BULL RUN WATERSHED
STORMWATER MANAGEMENT PLAN

SECTION III
WATERSHED CHARACTERISTICS

GENERAL DESCRIPTION

The Bull Run watershed is situated in the southeastern portion of Union County in north-central Pennsylvania. The watershed encompasses approximately 8.4 square miles. A general watershed map is presented as Plate III-1. Bull Run is the only major tributary in the watershed. Bull Run flows into the Susquehanna River at the eastern boundary of Lewisburg Borough.

POLITICAL FEATURES

The watershed is contained entirely within Union County. Portions of the following municipalities lies within the Bull Run watershed as indicated in Table III-1.

TABLE III-1
MUNICIPALITIES LYING WITHIN THE WATERSHED

Municipality	Area In Watershed (sq. miles)	Percent of Watershed (percent)
Lewisburg Borough	0.58	6.9
Buffalo Township	2.15	25.6
East Buffalo Township	5.67	67.5

The townships are townships of the 2nd Class and employ the township supervisor style of government. The Lewisburg Borough is governed by a council - mayor form of government.

NATURAL FEATURES

TOPOGRAPHY

The Bull Run watershed is located in the Northern Appalachian Mountain section of the Valley and Ridge Physiographic Provinces. The terrain of the basin consists primarily of rolling hills. The elevations within the watershed vary from a minimum of 430 feet at the confluence of the Susquehanna River and Bull Run up to a

maximum 700 feet above sea level along the periphery of the watershed. Due to the generally hilly character of the watershed, streams feeding into the Susquehanna River tend to mirror that of the mountain ridges. The general topography of the watershed is illustrated in Plate III-1.

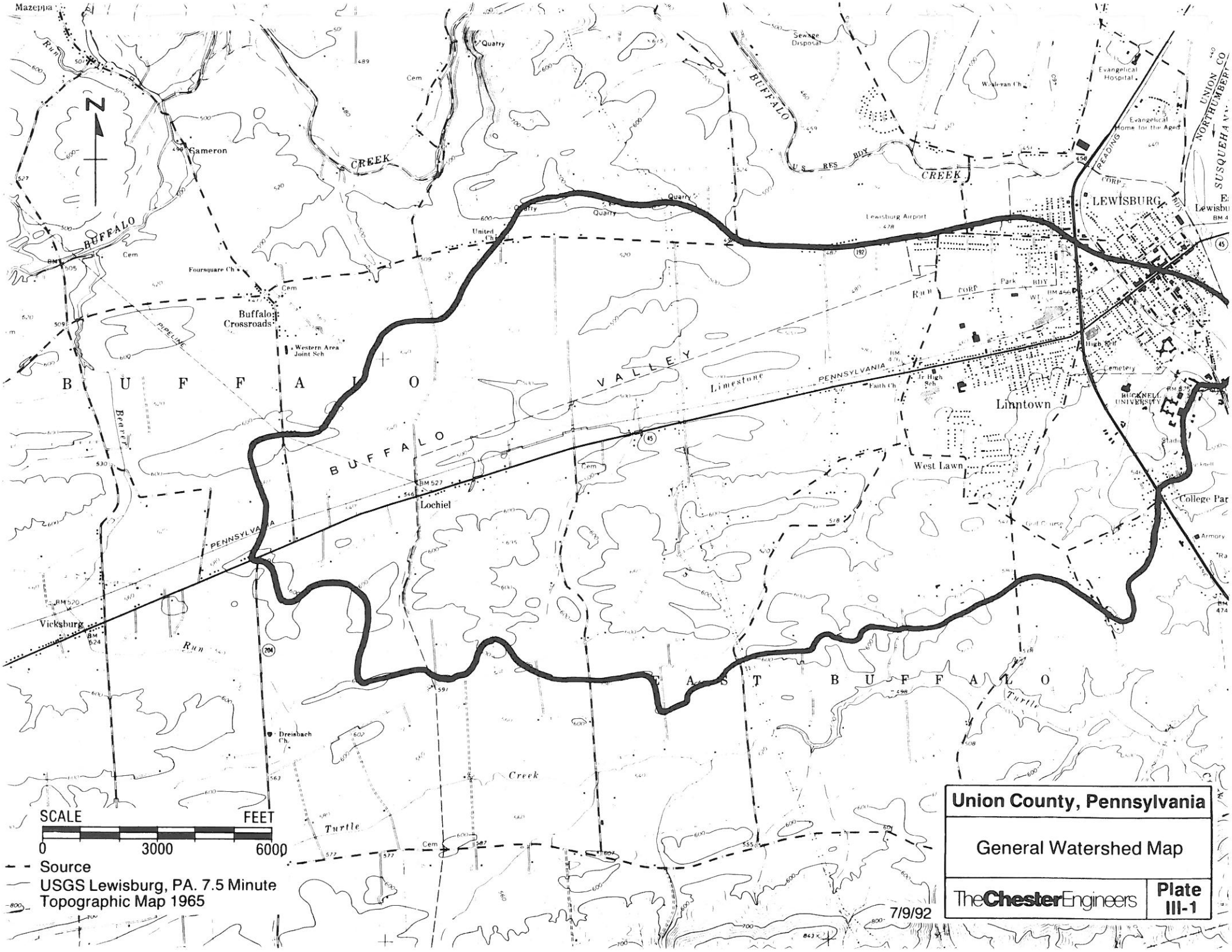
GEOLOGY

Geological formations of the Silurian Period, represented by Wills Creek, Tonoloway, and Keyser formations, underlay the watershed. The southernmost section of the watershed contains bedrock of the Tonoloway formation with a band of the Wills Creek formation to the north which forms the shale and sandstone topography in this area. The north central area of the Bull Run Watershed consists of the Tonoloway formation which forms limestone bedrock. At the northern tip of the watershed is a small area of the Keyser formation which forms a limestone bedrock. Limestone regions generally have a gently rolling topography with prolific sinkholes, depressions, and solution caverns.

SOILS

A detailed soil survey of the watershed was conducted by the U.S. Department of Agriculture, Soil Conservation Service, in cooperation with Penn State University. There are basically five soil associations identified in the watershed. Two of these associations have characteristics of flooding at slightly different levels of occurrence. They are located in the eastern section of the watershed and along various streams. The southern two-thirds of the watershed contains the Edom-Kutztown developed from calcareous materials. The northern one-third of the watershed is limestone derived soils with sinkholes, depressions, solution caverns, and undulating terrain. The United States Soil Conservation Service (S.C.S.) has defined four groups of soils having similar hydrologic properties which directly influence the volume and rate of stormwater runoff. The four hydrologic soils groups are defined as follows:

Group A	Soils having a high rate of infiltration, even when thoroughly wetted, and consisting chiefly of deep, well to excessively drained sands or gravels.
Group B	Soils having a moderate rate of infiltration when wetted and consisting chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse texture.
Group C	Soils having a slow rate of infiltration when thoroughly wetted and consisting chiefly of soils with a layer that impedes downward movement of water or soils with moderately fine to fine texture.
Group D	Soils having a very slow rate of infiltration rate when wetted and consisting chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with



Union County, Pennsylvania

General Watershed Map

The Chester Engineers

Plate III-1

a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material.

