas. Service areas should be located so that they are screened from roadways and adjacent uses. Ideally, circulation should provide at least one way in, a way around or through, and another way out. An experienced infantry sergeant once gave his Soldiers the following tactical guidance, "Never come back in by the same route you followed when you went out." The inverse of this maxim applies equally to the layout and design of circulation systems.

(3) Utilities and drainage. In siting utility and drainage facilities, conflicts with existing major utility lines should be avoided to minimize development cost. All buildings and facilities should be located on well-drained sites and not in major drainage courses.

(4) Energy conservation. Prevailing winds, solar orientation, and microclimatic conditions should be considered in facility siting in order to allow for conservation of energy and user comfort and convenience.

(5) AT/FP, environmental, and safety restrictions. Restrictions such as explosive quantity safety distances, noise contours, airfield and helipad safety zones, historical buildings or places, archeological sites, sensitive natural areas, unsuitable soils, and range surface danger zones should be considered when siting proposed buildings and facilities.

(a) The importance of AT/FP standards cannot be stressed enough. Planners should review applicable AT/FP UFCs such as UFC 4-010-01, UFC 4-010-02, the Joint Forward Operations Base Force Protection Handbook (JFOB), Graphic Training Aid (GTA) 90-01-010, and combatant command standards (Red Book and Sand Book), and consult with AT/FP experts such as those at the USACE Protective Design Center (see Appendix G, Figures G-3 and G-4 [pages G-6 and G-7], for sample standoff distance and building separation diagrams).

(b) When applicable, the boundaries of environmental/safety restrictions will be shown on the BDSP. Even though these restrictions have been considered during development of the land use plan, they should be reviewed again to ensure that all constraints have been considered in siting individual buildings.

9-4. Utility and Other Supplemental Plans. Once the recommended BDSP has been finalized by the planning team with assistance from design engineers (if they are not already team members), the team plans the layout of all primary, secondary, and tertiary utility lines in order to provide the appropriate services to each building and facility. Sites for the proposed water and wastewater treatment plants and solid waste disposal should already be located on the BDSP, but an additional check by the experts is advisable. Communications personnel often will call for site adjustments to meet the operating requirements of their equipment.

a. A key factor in the planning of utility systems layout is providing for maintainability and survivability. For example, a planning team would not locate underground mains along the axis and beneath the pavement of a roadway, but would align it off to the side so that repairs requiring excavation would not interrupt traffic flow. In another example, if high winds or extreme climates are prevalent, buried (instead of overhead) electrical lines should be considered to reduce service interruptions and maintenance requirements.

b. The philosophical approach to the development of utility, information, and communications systems should be one of steady upgrade and improvement within the limits of the particular circumstances found within the theater. For example, the plan should be to replace initial burnout latrines with chemical toilets and then to replace chemical toilets with a robust waterborne sewage collection and treatment system. Generators should give way to commercial, uninterrupted power. Unimproved roadways should be replaced with gravel ones, and wheeled-vehicle roads should be paved with asphalt or concrete. Field communications equipment should be replaced eventually with fixed communications systems, and so forth.

c. Per capita consumption, demand, and production rates for utility systems are established by theater standards criteria and allowances. The guidance documents that supported recent operations are another good source for estimated per capita allowances. Additional criteria are contained in the TCMS. However, it is always best to provide a reasonable amount of additional capacity to meet surge demands and accommodate the possible expansion of the base camp.

d. A utility capacity analysis should be performed wherever existing utilities are available or where they have been partially developed. For example, data is collected about sewer, electrical, and water systems and then compared to the proposed population data to analyze potential utility shortfalls. The philosophy of such an analysis is that "a chain is as strong as its weakest link." The results of one such analysis are shown in Appendix G, Figure G-5 (page G-8).

e. When planning the utility systems, a factor known among military facility planners as planning strength should be taken into account. The planning strength of a base camp is the total number of personnel falling into one of at least three categories.

(1) The number of authorized personnel of the base camp's assigned units. A unit's authorized number of personnel is contained in its MTOE or TDA documents. In a TO situation, the required population and equipment density should be used.

(2) The number of personnel who are not listed on an MTOE or TDA for the units assigned to the base camp. These could include allied or coalition forces assigned to the base camp, nonappropriated fund (NAF) personnel such as community club employees, HN employees, civilian personnel displaced by military operations or emergencies, and contractor personnel.

