5.0 EXISTING ENVIRONMENT

5.1 Air Resources

5.1.1 Climate

Kingsport, Tennessee, where the proposed demonstration unit would be located, is in the extreme upper East Tennessee Valley. The closest National Weather Service office is at the Tri-City Airport, which is approximately 15 miles east of the Eastman facility.

As reported by the National Weather Service, the area does not lie directly within any of the principal storm tracks that cross the country, but comes under the influence of storm centers that pass along the Gulf Coast and then up the Atlantic Coast toward the northeast. However, the topography has considerable influence on weather changes peculiar to this region. Moist easterly air flow in the low levels of the atmosphere is more or less blocked on the eastern slopes of the mountains, thus producing an abundance of precipitation on these higher ridges and subsequently reaching the Kingsport area rather dry and sometimes a little warmer. The maximum monthly amount of precipitation occurring in July is characteristically diurnal thunderstorms occurring most frequently during the afternoon and early night hours. A secondary maximum of precipitation occurring in the late winter months is due mainly to overrunning moist air associated with storm centers to the south and also the northeast.

Although average annual precipitation is near 41 inches in the immediate vicinity, annual amounts of 80 inches have been recorded on mountainous sections to the east and south (NOAA, 1990).

Monthly normal temperatures range from the January mean of 36°F to a July mean of 75°F. Prolonged periods of cold weather are generally due to slow-moving cold cells associated with storm centers in the vicinity of Pennsylvania and southern New York. On the other hand, periods of unusually high temperatures occur most frequently during diurnal heating under conditions involving subsiding superior air usually associated with high pressure systems dominating the eastern section of the Continental United States. Snowfall seldom occurs before November and rarely remains on the ground for more than a few days. However, mountains to the east and south are frequently well blanketed with snow for much longer periods of time (NOAA, 1990).

Eastman also collects meteorological data on site for use in air dispersion modeling at a 45-meter tower, the location of which is shown in Figure 5.1-1.

A windrose constructed from 1988 wind speed and wind direction data is shown in Figure 5.1-2. The predominant wind direction is from the southeast with secondary strong sectors being the west southwest and the west. The 10-year average wind speed at this site is 6.8 miles per hour.

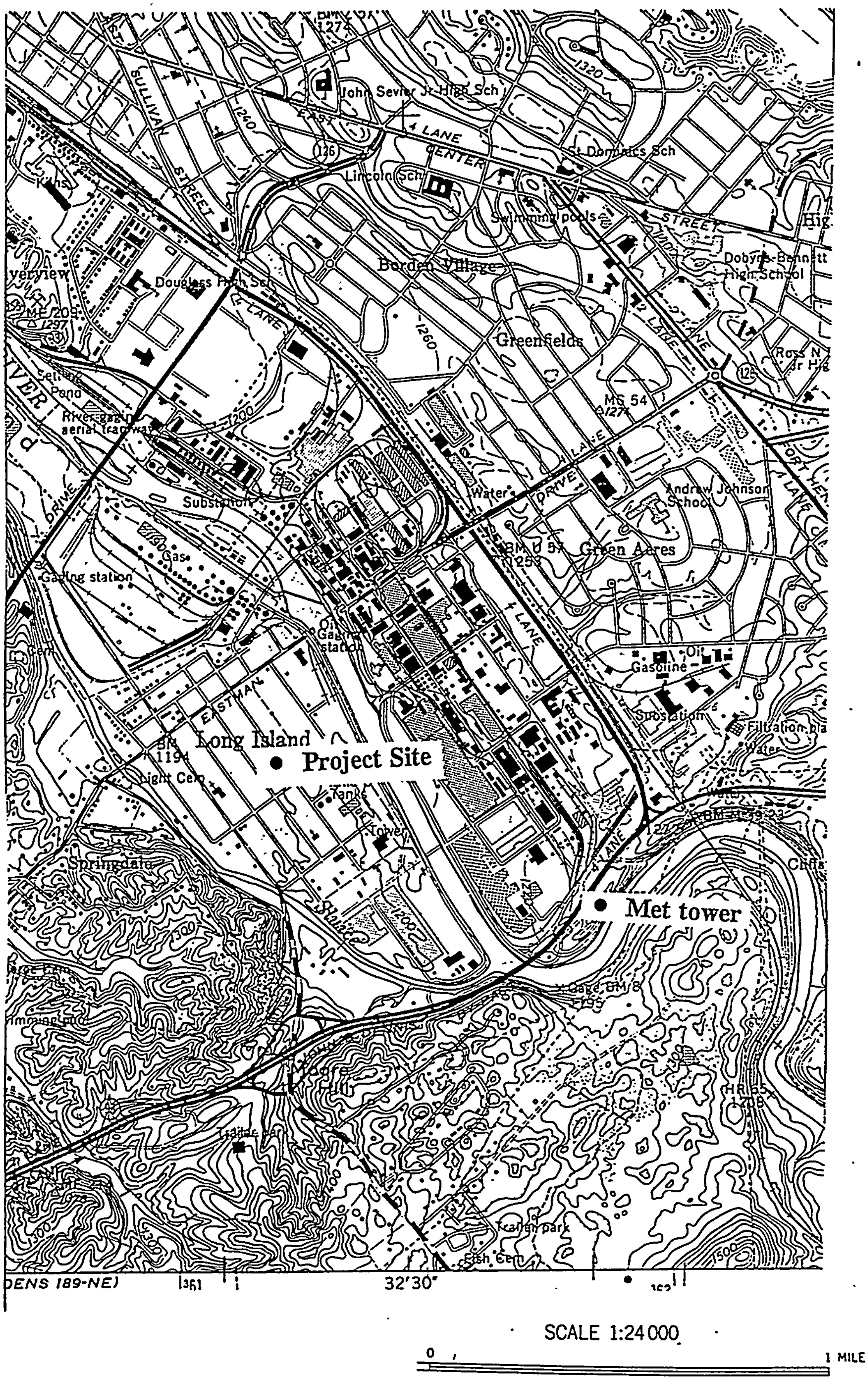


Figure 5.1-1 Location of Eastman Met Tower

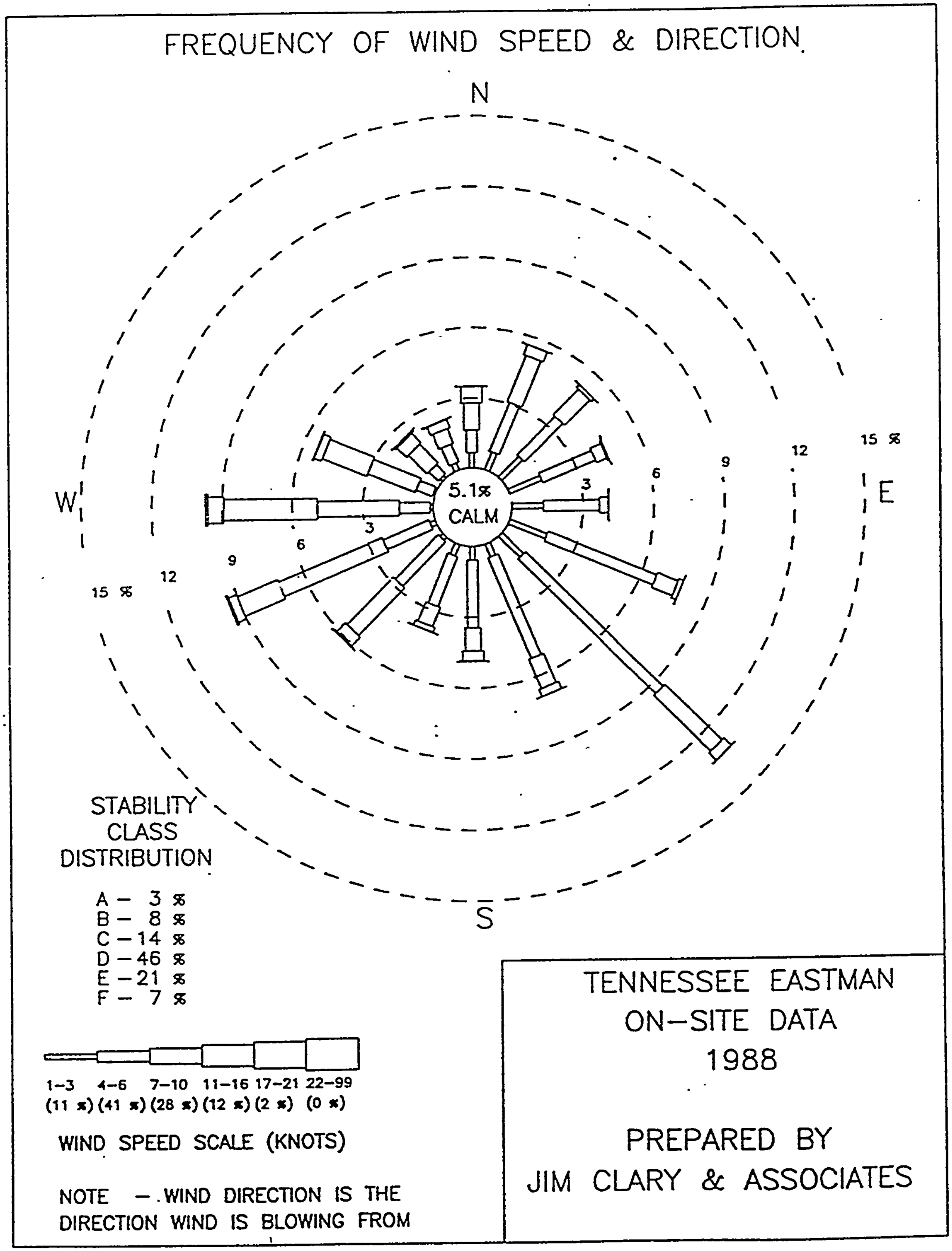


Figure 5.1-2 Windrose from TED Meteorological Data

5.1.2 Baseline Air Quality Condition

National Ambient Air Quality Standards (NAAQS) have been established by the Environmental Protection Agency for six major pollutants. These six pollutants are commonly referred to as criteria pollutants because the standards are based on published criteria documents that state current understanding of concentration levels that cause identifiable effects on health and welfare. The primary ambient air quality standards define levels of air quality which the Administrator judges necessary, with an adequate margin of safety, to protect the public health. The secondary ambient air quality standards define levels of air quality which the Administrator judges necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

Areas that have monitoring data showing that the air quality meets the primary and secondary NAAQS are classified as attainment, and likewise those areas that exceed air quality standard are classified as nonattainment. If monitoring data are not available the area is called unclassified and is treated as an attainment area. State agencies generally concentrate monitoring efforts in highly populated areas or those having major pollutant sources and do not monitor areas expected to be meeting standards.

The State of Tennessee has established the same standards for the criteria pollutants as the federal government. In addition, Tennessee has retained a standard for total suspended particulate matter, which was dropped as an indicator for particulates by EPA when the PM-10 standard was adopted. Tennessee also has a standard for gaseous fluorides. Both the EPA and Tennessee air quality standards are summarized in Table 5.1-1.

Sullivan County, where Kingsport is located, is in attainment or unclassified for all of the NAAQS. The Tennessee Division of Air Pollution Control (TDAPC) operates an ozone monitor, total suspension particulates (TSP) samplers, and PM-10 samplers within the county. Eastman monitors and submits to the TDAPC monitoring data for sulfur dioxide, nitrogen dioxide, carbon monoxide, TSP and PM-10. Monitoring data from 1990-1992 are summarized in Table 5.1-2. The monitoring stations referenced in this table are shown in Figures 5.1-3 and 5.1-4. Because the short-term standards are not to be exceeded more than once per year, the second highest value is determined for each year and the highest of those yearly values reported in the table.

Particulate Matter (PM-10 and TSP)

Particulate matter is measured both as TSP and PM-10 by Eastman at two sites, one on either side of the Kingsport manufacturing facility, shown on Figure 5.1-3. Measurements of TSP at the Eastman sites show a maximum annual average of 40 $\mu g/m^3$, which is 67 percent of the secondary guideline. The maximum 24-hour concentration of 96 $\mu g/m^3$ is 64 percent of the secondary standard. The maximum PM-10 annual average of 32 $\mu g/m^3$ is 64 percent of the standard, and the 24-hour maximum concentration of 78 $\mu g/m^3$ m is 52 percent of the annual secondary standard.