As the soil descriptions imply, runoff potentials increase from a minimum for Group A soils to a maximum for Group D soils.

Table III-2 contains a summary of soils located in the Bull Run watershed. A map illustrating the distribution of soil groups throughout the watershed is provided in Plate III-2. The distribution of soil groups throughout the watershed was determined based upon soil series information mapped on the S.C.S. soil survey for Union County. The aggregation of individual soil series into appropriate hydrologic soils groups was performed using S.C.S. Technical Release 55 information.

As the data indicates, the majority of the soils in the watershed are in Soil Group C, tending to produce a moderately high rate of stormwater runoff.

TABLE III-2
BULL RUN SOILS SUMMARY

Hydrologic Group	Percent of Watershed Covered
Group A	1.78%
Group B	12.44%
Group C	79.18%
Group D (incl. B/D)	6.42%
Open Water	0.07%
Quarry	0.12%

CLIMATE

The watershed is dominated by atmospheric flow patterns relevant to the Humid Continental type of climate. Most of the weather systems that influence the study area originate either in Canada or the central plains of the United States and are steered eastward by prevailing westerly flow aloft. Two flow patterns and primary sources of precipitation are weather systems associated with storms moving northward from the Gulf of Mexico and those moving eastward from the Great Lakes region. As a result of the dominant westerly air flow into the area, the moist air flow from the Atlantic Ocean is a modifying rather than a controlling climatic factor.

The normal successions of high and low pressure systems moving eastward across the United States produce weather changes in the area every few days in the winter and spring of the year. In the summer and fall the weather changes are less frequent due to a slowing down of the general atmospheric circulation during the warmer months. Winters are generally cold and snowy.

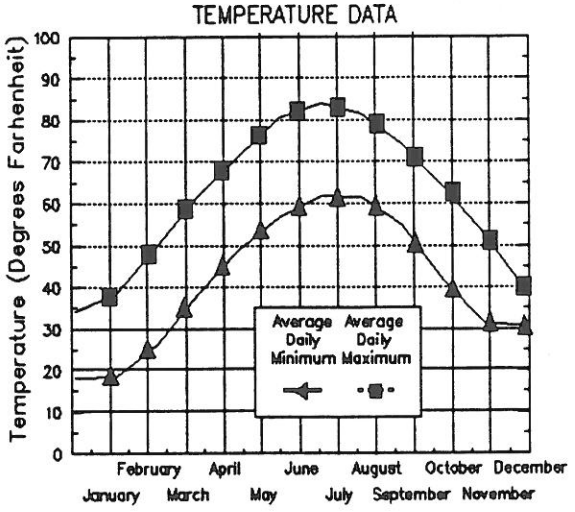
Low pressure cyclonic systems usually dominate the area with southerly winds, rising temperatures and some form of precipitation. The high pressure anticyclonic systems normally bring west to northwest winds, lowering temperatures and clearing skies to the area.

Hurricane or tropical disturbances, as they move northward, follow a northeasterly path in the middle latitudes and produce heavy rainfalls in the study area. These tropical storms are observed during the hurricane season, June through November.

TEMPERATURE

Temperature data for the area are summarized in Figure III-1. Normal daytime temperatures range from the low 30's to the low 40's in the winter and from the upper 70's to low 80's in the summer. The mean annual temperature for this area is approximately 52 degrees Fahrenheit.

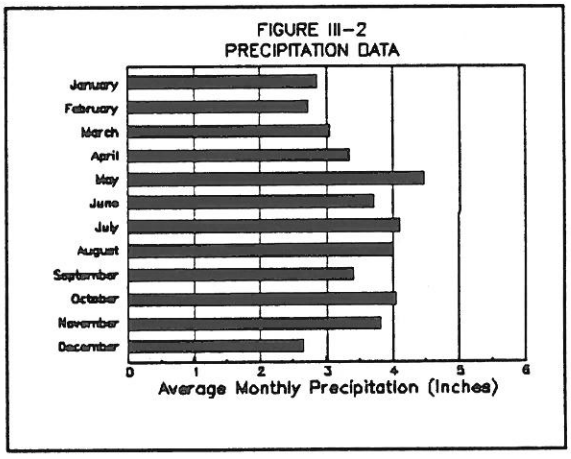
FIGURE III–1
TEMPERATURE DATA



PRECIPITATION

There are five automatic computer recorded rain gages in Union County. Only one of these gages is in the Bull Run Watershed. It is the "Lochiel Gage". There are approximately another 14 hand recorded rain gages throughout Union County. Of these, only one is believed to be located in the Bull Run Watershed. In both cases, data dates back to 1980. Total precipitation averages approximately 41 inches per year. About 55 percent of this total falls in the April through September growing

FIGURE III–2
PRECIPITATION DATA



N

Type A

Type B

Type C

Type B/D

Type D

Quarry

Water

Roads

GeoSpatial Solutions

Scale

Mile

0 1 2

11/91

Union County, Pennsylvania
Bull Run Watershed

Hydrologic Soil Groups

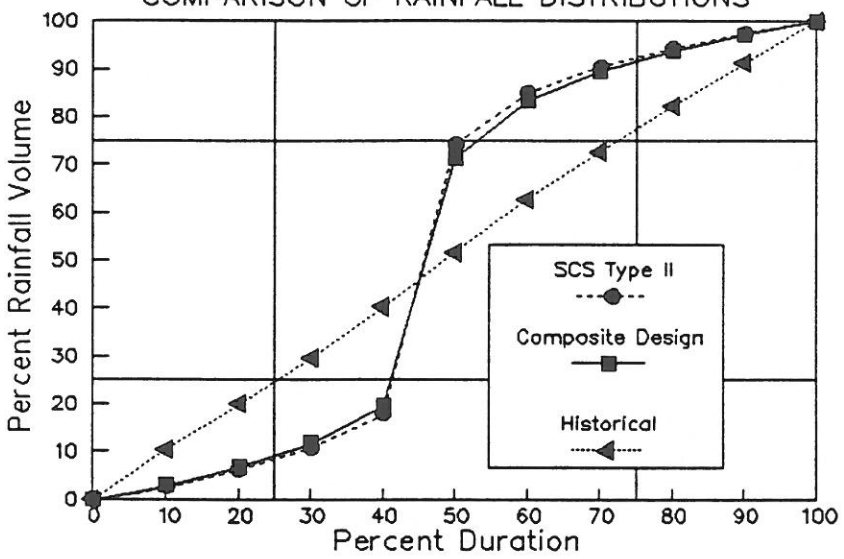
CHESTER ENVIRONMENTAL

Plate III-2

period. Thunderstorms can be expected on about 42 days in the period June through August. Some of these storms are accompanied by strong winds hail or both. Snowstorms are rarely greater than ten inches, and the snow normally does not persist for any length of time. Snow cover of one inch or more can be expected on about 42 days each winter.

Alternative design storm distributions for the area are presented and compared in Figure III-3.

