NATURAL CHARACTERISTICS

The natural characteristics of a community have a critical impact on overall development patterns and on the choice between conservation and development alternatives. In some cases, these natural characteristics are limitations that will create serious impracticalities in development because of excessive cost for land preparation, improvements and/or construction. In other cases, critical and unique areas would be forever lost if development were to proceed. Hazards might be created to both life and property. As public health, safety and environmental values are all critical factors that must be taken into consideration, analysis will suggest that, while there are good building sites in the City of Rensselaer, there are other land areas that either should be retained in a natural state or developed for open space purposes.

In order to properly determine where such areas are located in the City, and particularly along its riverfront, the following natural characterisitcs have been inventoried, based upon available and observable resource information:

- surficial/glacial geology
- soils
- topography/slope
- topography/relief
- water resources
- flood-prone areas

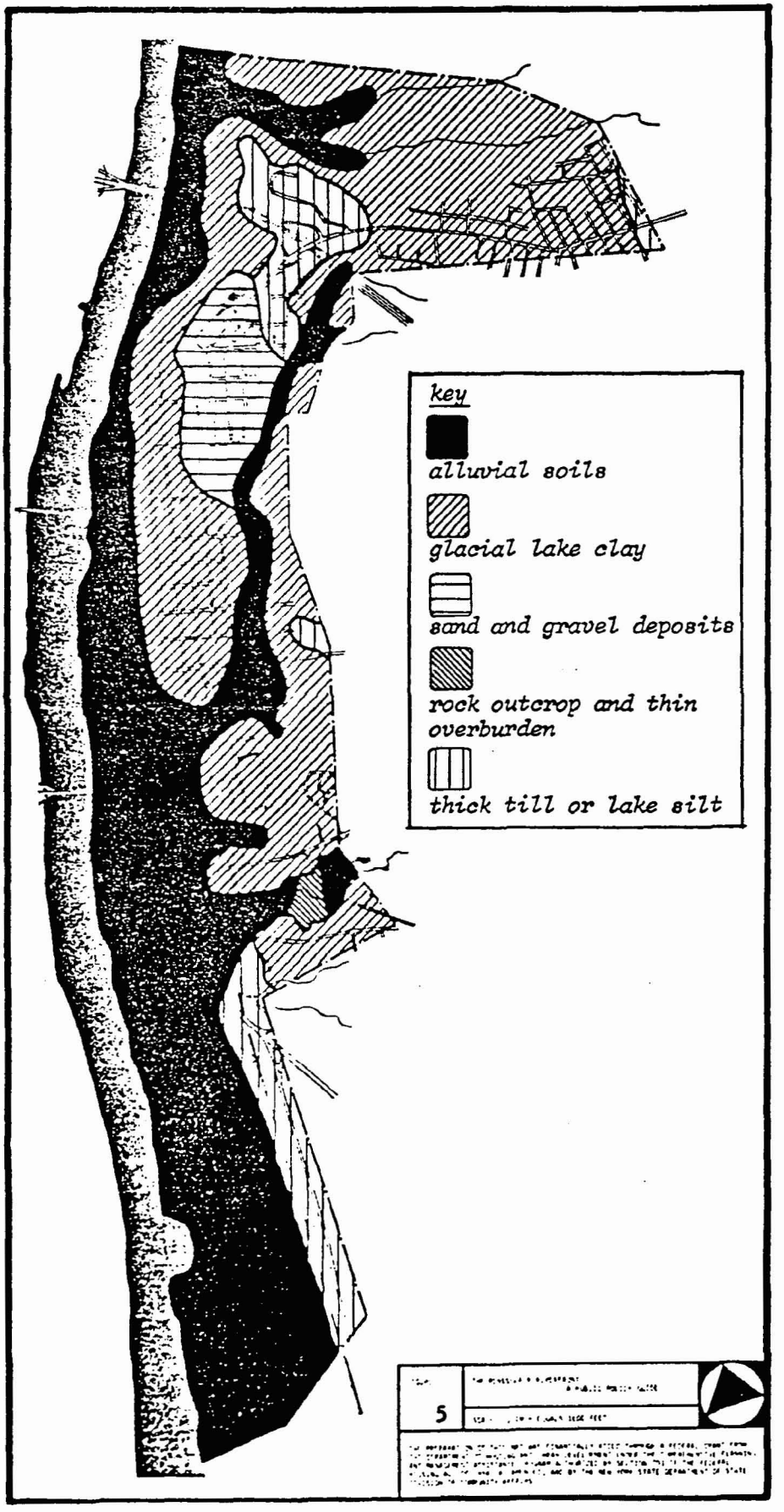
surficial/ glacial geology

A consultant geologist has mapped the various surface deposits and geologic situations encountered in Rensselaer County. Figure 5 provides these data for the City of Rensselaer. Broad areas of potential geologic hazard or restraint are shown. This map does not pinpoint on a lot-by-lot basis where particular problems will occur, but indicates where they do have a high probability of occurring.

The five mapping units and their basic implications for land use and development activity are as follows:

- Alluvial soils of modern origin are those soils typically found on the flood plains of streams and rivers, and in areas of swamps and marshes. Generally, this unit depicts bottom land frequently subject to flooding, and areas where the water table lies close to the surface, usually within five to ten feet.

surficial/
glacial geology



- o Glacial lake clay is generally laminated and stone-free. Percolation in this material is very poor; runoff is consequently rapid. The surface is soft and muddy when saturated or hard and brittle when excessively dried. Shoulders of gullies and slopes are subject to landslides, and slope faces are highly susceptible to surface creep. The conditions for development are negative, particularly so if associated with a slope condition.

