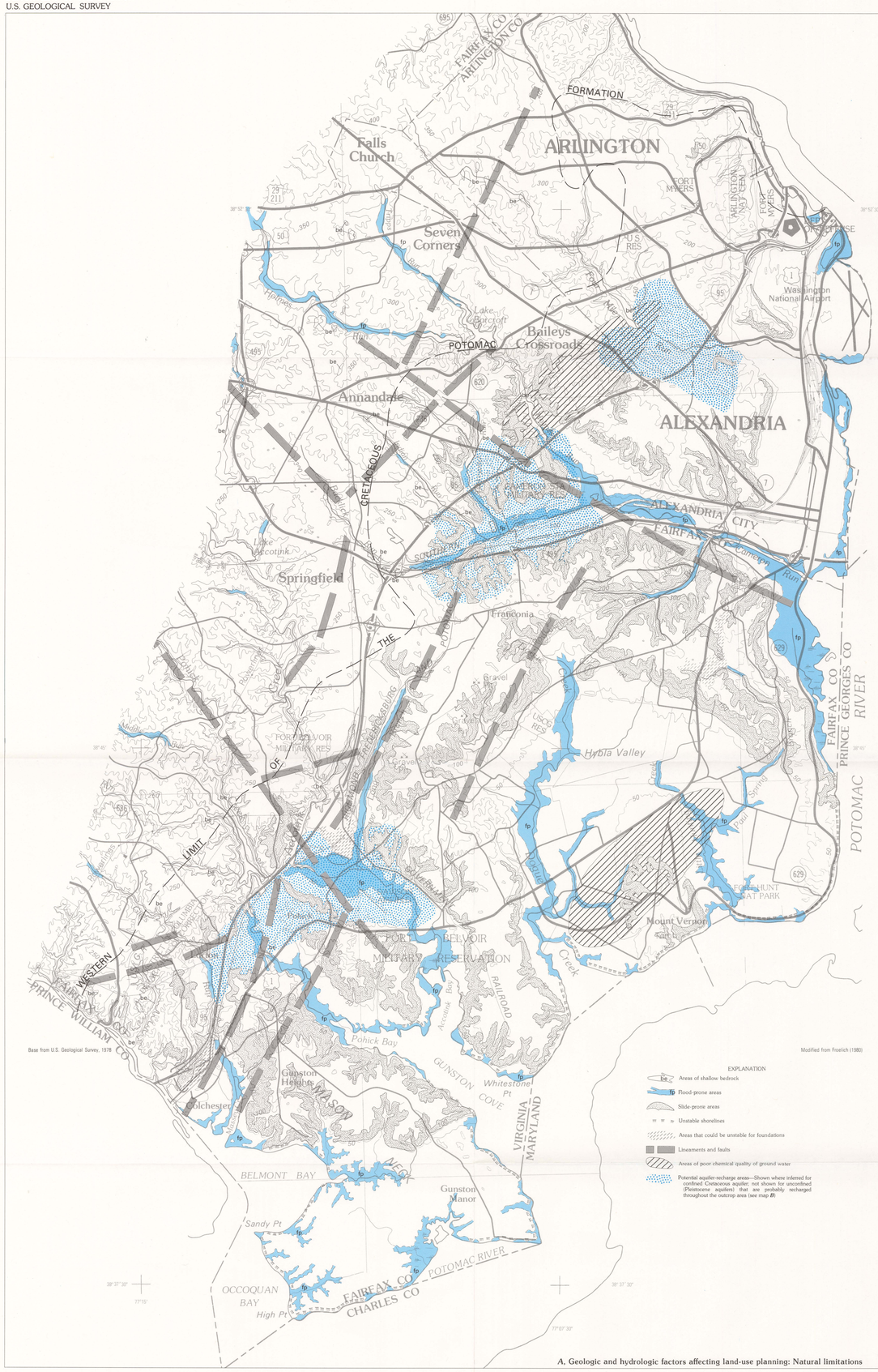
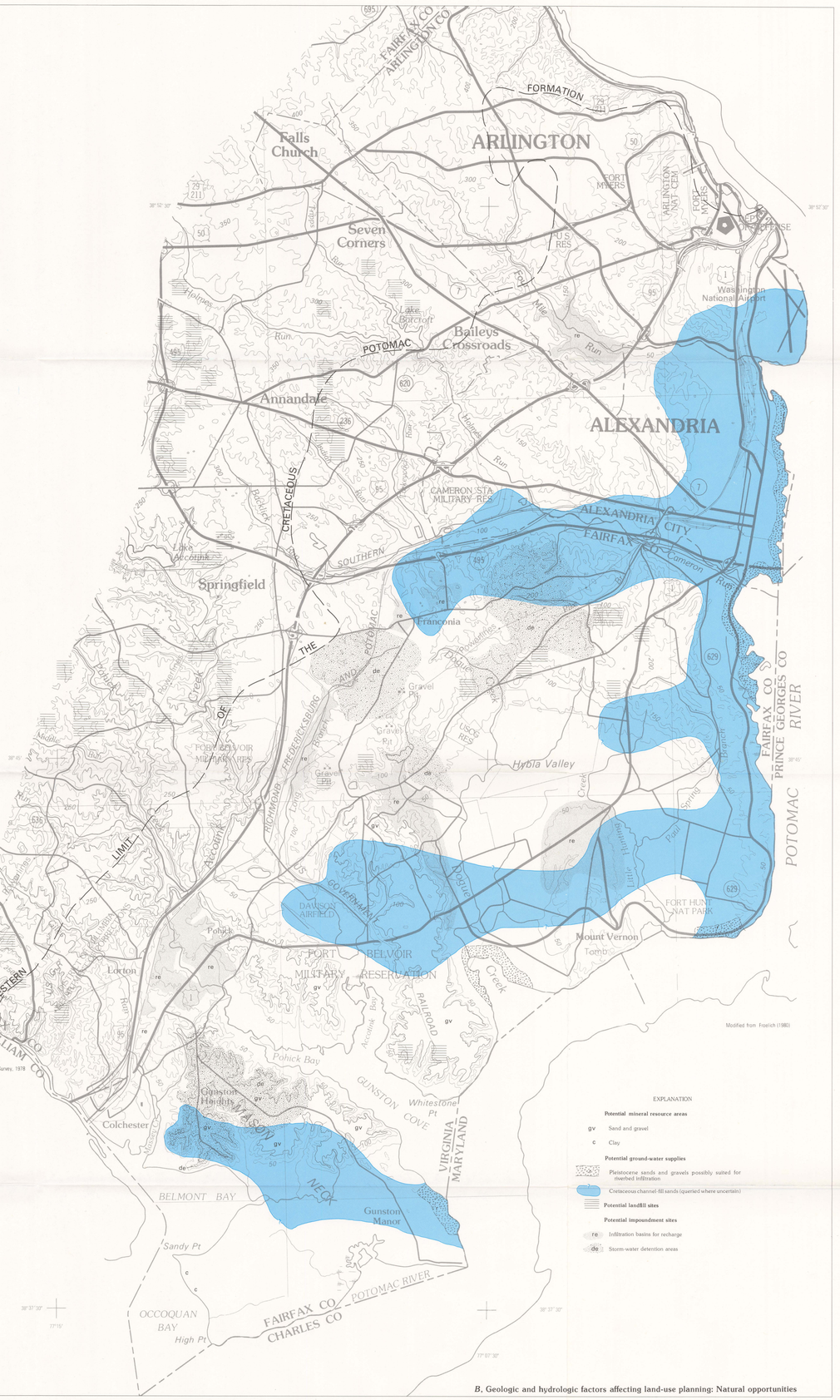