(3) The number of personnel consisting of portions of any of the two previous categories who would be considered as fractional individuals. Some examples of fractional individuals include—

- HN personnel who work in the base camp only during working hours (about one-third of a 24-hour day).
- Units or portions of units that stage through the base camp on their way to other locations. For example, they might only arrive for an evening meal, an overnight stay, a breakfast meal, refueling and servicing of their vehicles, and then depart.
- Assigned personnel who spend the majority of their time conducting operations away from the base camp. Although many commanders want to provide housing for all of these service members, the fact remains that they place little demand on the utility systems and certain other services while they are not occupying the base camp. Since these personnel are not full-time occupants of a base camp, the contributions of these individuals to the base camp's total planning strength are fractionalized by multiplying the number of

individuals in this category by the fraction of time they would be present at the base camp.

9-5. The Action Plan. Once the BDSP, the utility overlays, and other supplemental plans are completed, the planning team takes the next important step to prepare an action plan. An action plan establishes the priority order for the execution of a base camp's list of development projects, including listing the actions associated with executing these projects. Figure 9-2 shows how the BDSP and the action plan together contribute to the "Where?" and "When?" elements of the BCDP.

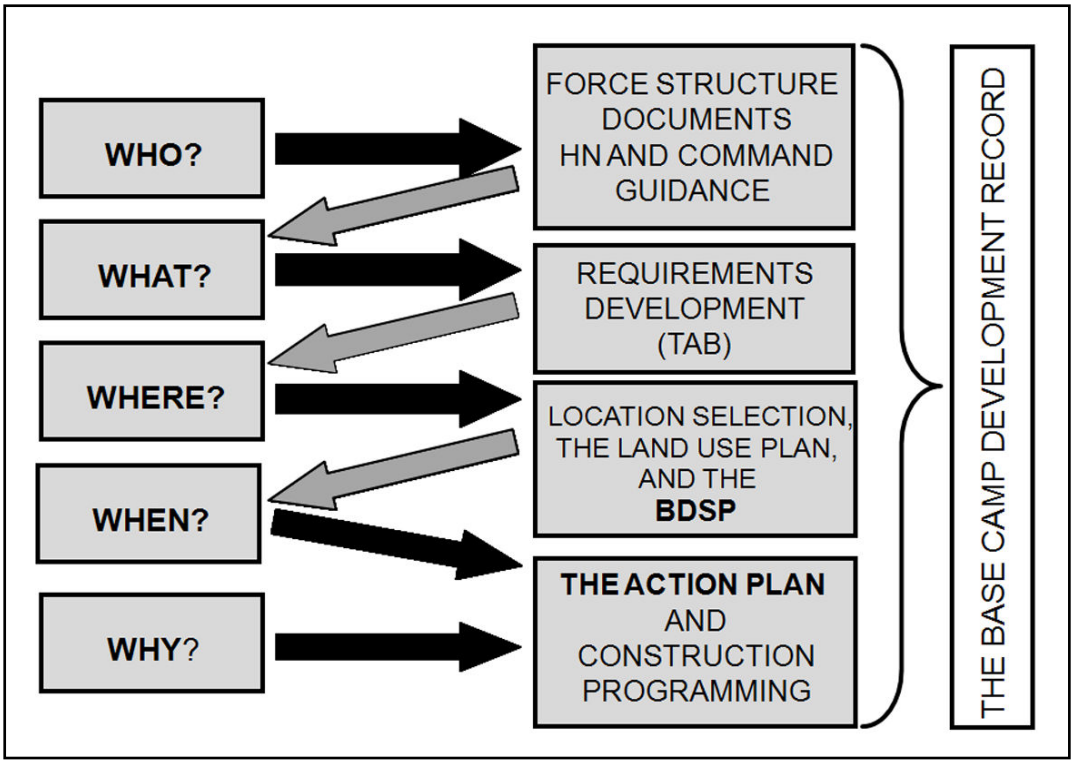

Figure 9-2. Four of the "five Ws" answered by the base camp development plan

9-6. How to Prepare the Base Camp Development Site Plan Action Plan. The implementation of any plan, especially in the case of a BDSP, includes the need to determine what must happen where, in what sequence, when and, often, by whom. The BDSP resolves the "where" issues. But other means are needed to identify what projects and associated actions should be done first, second, third, and so forth. In other words, what has to be known is: "What must happen before other things can happen?" For example, building demolition or explosive ordnance disposal (EOD) may be required even before a new site can be accessed. There may be various nonconstruction actions required, such as moving people out of an area so that development can occur, leasing facilities from the HN so that construction requirements can be reduced, or obtaining funds to pay for a HN labor force.