- o Sand and gravel deposits are areas with good percolation and absorptive capacity. These areas have little geologic hazard for development. If currently undeveloped, these areas represent a potential source of aggregate and are therefore subject to pressure for excavation.

- o Rock outcrop and thin overburden are areas of semi-consolidated material of glacial origin overlying rock, generally with less than five feet to the rock surface. Excavation is difficult, construction cost is high, and downward percolation of water extremely limited where this situation is encountered.

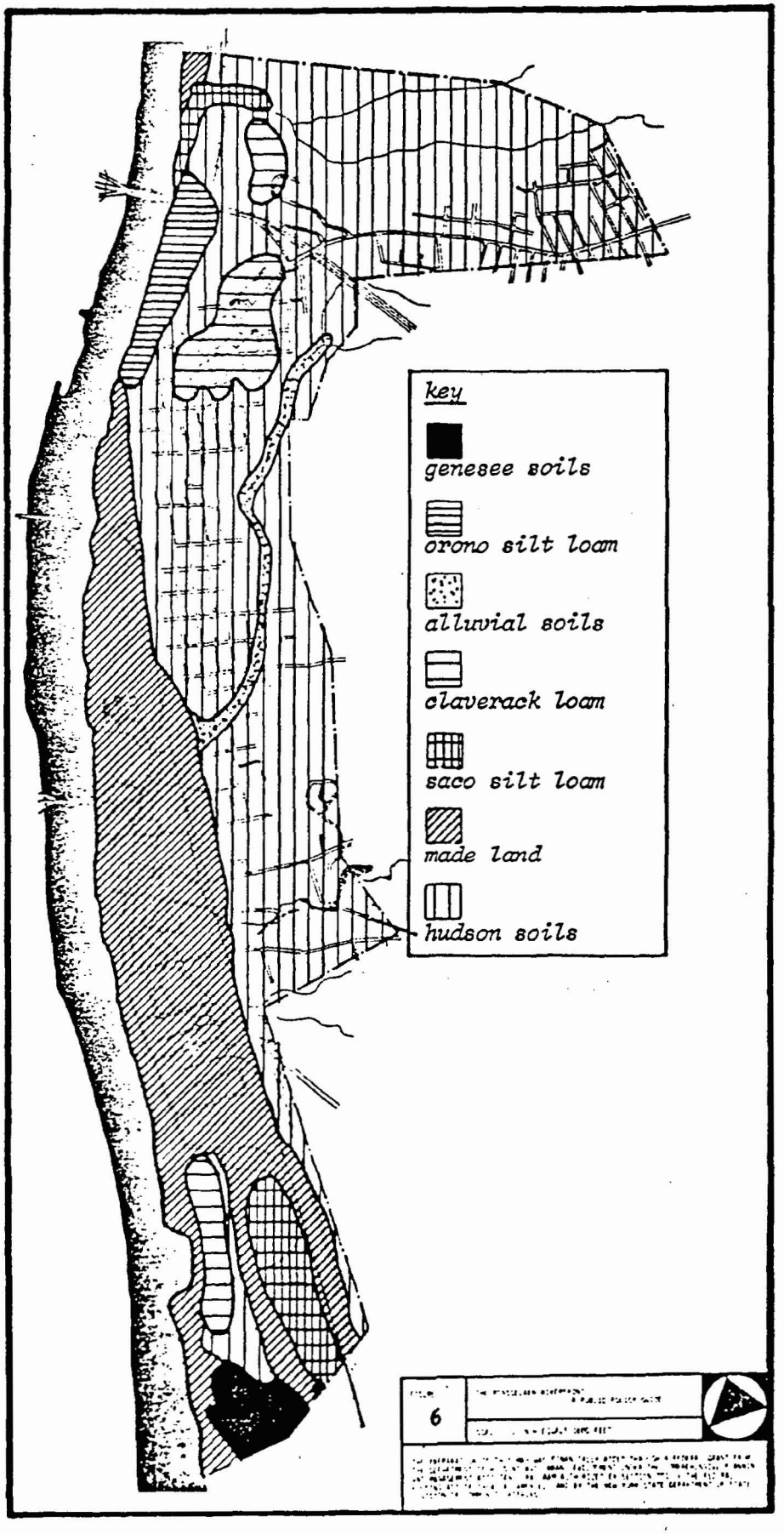
- o Thick till or lake silt are areas of dense, fine-grained matrix material in which is suspended a variety of stones and rock fragments. Slopes in excess of fifteen percent are often associated with the edges of such a deposit.

soils

Soil Conservation Service investigations provide detailed information regarding soils that is extremely useful for planning purposes. This information is limited in part by the range of SCS study, extending to a depth of some four to five feet below the surface. Thus, if significant cut and fill activity occurs on a particular site, the value of this soils information will be greatly reduced. A second limitation concerns the category "made land." Where land has been created by man, by dredging, fill or other activity, SCS can do little more than identify the condition and indicate that soils for these areas must be evaluated on a site-by-site basis, even for detailed planning purposes. In all instances, a soils engineer should be a key part of the design team for major development, including subdivision activity.

Figure 6 indicates the particular soils found in Rensselaer. SCS has provided the following brief description of these soils. An estimate of the percentage of the lands in Rensselaer falling under each description is also noted.

soils


key
genesee soils
orono silt loam
alluvial soils
claverack loam
saco silt loam
made land
hudson soils
6

- Genesee soils (2%) are deep, well-drained soils occurring on stream bottom land. Genesee soils have a brown silt loam or loam surface soil eight to ten inches thick which grades into a yellow-brown silt loam of fine texture to a depth of forty to forty-eight inches. In some cases, the soil becomes slightly heavier below this depth. The surface soil may be acid, but in most locations it is mildly alkaline or neutral. The subsoil everywhere is alkaline.