Table 5.1-1. Summary of National Ambient Air Quality Standards (NAAQS) and Tennessee State Standards[1]

Pollutant	Averaging Interval	NAAQS		Tennessee	
		Primary	Secondary	Primary	Secondary
Total Suspended Particulates (TSP)	Annual[2] 24 hours	- -	- -	75 260	60 150
Particulate Matter < 10 um (PM-10)[3]	Annual 24 hours	50 150	50 150	50 150	50 150
Sulfur Dioxide	Annual 24 hours 3 hours	80 365 -	- - 1300	80 365 -	- - 1300
Carbon Monoxide	8 hours 1 hour	10,000 40,000	10,000 40,000	10,000 40,000	10,000 40,000
Ozone[4]	1 hour	235	235	235	235
Nitrogen Dioxide	Annual	100	100	100	100
Lead	Cal. quarter	1.5	1.5	1.5	1.5
Gaseous Fluorides as HF	30 days 7 days 24 hours 12 hours	- - - -	- - - -	1.2 1.6 2.9 3.7	1.2 1.6 2.9 3.7

[1] All values other than annual and quarterly values are maximum concentrations not to be exceeded more than once per year. All values are in µg/m^3.

[2] The annual TSP values are geometric means. The secondary value of 60 µg/m^3 is a guide to be used in addressing implementation plans to achieve the 24-hour standard.

[3] The PM-10 standards are attained when the expected number of days per calendar year with a 24-hour concentration above 150 µg/m^3 is equal to or less than one and when the expected annual arithmetic mean is less than or equal to 50 µg/m^3 as determined by 40 CFR 50, Appendix K.

[4] The ozone standard is attained when the expected number of days per calendar year with a maximum hourly average concentration is above the standard or is less than or equal to one as determined by 40 CFR 50, Appendix H.

Table 5.1-2. Summary of Air Quality Monitoring data Kingsport, Tennessee 1990-1992

Pollutant	Averaging Interval	Highest[1] Concentration µg/m³	Monitor Location	Site ID
TSP	Annual	40	Eastman Robinson	47-163-0007
	24 hours	96	Eastman Meadowview	47-163-0005
PM-10	Annual	32	Eastman Robinson	47-163-0007
	24 hours	78	Eastman Robinson	47-163-0007
SO_2	Annual	29	Eastman Robinson	47-163-0007
	24 hours	163	Eastman Robinson	47-163-0007
	3 hours	441	Eastman Robinson	47-163-0007
CO	8 hours	5557	Eastman Robinson	47-163-0007
	1 hour	8165	Eastman Robinson	47-163-0007
O_3	1 hour	225[2]	TDAPC Hill Rd.	47-163-2002
NO_2	Annual	37	Eastman Robinson	47-163-0007

[1]. Annual values are the highest site annual average in the 3-year period. Short-term values are the highest of the yearly second high values.

[2]. Ozone value is the design value (fourth highest value during 1991-1993).

Sulfur Dioxide (SO_2)

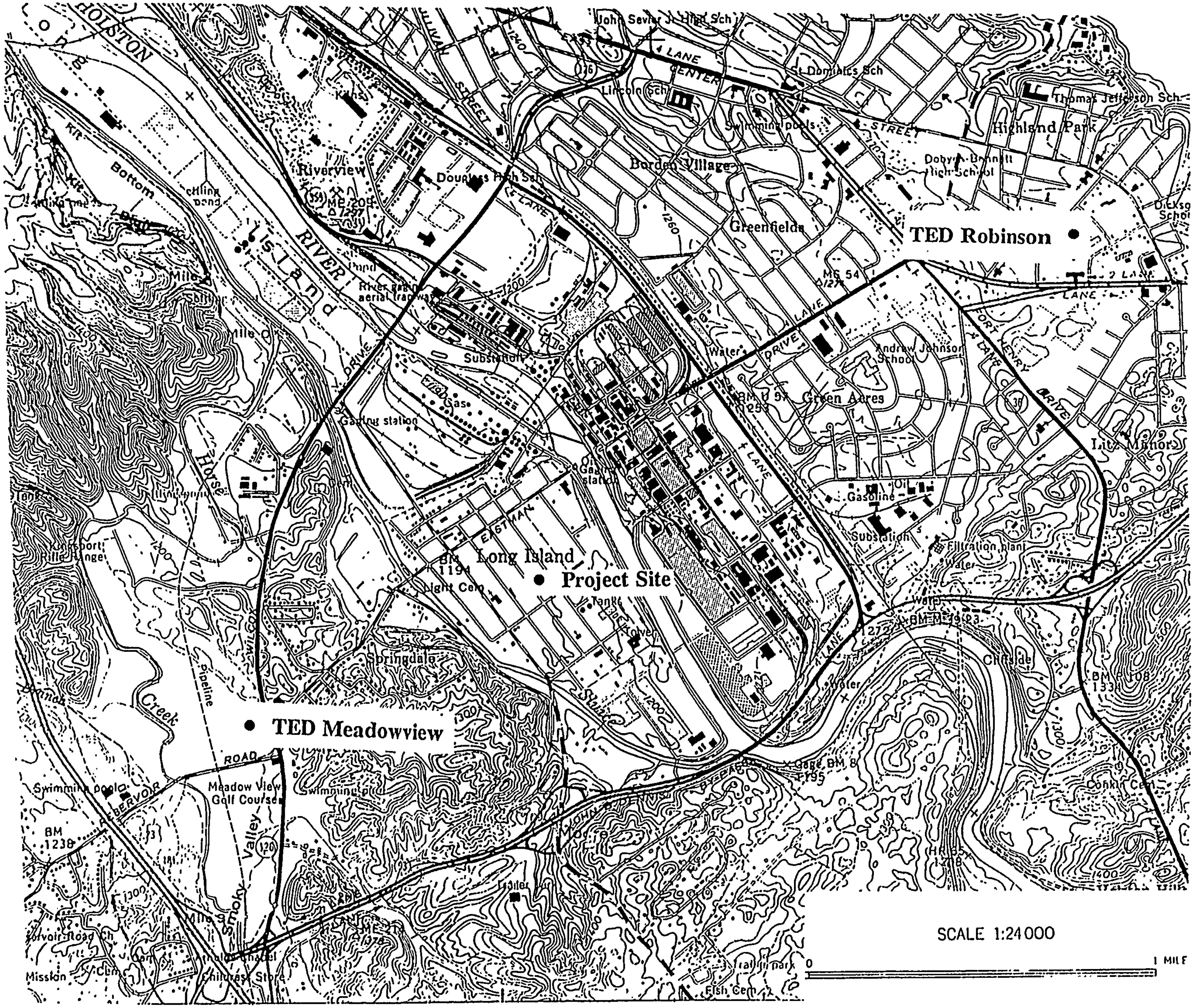


Figure 5.1-3 Location of Eastman Ambient Air Monitors

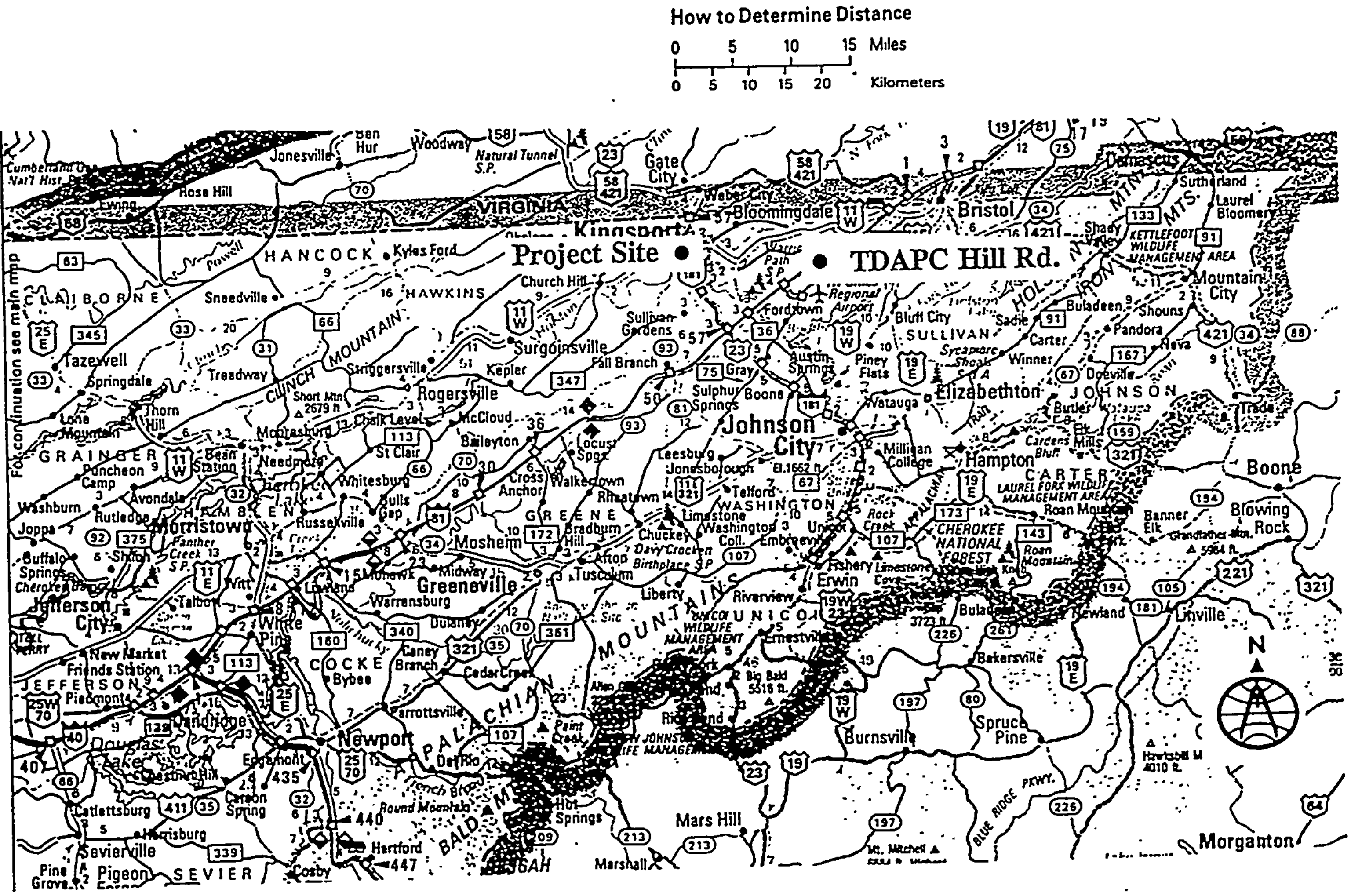


Figure 5.1-4 Location of TDAPC Ambient Air Monitor

Eastman monitors sulfur dioxide at both monitoring locations. The highest annual average in the 1990-1992 data set is 29 $\mu g/m^3$ which is 36 percent of the NAAQS. The short-term averages are also well below their respective standards. The highest 24-hour concentration of 163 $\mu g/m^3$ is 45 percent of the 24-hour standard, and the highest 3-hour concentration of 440 $\mu g/m^3$ is 34 percent of the secondary standard.

Carbon Monoxide (CO)

Carbon Monoxide concentrations measured by Eastman are also well under the NAAQS levels. The maximum 8-hour concentration is 5557 $\mu g/m^3$ which is 56 percent of the standard. The 1-hour concentration of 8165 $\mu g/m^3$ represents 20 percent of the standard.

Ozone (O_3)

Ozone is measured by the TDAPC at a site within Sullivan County approximately 15 miles east of Eastman and shown in Figure 5.1-4. Compliance with the standard is achieved when the expected number of days over the standard per calendar year is less than or equal to one. The most recent three years of monitoring data are used for the compliance determination. Thus, the fourth highest value in a three-year data set, which is called the design value, is used to determine attainment status for an area. The design value for the Kingsport area is 225 µg/cu m for 3-year period 1991-1993. Based on this design value, Sullivan County is currently classified as an attainment area for ozone.