A, Geologic and hydrologic factors affecting land-use planning: Natural limitations



B, Geologic and hydrologic factors affecting land-use planning: Natural opportunities

SCALE 1:48 000
1 0 1 2 3 MILES
1 0 1 2 3 4 5 KILOMETERS
CONTOUR INTERVALS 50 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

INTERIOR—GEOLOGICAL SURVEY, RESTON, VA—1985—GB317

These maps show a composite of selected geologic and hydrologic characteristics that reflect some of the regional limitations (map ***A***) and opportunities (map ***B***) for sensitive long-term planning for land and water use in the Coastal Plain of Fairfax County and vicinity, Virginia. The maps portray the major natural characteristics of the physical environment as perceived by geologists and hydrologists. Original source maps for each factor are listed in the references cited and are available as Open-File Reports, for review at the U.S. Geological Survey library in Reston, Va., and for purchase at the Fairfax County Office of Comprehensive Planning, 12th floor, Massey Building, Fairfax, Va.

Map ***A***, showing limiting geologic and hydrologic factors, defines areas where certain types of land use may be more desirable or more cost-effective than others. It does not portray limitations to all types of development. Furthermore, some factors shown indicate serious potential hazards, whereas others present only minor engineering problems; in fact, some factors are neither limitations nor opportunities. For example, the presence of a potential aquifer recharge area suggests that low density residential use in the area is likely to pose fewer problems to ground-water resources than would waste disposal in the same area.