- Orono silt loam (2.5%) occupies level or slightly depressed imperfectly-drained areas. The surface soil is granular silt loam to a depth of five or six inches where it passes into a slightly firm silt loam. At a depth of ten to thirteen inches is found a heavy silt loam overlying a very slowly permeable bluish-gray, compact, silty clay loam.

- Alluvial soils (4%) occupy areas along streams subject to flooding in either Spring or periods of heavy rainfall. The soils consist primarily of silt or very fine sands that have been moved and redeposited by stream action. Alluvial soils are generally poorly drained soils with moderately fine-textured subsoil. Development limitation is severe.

- Claverack loam (5%) is a deep, moderately well-drained, strongly acid to neutral coarse-grained soil that formed in sandy lake sediments that overlie clayey lake-laid deposits. The soil is typically stone-free. This nearly level, or undulating to sloping soil, is found on deltas or similar sandy sediments associated with glacial lake deposits. Claverack loam has seven to ten inches of friable to loose, rapidly permeable, loamy fine sand to fine loamy sand over thirteen to thirty inches of very friable, rapidly permeable loamy fine sand or fine sand. The substratum is generally firm, very slowly permeable, calcareous silty clay loam.

- Saco silt loam (6%) is an alluvial, very poorly drained soil frequently occurring on flood plains and other bottom land. It is subject to frequent overflow and is often covered by slack water. It is characterized by a four to six inch dark surface soil high in organic matter, overlying a silty clay loam subsoil which passes below a depth ranging from fifteen to twenty inches, into a tough and plastic clay. In most places this clay is acid above

thirty-six inches and may be calcareous below that depth. Cattails or coarse grasses are prevalent. This soil is severely limited for urban development, providing good sites for wetland and wildlife development.

- Made land (31%) is located along major sections of the riverfront. It consists of dredgings of gravel, sand and mud from the Hudson River, material from building excavations, railroad-associated cinders and trash. This material was used to fill in low areas, marshes and bottom lands and in most places this material is raw and covers the original land surface to a depth of several feet. Made land is usually of little value in supporting quality vegetation.

- Hudson soils (49.5%) are deep, moderately well to well-drained, medium acid to neutral, fine textured soils formed in calcareous, clayey glacial landforms that were mantled with lake sediments. Hudson soils have one to two feet of moderately slowly permeable silt loam or silty clay loam over slowly permeable silty clay loam over slowly permeable silty clay to a depth of three and one half feet. These materials are generally underlain by slowly permeable lake-laid deposits consisting of layers of silty clay or clay separated by thinner silty layers. Hudson soils are frequently associated with steep slope conditions. In these areas frequent land slides and erosion are constantly causing the formation of new surface soils, so that it may be difficult for tree growth or other vegetation to get started.

In summary, the soils in Rensselaer are primarily composed of silty and clayey material of outwash and terrace origin. They generally overlie a soft shale bedrock, the bedrock through which the Hudson River carved a trench about one mile wide and some two hundred feet below the earlier plain level. Both the predominance of clay composition soil in the bulk of the City and the uncertainties inherent with man-made land generally in the remainder present severe development limitations.

topography/ slope

The slope of the land, which is a function of topography, has an important bearing on the development of land, both for urban and recreation purposes. Slope which is too steep makes it difficult to lay out streets, site buildings, and provide utilities or other improvements. Slope is usually expressed in terms of a percentage; for example, land which rises or falls ten feet in a vertical sense for each one hundred feet of movement in a horizontal sense is said to have a slope of ten percent.

While technologically it may be possible to build on any slope, the problems and costs associated with both initial development and long-term maintenance typically increase as slopes increase. Drainage problems may also exist where there is too little slope. A traditional planning standard suggests that all urban development be discouraged in areas where slopes exceed fifteen percent. Public improvements, such as the laying of streets and utilities, should be restricted to flatter slopes, with ten percent being a workable standard.

Slopes generalized within the City of Rensselaer are mapped on Figure 7 in the categories zero to three percent slope, three to fifteen percent slope, and slopes in excess of fifteen percent.

topography/ relief

Relief, or land elevation, is a second function of topography. Relief in Rensselaer ranges from less than five feet above sea level at the Hudson River to two hundred fifty-five feet near the "rock cut" on Washington Avenue in the Eastland Park area of the City. Figure 8 exhibits a mapping of relief at forty feet intervals. The first forty feet contour is particularly significant to this study, for it establishes a natural boundary for defining "The Riverfront."