FIGURE III–3
COMPARISON OF RAINFALL DISTRIBUTIONS



The SCS Type II distribution illustrated is a synthetic distribution developed by the United States Soil Conservation Service (SCS) to represent a pattern of rainfall arranged in a sequence which serves to maximize peak rates of runoff resulting from any given rainfall volume. The Composite Design Storm distribution represents a similar pattern as recommended in the Pennsylvania Department of Transportation Field Manual of Storm Intensity-Duration-Frequency Charts. The historical distribution was produced through an analysis of rainfall data collected at the Selinsgrove observation station.

As is indicated in Figure III-3, the differences between the historical and synthetic distributions are significant. The synthetic distributions (SCS Type II and Composite Design Storm) concentrate much of the precipitation near the middle of the storm event. The historical pattern, on the other hand, indicates a more uniform distribution of rainfall throughout the event.

HYDROLOGY

The Bull Run watershed is elongated in shape. The total length of the watershed measures approximately 2.0 miles along its long (north-south) axis and is roughly 4.5 miles wide at its widest point. The total area drained is approximately 8.4 square miles. Bull Run (Limestone Run) is the only named waterway in the watershed.

Bull Run itself flows in a generally easterly direction from its origin to its mouth on the west branch of the Susquehanna River. Bull Run is fed by approximately 9 unnamed tributaries and direct runoff.

STREAM GAGING STATIONS

There are three stream gages on Bull Run. Data for these gages are kept at the Union City Emergency Management Department. Descriptions of these gages are as follows:

Gage #1	-	Located on Fairground Road between Route 45 and Route 192 at new bridge.
Gage #2	-	Located just down stream from railroad bridge near intersection of St. George Street and St. Catherine Street.
Gage #3	-	Located in middle of stream half a block north of Market Street bridge.

All available data dates back to around 1980 and has not been consistently recorded. Readings were, and still are, generally taken only during high water times. Throughout Union County are approximately another 10 stream gages. However, data for these gages are also inconsistently recorded.

Additional stream gaging data was obtained from the Department of Civil Engineering at Bucknell University. During 1978 through 1980 stream flow and rainfall data were collected within the Bull Run Watershed. Stream flow data were collected using a stage recorder and a rating curve developed for the station. The rainfall data were collected using a continuously recording raingage.

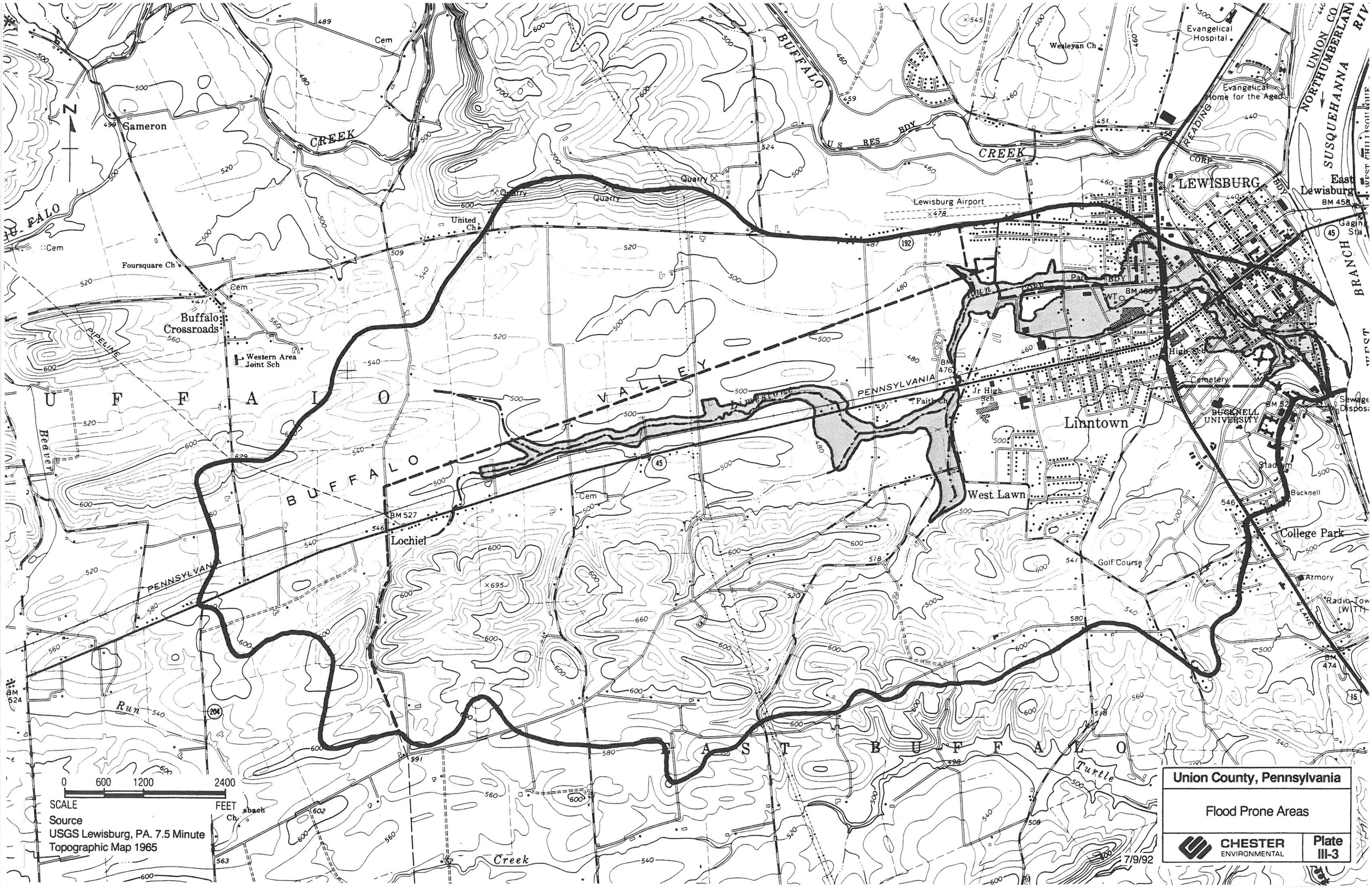
FLOOD FREQUENCY / DISCHARGE INFORMATION

Estimated flood frequency / discharge information for Bull Run at the confluence of the West Branch Susquehanna was located in the Lewisburg Borough Flood Insurance Study. Floods having recurrence intervals of 10-, 50-, 100-, and 500-years have estimated discharge rates of 1,250 cfs, 2,400 cfs, 3,200 cfs, and 5,400 cfs, respectively. Other Flood Insurance Studies have been completed in the area, but provide similar estimates for Bull Run.