To be used realistically, a map of the developed areas and those areas occupied by national, State, and county parkland should be superimposed on map ***A*** in order to focus attention on the less-developed parts of the map area where choices for optimum land use remain.

Map ***B***, showing advantageous geologic and hydrologic factors, portrays areas where the geologic setting may offer a specific factor or favorable combination of factors particularly well-suited to a specific land-use or multiple related uses. Although shown separately on two maps for simplicity, both limiting and favorable geologic factors commonly overlap or coincide. A preliminary evaluation of a local area may reveal potential or apparent land-use conflicts; thus, the user should refer back to the primary source maps to define relevant factors and to clarify potential problems. For example, an apparent "conflict" may be present in the Coastal Plain where slide-prone clays are present on slopes above a potential aquifer at depth. However, in this example, no true land-use conflict is present; the limitation to development at or near the surface is largely irrelevant to development of the ground-water resources.

Natural factors deemed to be potential *limitations* to certain types of development include:

1. *Flood-prone areas* (Mohler and Novak, 1978)—Valley floors subject to inundation by the 100-year flood.
2. *Slide-prone areas* (Obermeier, 1979a; Force, 1975; Drake and others, 1979)—Moderately to highly unstable slopes on expansive clays and interbedded clay-rich sands.
3. *Unstable shorelines* (Obermeier, 1979a)—Unstable cliffed headlands of nonconsolidated sediments or expansive clays and interbedded sands.
4. *Unstable foundation conditions* (Langer, 1978; Obermeier, 1979b)—Nearly level to gentle slopes on expansive clays. These clays shrink when dry and swell when wet, predicting drainage problems and causing differential stresses on foundations.
5. *Lineaments and faults* (Froelich, 1978)—Linear zones of past or potential weakness that include faults, shear zones, through-going joint systems, prominent inferred structural alignments apparent on LANDSAT imagery, and topographic alinements. Such zones are potential avenues for ground-water contamination and may pose significant engineering problems to foundations.
6. *Areas of poor chemical quality of ground water* (Larson, 1978)—Lower Potomac (Cretaceous) aquifers locally contain water having high sodium chloride, iron, and total dissolved solids. Water quality of Pleistocene-age potential aquifers is unknown.
7. *Potential aquifer-recharge areas* (Johnston and Van Driel, 1978; Johnston and Froelich, 1977; Drake and others, 1979)—Lower Potomac aquifers are recharged partly from the outcrop belt, partly from the subcrop beneath permeable upland gravels, and partly from vertical leakage in areas where overlying clay beds are thin, absent or fractured, and where downward hydraulic gradients exist. Potential aquifers of Pleistocene age are recharged naturally by infiltration in outcrop areas; however, recharge may be induced by wells located close to the Potomac Estuary (Froelich and others, 1978).

Areas considered to provide potential *opportunities* for specific types of development or land use include:

1. *Mineral resource areas* (Froelich, 1976)—For construction materials, such as potential sites for extraction of sand, gravel or clay. Because of their high place value such resources require prior assessment to plan for sequential long-range use and reclamation.
2. *Potential ground-water supplies* (Johnston and Larson, 1979)—*Coastal Plain aquifers* include Cretaceous channel-fill sands at depth that are potential sources of supplemental municipal and industrial water supplies and Pleistocene sands and gravels adjacent to the Potomac Estuary that may supply water to wells by means of riverbed infiltration (Froelich and others, 1978).
3. *Potential landfill or sludge disposal areas* (Johnston and Van Driel, 1978; Van Driel, 1980; Lewis, 1981)—Areas where thick unconsolidated material occurs on upland surfaces with no major lineaments or fractures and where certain conditions that can minimize contamination to surface and ground-water supplies are present. Requires consideration of many other factors prior to final selection.
4. *Potential impoundment sites* (Johnston and Larson, 1976; Froelich and Heironimus, 1977; Drake and others, 1979; Mohler and Novak, 1978)—*Infiltration basins* in the Coastal Plain are temporary storm-water runoff pits underlain by porous sands that can serve to recharge an underlying Cretaceous aquifer. *Storm-water detention ponds* are temporary storm-water runoff storage ponds, which are underlain by impermeable clays, designed to delay flood peaks.

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Sheet 5 of 5: Maps showing some geologic and hydrogeologic factors affecting land-use planning in the Coastal Plain of Fairfax County and vicinity, Virginia: Limitations and opportunities

FOLIO OF GEOLOGIC AND HYDROLOGIC MAPS FOR LAND-USE PLANNING IN THE COASTAL PLAIN OF FAIRFAX COUNTY AND VICINITY, VIRGINIA

By
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1985