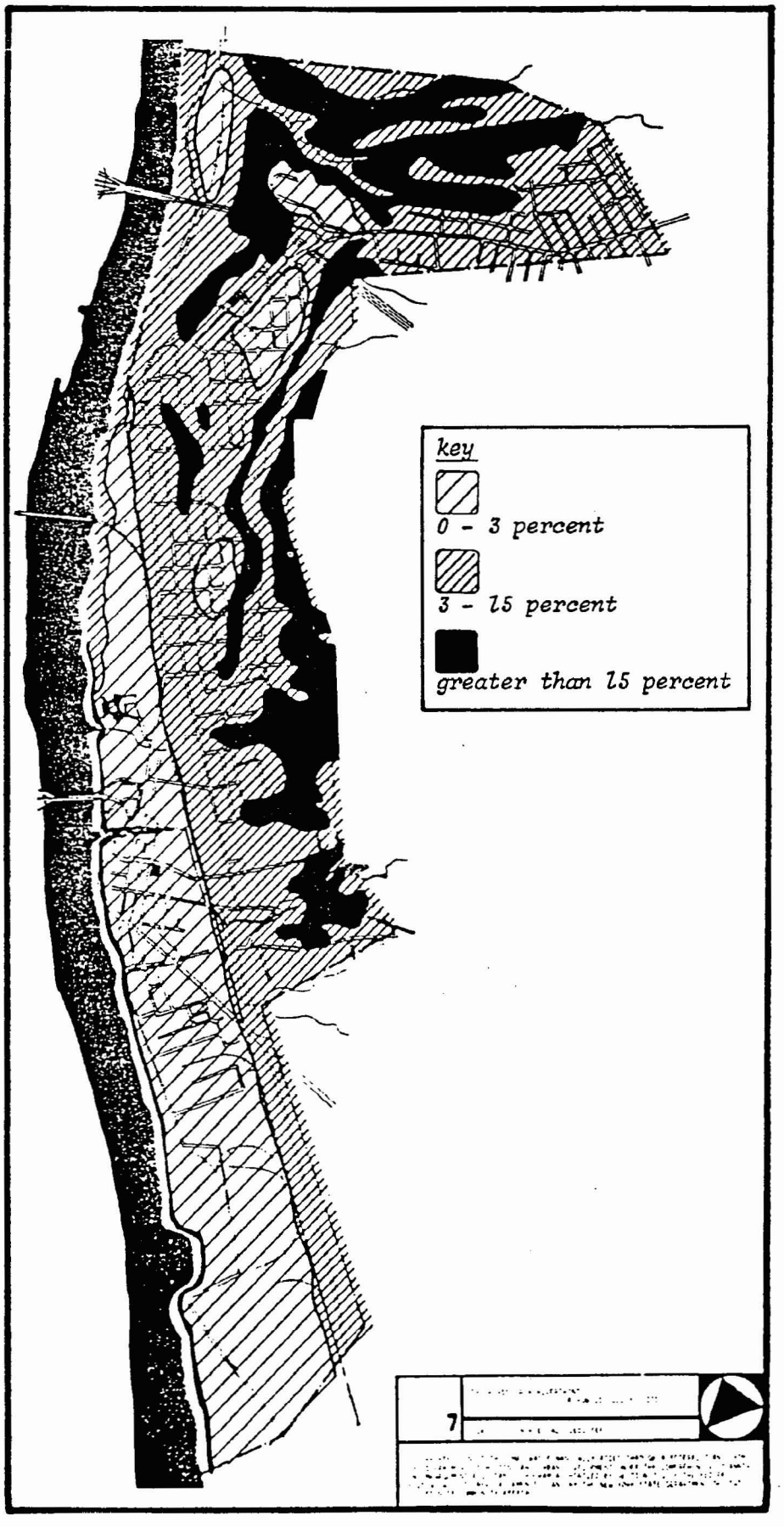
The relief profiles that are also included on Figure 9 identify Rensselaer's four basic landforms. From west to east across the City, the landforms are as follow:

- River flat - basically a riverfront shelf which varies from 400 to 2000 feet in depth from the Hudson shoreline. Much of this riverfront shelf is man-made land, created by the Army Corps of Engineers in their efforts to channel the Hudson to improve navigation and flood control in the area. Areas of either concrete or wooden dike, constructed and maintained by the Corps, are located along major sections of the riverfront.

- Sloping land - a relatively steep escarpment is penetrated at several locations by deep east to west ravines, generally wooded and with slopes in excess of twenty to twenty-five percent.

- Plateau land - a major portion of residentially-developed Rensselaer. The broad plateau lands slope gently upward to the east and are framed by tree-lined ravines.