FLOOD HAZARD / STORMWATER PROBLEM AREAS

DELINEATED FLOOD PRONE AREAS

Delineated flood prone areas as defined by the U.S.G.S. for the Federal Insurance Administration are illustrated on Plate III-3. The boundaries illustrated represent


Sameron
Cem
CREEK
BUFFALO
U S RES BDY
Quarry
United Ch
Foursquare Ch
Cem
Buffalo Crossroads
PIPELINE
Western Area Joint Sch
U F F A L O
VALLEY
PENNSYLVANIA
Lochiel
BM 527
Cem
Run
Creek
Wesleyan Ch
Evangelical Hospital
Evangelical Home for the Aged
READING
CORP
LEWISBURG
East Lewisburg
BM 458
Lewisburg Airport
×478
BM 460
WTO
High Sch
Cemetery
Jr High Sch
Faith Ch
BM 476
Linntown
BUCKNELL UNIVERSITY
Stadium
Bucknell
College Park
Golf Course
Armory
West Lawn
Sewage Disposal
NORTHUMBERLAND
SUSQUEHANNA
BRANCH
WEST
UNION CO
Turtle
A S T B U F F A L O
0 600 1200 2400
SCALE FEET
Source
USGS Lewisburg, PA. 7.5 Minute
Topographic Map 1965
Union County, Pennsylvania
Flood Prone Areas
CHESTER ENVIRONMENTAL
Plate III-3
7/9/92

an approximation of the areas which, on average are likely to be inundated by flood waters at a frequency of once in 100 years.

IDENTIFIED STORMWATER PROBLEM AREAS

The delineated flood prone areas established by flood insurance studies relate primarily to stream flooding during major storm events. As such they do not provide information concerning more minor flooding problems or stormwater problems separate from stream flooding such as street flooding, soil erosion or stormwater pollution instances.

Each of the municipalities in the watershed was contacted to solicit information relative to stormwater conditions which are perceived locally to be problems. In many cases, these problems may be somewhat localized, and related to local drainage limitations apart from stream flooding and may occur at a high frequency. Also, information relative to stormwater problems in addition to flooding (i.e., accelerated erosion, sedimentation and water pollution) was requested.

Data obtained through this effort was supplemented by a review of Flood Insurance Studies conducted in the watershed to produce the listing of identified stormwater problem areas summarized in Table III-4 and illustrated on Plate III-4.

A total of 24 problem areas were identified in the three municipalities in the watershed. The distribution of identified problem types and suggested solutions is presented in Figure III-4. As is indicated in Figure III-4 and as one would expect, the predominant problem type reported is flooding, with and without accompanying erosion and sedimentation.

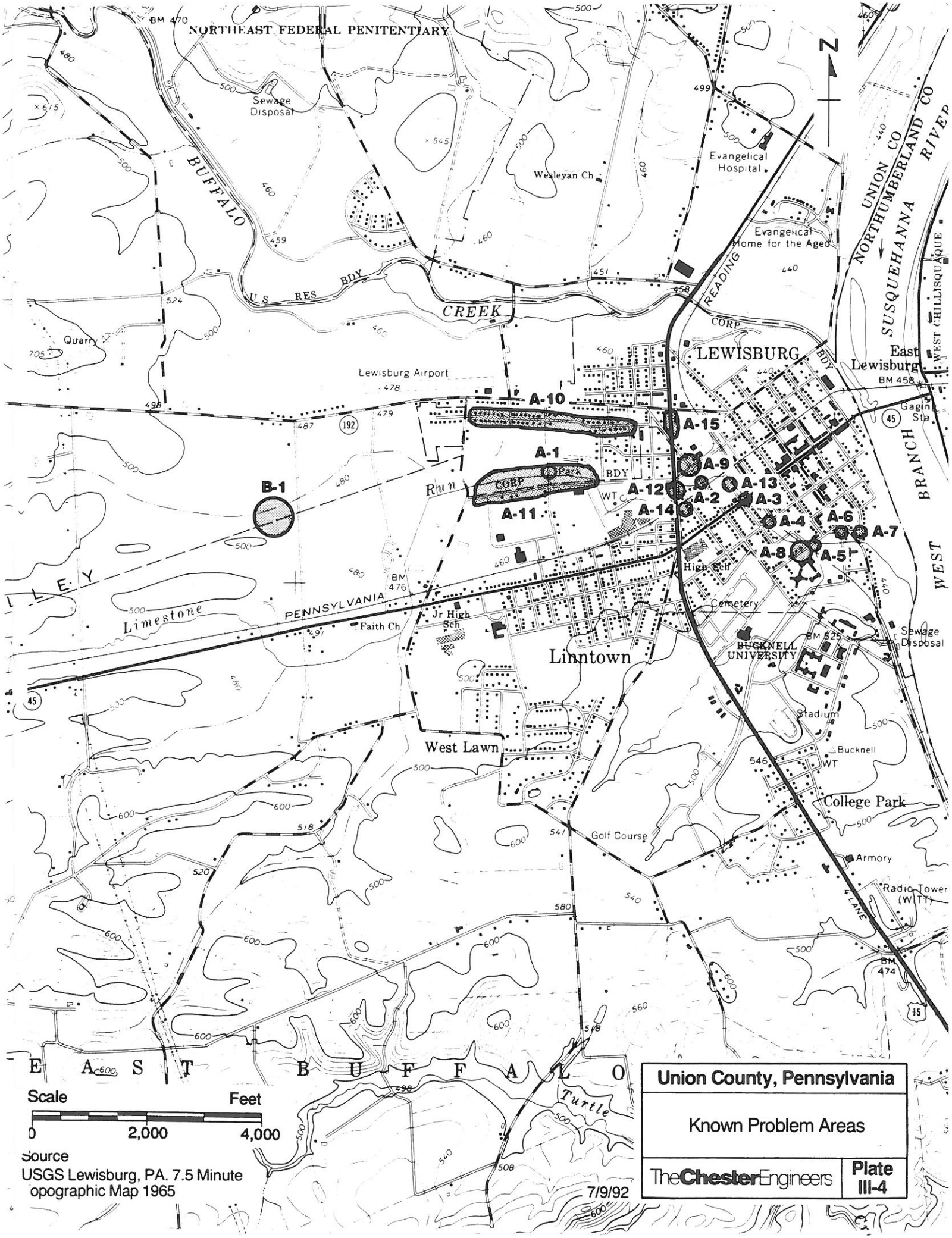
The identified flooding problems are in most cases stream flooding generally caused by stormwater runoff rates exceeding the channel and/or obstruction capacities. Erosion and sedimentation are frequently reported as accompanying the flooding conditions.

Several types of suggested solutions to recognized problems were offered. The suggested solutions include structural approaches such as increasing the capacity of storm sewers, constructing culverts and the construction of stormwater detention or ponding areas. Also included are such remedial actions as stream dredging for the removal of accumulated silt, the clearing of debris from culvert and bridge openings and the removal of obstructions from the stream bed.

All of the suggested solutions offered to restore or increase hydraulic capacities. It is important to note that the ultimate success of any of these efforts will require that the incremental increases in hydraulic capacity not be offset by future increases in stormwater runoff. The nature of the problems currently encountered in the watershed and the types of solutions increase the importance of effective stormwater management in the basin.