For projects in attainment areas, Prevention of Significant Deterioration (PSD) regulations may also apply. This regulation is triggered when emissions are increased above pollutant-specific levels. For instance, the triggers for carbon monoxide and volatile organic compounds are 100 tons per year and 40 tons per year, respectively. The proposed project will increase emissions of carbon monoxide and volatile organic compounds, but the increases are not greater than these levels. In addition, the proposed project will not increase emission rates of the other compounds mentioned in the Prevention of Significant Deterioration regulations, such as sulfur dioxide and nitrogen oxides.

5.2 Earth Resources

The Eastman facility is located in the Valley and Ridge geologic province, a region of parallel valleys and ridges that trend northeastward across eastern Tennessee. In general, the ridges are comprised chiefly of sandstone, siliceous limestone, and dolomite, and the valleys are underlain by less resistant rocks such as calcareous shale and limestone. Unconsolidated materials occur at the land surface in valley bottoms as products of stream and river deposition, and as residuum weathered from the underlying bedrock. Generally, the thickness of the residuum is many times greater over limestone and dolomite than it is over shale bedrock. Trellis drainage patterns are dominant in the Valley and Ridge where numerous streams flowing perpendicular to the trend of the ridges empty into a single stream in the valley bottom (Geraghty and Miller, 1990).

The Eastman facility is located in a large valley occupied by the South Fork Holston River and an adjoining valley occupied by Horse Creek, a tributary of the South Fork River. An extremely thick section (as great as 4,000 feet) of shale bedrock underlies the facility except for the area southeast of the Cliffs Fault which separates the Sevier Shale and its equivalents from the older Knox Group (Figure 5.2-1). The Tellico, Blockhouse and Lenoir Formations are equivalent to the Sevier Shale previously identified in this area. Alluvium overlies the bedrock on Long Island, and adjacent to Horse Creek, Big Sluice and South Fork Holston River. The area between Horse Creek and Big Sluice is characterized by low bedrock knobs covered by a thin layer of residuum (Geraghty and Miller, 1990).

Figure 5.2-2 shows a generalized cross section through the area south of the Eastman facility. The Bays Mountain syncline is a major structural feature that terminates above ground just south of the facility. Bays Mountain formed during a period of intensive structural deformation as rock layers were thrust to the surface from the southeast. Compressional forces responsible for thrusting older rock layers on top of younger layers, as is the case along the Cliffs Fault where the older Knox Group was thrust onto the Sevier Shale, also caused the rocks below Bays Mountain to crumple into a large syncline. Local structural deformation has resulted in varied orientations of the rocks in the area such that bedding may dip to the southeast or the northwest with orientations ranging from horizontal to nearly vertical. East of Horse Creek, beds in the Blockhouse Shale and the overlying Tellico Shale are overturned (Geraghty and Miller, 1990).

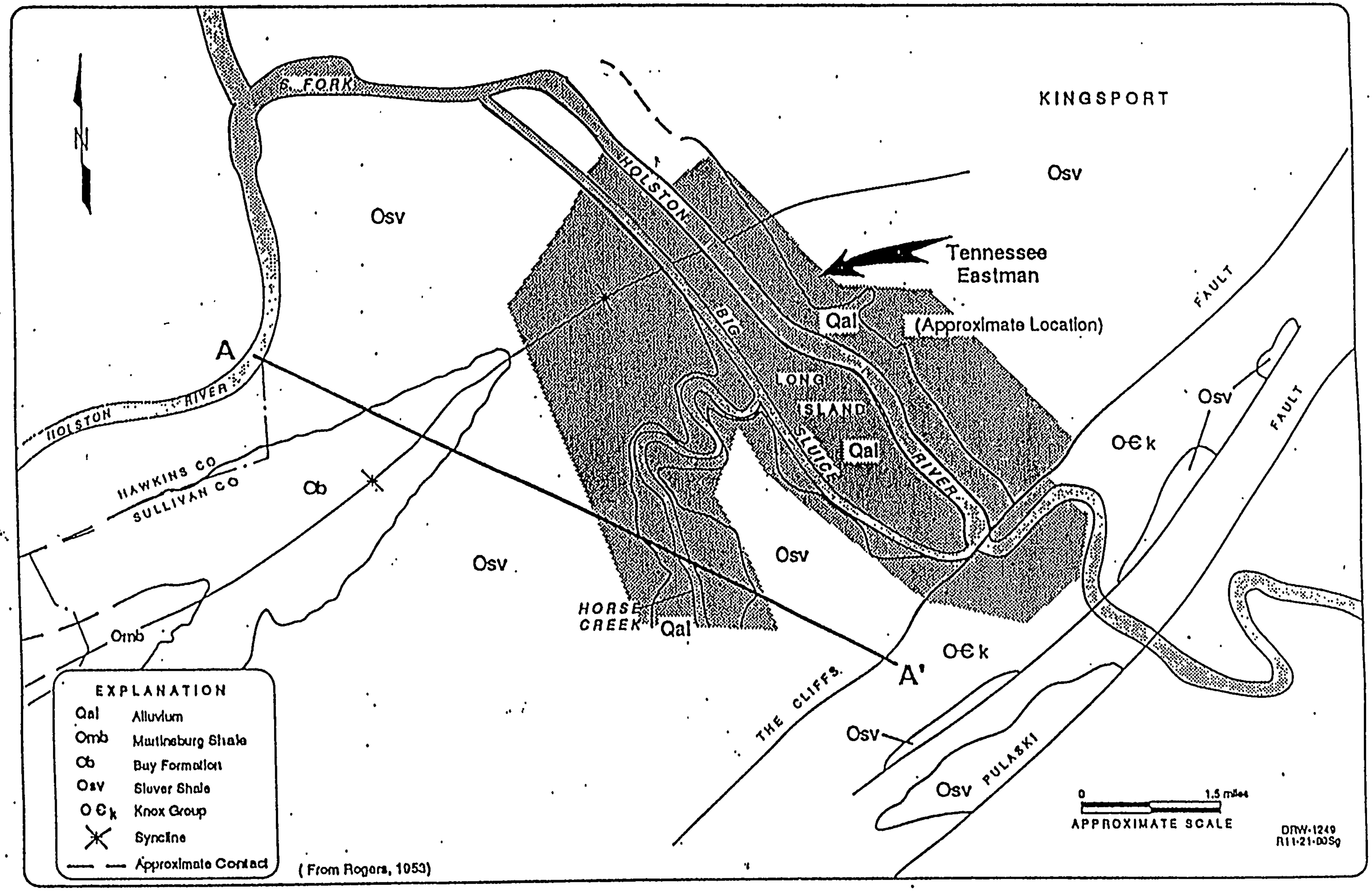


FIGURE 5.2-1. GEOLOGY NEAR EASTMAN

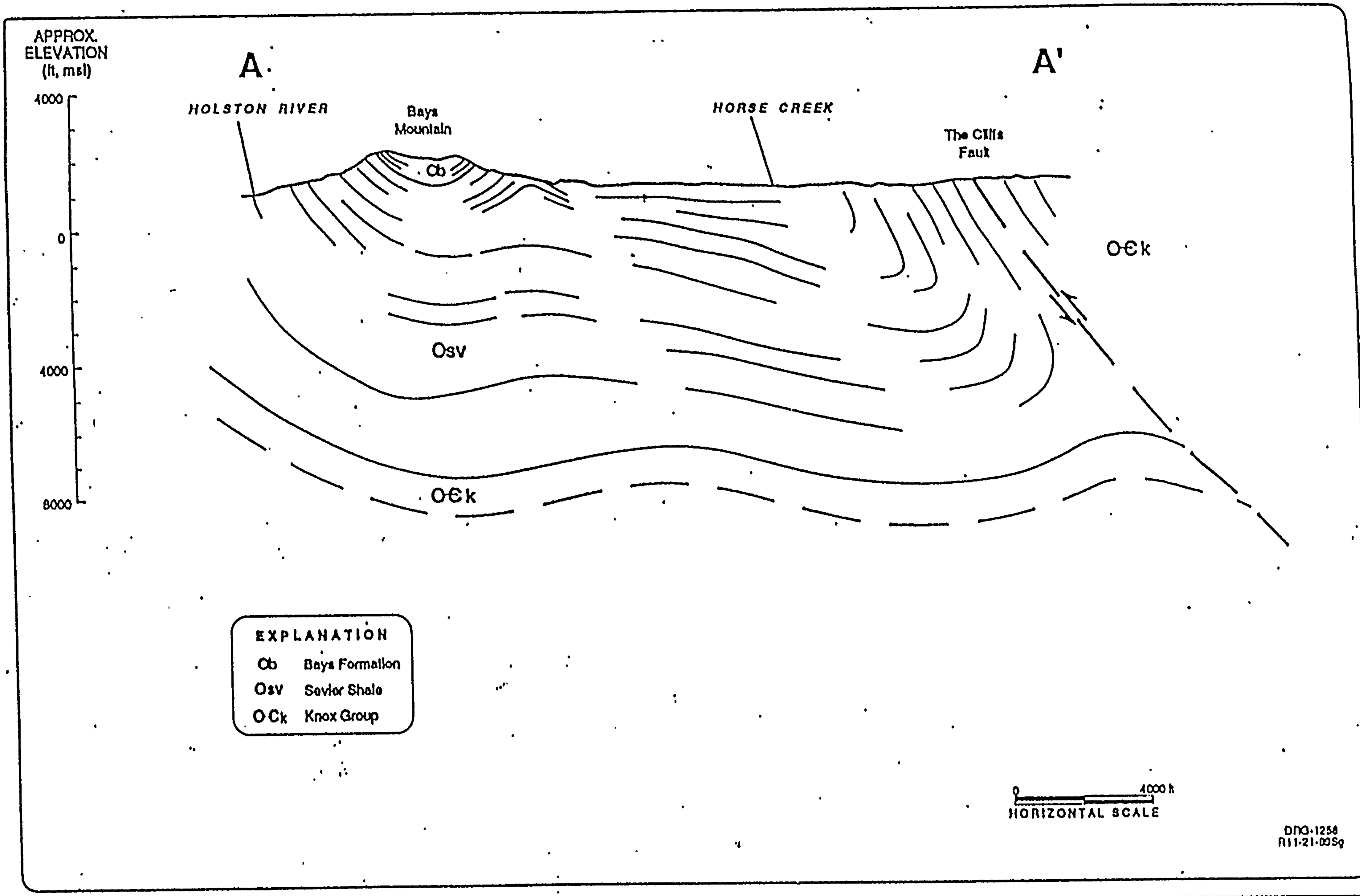


FIGURE 5.2-2. GENERALIZED GEOLOGIC CROSS SECTION A-A' SOUTH OF EASTMAN

5.3 Water Resources

5.3.1 Surface Water

5.3.1.1 Hydrology

The South Fork Holston River includes 2,048 square miles of watershed of which 869 square miles are drained by the Watauga River. Originating in Smyth County, Virginia, the South Fork Holston River flows southwestward joining with the Watauga River and eventually merging with the North Fork of the Holston River to form the Holston River immediately downstream of Kingsport, Tennessee. Flow in the South Fork is regulated throughout its length by a series of dams operated by the Tennessee Valley Authority (TVA). These include South Holston (South Fork Holston River Mile or SFHRM 49.8) followed by Boone (SFHRM 18) and Fort Patrick Henry (SFHRM 8.2). Two other dams are located on the Watauga River (TVA, 1970).

Elevations in the South Fork watershed range up to 5,720 feet. The Watauga River, which joins the South Fork 20 miles above its mouth, lies in the heavily forested Blue Ridge region of eastern Tennessee and western North Carolina. Elevations along the Watauga watershed rim range up to 6,285 feet. Some 57 percent of the Watauga River basin is forested as compared with 45 percent of remainder of the South Fork Basin (TVA, 1961).

The Fort Patrick Henry Dam is located approximately three river miles upstream of the Eastman facility. At the upstream Eastman boundary (SFHRM 5.6), the South Fork splits into two channels the smaller of which is named the Big Sluice. The two channels join together again at a point approximately one mile upstream of the confluence of the North Fork and the South Fork of the Holston River. The island which exists between the main channel of the South Fork and the Big Sluice is called the Long Island of the Holston. Part of the Eastman facility is located on the most upstream section of this island.