topography/slope



topography/relief

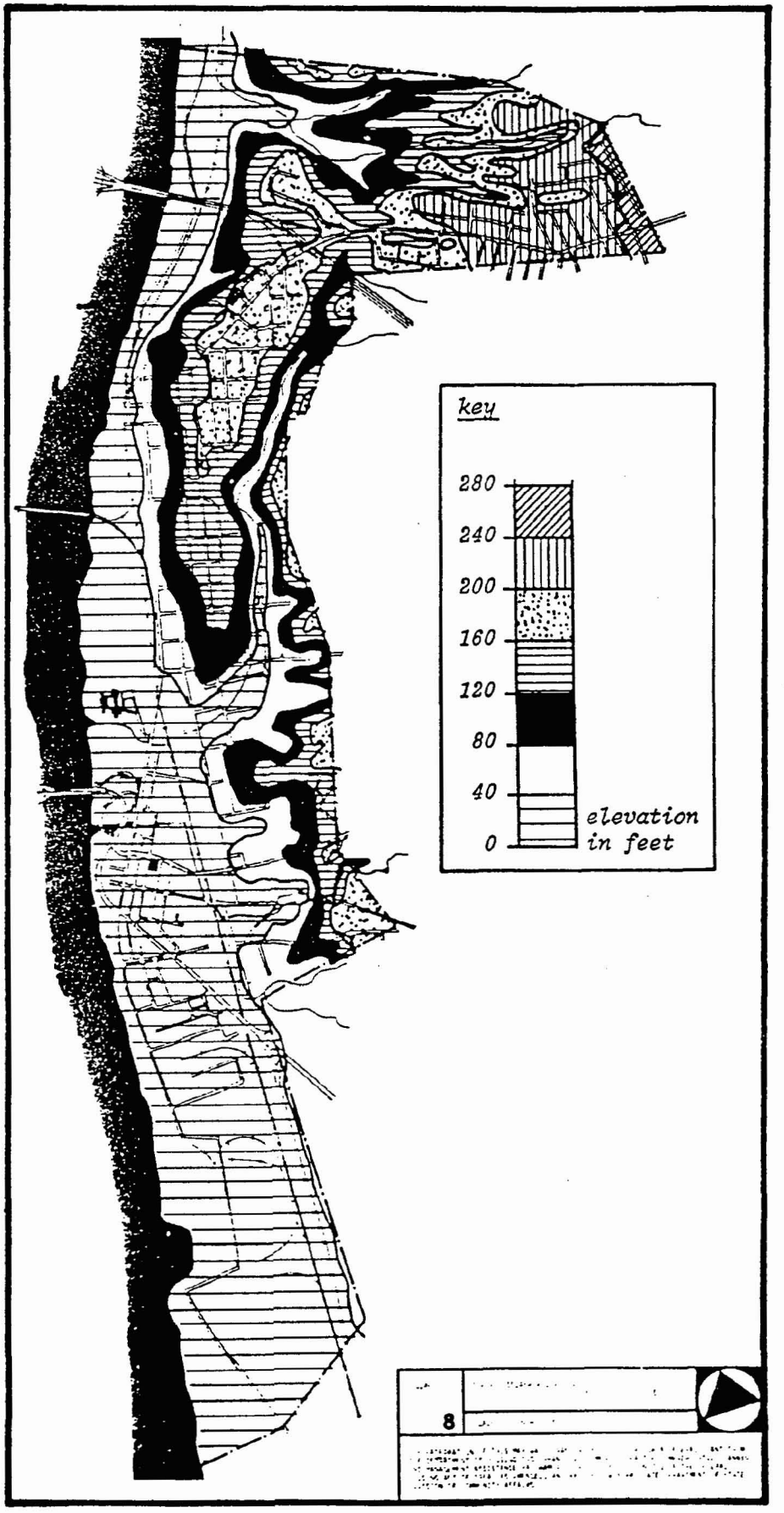
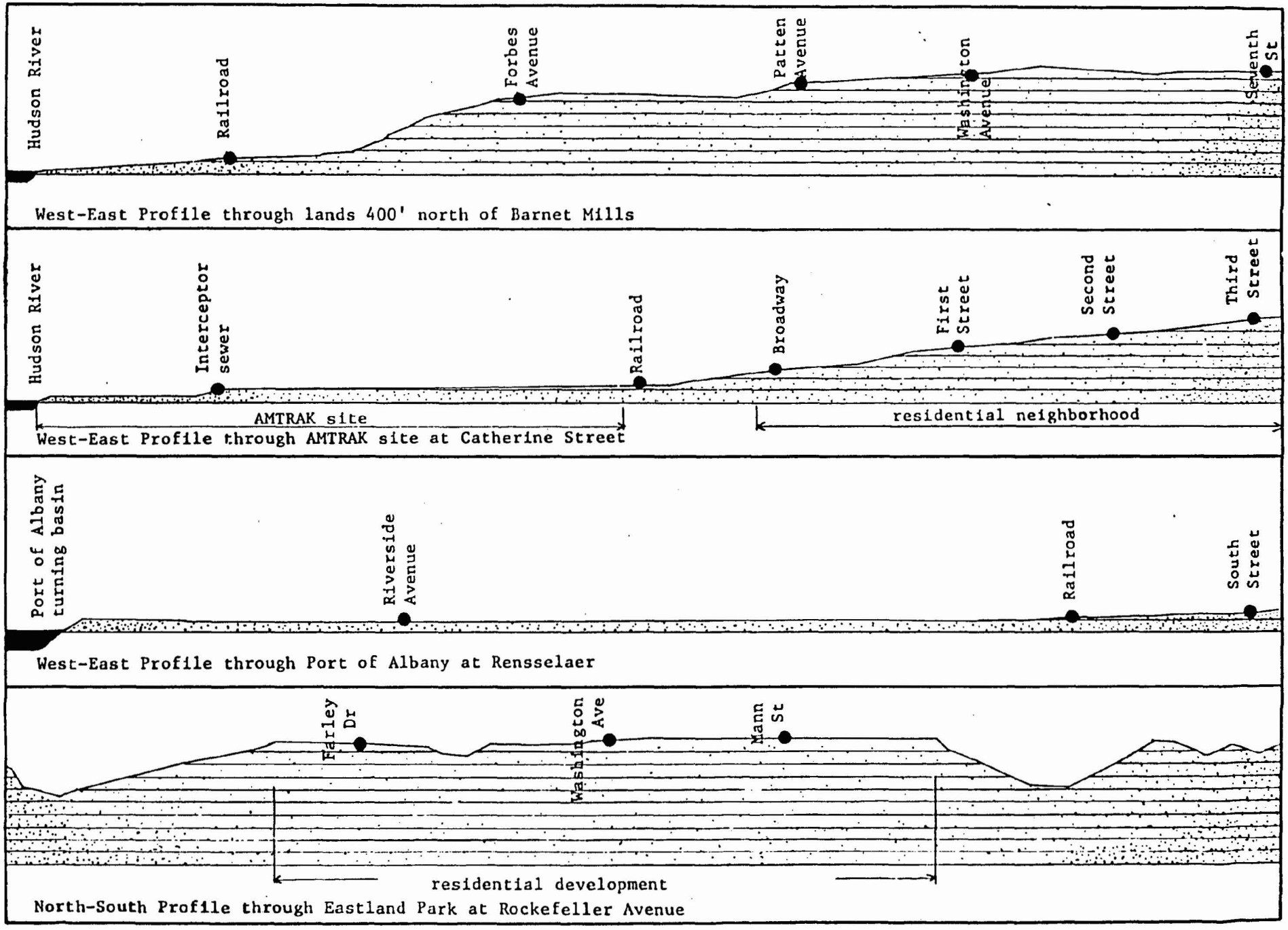