Table III – 4
Inventory of Reported Problems

Map Code	Municipality	Description	Stream/ Location	Identified Causes	Frequency	Proposed Solution(s)	Information Source
A – 1	Borough of Lewisburg	Erosion	Bull Run @ Rt. 15	Runoff from upstream	> once per year	None identified	Municipal Questionnaire
A – 2	Borough of Lewisburg	Erosion	Bull Run @ 7th	Runoff from upstream	> once per year	None identified	Municipal Questionnaire
A – 3	Borough of Lewisburg	Erosion	Bull Run @ Marnet	Runoff from upstream	> once per year	None identified	Municipal Questionnaire
A – 4	Borough of Lewisburg	Flooding, erosion	Bull Run @ Rt. St. Louis	Runoff volume	> once per year	None identified	Municipal Questionnaire
A – 5	Borough of Lewisburg	Flooding	Bull Run @ St. George	Obstruction, runoff	> once per year	Clear obstruction	Municipal Questionnaire
A – 6	Borough of Lewisburg	Erosion	Bull Run @ University	Obstruction, runoff	> once per year	Clear obstruction	Municipal Questionnaire
A – 7	Borough of Lewisburg	Flooding, erosion	Bull Run @ Brown St.	Obstruction, runoff	> once per year	Clear obstruction	Municipal Questionnaire
A – 8	Borough of Lewisburg	Flooding	RR @ St. George St.	Obstruction, runoff	> once per year	Increase maintenance	Municipal Questionnaire
A – 9	Borough of Lewisburg	Flooding, sedimentation	7th and St. Mary Sts.	Obstruction, runoff	> once per year	Reconstruction	Municipal Questionnaire
A – 10	Borough of Lewisburg	Flooding	St. Paul Street	Volume	> once per year	Constuct storm sewers	Municipal Questionnaire
A – 11	Borough of Lewisburg	Flooding	E. Buffalo and St. Mary	Volume	> once per year	Constuct storm sewers	Municipal Questionnaire
A – 12	Borough of Lewisburg	Flooding, erosion	RR track bridge	Obstruction, runoff	> once per year	Clear obstruction	Municipal Questionnaire
A – 13	Borough of Lewisburg	Flooding	RR @ N. 6th St. and Cherry	Runoff from upstream	> once per year	None identified	Municipal Questionnaire
A – 14	Borough of Lewisburg	Flooding	N. 6th to Rt. 15	Runoff from upstream	< once per year	None identified	Municipal Questionnaire
A – 15	Borough of Lewisburg	Flooding	Rt. 15 t Borough line	Runoff from upstream	> once per year	None identified	Municipal Questionnaire
N/A	Borough of Lewisburg	Flooding	All streams	Rains and snow melt	< once per year	None identified	Municipal Questionnaire
N/A	East Buffalo Township	Flooding	All streams	Rains and snow melt	< once per year	None identified	Municipal Questionnaire
B – 1	Buffalo Township	Flooding	Bull Run	Obstruction, runoff	> once per year	None identified	Municipal Questionnaire
N/A	Buffalo Township	Flooding	All streams	Rains and snow melt	< once per year	None identified	Municipal Questionnaire


NORTHEAST FEDERAL PENITENTIARY
BM 470
Sewage Disposal
BUFFALO
U.S. RES BDY
CREEK
Wesleyan Ch
Evangelical Hospital
Evangelical Home for the Aged
READING
CORP
LEWISBURG
East Lewisburg
BM 458
Gaging Sta
Lewisburg Airport
A-10
A-15
A-1
A-9
A-12
A-13
A-2
A-3
A-14
A-11
A-4
A-6
A-7
A-8
A-5
B-1
BDY
WT
Run
High Sch
Cemetery
BM 476
PENNSYLVANIA
Limestone
Faith Ch
Jr High Sch
Linntown
BUCKNELL UNIVERSITY
BM 525
Sewage Disposal
Stadium
West Lawn
Bucknell
WT
College Park
Golf Course
Armory
Radio Tower (WTTT)
4 LANE
BM 474
EAST BUFFALO
Turtle
UNION CO
NORTHUMBERLAND CO
SUSQUEHANNA RIVER
WEST CHILLISQUAQUE
BRANCH
WEST
Quarry
Scale
Feet
0
2,000
4,000
Source
USGS Lewisburg, PA. 7.5 Minute
Topographic Map 1965
7/9/92
Union County, Pennsylvania
Known Problem Areas
TheChesterEngineers
Plate III-4

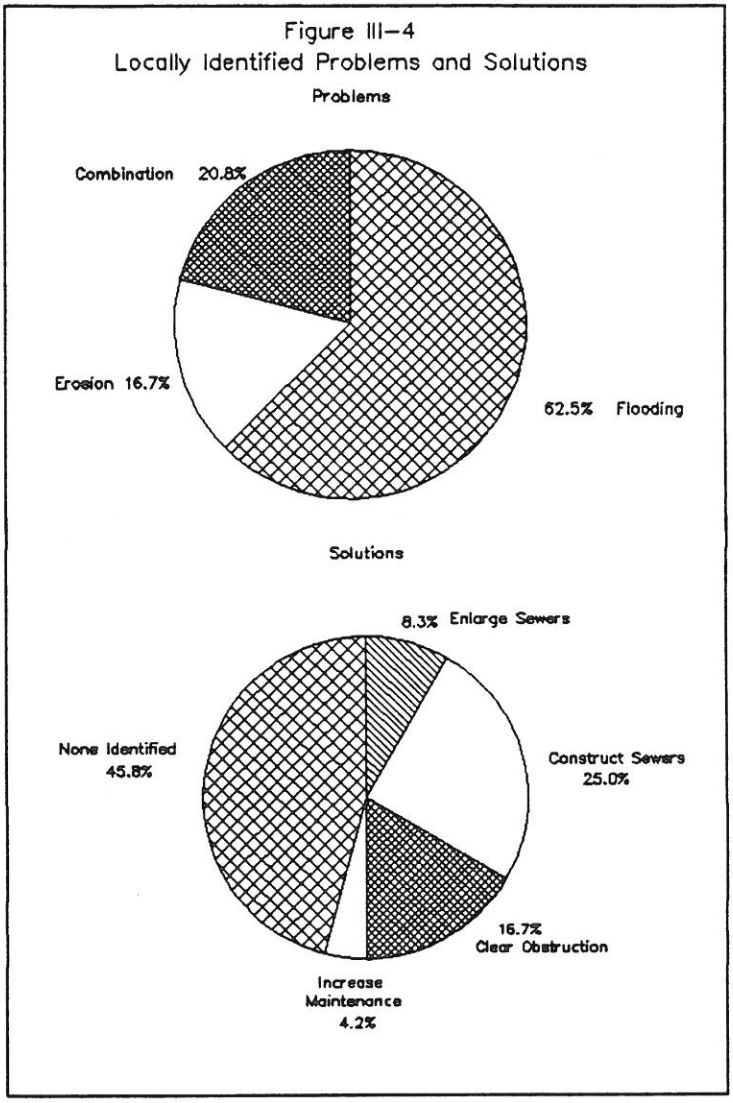
DEVELOPMENT IN FLOOD HAZARD AREAS

The State Water Plan for Subbasin 10 identifies Lewisburg Borough as a damage center in the watershed. Information provided in the municipal questionnaires describes flooding which occurs in 24 separate areas. Flood effects on residential properties are reported in Lewisburg Borough.

As is indicated in Plate III-3, the problem areas in which residential development is most dense lie adjacent to Bull Run in Lewisburg Borough.

No major new development is currently projected to occur in the identified flood hazard areas. However, land development upstream of these areas and within identified flood prone areas can be expected to occur unless adequately controlled. This points to the importance instituting adequate stormwater management and enforcing flood plain management ordinances throughout the watershed.