Two minor tributaries contribute flow to the river in the vicinity of the Eastman facility. These are Horse Creek which empties into the Big Sluice 2.2 miles upstream of where Big Sluice and the South Fork of the Holston join together and Reedy Creek which discharges to the main channel at a point downstream of the Eastman facility at SFHRM 2.1.

The nearest active gaging station is operated by the United States Geological Survey and is located over 140 river miles downstream of Eastman near Knoxville, Tennessee. However, historical data on the combined flows of the South Fork Holston main channel and the Big Sluice are available from gaging stations which were operated in Kingsport from 1925 through 1977. The average discharge for this period of record was 2,610 cubic feet per second (cfs). The maximum discharge since the regulation of flows by the upstream reservoirs was 24,200 cfs which occurred on March 12, 1963 (USGS, 1978).

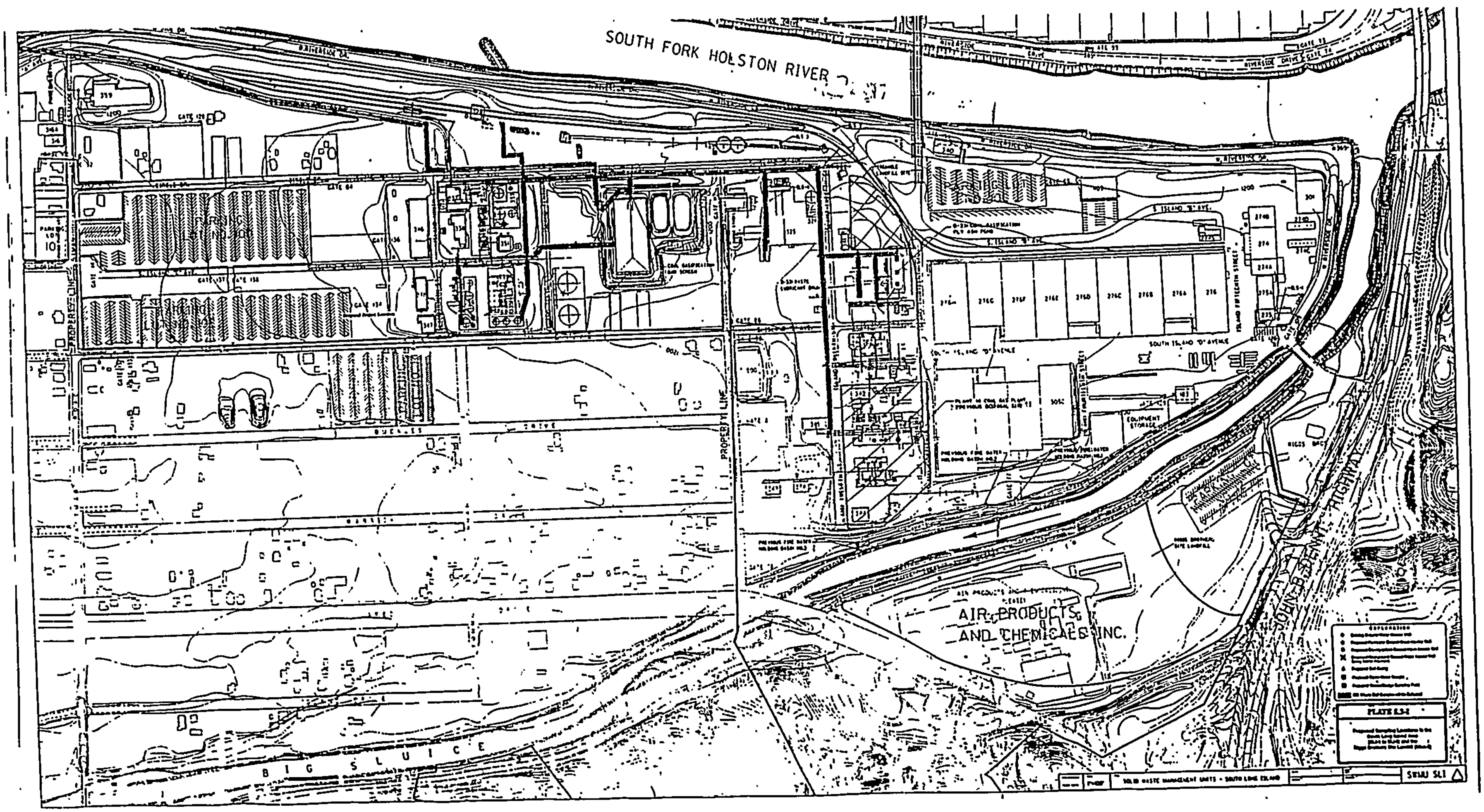
5.3.1.2 Surface Water Quality

The South Fork Holston River in the vicinity of Eastman is classified by the state of Tennessee for use as an industrial water supply, recreation and the propagation of aquatic life. Periodically, the Tennessee Department of Health and Environment (TDHE) evaluates the ability of the State's surface waters to meet their designated use classifications. Data for 18 chemical, physical and bacteriological parameters are compared to criteria or standards specific to the appropriate use classification. Judgments are then made as to whether or not a stream fully supports, partially supports or is not supporting its designated uses.

In the most recent study which was issued in 1990, the South Fork Holston River near Eastman is listed as partially supporting its designated uses. Reasons for this classification included poor water quality releases from Boone and Fort Patrick Henry reservoirs, elevated concentrations of nitrate and fecal coliform, occasional spills from Eastman and the presence of dioxin detected in fish tissue downstream of Mead Paper Company (TDHE, 1990).

In the summer of 1990 the Academy of Natural Sciences of Philadelphia completed the fifth in a series of comprehensive river studies for Eastman. Results from chemical, physical and bacteriological analyses taken during the most recent study substantiate the State's conclusions regarding current river water quality. However, the Academy's work also documented substantial improvements in water quality since the first study in 1965 (Academy, 1992).

Figure 5.3-1 shows the location of sampling stations used during the Academy study. Station 2 is upstream of Eastman and stations 3 and 5 are downstream of the facility in the main channel of the South Fork Holston River. Station 4 is in the Big Sluice. Table 5.3-1 lists the mean concentrations at the various stations for the 18 water quality indicator parameters used by the State of Tennessee to evaluate surface waters. The State's criteria are also listed. All values for the parameters are well within the State's criteria with the exception of dissolved oxygen, nitrate and fecal coliform. Lower dissolved oxygen concentrations are present in the water released from Fort Patrick Henry Dam upstream of the Eastman facility. Dissolved oxygen concentrations improve through reaeration as the water flows downstream. Nitrate concentrations also exceed the state's criteria at the upstream sampling point and remain virtually unchanged at the downstream locations. Nitrate is a pollutant common to both agricultural and urban development and its presence in the South Fork Holston River is indicative of development within the watershed. The presence of fecal coliform within the Kingsport area is indicative of the influence of urban development (e.g., treated municipal wastewater, stormwater runoff, and septic systems) on the river (Academy, 1992).


SOUTH FORK HOLSTON RIVER
PROPERTY LINE
AIR PRODUCTS AND CHEMICALS INC.
JOHN B. DENNIS HIGHWAY
BIG SLUICE
SOUTH ISLAND "D" AVENUE
EQUIPMENT STORAGE
PLATE 2.5-2
SOLID WASTE MANAGEMENT UNITS - SOUTH LONG ISLAND
SWMU SLI

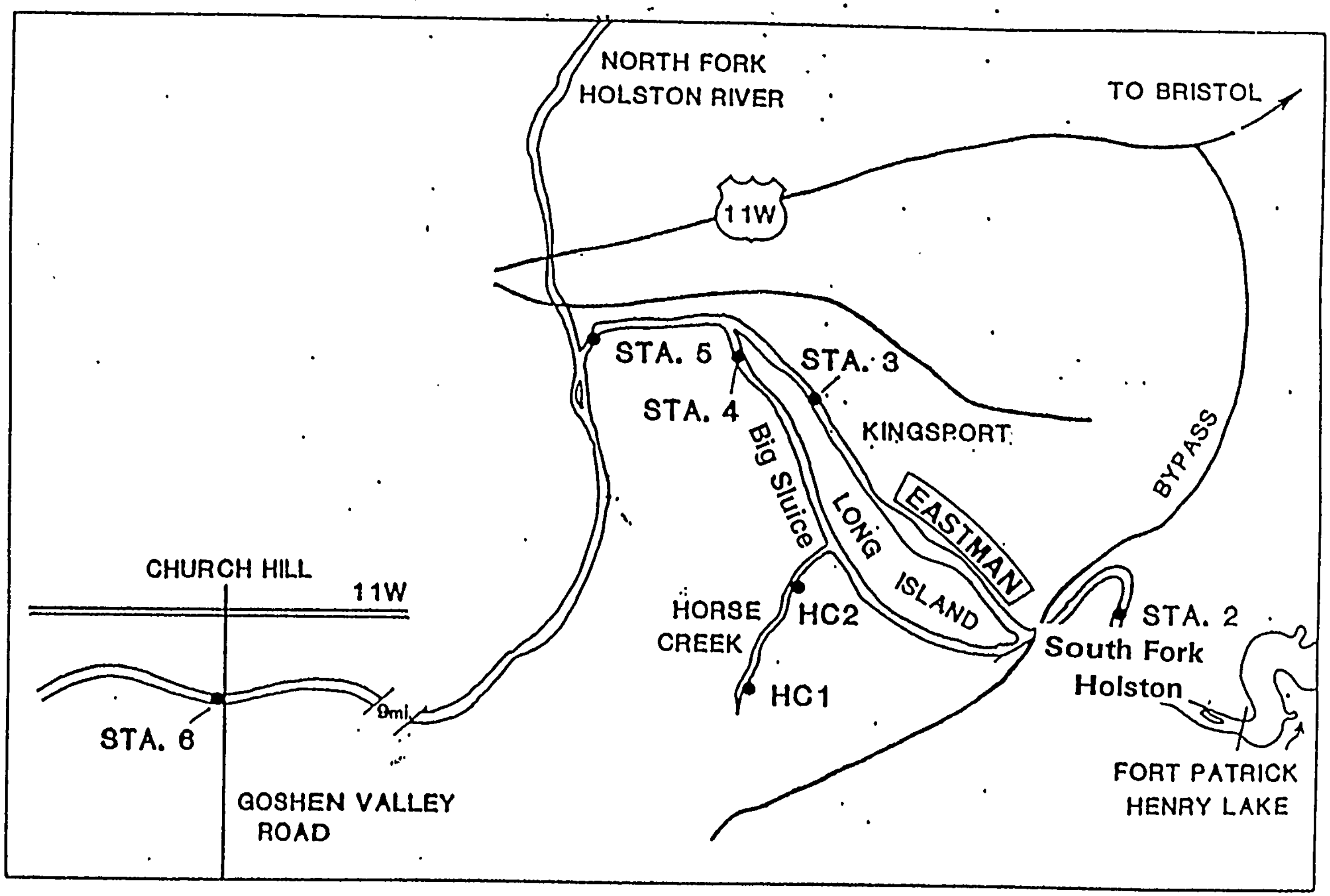


Figure 5.3-1 Sampling sites for 1990 studies on the South Fork and mainstream Holston River, Big Sluice and Horse Creek.

Table 5.3-1. Mean Concentrations for Water Quality Indicator Parameters, June 6-July 24, 1990.

