DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

OPEN FILE MAP, 77-797
FROELICH AND HEIRONIMUS –
THICKNESS OF OVERBURDEN MAP,
FAIRFAX CO., VA.

Introduction

Overburden, as used on this map, is all surficial earth materials that overlie bedrock. Overburden includes: alluvial deposits in flood plains; hillside colluvium; soil; artificial fill; residuum on Triassic sedimentary rocks; Coastal Plain sediments; and saprolite on crystalline bedrock. Overburden can generally be moved directly by power shovels, whereas bedrock requires ripping or blasting for removal.

Saprolite is the most extensive unit of overburden in Fairfax County. It is a soft, earthy, clay-rich decomposed material developed in place by chemical weathering of bedrock. Saprolite thickness in Fairfax County reanges from zero to more than 200 feet (60 m). Thickness of saproiite is related to topographic position and to the lithology and structure of the underlying bedrock. Structural aspects important to chemical weathering of bedrock include spacing, distribution, and orientation of parting surfaces, joints, fractures, and foliation (laminated structure resulting from platy minerals such as mica oriented into parallel layers). These factors have a significant influence on ground water movement and chemical decay of bedrock.

Coastal Plain strata in the eastern portions of Fairfax County form the thickest unit of overburden. These sediments form a southeastward thickening wedge and are chiefly comprised of clay and silt interbedded with sand and gravel. Thickness ranges from zero to more than 600 feet.

The contoured intervals in feet are: less than 10, 10 to 50, 50 to 100, 100 to 150, 150 to 200, 200 to 300, 300 to 400, 400 to 500, 500 to 600, and greater than 600.

Data for control on the contours includes the surface elevation of the exposed overburden-bedrock interface, distribution of fresh rock outcrops, and overburden thickness estimates from water well logs, foundation and highway borings, and excavations. In addition, a limited amount of new field geologic, geophysical and core-drilling work was carried out to ascertain overburden thickness in the county. Although the overburden thickness can be generalized, local variations are common. The map is not intended to replace site investigations, which require geologic and geophysical investigations, as well as other studies such as drilling or coring.

In general, the wedge of southeastward thickening Coastal Plain sediments is reflected by the northeast-trending belt of thick overburden (Units 4-10) in the eastern part of the county; the Triassic Lowland in the western part of the county is characterized by generally thin overburden (Units 1 and 2); the Piedmont of central Fairfax County is characterized by irregular north-northeast trending belts of thin to moderately thick overburden (Units 1-4) that reflect the regional trend of bedrock structure and the stream network. (See diagrammatic cross-section). Two relatively large areas of thick overburden in the Piedmont upland are present at Tysons Corner (outlier of Coastal Plain strata) and near Fairfax City (thick saprolite and colluvium). Overburden is thin along most stream valleys and lowlands except in the Coastal Plain or where moderately thick deposits of alluvium occupy broad Piedmont valleys, as along parts of Difficult Run. Thin residuum overlies upland surfaces on Triassic rocks, and little or no overburden overlies quartz veins and ultramafic rocks. Saprolite overburden is thickest beneath upland areas underlain by schist, and areas of locally thick saprolite overlie gneiss, granite and phyllite. Mafic rocks commonly underlie areas of moderately thin saprolite.

Possible Uses of the Map

The map enables a rapid and generalized evaluation of large areas of Fairfax County for surface and subsurface construction. It may be useful in preparing cost estimates based on volumes of easily removable material versus material requiring ripping or blasting prior to removal. When used in conjunction with the bedrock map (Drake and Froelich, 1977) areas of thin overburden over desirable rock types may be delineated for potential quarry sites. These areas may also be desirable sites for construction requiring maximum structural support.

Using this map in conjunction with the relevant engineering tables and a soils map (Porter and others, 1963), surface materials map (Langer, 1977), and base of saprolite map (Froelich and Heironimus, 1977), some areas of greater than 50 feet of overburden may be suitable for location of surface disposal areas and septic-tank leaching fields. Such overburden should be checked for infiltration rates, drainage characteristics and filtering characteristics favorable to these uses. In particular, the Coastal Plain area will require on-site investigations to determine areas that naturally protect sand aquifers from contamination. Areas of thick overburden may also be suitable locations for utility lines and pipelines requiring deep burial. A preliminary assessment of slope stability and potential erosional problems in areas of thick overburden adjacent to steep natural or artificially steepened slopes can also be made using this map. Areas of relatively thick saprolite overburden in the Piedmont contain large volumes of ground-water in shallow storage. Such areas, where underlain by crystalline bedrock with effective fracture permeability, may provide favorable sites for water wells of moderate yield (25 to 100 gallons per minute).

Used with the drainage basin map (Mohler, 1977) a comparison of overburden distribution between different basins can be made. Overburden thickness is one of several factors that influence rates of runoff, and therefore should be considered in land-use planning.

Selected References

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Langer, W. H., in prep., Surface materials map of Fairfax County, Va.: U.S. Geol. Survey open-file report .

Larson, J. D., and Froelich, A. J., 1977, Map showing extent, altitude of base. and thickness of the Potomac Group in Fairfax County, Va.: U.S. Geol. Survey open-file report no. 77-286.

