PART TWO
GENERAL DESIGN GUIDELINES

CHAPTER 5
TOPOGRAPHICAL FEATURES

The purpose of this chapter is to describe the topographic features of Fort Lewis; that is, those features dealing with landforms, soils and hydrology; to analyze those features in terms of their effects on master planning, site design and architecture and to provide practical application of that analysis.

SECTION A
DETAILED ANALYSIS

Landform Character

Located on a glacial outwash plain bordering Puget Sound, Fort Lewis is characterized by flat to gently rolling terrain with isolated mounds rising sharply above their surroundings. Some 30 glacial kettle lakes from one to 1123 acres in size, extensive stands of Douglas fir and large but less extensive prairie grass

communities grace this terrain. With the exception of the Nisqually River and Muck Creek flood plains, surface drainage channels on Fort Lewis are poorly defined or non-existent due to the highly permeable surface material.

Low Plains, High Plains, Escarpments

The three landform types found in or adjacent to the cantonment area are low plains, high plains, and escarpments. Escarpments line Puget Sound, just northwest of the "North Fort" area, and the Nisqually River flood plain, southwest of the cantonment area. These steep, rocky cliffs with slopes almost always greater than 30% are not visible from any intensively used portions of Fort Lewis, with the possible exception of Solo Point on Puget Sound, but help isolate the post from its surroundings. High plains, which comprise approximately 30% of the post, are found around Miller Hill, at the top of the Puget Sound escarpment, just north of the 91st Division Prairie, and at other areas remote from the cantonment area. This terrain unit is usually thickly forested with Douglas fir, and the glacial mounds associated with it provide some of the best natural views and vistas on the post.

Slopes Analysis

Slopes, aside from the much steeper glacial mounds, usually fall between 0 and 15%. The majority of Fort Lewis (65%) is classified as low plains characterized by dense, evergreen forests, open, grassy meadows and marshes on flat or very gently rolling terrain. Most of the ponds and lakes on the post are found in this landform type which has slopes almost never exceeding 3%. As stated before, most of Fort Lewis is located on flat terrain which provides abundant land for military activities. Because of the vegetation generally found on them, the visual qualities that they possess and the relatively high site and building development costs, the hills and bluffs that do exist should be kept free from all uses except passive recreation facilities such as hiking and nature trails.

Soils Analysis

Fort Lewis is located at the southern end of the Puget Sound trough, an area covered by the Fraser Glaciation some 14,000 years ago. The glaciers deposited thick layers (up to 200 feet in the Fort Lewis area) of advance glacier outwash and glacial till, a compact mixture of clay, silt, and sand. Upon melting, the glacier left layers of unconsolidated course gravels known as recessional outwash. These moderately to excessively drained sandy and gravelly soils form the vast majority of the present day land surface on the Post, and are primarily of the Spanaway and Everett Series. Other non-organic soils found scattered throughout the cantonment and nearby areas are Alderwood and Sinclair series compacted silts and gravels, well drained alluvial plain sandy soils along the Nisqually River, small pockets of poorly drained silty clay Pilchuck and Puyallup series soils in upland depressions and terraces, and stony, gravelly, excessively drained soils on steep, exposed slopes. Peat and other highly organic soils of the Mukilteo, Semiahmoo, and Rifle series occur in depressions and along creeks.

Soils and Buildings

Even though the Fort Lewis region is subject to seismic activity, significant damage is extremely rare due to the minor strength of local earthquakes and the dampening capabilities of gravelly outwash soils. These same soils provide generally excellent support for building foundations and roads. Their very low shrink-swell potential also reduces foundations costs. Construction of any kind should be avoided in the limited areas of peat or other highly organic soils, to limit both development costs and environmental damage. Likewise, construction and maintenance on the exposed stone and gravel of some of the Post's steeper slopes and escarpments would be relatively expensive and lead to erosion problems.

Drainage Analysis

Because of the high soil porosity, a large portion of Fort Lewis' considerable rainfall seeps directly into the ground. Ground water is found at depths ranging from about 200 feet to the surface as in the case of permanent lakes or marshes. Because of this high porosity, as well as the seasonal fluctuations in rainfall, considerable fluctuations in the ground water level can occur. One obvious development ramification of this seasonal fluctuation and locational diversity is that the ground water depth must be measured during the rainy season when it should be at its highest at a given project site. The soil porosity, combined with generally level terrain, limits the potential for erosion. In the cantonment area, only steep slopes such as those found on Miller and Davis Hills and 30th Infantry and 6th Engineer Bluffs are likely to erode if the vegetative cover is removed. Other nearby areas with a potential for surface erosion or mass failure are the steep bluffs associated with Puget Sound, the Nisqually River, and Muck Creek. Because of relatively level terrain and highly permeable soil, Murry and Sequalitchew Creeks are the only defined natural drainageways in the cantonment area (Fig. F-5-A). Nearby, however, the Nisqually River and Muck Creek both have well defined channels.