Parameter	STATION				CRITERIA
	2	3	4	5	
Temperature, °C	16.1	20.5	21	21.5	< 30.5
Dissolved Oxygen	3.6	4.4	9.9	5.0	> 5.0
pH, units	7.0	7.2	8.0	7.5	6.5-8.5
Dissolved Residue	114	165	-	173	< 2,000
Suspended Residue	6.1	6.3	5.6	17.4	< 80
Ammonia	ND	0.23	0.015	0.05	< 0.66
Arsenic	ND	ND	ND	ND	< 0.072
Cadmium	ND	ND	ND	ND	< 0.002
Chromium	ND	ND	ND	ND	< 0.1
Copper	ND	ND	ND	ND	< 0.02
Lead	ND	ND	ND	ND	< 0.05
Nickel	ND	ND	ND	ND	< 0.056
Zinc	ND	ND	ND	ND	< 0.1
Mercury	ND	ND	ND	ND	< 0.0002
Phosphorus	0.01	0.07	0.05	0.03	< 0.2
Nitrate/Nitrite	0.68	0.65	0.54	0.68	< 0.2
Biochemical Oxygen Demand	1.3	1.8	1.2	1.1	< 5.0
Fecal Coliforms, colonies/100ml	97	1538	102	1000	< 200

All concentrations in mg/L unless noted

5.3.2 Ground Water

5.3.2.1 Hydrology

In 1989, Eastman initiated a study by Geraghty & Miller, Inc. to characterize the hydrogeology at the Eastman facility. The purpose of the study was to better determine the local patterns and rates of ground-water movement in the principal water-bearing units, identify areas of groundwater recharge and discharge, and determine the amount of groundwater discharge to the surface-water bodies. The study area included the entire Eastman facility, except that portion south of John B. Dennis Highway underlain by the Knox Group. The principal water-bearing units in the study area include the bedrock strata comprised of the Sevier Shale and overlying unconsolidated deposits derived from the weathering of the underlying shale and from deposition by rivers and streams. The shale unit is present beneath the entire study area; whereas, the unconsolidated unit is locally important adjacent to Horse Creek, Big Sluice, and South Fork Holston River.

The scope of the investigation included the installation of twelve piezometer clusters and seven single piezometers designed to provide information about the magnitude and direction of vertical and horizontal hydraulic gradients in the bedrock and the unconsolidated units, and hydrologic testing of the piezometers to determine representative hydraulic conductivity values for each unit. The locations of these piezometers are shown in Figure 5.3-2. A program of water-level monitoring was conducted for three months to determine representative vertical and horizontal hydraulic gradients in the saturated zone.

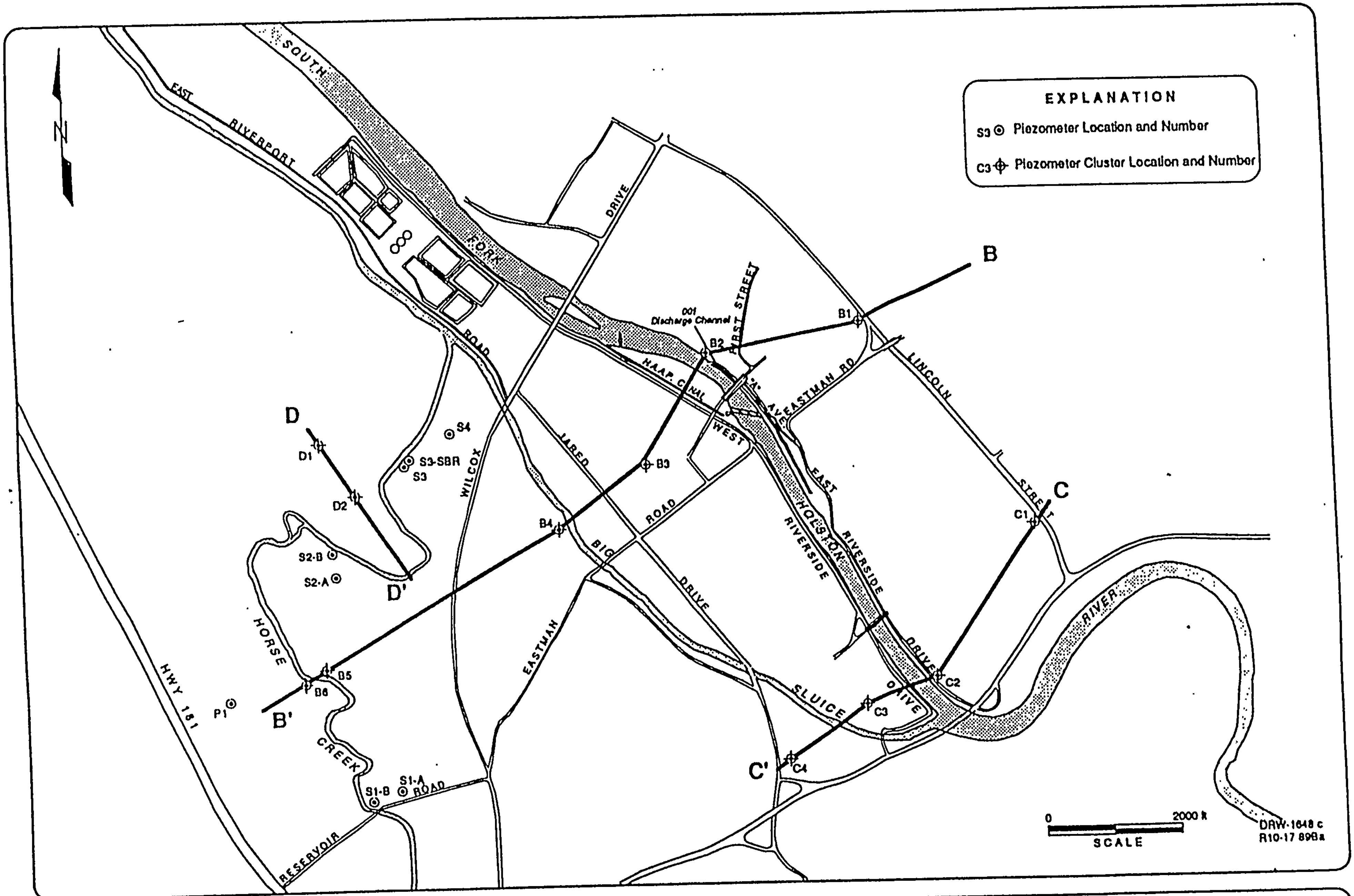


Figure 5.3-2. Piezometer Locations for Study

Vertical hydraulic gradients were determined at each piezometer cluster based on water-level measurements taken on August 22, 1989. The magnitude of the gradients ranged from 0.001 to 0.18. Generally, the direction of the vertical gradients were upward along Horse creek, the Big Sluice, and the South Fork Holston River. Downward vertical gradients were observed along the center of Long Island, caused by the relief of the water table between the Big Sluice and the South Fork Holston River. Vertical gradients located next to the South Fork Holston River, were observed to change from upward to downward, and are likely to be strongly influenced by changes in river stage. These data confirm that the South Fork Holston River, the Big Sluice, and Horse Creek represent discharge boundaries for ground water in the bedrock and unconsolidated units beneath the Eastman facility.

Slug tests were conducted in 30 of the 41 piezometers that were installed to determine hydraulic conductivity of the bedrock and the unconsolidated zones. Results of these tests show that the shallow bedrock zone has the highest mean hydraulic conductivity (7.1 ft/day or 2.5×10^{-3} cm/sec), which is significantly greater than the mean hydraulic conductivities of the deeper bedrock zones (0.34 ft/day or 1.2×10^{-4} cm/sec and 0.17 ft/day of 5.9×10^{-5} cm/sec). The mean hydraulic conductivity of the unconsolidated sediments on Long Island, determined from slug tests in two piezometers, is 6.2 x 10^{-3} ft/day (2.2 x 10^{-6} cm/sec). The unconsolidated sediments along Horse Creek have a mean hydraulic conductivity of 1.4 ft/day (4.9 x 10^{-4} cm/sec).

Estimates of horizontal ground-water flow rates and discharge were made based on the calculated values of hydraulic conductivity and hydraulic gradient. The estimates of ground-water discharge were compared to surface-water flows. The volume of ground water discharging from the main plant area to the South Fork Holston River across a face 150-feet deep and 7,000-feet long was estimated to be approximately 1.7 ft^3/sec compared to the average flow in the river which is approximately 2,600 ft^3/sec. Similarly, it was estimated that approximately 1.0 ft^3/sec of ground water discharges to both the river and the sluice from Long Island, where the proposed project would be located. Ground-water discharge to the Big Sluice from Horse Creek Valley was estimated to be approximately 0.08 ft^3/sec. Average flow in the Big Sluice below Horse Creek is approximately 320 ft^3/sec. These calculations probably overestimate discharge because the hydraulic conductivity of the shallow bedrock zone was applied to the entire 150 feet vertical section, when in fact, it has been shown that the hydraulic conductivity decreases with depth in the bedrock.

Figures 5.3-2, 5.3-3, 5.3-4, 5.3-5, and 5.3-6 are included to show the geology of Long Island that affect groundwater transport and the direction of groundwater flows. Figure 5.3-2 shows the locations of the piezometers and the cross sections BB' and CC'. Since the proposed project site lies halfway between these two cross sections, geology and groundwater flows are shown for both cross sections.

5.3.2.2 Ground Water Quality

The proposed demonstration project would be located on South Long Island. Ground water beneath South Long Island is shallow, occurring between 10 to 20 feet below ground surface. A geotechnical exploration of a site 350 feet southwest of the proposed plant site showed the water table at 10 to 11 feet below grade (S & ME, 1992). The uppermost water-bearing zone in this area is a heterogeneous mixture of fill and poorly sorted, unconsolidated alluvial deposits containing abundant cobbles. At the site referenced above, the depth of this layer ranges from 25 to 32 feet below grade. Monthly water-level measurements from piezometers in this area show that the water table occurs year round in the unconsolidated zone. The Sevier Shale underlies the unconsolidated zone at depths ranging from 15 to 30 feet. Again the exploration referenced above identified the residuum starting at depths of 25 to 32 feet with the bedrock at 27 to 35 feet. Ground water beneath South Long Island moves from a ground-water high along the island center toward the adjacent South Fork Holston River and Big Sluice where it discharges (Geraghty and Miller, 1990).

Currently, there are four monitor wells, ILS-1, ILS-2, ILS-3, and ILS-4, located on South Long Island (Plate 5.3-1) which monitor ground water in the unconsolidated zone. Historical data are available for these wells (Table 5.3-2) on chemical constituents which could have been released to the groundwater. Except for one anomalous

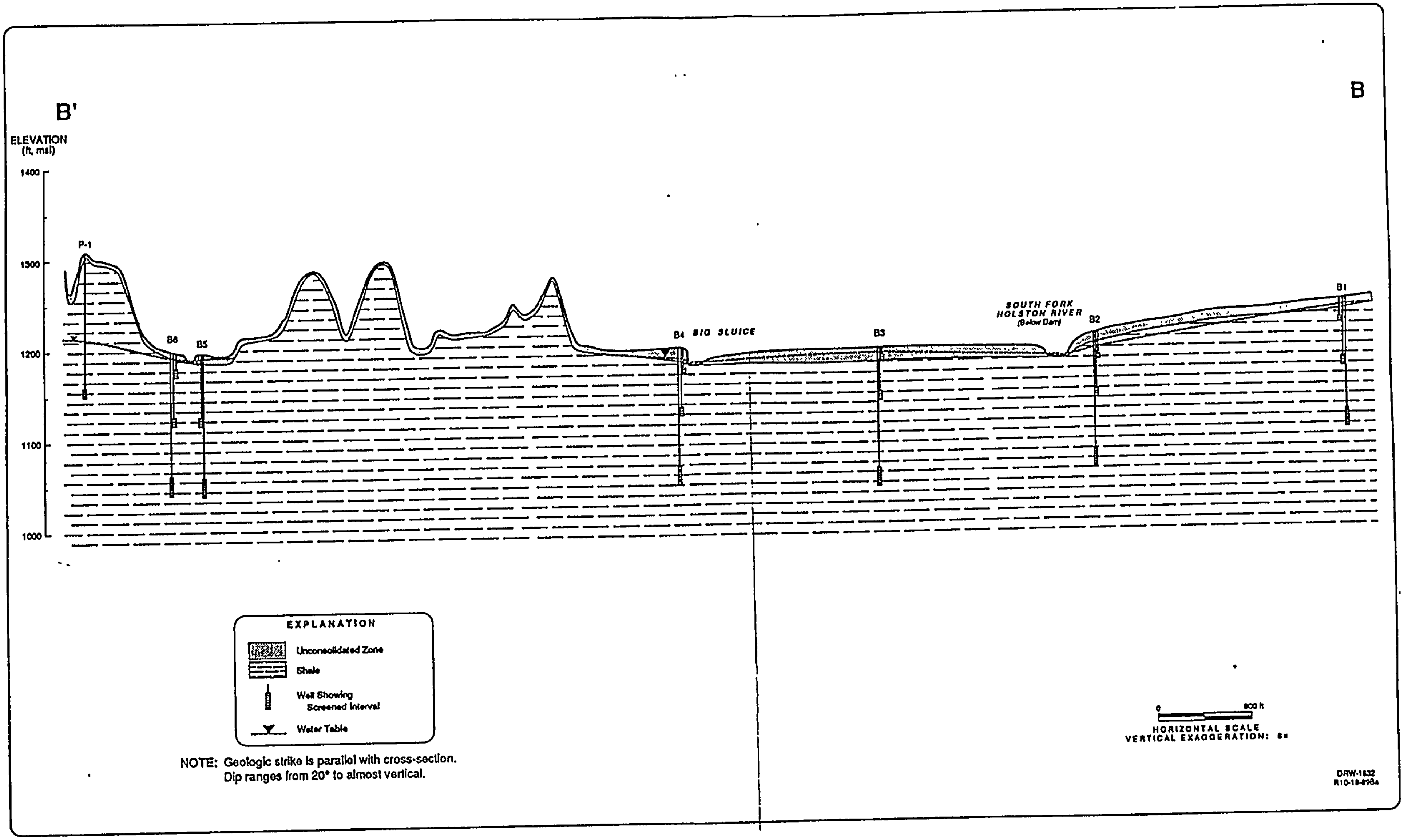


Figure 5.3-3. Hydrogeologic Cross section B-B' (see Figure 5.3-2)