FIGURE 9: RELIEF PROFILES



- The "Big Hollow" - a deep north-south ravine along the central eastern boundary of the City, through which flows the Quackenbush Creek. Slopes along both the east and west sides of the Big Hollow range from twenty-five percent to nearly vertical.

water resources

An inventory of the surface waters of the City of Rensselaer is clearly dominated by the Hudson River. The Quackenbush Creek and the Mill Creek are tributaries of the Hudson flowing through Rensselaer. While the Quackenbush drains only the Big Hollow and its immediate environs, Mill Creek is considerably more significant, for its drainage basin of some fifteen and eight-tenths square miles includes major urbanizing portions of the Town of East Greenbush. Two noteworthy features along Mill Creek are a picturesque water fall as the stream breaks sharply down the escarpment to the west of High Street, and Huyck Pond created by the low dam just east of Broadway. A high degree of silting is currently present in both streams.

The Hudson River at Rensselaer is a tidal estuary, some 800 to 1000 feet in width, with a channel depth of thirty-two feet at the Port of Rensselaer. The mean tidal range is recorded as five and three-tenths feet, with a low water level of about three feet below mean sea level. The area from the Hudson's junction with the Mohawk River at Waterford to its mouth some one hundred and fifty miles south at New York Harbor, thus including the Rensselaer Riverfront, is considered part of the Lower Hudson Drainage Basin.

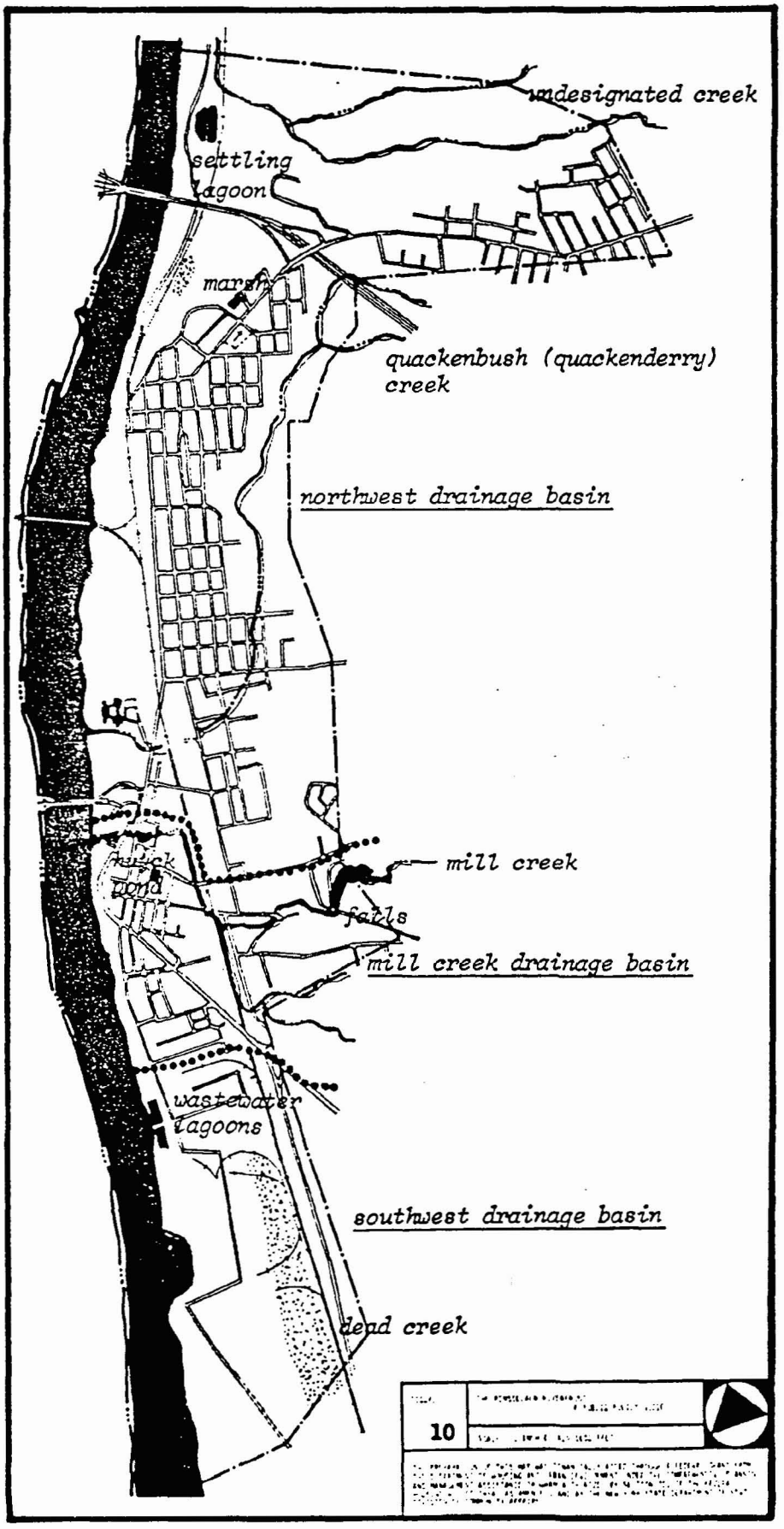
The only non-flowing surface water bodies are a man-made settling lagoon complementary to the gravel washing operation north of the Patroon Island Bridge and a waste-water treatment lagoon in the Port-Industrial District.