Fig F-5-A

Several marshes, some of which almost dry up during the summer dry season, are located in or near the cantonment area and, as stated before, development in these areas must be avoided to limit construction costs and environmental damage. Most stormwater from the portion of the cantonment area south of Interstate Highway 5 flows into a drainage system that discharges into Murry Creek which then flows into American Lake, the largest and deepest lake on the Post. Except for limited areas in which stormwater flows directly into American Lake, almost all of the North Fort area is drained by an open ditch that empties into Puget Sound near Solo Point.

Spatial Concepts

Containment and Focus

Much as the interior of a building has certain visual characteristics which define the various spaces within, the natural environment has its own characteristics which visually define regions, localities, and individual sites. The outdoor environment at Fort Lewis is no exception; in fact, it is the relationships between the built-up areas on flat ground, and the surrounding hills and bluffs which give Fort Lewis much of its unique character. These hills, by blocking site lines to relatively close areas, "contain" various neighborhoods of the Post, and "focus" views such as that of Mt Rainier (Fig. F-5-B) (Fig. F-5-C).

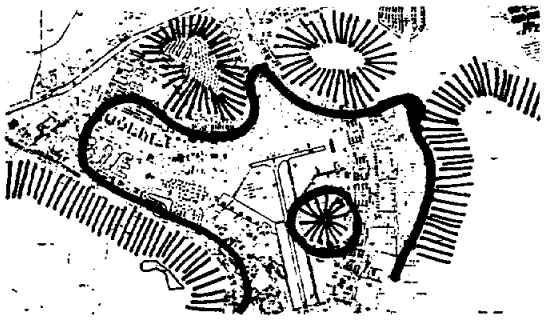

Fig F-5-B

Fig F-5-C

Slopes

Differences in elevation also define the visual or psychological importance of a given area. Care should be taken at all levels of design, from master planning to building and site furnishing design, not to compete with the natural physiography of a locality or site. Rather, planning should take advantage of the topography and other features of the land in order to achieve a cohesive, visually pleasing, and functionally logical result. This is especially true for military planning. A division headquarters building, for example, would properly be located in a higher, more prominent location, possibly with a natural backdrop, than other, less important buildings within a complex.

SECTION B
APPLICATION

Master Planning

Good design begins at the master planning level. Mistakes made in this phase invariably leave a trail of financial and visual consequences which often require extraordinary corrective measures with landscaping or other screening. These problems can be avoided by applying the appropriate planning principles at this first stage of project development.

Circulation

Although Fort Lewis' circulation scheme is obviously well defined and probably will not change much in the future, any additional expansions, relocations and so on must be well thought out in relation to the terrain through which roads will pass. Roads should skirt hills whenever possible and, when they do climb and descend, should cross contour lines on the diagonal as opposed to perpendicularly.

Excessive cutting or filling must be avoided for financial as well as aesthetic reasons. Cut and fill slopes should be rounded so that the road appears to be a part of the natural landform. Variable width medians also add visual interest and can cut construction costs. This concept should be explored when North 41st Division Drive is widened from two to four lanes (Fig. F-5-D) (Fig. F-5-E).

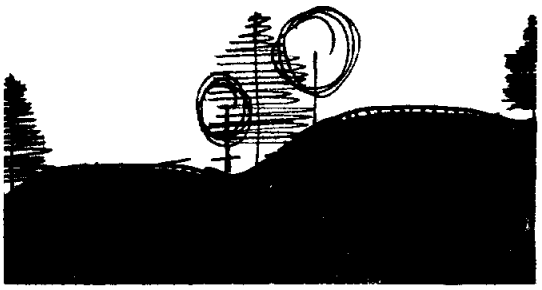

Fig F-5-D

Fig F-5-E

Sidewalks, footpaths, and bicycle paths generally follow roadways but can obviously follow more serpentine routes than roads. This fact can be used advantageously when planning bicycle and circulation systems, and care must be given to control grades, especially on bike paths, if they are to be used by a significant number of people. The views from vehicles must also be taken into consideration when laying out roadways. Views to hills, lakes and forests, and the sequential revealing of the landscape can all be used to provide visually pleasing travel routes.