Figure III-4
Locally Identified Problems and Solutions



Effective stormwater management ordinances will prevent upstream development from aggravating existing flooding problems. Flood plain management ordinances, when effectively enforced provide means of controlling development in flood prone areas so as to: 1) limit the development of land which is exposed to flood damage where appropriate; 2) guide development of proposed construction away from locations which are threatened by flood hazards; 3) reduce damage caused by floods. All of the municipalities in the watershed required under Act 166 to adopt flood plain management ordinances have done so. The adoption and enforcement of effective flood plain management ordinances is an important adjunct to stormwater management and should be afforded a high priority for implementation.

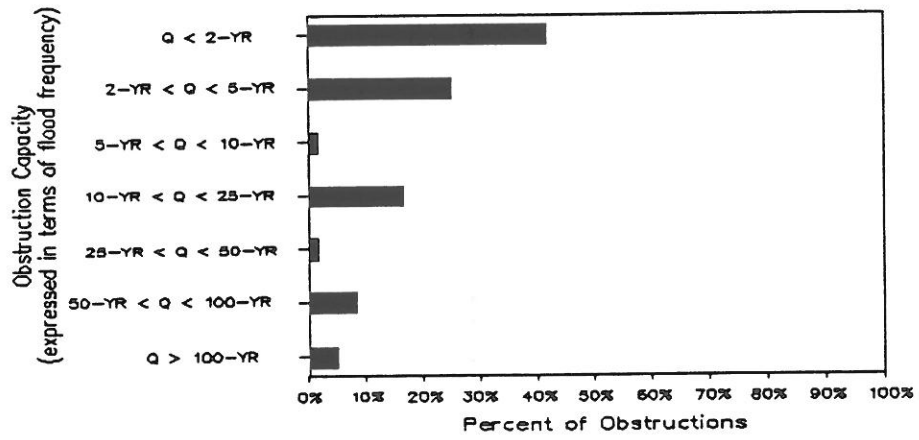
STREAM OBSTRUCTIONS

Stream obstructions are defined as structures or assembly of materials which may impede, retard or change flood flows. Typical obstructions include bridge crossings, culverts, piers, suspended pipelines, etc.. Information describing the dimensions, condition and flow capacity of approximately 70 separate stream obstructions was developed during the preparation of this plan. The approximate locations of these obstructions are illustrated in Plate III-5.

CAPACITIES

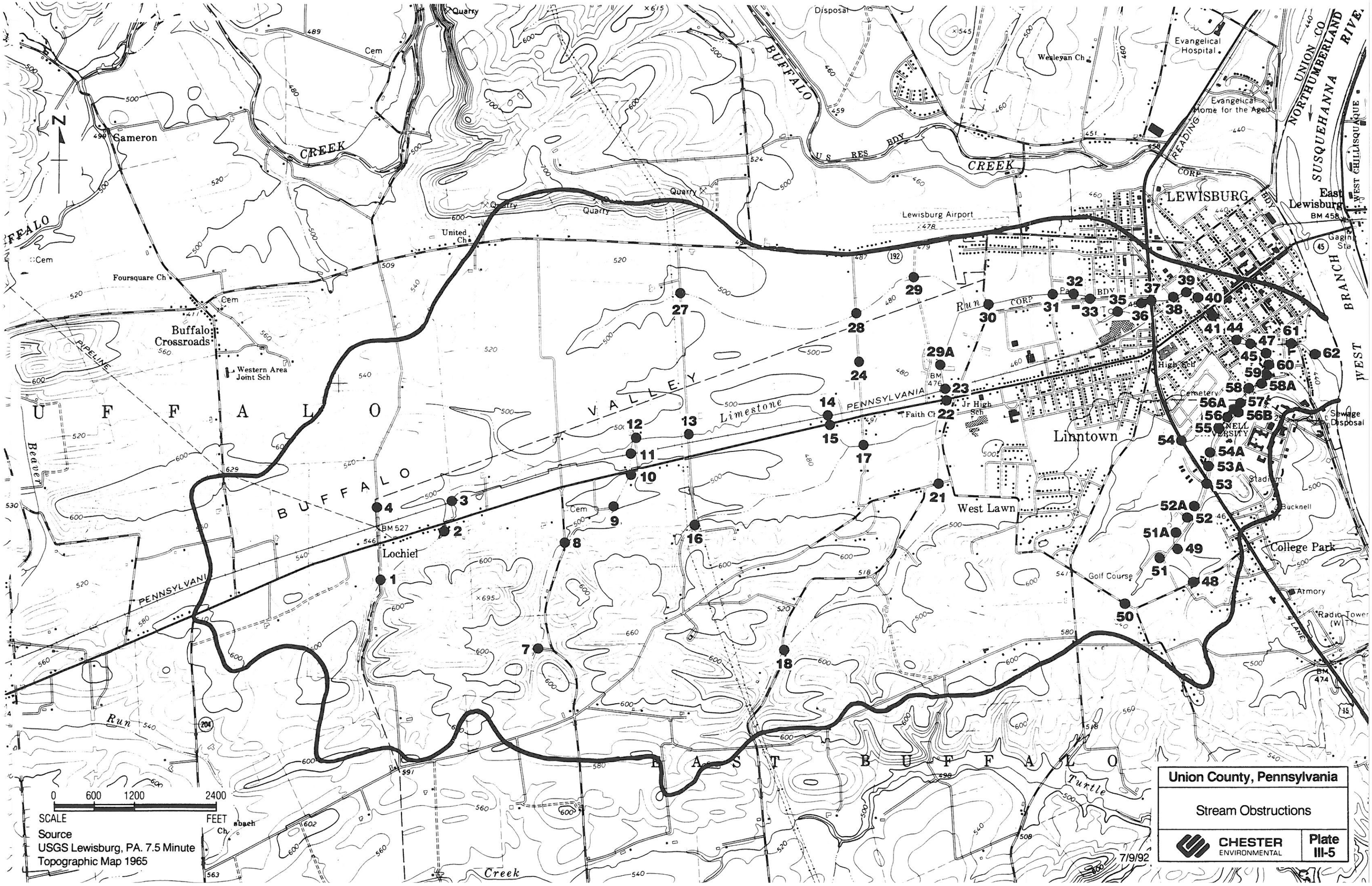
The capacities of each of the obstructions were calculated based upon field measurements and the application of procedures outlined in the U. S. Department of Transportation's publication *Hydraulic Design of Highway Culverts*. The calculated capacities represent full, but not surcharged conditions and, in most cases, inlet control conditions. Calculated obstruction capacities are presented in Table A-1, located in Appendix A. Capacities are presented in terms of adequacy as compared to estimated flood peaks at each location for various flood return frequencies. The flood peaks were estimated using the "Flippo Equation" as documented in *Hydrology of Area 2 Eastern Coal Province, Pennsylvania and New York* (U.S.G.S., 1983) . Obstruction capacity data in the watershed is summarized in Figure III-5.