The City is divided into three natural drainage areas, being divided by Mill Creek which drains the lands generally north of the Port and south of Third Avenue. These drainage areas and surface waters are shown on Figure 10.

flood-prone areas

Perhaps the most significant natural characteristic of the City of Rensselaer is a strong susceptibility to flooding along its western edge, the Hudson Riverfront. The associated planning implication is an absolute necessity to comply with the full requirements of the National Flood Insurance Program, as was discussed earlier.

water resources



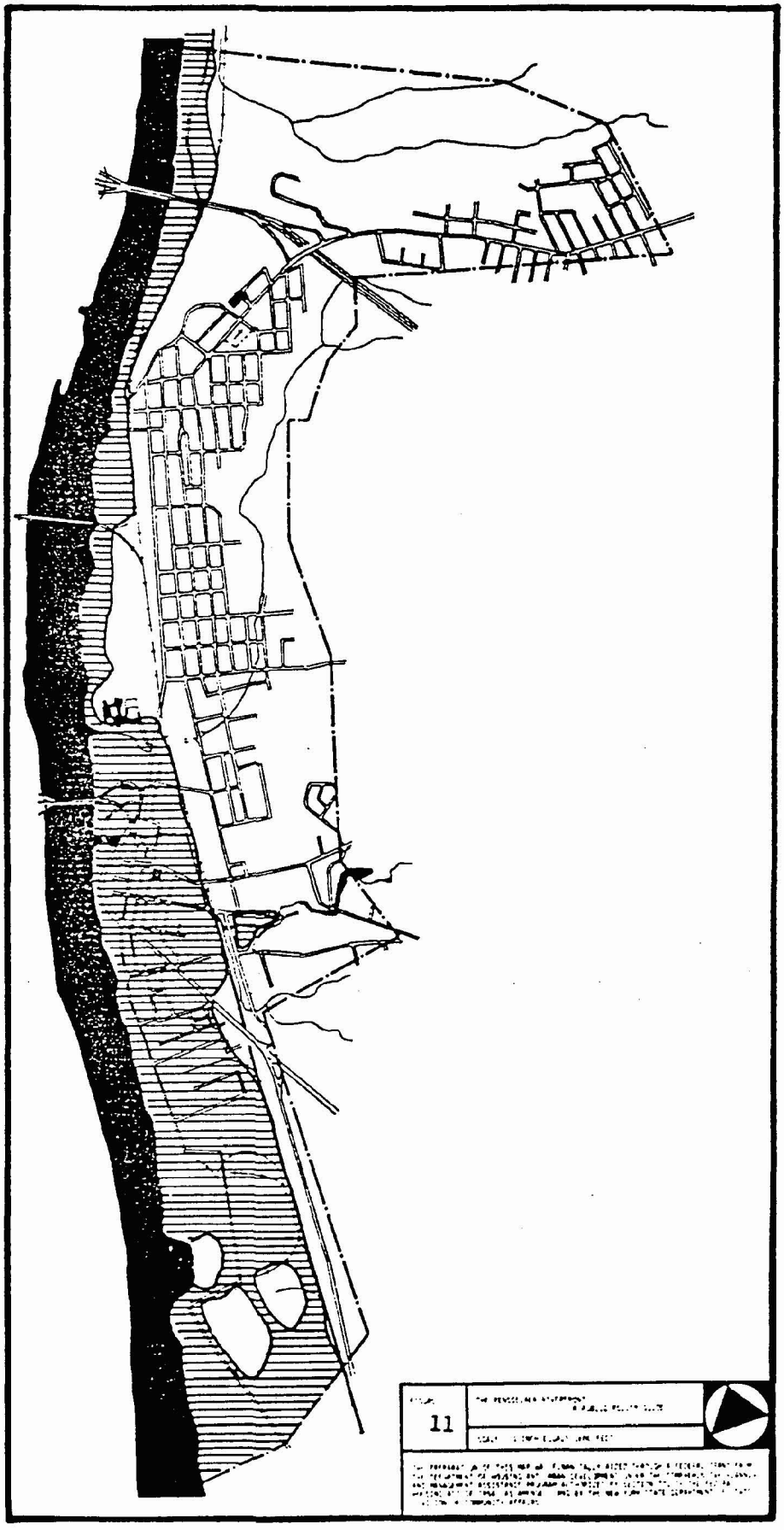
The City received a preliminary Flood Hazard Boundary Map from the Federal Flood Insurance Administration on 26 July 1974. This notification identified nearly all of the City to the west of the Penn Central and Troy-Greenbush Railroad tracks as a "special flood hazard area;" exceptions were made for two major areas, lands immediately east of the turning basin at the Port of Rensselaer and extending into the northeast corner of the tank farm and, secondly, the High School site, where adequate attention was given to possible flooding during the design and construction phase, and the eastern two-thirds of the lands now of AMTRAK immediately to the north. In the preparation of its initial application for certification under the National Flood Insurance Program, the City was in communication with the United States Geological Survey concerning approximate 100-year flood elevation (the design standard included the legislation for determining the boundary of the flood fringe area). Twenty feet, plus or minus a foot, was reported as approximate 100-year flood elevation at the Patroon Island Bridge, and nineteen feet, plus or minus a foot, for the riverfront area from the Livingston Avenue railroad bridge south to the City limits.

During the course of this study, the initial updating of this flood hazard information was received from a consulting engineering firm under contract to the Federal Flood Insurance Administration. Their map essentially substantiated the earlier information provided by USGS and somewhat refined the map of July 1974. This latest map serves as the basis for Figure 11 .