a. There are several ways to prepare an action plan. The three most common ones are—

(1) A project phasing plan. The first way to prepare an action plan is with a project phasing plan. This project phasing plan becomes a vital part of the BCDP and is prepared and submitted according to the policies of the appropriate higher command. The phasing plan consists of a copy of the BDSP annotated to identify individual project locations, other actions, and the time frames in which the projects will be programmed and executed. It also contains a project phasing map. The basic objective of the project phasing plan is to outline a flexible, short-term program of projects based on the goals, objectives, and site locations proposed by the BDSP. Another important objective of the project phasing plan is to show which improvements have the highest priority for implementation in light of the identified level of allocated funds or other available resources required to implement the plan's recommendations. Also, the document provides a means by which development funding programs can be measured in terms of how well they meet the base camp's requirements.

(a) Project identification. The first step in preparing a phasing plan is to arrange the projects identified by the TAB and/or TCMS into groups. In some cases, the higher headquarters might later combine all of the projects identified into one project and add it to their critical construction list. The groups of projects are as follows:

- New facilities, utilities, and infrastructure that must be constructed.
- Existing facilities and infrastructure that must be improved or repaired to meet functional requirements.
- Existing facilities that must be replaced because they are inadequate.
- Existing utility systems that must be improved or replaced.
- Existing road networks that must be improved or replaced.

(b) Project scope. The scope (size or similar quantitative aspect) of the projects identified in the TAB document represents the basic data for the prioritization of the projects to be included in the project phasing plan and on the project phasing map. Where a project can logically be programmed in two or more stages, project phasing should be considered in order to make the most effective use of available resources. An example of a project phasing map is shown in Appendix G, Figure G-6 (page G-9).

(2) A sequencing chart. A second way to prepare an action plan is to use a sequencing chart. A Gantt chart and a critical path method chart are two examples of a sequencing chart. These charts show a sequence of events that includes not only the construction projects but also the supporting policies, standards, actions, unit relocations, and major maintenance and repair tasks.

(3) Lists of projects and other real property associated actions. A third way to prepare an action plan is to prepare a time-sequenced project list, such as the ones submitted to higher headquarters in support of construction and major maintenance and

repair projects. An example or a portion of a sequencing list is shown in Appendix G, Table G-2 (page G-9).

b. The process for prioritizing construction projects is as follows:

(1) The process should begin with an evaluation of each project on the project list and end with the preparation of a prioritized list of construction projects. To facilitate the prioritization process, the projects should be organized into similar sets of projects that support the specific objectives of the BCDP. The priority of the projects should be based on how each project would—

- Contribute to achieving a specific goal and objective identified in the base camp development record.
- Resolve a current problem or be necessary to carry out other projects.
- Contribute to the completion of facilities or programs already underway.
- Be funded within authorized levels or qualify for funding from other sources.
- Improve the quality of the natural or man-made environment.
- Be incorporated into existing facilities to extend or improve their functional capability.
- Have the capacity to support multiple functions.

(2) The basis for prioritization should be a function of how well each project contributes to accomplishing the goals and objectives of the BCDP. (See Appendix G, Table G-3 [page G-10], for an example of a project priority list with phasing sequence.) One way to prioritize projects is as follows (keep in mind that each priority group could consist of many projects and associated actions):

- Priority Group #1 - Projects that meet an AT/FP, health, safety, or environmental requirement.
- Priority Group #2 - Projects that resolve a critical mission support or functional deficiency.
- Priority Group #3 - Projects that are a necessary precondition for other projects to support base camp development.
- Priority Group #4 - Projects that resolve a current but noncritical functional deficiency.
- Priority Group #5 - Projects that support future expansion capability.
- Priority Group #6 - Other projects.