Site Selection

Along with circulation design, the major way in which the master planning process affects the visual quality of a post is through site selection. Physiographic features can be ignored, resulting in expensive and visually displeasing projects; or, alternatively, they can be used to the advantage of the specific activity and the Post in general. Functions such as motor pools which require large, flat, open tracts of ground should be located in naturally open, gently sloping areas and, since they generally present a less than attractive image, should be located behind naturally occurring screens such as stands of trees and low ridges of land (Fig. F-5-F). Prominent, militarily important buildings and activities should, when possible, be located so as to be higher in elevation or otherwise more prominent than less important activities. Also, dangerous activities such as firing ranges should be located where the topography provides a natural backdrop or screen.

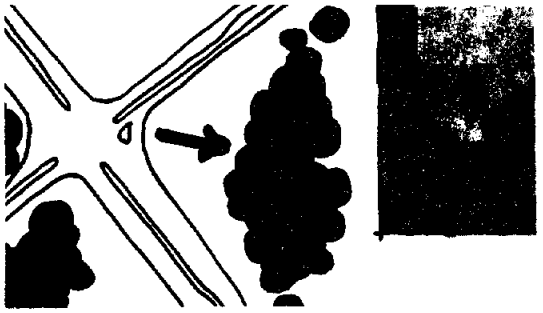

Fig F-5-F

Environmental Disruption

The soil and drainage conditions of a given site and the corresponding requirements of a proposed activity must also be taken into consideration to minimize both costs and environmental damage. Multi-story buildings which must rest on bedrock or high bearing pressure soils should not be planned for sites with relatively weak soils which might be suitable for residential or other small buildings. Furthermore, activities which require extensive excavation for basements will cost more to develop on a given site with shallow bedrock than those which require only limited below grade construction.

Site Design

Once a site has been determined, the location of the building, parking lot and other supporting structures within the site must be planned. Functional aspects of circulation are typically the dominant site planning criteria, but physiographic features should also play a significant part in the site design process. Within a given site, soil types, topography, and other conditions may vary dramatically so attention must be given in these areas to insure that the various activities are placed, whenever possible in light of other factors, so as to insure the greatest economy of project development and maintenance.

Slopes over 15%, or under 1% when soil porosity is low, should be avoided, and topographic features which in turn affect climatic conditions should be identified. These features include windward slopes in the direction of prevailing winds which can increase wind velocities, valleys which may contain fog or frost pockets, and increased humidity along coastal lowlands. Any surface drainage channels should be identified and avoided, as should depressions or other marshy areas. Again, the goal is to minimize environmental disruption and landscape reconstruction costs (Fig. F-5-G).

Fig F-5-G

Spatial Concepts

Visual concerns must also be addressed in site planning. The orientation of entrance drives, buildings, and outdoor spaces should take advantage of views to natural features such as distant mountains, hills, bluffs, forests, lakes, and ponds. Hills, bluffs, and forests can also act as a backdrop for, or to help focus attention on, important buildings and also should be used to screen objectionable views.

Likewise, the various buildings or activities on the site should be topographically located so as to reinforce the military hierarchy: i.e., a battalion headquarters building should generally be at a higher elevation than the parking lots or vehicle maintenance shops which support the battalion.

Building Design

After a building has been located on a site, the design of the building itself should reinforce the principles established in site design and master planning, or attempt to correct any deficiencies created in those stages. Buildings should be adapted to their sites for functional, economical, and aesthetic reasons. One example of this is for a large building on a moderate slope to be broken down into segments which step down the hill. This minimizes grading and excavating costs and greatly reduces the visual impact of the building on its surrounding environment. Large buildings can also be sunk into hillsides to reduce their apparent masses. Buildings openings should be located so as to take advantage of natural views (Fig. F-5-H).

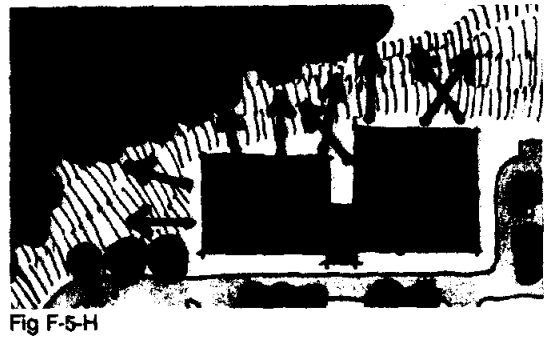
Fig F-5-H