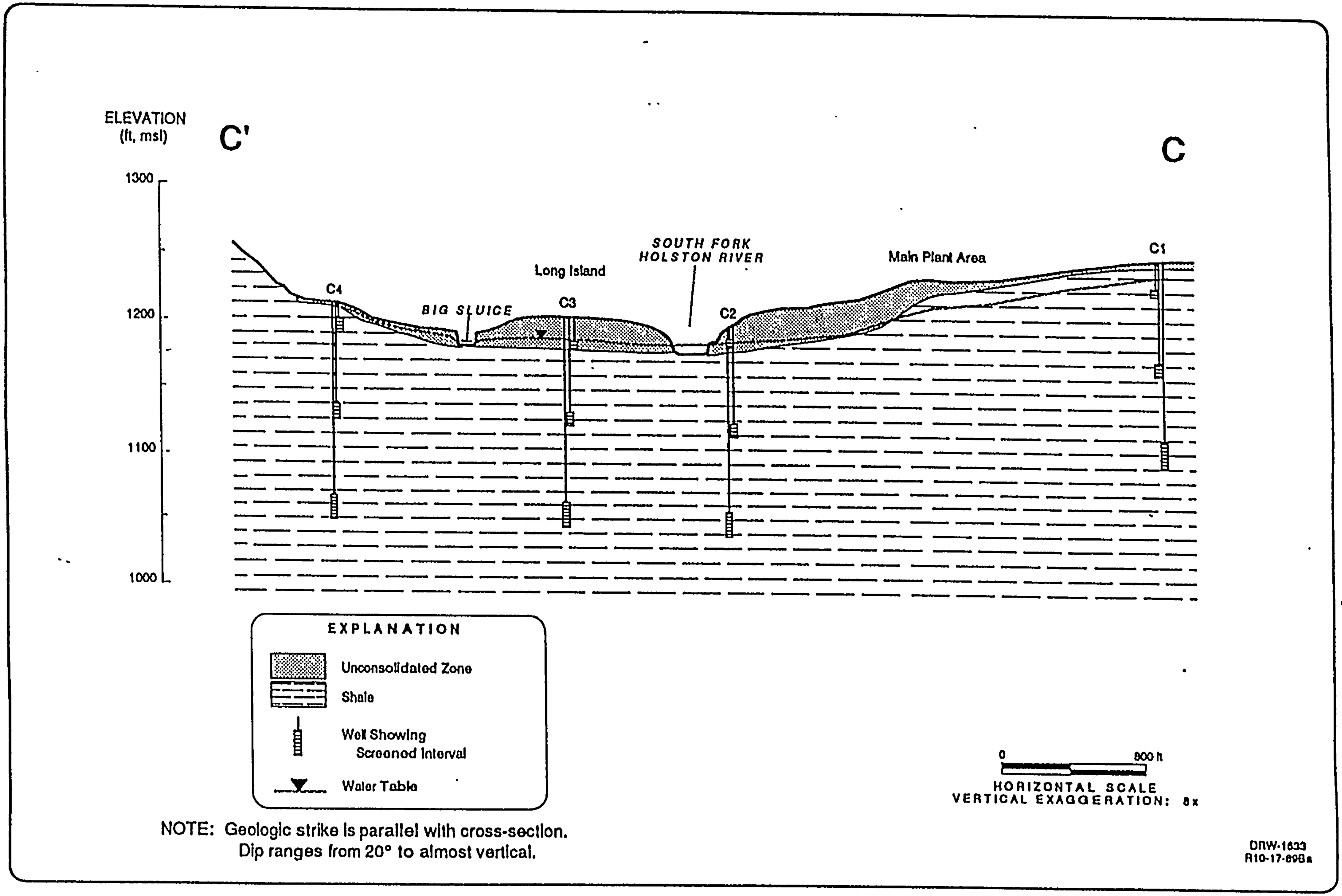


Figure 5.3-4. Hydrogeologic Cross section C-C' (see Figure 5.3-2)

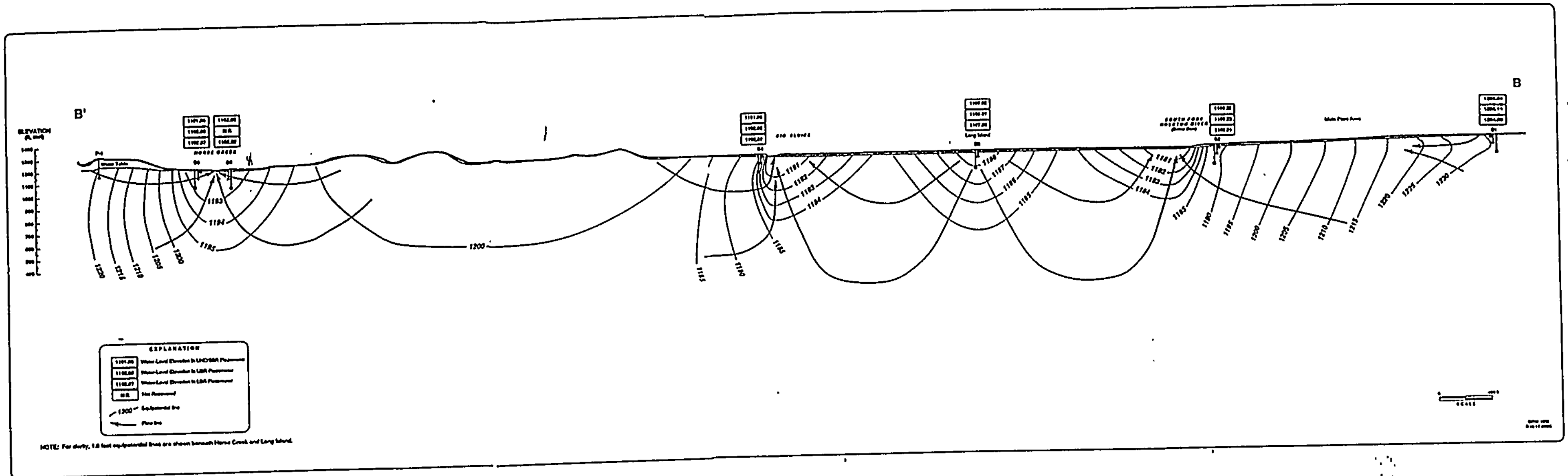


Figure 5.3-5. Hydraulic-Head Distribution and Groundwater Flow Pattern Along Cross section B-B'

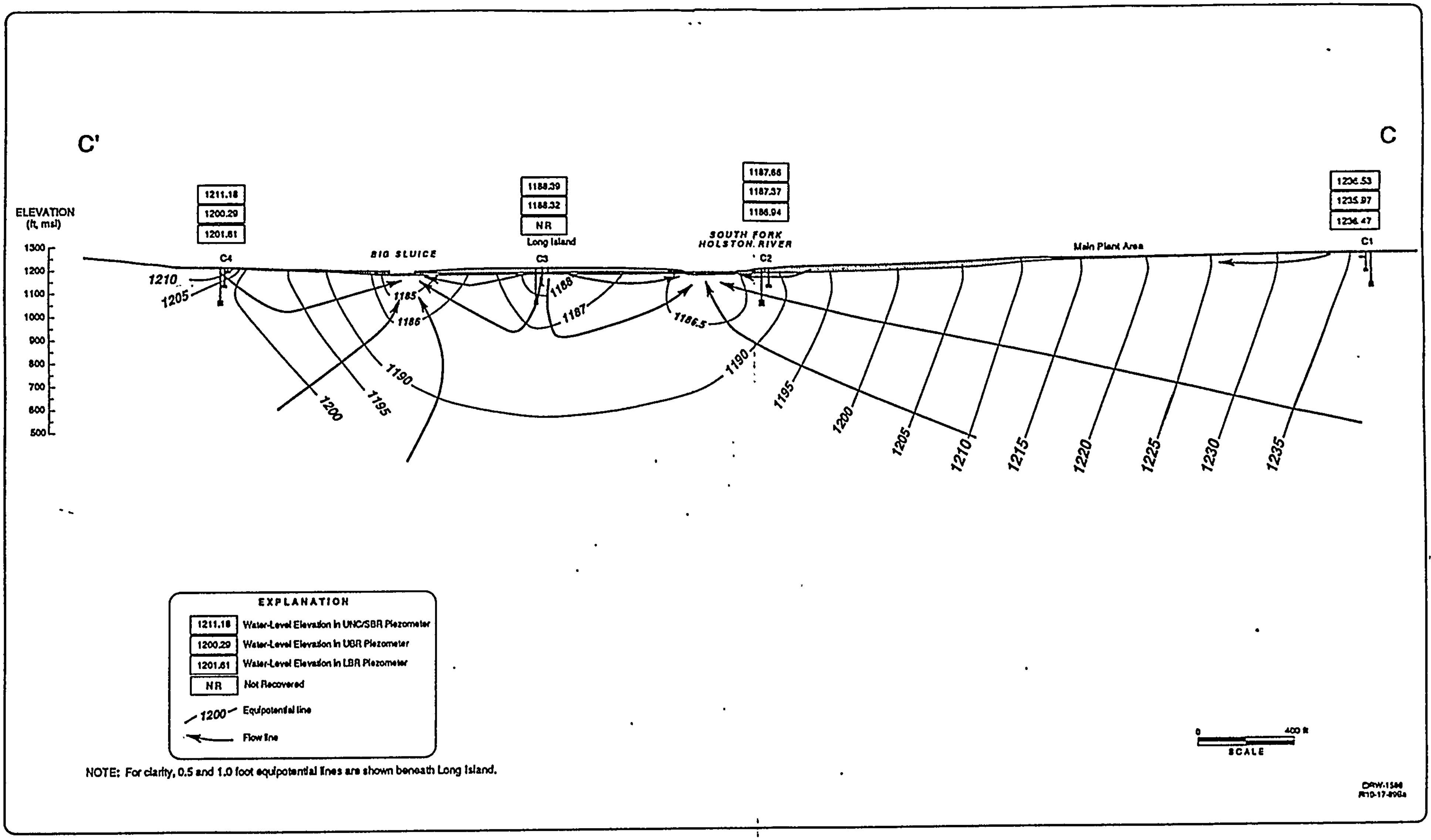


Figure 5.3-6. Hydraulic-Head Distribution and Groundwater Flow Pattern Along Cross section C-C'

methanol occurrence, all organic constituents were below the detection limit and copper and zinc concentrations showed a variability common at concentrations at or near detection limits.