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Nelson, A. E., 1976, Thickness of overburden map of the Herndon quadrangle, Va.: U.S. Geol. Survey open-file report no. 76-310.

Neuschel, S. K., and Froelich, A. J., 1975, Thickness of overburden map of the Vienna quadrangle, Va.: U.S. Geol. Survey open-file report no. 75-520.

Porter, H. C., Derting, J. F., Elden, J. H., Henry, E. F., and Pendleton, R. F., 1963, Soil survey of Fairfax County, Va.: U.S. Soil Conserv. Service, 103 p.

EXPLANATION

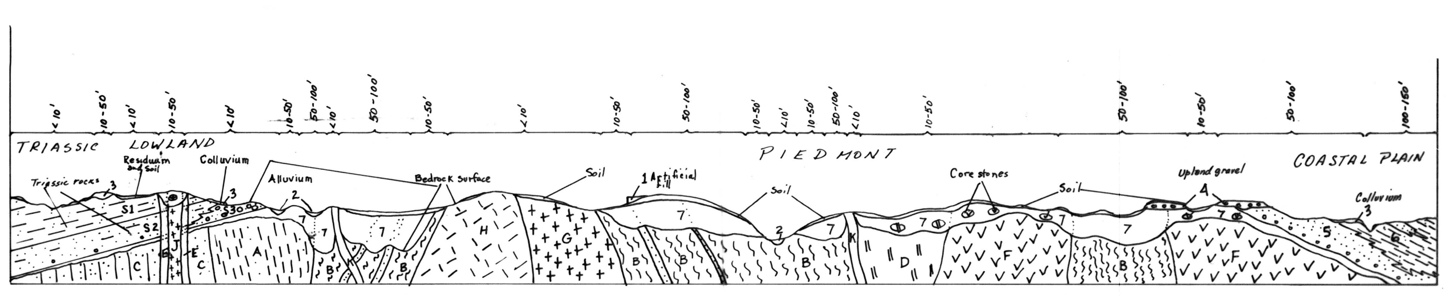
Thickness of Overburden, in Feet Below Land Surface

Interval	Unit	Thickness (feet)
100 ft. interval	10	More than 600
	9	500 - 600
	8	400 - 500
	7	300 - 400
	6	200 - 300
50 ft. interval	5	150 - 200
	4	100 - 150
	3	50 - 100
<50 ft. interval	2	10 - 50
	1	Less than 10 (fresh bedrock outcrops (X) common)

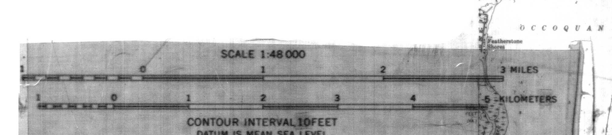
Data Control Point

X Bedrock outcrop - generally fresh; not all outcrops shown

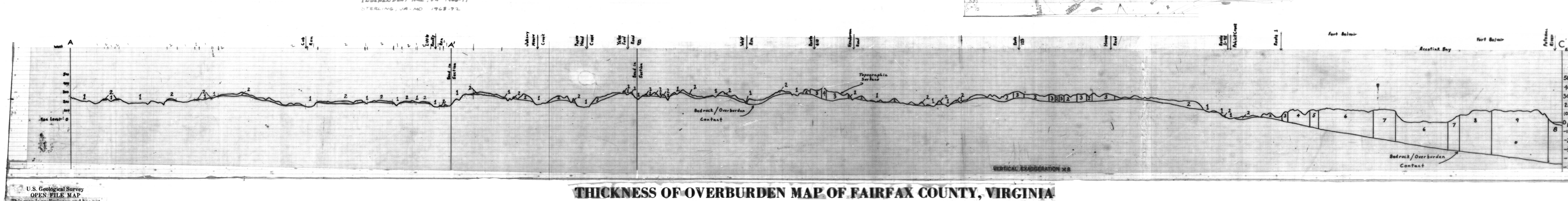
(28) 30• Drill hole, approximately located - number indicates thickness of overburden in feet estimated from driller's logs or inferred from length of casing in water wells; number in parenthesis indicates thickness of saprolite in hole penetrating Coastal Plain strata and terminated in bedrock



Diagrammatic cross section showing the relationship of overburden type and thickness to parent rock type and topography in Fairfax County, Virginia. Bedrock unit: A, phyllite; B, schist; C, metagraywacke, D, gneiss; E, hornfels; F, granitoid rocks; H, ultramafic rocks; J, diabase; K, quartz vein; S1, siltstone; S2, sandstone; S3, conglomerate. Overburden unit: 1, artificial fill; 2, alluvium; 3, colluvium; 4, upland gravel; 5,6, Coastal Plain deposits; 7, saprolite.



SENECA, MD-VA 1968
OCCOQUAN, VA 1966-71
GAINESVILLE, VA 1968-72
INDEPENDENT HILL, VA 1966-71
STERLING, VA-MD 1968-72



THICKNESS OF OVERBURDEN MAP OF FAIRFAX COUNTY, VIRGINIA

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1977