FIGURE III-5
Obstruction Capacity Histogram



OBSTRUCTION CONDITIONS

The survey of stream obstructions also provided information characterizing their condition. The field data acquired indicate that sedimentation and/or accumulations of vegetation in the stream openings of the obstructions is evidenced in a relatively small but significant number of locations throughout the watershed. As is indicated in Figure III-6, the openings of nearly twenty percent of the obstructions surveyed contained observable amounts of sediment/debris. In roughly 6% of the cases, the degree of deposition can be classified as moderate to severe.



0 600 1200 2400

SCALE FEET

Source
USGS Lewisburg, PA. 7.5 Minute
Topographic Map 1965

Union County, Pennsylvania

Stream Obstructions

CHESTER ENVIRONMENTAL

Plate III-5

7/9/92

The accumulation of debris in what should be the clear openings of culverts and bridges reduces the hydraulic capacity of the structures and increases the risk of flooding. The maintenance of clear openings under stream crossings, while not strictly speaking a stormwater management function, should be given a high priority by the responsible agencies in the watershed.

FLOOD CONTROL FACILITIES

The lower reaches of Bull Run are channelized. Otherwise, there are no flood control facilities located within the watershed and no flood control measures are currently proposed.

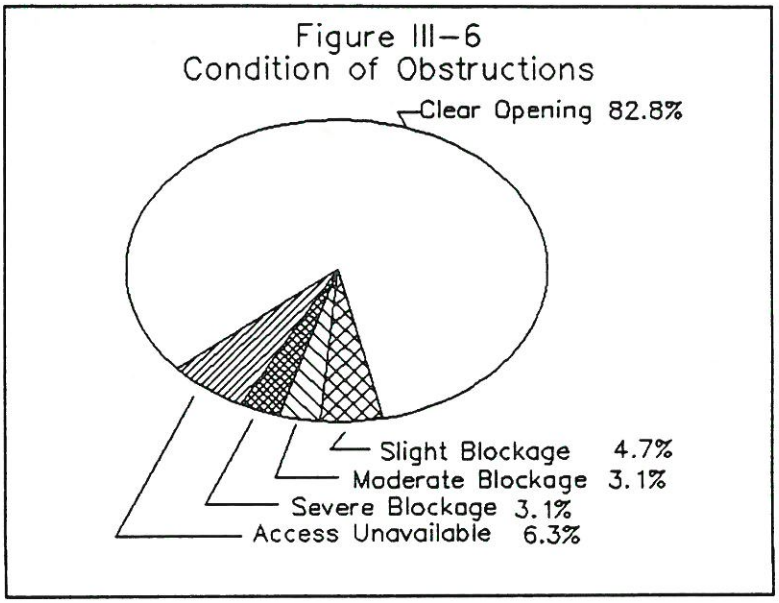


Figure III–6
Condition of Obstructions

STORM SEWER SYSTEMS

EXISTING AND FUTURE STORM SEWER SYSTEMS

The existing storm significant storm and combined sewer systems are confined to the boundaries of Lewisburg Borough. Other small, isolated storm drainage facilities are scattered at various locations in the watershed. Future storm sewer system construction will occur as residential and commercial development progresses. The locations of future storm sewer systems will approximate the locations of anticipated future residential and commercial development as presented later in this section. The timing of new storm sewer construction will parallel that of new development in general.

FINANCING STORM SEWER CONSTRUCTION

Under current practice and conditions, most if not all major new storm sewer construction is performed by and paid for by private developers. Consequently, the construction of new storm sewers in the watershed will essentially be financed by private land developers and paid for by the purchasers of the property. The costs incurred by municipalities in relation to such construction will be minimal.

Recent amendments to the Pennsylvania Infrastructure Investment Authority (PENNVEST) make municipalities located within watersheds for which stormwater management plans have been approved by the Pennsylvania Department of Environmental Resources eligible to receive financial assistance from PENNVEST to construct stormwater management improvements, including storm sewer systems. In the event municipalities become involved in new or remedial storm sewer construction, they should investigate the potential for the receipt of funding assistance from PENNVEST.

STORMWATER CONTROL FACILITIES

EXISTING AND FUTURE STORMWATER CONTROL FACILITIES

The survey of Bull Run watershed municipalities conducted during the preparation of this plan requested information relative to current and planned stormwater control facilities. The municipalities indicated that no stormwater management existed in the watershed at the time the questionnaires were completed.

PRESENT AND FUTURE LAND USE

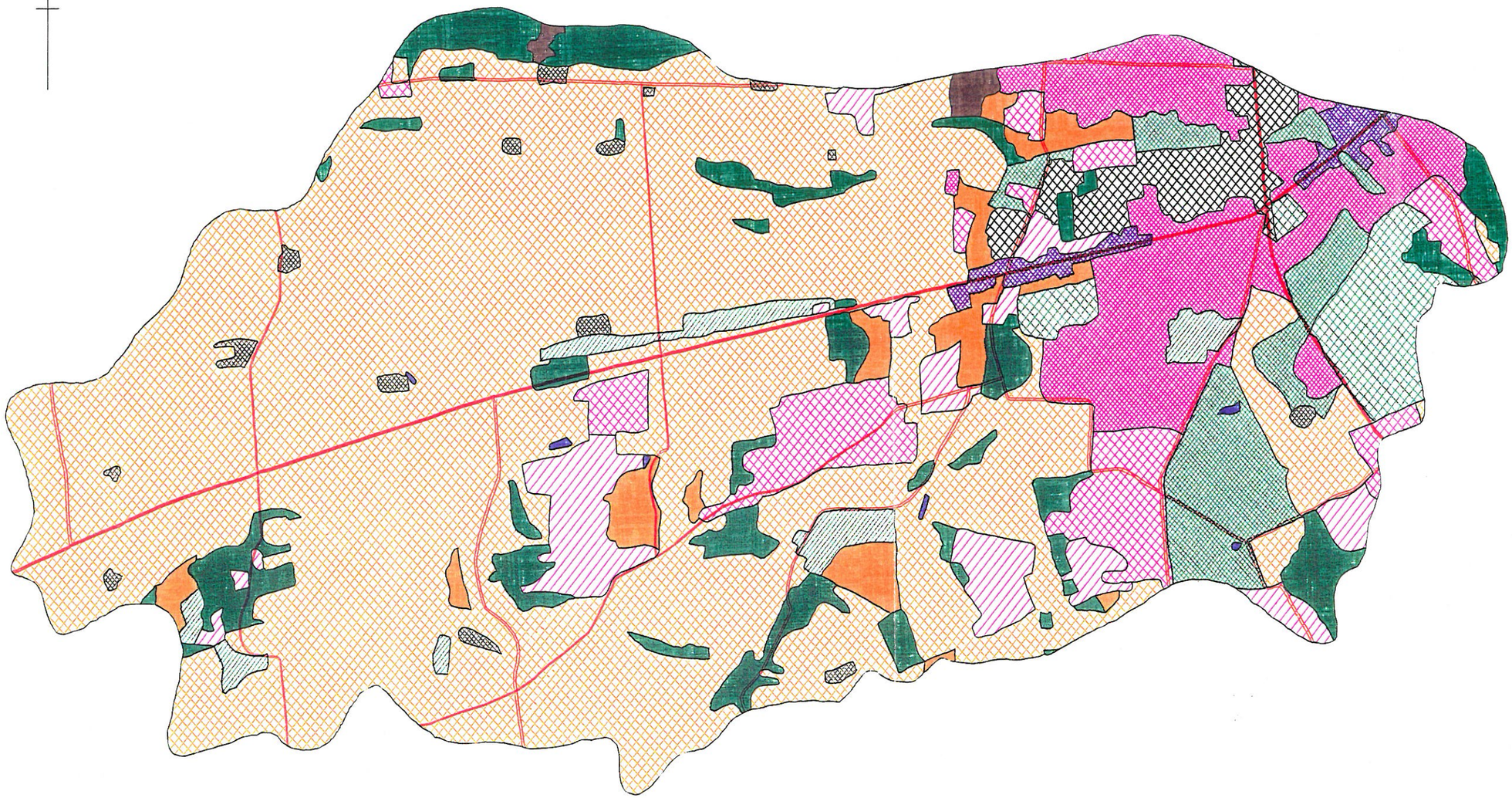
Land use in the watershed is predominantly open space and agricultural in nature. The most dense residential, commercial and industrial land use types lie primarily in close proximity to Lewisburg Borough. Current development densities, as indicated by 1990 census municipal population densities, are presented in Table III-7. Existing land use / land cover patterns are indicated on Plate III-6. Land use was determined based upon interpretation of infared aerial photography (see Section IV).