The South Long Island wells are not in an appropriate location to monitor ground water near the proposed Liquid Methanol Demonstration project, so no definite conclusions can be made regarding the groundwater closer to the proposed project site. However, Eastman will be conducting a Resource Conservation and Recovery Act (RCRA) Facility Investigation. This investigation is required of all sources permitted to manage RCRA-hazardous waste. As part of the RCRA investigation, there are plans to install a perimeter ground-water monitoring system for the Eastman facility. This system is designed to monitor ground water discharging from the Eastman facility to the nearby surface waters. There is a proposed perimeter monitoring well which would serve as a suitable monitoring location for the proposed facility (Plate 5.3-1). Installation of the well and the commencement of monitoring has been approved by EPA Region IV and will be completed by the fall of 1994.

Table 5.3-2. Ground-Water Monitoring Data

Sample Date & Parameter	Units	ILS-1	ILS-2	ILS-3	ILS-4
Ground-Water Elevations					
10/3/85	Feet	1184.3	1181.5	1185.3	1186.9
12/9/85	Feet	1185.0	1182.5	1186.1	1187.8
2/19/86	Feet	1184.9	1182.7	1186.2	1188.1
4/23/86	Feet	1184.5	1181.6	1185.7	1187.5
6/18/86	Feet	1184.8	1181.6	1185.5	1187.3
8/29/86	Feet	1184.3	1182.1	1185.6	1187.1
Xylene					
10/3/85	mg/L	ND	ND	ND	ND
12/9/85	mg/L	ND	ND	ND	ND
2/19/86	mg/L	ND	ND	ND	ND
4/23/86	mg/L	ND	ND	ND	ND
6/18/86	mg/L	ND	ND	ND	ND
8/29/86	mg/L	ND	ND	ND	ND
Methanol					
10/3/85	mg/L	ND	ND	ND	ND
12/9/85	mg/L	ND	ND	ND	ND
2/19/86	mg/L	ND	ND	ND	ND
4/23/86	mg/L	ND	ND	ND	ND
6/18/86	mg/L	ND	ND	ND	ND
8/29/86	mg/L	ND	ND	ND	ND
Toluene					
10/3/85	mg/L	ND	ND	ND	ND
12/9/85	mg/L	ND	ND	ND	ND
2/19/86	mg/L	ND	ND	ND	ND
4/23/86	mg/L	ND	ND	ND	ND
6/18/86	mg/L	ND	ND	ND	ND
8/29/86	mg/L	ND	ND	ND	ND
Acetone					
10/3/85	mg/L	ND	ND	ND	ND
12/9/85	mg/L	ND	ND	ND	ND
2/19/86	mg/L	ND	ND	ND	ND
4/23/86	mg/L	ND	ND	ND	ND
6/18/86	mg/L	ND	ND	ND	ND
8/29/86	mg/L	ND	ND	ND	ND

Table 5.3-2. Ground-Water Monitoring Data (cont.)

Sample Date & Parameter	Units	ILS-1	ILS-2	ILS-3	ILS-4
Copper					
10/3/85	mg/L	0.029	0.044	0.034	0.011
12/9/85	mg/L	0.015	0.046	0.064	0.013
2/19/86	mg/L	0.011	0.026	0.010	0.021
4/23/86	mg/L	0.026	0.034	0.014	0.027
6/18/86	mg/L	0.077	0.080	0.026	0.011
8/29/86	mg/L	0.014	0.010	0.005	0.011
Zinc					
10/3/85	mg/L	0.02	0.04	0.02	0.01
12/9/85	mg/L	0.01	0.02	0.02	0.01
2/19/86	mg/L	0.02	0.06	ND	0.03
4/23/86	mg/L	0.03	0.06	ND	0.02
6/18/86	mg/L	0.03	0.03	0.01	0.01
8/29/86	mg/L	0.01	ND	ND	0.01

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NOTE: a) ND = Not Detected above 1.0 mg/L for organic constituents, 0.01 mg/L for copper and zinc.
b) All analyses performed by TEC's Services Analytical Laboratory.
c) From Tennessee Eastman Company, 1987. Results of Site Investigation for Inactive Landfill Sites (Appendix B).

5.3.3 Water Demand for Eastman

Water is used at Eastman for process cooling, facility services and steam generation. Figure 5.3-7 provides a water flow diagram for the facility. Average daily water demand is 406 million gallons per day (MGD). The majority of this water (378.5 MGD) is used for heat removal in a once-through, non-contact cooling system. This water is returned to the South Fork Holston River through outfalls 001, 004, 005 and 006 which are permitted under the National Pollutant Discharge Elimination System (NPDES).

Water treated by sand filtration (27.5 MGD) is used as process water. Wastewater generated by the processes is collected and treated in an industrial wastewater treatment facility by neutralization, grit removal, equalization and activated sludge followed by secondary clarification. Treated water is then returned to the river by NPDES permitted outfall 002.

5.4 Terrestrial and Aquatic Ecological Resources

5.4.1 General Ecological Characteristics

The proposed demonstration unit would be located on a 0.6 acre plot within the 1,046 acre Eastman manufacturing complex (Figure 5.4-1). The land on which the project is to be constructed has been backfilled with 6 feet of fill and surfaced with gravel. The plot is bordered on the east by Building 354 which houses a methyl acetate process. To the southeast is a building with a control room, laboratory and offices and the Building 347 gate house, change house and waiting room. On the west, Park Drive separates the proposed facility from another manufacturing complex which includes the Building 474 Hydrogenation Reactor and Pump House, the Building 473 Tank farm and

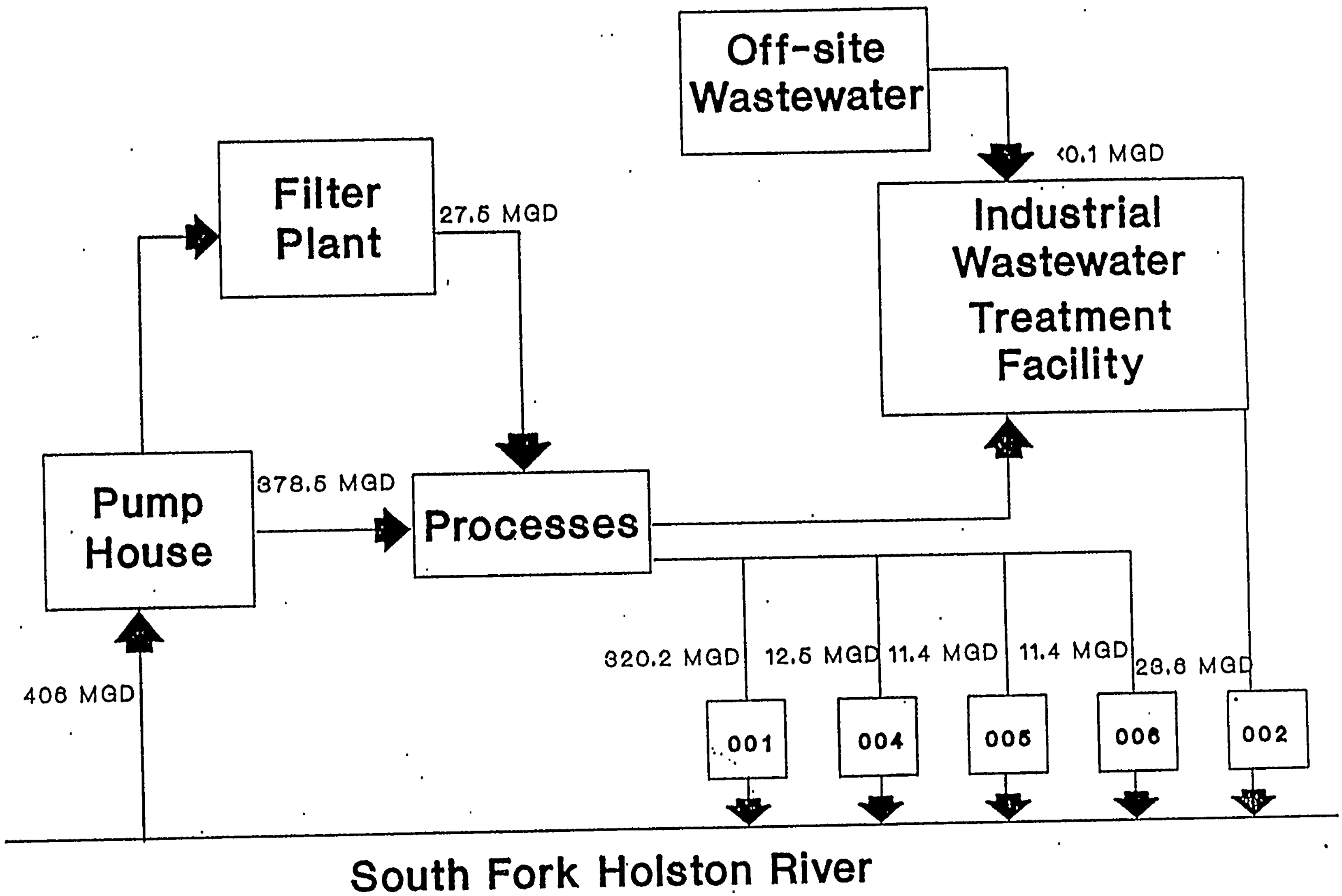

Figure 5.3-7 Summary Schematic of Water Flow
TENNESSEE EASTMAN

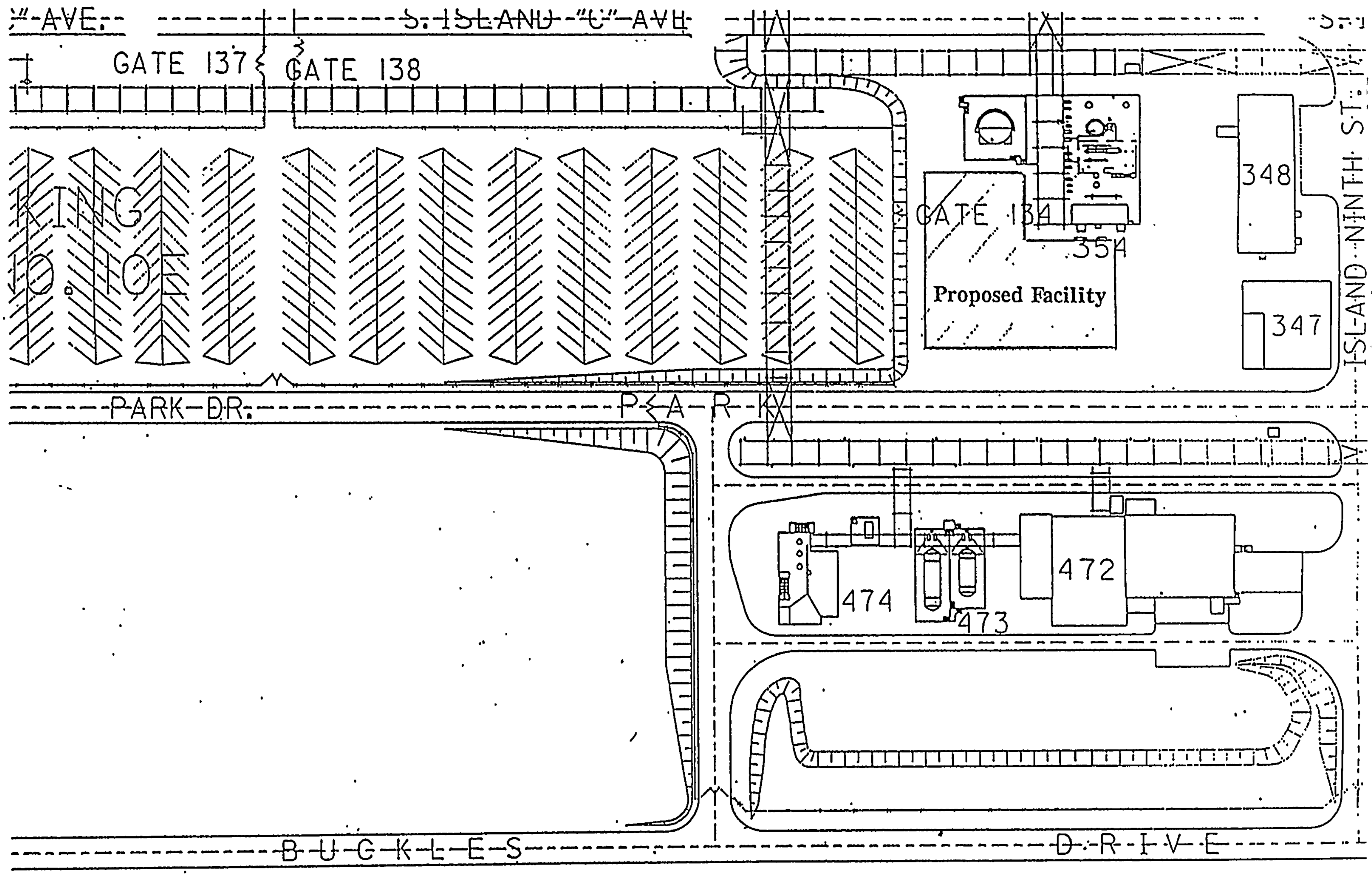

Figure 5.4-1 Site Map for Proposed Facility

Building 472 Manufacturing Facility. Finally, to the northwest there is a large gravel parking lot. A gravel cover exists in all areas between these buildings. There are no plantings of grass or landscape shrubs available for wildlife habitat.