The USGS has also provided a set of preliminary figures derived from a standard, machine-run hydrological calculation of flood elevations for a location behind the old Federal Building in Albany, where a gauging station has been operational for several decades. All elevations reported refer to mean sea level and give an indication of frequency and elevation of flooding to be expected on the Rensselaer Riverfront. The actual number of occurrences of such flooding since 1930 has been compiled using freshet data obtained from the Army Corps of Engineers:

Flood Frequency	Flood Elevation	Actual Occurrences Past 45 Years
2 years	8.6'	30
5 years	11.2'	9
10 years	13.1'	6
25 years	15.9'	3
50 years	18.3'	1
100 years	20.8'	last occurrence 1913
200 years	23.6'	last occurrence unknown
500 years	27.8'	last occurrence unknown

flood hazard areas



The actual occurrence data would suggest the projections to be, if anything, conservative. These elevations might be interpreted more easily by giving the elevation of several readily-identifiable street intersections within Rensselaer:

- Columbia Street at Broadway 16' (approximate)
- Columbia Street at Aiken Avenue 13' (approximate)
- Aiken Avenue at Broadway 17' (approximate)

Using these figures, for example, it is easily seen that a 100-year flood (a flood which has a probability of occurring once each hundred years, but may occur any number of times during that period, even in successive years) would place the intersection of Columbia Street at Broadway under four and eight-tenths feet of water. Seven and eight-tenths feet would be standing at the intersection of Columbia Street and Aiken Avenue. Similar flooding has been recorded in Rensselaer in the past. The floods of March 1913, March 1936, September 1938 and January 1949 are statistically the most substantial at Rensselaer. The March 1913 flood is the only one of these which preceded the Hudson River Regulating District's construction of the Sacandaga Reservoir Dam in 1930 which, though primarily designed to augment low flows in the Hudson during periods of little precipitation, does have incidental flood control benefits. Maximum flood elevation data for these four occurrences on the Hudson River at State Street in Albany are, according to the Army Corps of Engineers, as follows:

- March 1913 21.45'
- March 1936 17.86'
- September 1938 16.49' (when clock stopped)
- January 1949 18.75'

These data indicate, for example, that the calculated 25-year flood elevated was actually exceeded thrice within the thirteen-year period of March 1936 through January 1949, and further that there have been no such occurrences since that time.

ENVIRONMENTAL STANDARDS

As pointed out in the earlier discussion of Federal and State programs and policies that impact existing and potential development activity in Rensselaer, an increasing emphasis is being given to environmental standards, particularly in terms of water and air quality. The issue of noise is also being addressed.

water quality

Surface waters are classified, as shown below, according to "best usage," that is, the usage of the water requiring the highest level of quality standards and considered to be in the best interest of the public.

Class	Best Usage
AA & A	Water Supply
B	Bathing and Recreation
C	Fishing
D	Agriculture
E	Sewage and Wastes/Transportation
F	Sewage and Waste Disposal

The recommended classifications for the surface waters of the Hudson River, Mill Creek and Quackenbush Creek in the City of Rensselaer are "C". The classification is based on the results of water sample analyses and pollution source investigations. Studies prepared by the Water Resources Commission for the New York State Department of Health recommend such a "C" classification for that part of the Hudson River between its confluence with the Mohawk to the southern boundary of Rensselaer County. Downstream recommended classification of the Hudson is considerably higher, broadening its recreational potential.

The recommended "C" classification implies that the water can not be used as a water supply source for public consumption, food processing, or contact recreation, such as swimming. However, water classified "C" is considered suitable for fishing (barring PCB's as an issue) and activities such as agriculture, industrial cooling and transportation.

Continuing improvement in the actual water quality of both the Hudson and its tributary streams is expected to improve as a result of sewage treatment plant construction and new waste treatment policies at the State and Federal levels requiring treatment of all domestic and industrial wastes before discharging into the river.

air quality

Definitionally, "air pollution" is any substance in the air which is potentially injurious to health, property and vegetation. Air pollutants are, therefore, both physically and economically harmful. Carbon monoxide (CO), sulfur oxide (SO_2), nitrous oxide (NO_2), hydro-

carbons (HC), particulate matter and ozone are the primary air pollutants addressed.

Certain environmental factors, with an emphasis placed upon climate and topography, affect air pollution. Wind and air influence the travel of pollutants, in terms of speed and direction. Air temperature inversion, for example, prevents the transporting of pollutants from their point of origin. Precipitation has a reverse impact; it cleanses the air of pollutants.

The valley topography heightens the potential for surface inversions which trap air pollutants near their origin. Such surface air inversions can subject populated and industrialized valley areas to critical accumulations of pollutants, creating what is referred to as an "air pollution episode."

Air classification levels in the Capital District Region range from level 1 to level 3. Rensselaer is included in the level 3 classification, and must meet level 3 air quality standards (air contaminant measures) as determined by the New York State Department of Environmental Conservation.

An air monitoring station in the City of Rensselaer recorded air pollution levels for a one year period ending 30 June 1974. The following annual air pollution averages in parts per million were recorded and are here compared to the level 3 standard:

Air Pollutant Type	Rensselaer	Annual Mean Standard
SO_2	0.017	0.030
CO	2.5	9.
NO	0.015	
NO_2	0.020	0.050
Particulates	62.	100.
Ozone	0.020	0.080

While any anticipated industry in Rensselaer would be subject to EPA regulations for particulate and gaseous emissions, increased industrial activity, in itself, would not force the occurrence of an air pollution episode.