9-7. The Review and Approval Process. The appropriate combatant or theater commander will designate the level(s) of command that will have site approval authority, with the exception of approvals for special types of projects, as described earlier. A site approval certifies the acceptability and constructability of a proposed facility location. Proper siting denotes that each project identified by the TAB or the TCMS has been located on a proposed site that conforms to the tenets listed on the BCDP checklist.

a. All proposed projects must have site locations portrayed on the BDSP and be approved by the base camp commander and the designated higher command approval authority, regardless of the type of funding or project size. This would apply to all projects that involve—

- Construction or relocation of facilities.
- Additions to existing facilities.
- Replacement of a facility at the same location with a facility of a different use category.
- Facility siting that requires a change to the approved land use plan.

b. In most instances, a project site approval would become invalid when the site location of a project or set of projects changes. The appropriate higher headquarters would determine if a particular shift in location qualifies as a resiting. All site approvals based on safety criteria or a special technical review and approval become invalid when the project scope or location is changed from that which was approved by the command and the agency or office responsible for issuing the initial approval. Requests for revalidating a site approval should be processed as soon as possible after a site relocation or project rescoping requirement becomes known.

c. The combatant or theater commander or the appropriate intermediate commander, if so designated, would determine the BCDP documents to be prepared and those requiring review and approval. Examples of such documents include—

(1) The BDSP as described in this chapter.

(2) Utility overlays to the BDSP showing the existing utilities recommended for retention, modification, abandonment, or replacement; the primary components and alignments of all proposed utilities; and all central utility plants.

(3) The base camp development record with emphasis on the portions that explain the alternatives analysis process that led to the approved BDSP. (See Appendix G, Table G-4 [pages G-11 and G-12], for example formats for the base camp development plan record).

(4) The action plan. This plan would be placed in the base camp development record along with a description of the rationale used in the general site planning process. It might also be submitted as a separate set of documents in support of the construction or land acquisition programming process.

(5) Other possible overlays/layers or variable-scale extracts of the BDSP. These could include—

(a) AT/FP plan. This overlay might portray physical features, measures, zones, and clearances planned to protect the force and to provide for the physical security of property. Typically, this plan is a controlled-access document.

(b) Transportation plan. This plan shows recommendations for the highway and railroad systems that would serve the base camp including proposed layout; type, class, and weight of rail; and width and load capacity of roads, bridges, hardstands, paved parking areas, and tracked-vehicle trails.

(c) Range and training land program development plan. This plan would be prepared in coordination with the USACE Range and Training Land Program (RTLP) Mandatory Center for Expertise (MCX), Huntsville, Alabama. It is normally required for enduring locations where range firing or maneuver training would be conducted on a sustained basis.

(d) Information systems plan. This plan shows existing and proposed major command, control, communication, and information management features.

(e) General drainage plan. This plan shows all existing major storm water drainage facilities recommended for retention, modification, or abandonment and the primary components of all new drainage features and structures.

(f) Airfield plan. At base camps where high-use airfield or heliport facilities are planned, a separate plan would show the airfield facilities only. The scale may vary from the base topographic maps in order to ensure that the layout complies with exacting airfield criteria. Special reviews and approvals are required for this type of plan.

(g) Area development plans. These plans are enlarged portions of the BDSP that show the detailed development of proposed complexes, community centers, utility services, firing ranges, or a single key building and its associated support elements.

(h) Other plans. These plans enhance base camp development and management and are prepared on an optional basis. Some examples are—cultural and natural resources management plans, MWR facilities plans, unit-specific site plan extracts, AAFES facilities plans, facilities utilization plans, facility maintenance and repair plans, parking plans, DFAC support plans, and signage plans.

d. The review and approval process for the recommended base camp requirements COA would vary based on the respective commands and the uniqueness of each base camp mission.

(1) In a typical situation, the review and approval chain likely would proceed from the base camp to the appropriate intermediate headquarters, to the theater and/or combatant command headquarters, and perhaps to HQDA. Special reviews and approvals, such as those required for aviation, munitions, and ranges and training

facilities, should be obtained in advance, or be underway, before submitting the BDSP and action plan through the command approval chain.

(2) In some special cases, there could be Executive Office, Cabinet-level, or Congressional oversight of a plan to establish a base camp. In such cases, a planner might be asked to provide information beyond that which is customarily associated with the development of a base camp.