TABLE III-7
POPULATION DENSITIES

Municipality	Population Density Persons/Sq.Mi.
Lewisburg Borough	2,687
Buffalo Township	92
East Buffalo Township	269

Potential future land use / land cover patterns are indicated on Plate III-7. A comparison of existing and projected future land cover statistics is presented in Table III-8.

N



- High Density Residential
- Medium Density Residential
- Low Density Residential
- Commercial
- Industrial
- Parks, Cemeteries, Ballfields etc.
- Schools
- Wooded
- Brush
- Meadow
- Agricultural
- Farmstead
- Open Water
- Disturbed
- Roads

GeoSpatial Solutions

Scale

0 1 2 Mile

11/91

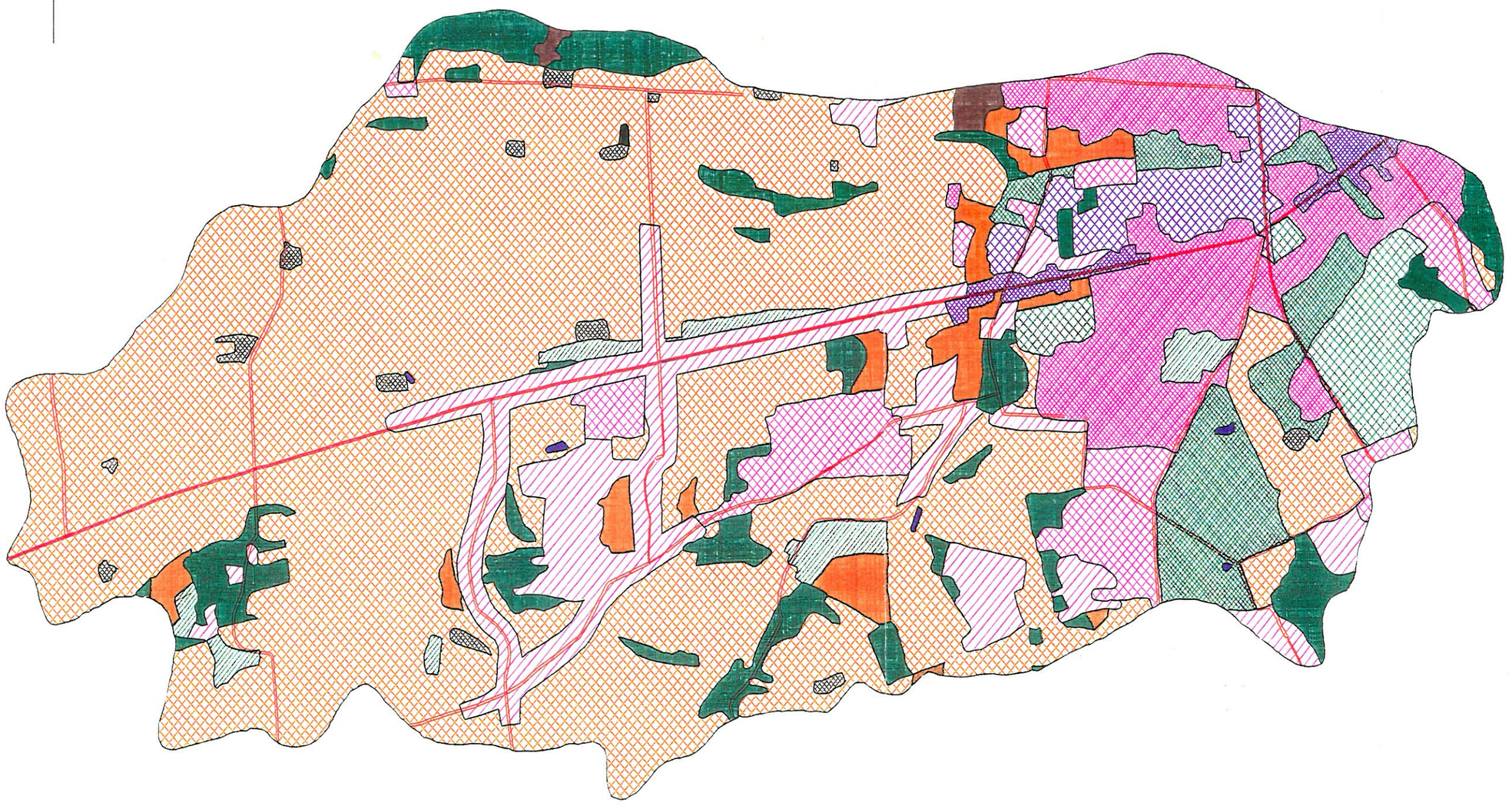
Union County, Pennsylvania
Bull Run Watershed

Land Cover Classification

CHESTER ENVIRONMENTAL

Plate III-6

N



- High Density Residential
- Medium Density Residential
- Low Density Residential
- Commercial
- Industrial
- Parks, Cemeteries, Ballfields etc.
- Schools
- Wooded
- Brush
- Meadow
- Agricultural
- Farmstead
- Open Water
- Disturbed
- Roads

GeoSpatial Solutions

Scale

0 1 2 Mile

Union County, Pennsylvania
Bull Run Watershed

Future Land Cover

CHESTER ENVIRONMENTAL

Plate III-7

1/93

TABLE III-8
LAND COVER STATISTICS

Land Cover Description	Percent of Watershed Existing	Future
High Density Residential	7.89	7.89
Medium Density Residential	5.19	5.19
Low Density Residential	4.40	9.79
Commercial	0.99	0.99
Industrial	2.32	2.32
Parks, Cemeteries, etc	4.14	4.14
Schools, University	2.58	2.58
Wooded	7.15	6.90
Brush	2.90	2.66
Meadow	1.80	1.63
Agricultural	59.55	54.82
Farmstead	0.70	0.70
Open Water	0.07	0.07
Disturbed	0.32	0.32