Outside the boundary of the Eastman manufacturing complex on Long Island and within 1,000 feet of the proposed project site there are three occupied private residences and two open fields less than one acre which are maintained with planted grass covers. The nearest ecological habitats of any significance are the South Fork Holston River and the Big Sluice which border Long Island. These surface waters provide habitat for aquatic life and birds as described in the following sections. Both sections of the river are shallow with riffles and pools and some areas of dense aquatic vegetation. In the proximity of the plant, the South Fork is between 200 and 500 feet wide and the depth varies from 1 to 10 feet. The Big Sluice is 50 to 100 feet wide and the depth ranges 1 to 4 feet.

5.4.2 Aquatic Resources

The Holston River system in the vicinity of Kingsport, Tennessee is complex, and biological communities are potentially affected by an array of changes to the system. Dams on the upper river affect both upstream and downstream reaches. Some effects are difficult to document because flow fluctuations resulting from dam operation may introduce short-term changes in distributions of mobile organisms and may affect comparability of samples taken from different locations or under different flow conditions. Impounding has destroyed much riverine habitat, restricting the opportunity for making upstream-downstream comparisons to estimate biological impacts. In addition, several industrial and municipal point sources may affect biological communities. Major point sources are Eastman (SFHRM 3.5 and 4.5), Mead Paper

(SFHRM 2.3 and 2.5), Holston Army Ammunition Plant (SFHRM 4.0), and the City of Kingsport wastewater treatment plant (SFHRM 2.2). The locations of these inputs and habitat characteristics in the receiving waters make it difficult to assess effects of individual inputs on comparable biological communities.

In the summer of 1990, the Academy of Natural Sciences of Philadelphia completed the fifth in a series of comprehensive river surveys on the South Fork Holston River, the Big Sluice and Horse Creek. Academy scientists studied water chemistry, the populations of algae and aquatic macrophytes, non-insect macroinvertebrates, insects and fish. In general, the Academy results indicated poorer water quality at the upstream locations near Fort Patrick Henry Dam and Eastman with improved conditions at downstream locations. Overall the water quality at all sampling locations was improved in 1990 compared to earlier surveys. (Academy, 1992). This can be attributed to installation or improvements of wastewater treatment facilities and the reduction of the number of point sources.

Figure 5.3-1 provides a map of the sampling stations used by the Academy. Station 2 is upstream of Eastman on the South Fork Holston River. Stations 3, 5, and 6 are downstream on the main channel of the river. Station 4 is on the Big Sluice and Stations HC1 and HC2 are on small tributary stream, Horse Creek. The following sections provide listings of plants and animals collected at these sampling locations.

5.4.2.1 Algae and Aquatic Macrophytes

In an aquatic ecosystem such as the Holston River, algae and aquatic macrophytes (aquatic plants) perform several roles central to the establishment and maintenance of the biota. Although there are many sources of energy for riverine ecosystems, algae and aquatic plants, through the process of photosynthesis, transform the sun's energy into forms readily usable by other aquatic organisms. Aquatic plants also support growth and reproductive activities of various species of invertebrates and fish (Academy, 1992).

The structure of algal and aquatic macrophyte communities may be used, as an indicator of conditions in aquatic environments. Because most algae and aquatic macrophytes (plants) are not mobile, their community structure is assumed to be adapted to previously existing conditions, or conditions present when the communities were formed. Algal and aquatic macrophyte community composition, as determined by the species present, their number and abundance, can explain many effects of alterations to the riverine ecosystems. The particular ecological tolerances of many species, especially algae known as diatoms, can be used to characterize aquatic environments such as the Holston River (Academy, 1992).

Table 5.4-1 provides a listing of the algae and aquatic macrophytes collected during the Academy survey. The algal and aquatic macrophyte communities observed at all stations were indicative of areas affected by enrichment by nutrients. Severe pollution of organic material not broken down, which was observed in previous studies, was not observed during 1990 (Academy, 1992).

Table 5.4-1. List of taxa of algae and aquatic macrophytes collected at zones on the Holston River, sluice and Horse Creek near Kingsport, Tennessee in 1990. (X = present; – = not present.)

	Holston R.					Horse Cr.	
	2	3	4	5	6	1	2
Phylum Cyanophyta							
Class Myxophyceae							
Order Chroococcales							
Family Chroococcaceae							
Agmenellum quadruplicatum (Menegh.) Breb.	—	—	X	—	—	—	—
Undetermined coccoid Cyanophyta	—	—	—	—	X	—	—
Family Chamaesiphonaceae							
Entophysalis lemaniae (Ag.) Dr. & Daily	—	—	—	—	—	—	X
Order Hormogonales							
Family Oscillatoriaceae							
Microcoleus vaginatus (Vauch.) Gom.	X	X	X	X	X	—	X
Schizothrix calcicola (Ag.) Gom.	—	X	X	X	X	X	X
Family Nostocaceae							
Nostoc commune Vauch.	—	—	—	—	X	—	—
Phylum Chrysophyta							
Class Xanthophyceae							
Order Vaucheriales							
Family Vaucheriaceae							
Vaucheria sp.	X	X	X	X	X	—	—
Phylum Bacillariophyta							
Class Bacillariophyceae							
Order Centrales							
Family Biddulphiaceae							
Biddulphia laevis Ehr.	—	—	—	—	—	X	—
Family Coscinodiscaceae							
Cyclotella meneghiniana Kuetz.	—	—	X	—	—	—	X
C. pseudostelligera Hust.	X	X	X	X	X	—	—
C. stelligera Cl. ex Grun.	—	X	—	—	—	—	—
Melosira ambigua (Grun.) O. Muell.	X	X	X	X	—	—	—
M. italica (Ehr.) Kuetz.	—	X	X	—	—	—	—
M. italica v. tenuissima (Grun.) O. Muell.	X	—	—	—	—	—	—
M. varians Ag.	X	X	X	X	X	X	X
Skeletonema potamos (Weber) Hasle	X	X	X	X	—	—	—
Stephanodiscus astrea v. minutula (Kuetz.) Grun.	X	X	—	X	—	—	—
S. hantzschii Grun.	X	X	—	X	—	—	—
S. minutus H. L. Sm.	X	X	X	X	X	—	—
Order Pennales							
Family Fragilariaceae							
Diatoma tenue v. elongatum Lyngb.	X	X	—	X	—	—	—

Table 5.4-1.(continued). List of taxa of algae and aquatic macrophytes collected at zones on the Holston River, sluice and Horse Creek near Kingsport, Tennessee in 1990. (X = present; – = not present.)

	Holston R.					Horse Cr.	
	2	3	4	5	6	1	2
D. vulgare Bory	—	—	—	—	X	—	—
Fragilaria construens (Ehr.) Grun.	X	—	—	—	—	—	—
F. crotonensis Kitton	X	X	—	X	—	—	—
F. pinnata Ehr.	X	X	X	X	X	—	—
F. vaucheriae (Kuetz.) Peters.	X	X	X	X	X	—	—
Opephora martyi Herib.	X	—	—	—	—	—	—
Synedra pulchella v. *lacerata* Hust.	X	—	—	—	—	—	—
Synedra rumpens Kuetz.	X	X	X	X	—	—	—
S. rumpens v. *familiaris* (Kuetz.) Hust.	X	—	—	—	—	—	—
S. rumpens v. *meneghiniana* Grun.	X	—	X	X	—	—	—
S. tenera W. Sm.	X	X	—	X	—	—	—
S. ulna (Nitz.) Ehr.	X	—	—	—	—	—	—
Family Achnanthaceae							
Achnanthes affinis Grun.	—	—	X	—	—	—	—
A. clevei Grun.	—	—	—	—	—	X	—
A. lanceolata (Breb.) Grun.	—	—	—	—	—	X	—
A. lanceolata v. *dubia* Grun.	X	X	X	X	—	X	—
A. linearis v. *pusilla* Grun.	X	—	—	—	—	—	—
A. minutissima Kuetz.	X	X	X	X	X	X	X
A. pinnata Hust.	—	—	—	—	—	X	—
Cocconeis pediculus Ehr.	X	X	X	X	X	X	X
C. placentula v. *euglypta* Ehr.	X	X	X	X	X	X	X
C. placentula v. *lineata* Ehr.	X	X	—	X	X	—	—
Rhoicosphenia curvata (Kuetz.) Grun.	X	X	X	X	X	X	X
Family Naviculaceae							
Caloneis bacillum (Grun.) Meresch.	—	—	—	—	—	—	X
Frustulia vulgaris (Thwaites) DeT.	—	—	—	—	X	—	—
Gyrosigma attenuatum (Kuetz.) Rabh.	—	—	—	—	—	X	X
G. scalproides (Rabh.) Cl.	—	—	—	—	—	X	X
G. spencerii (Quek.) Griff. & Henf.	—	—	—	—	—	X	X
Navicula biconica Patr.	—	—	—	—	X	—	—
N. canalis Patr.	—	—	—	—	—	X	—
N. capitata Ehr.	—	—	—	—	—	—	X
N. cincta v. *rostrata* Reim.	—	X	—	—	—	—	X
N. cryptocephala Kuetz.	X	X	—	X	—	X	X
N. cryptocephala v. *exilis* (Kuetz.) Grun.	X	—	X	X	X	X	X
N. cryptocephala v. *veneta* (Kuetz.) Rabh.	—	—	X	X	X	X	X
N. graciloides X. Mayer	X	X	X	X	X	X	X
N. gregaria Donk.	—	X	—	X	X	X	X
N. lanceolata (Ag.) Kuetz.	—	—	—	—	—	X	X
N. luzonensis Hust.	—	—	—	—	X	X	—

Table 5.4-1.(continued). List of taxa of algae and aquatic macrophytes collected at zones on the Holston River, sluice and Horse Creek near Kingsport, Tennessee in 1990. (X = present; – = not present.)

	Holston R.					Horse Cr.	
	2	3	4	5	6	1	2
N. menisculus Schum.	—	—	—	—	—	X	—
N. minima Grun.	X	X	X	X	X	X	X
N. mutica Kuetz.	X	—	X	X	—	—	—
N. neoventricosa Hust.	X	X	—	X	—	—	—
N. ochridana Hust.	—	—	X	X	X	—	—
N. paratunkae Peters	—	—	—	—	X	—	—
N. pelliculosa (Breb. ex Kuetz.) Hilse	—	—	X	X	X	X	—
N. peregrina (Ehr.) Kuetz.	—	—	—	—	—	X	—
N. pupula Kuetz.	—	—	—	—	—	X	X
N. pupula v. *mutata* (Krasske) Hust.	—	—	—	—	—	X	X
N. rhynchocephala v. *germainii* (Wallace) Patr.	—	—	X	—	—	X	X
N. salinarum v. *intermedia* (Grun.) Cl.	X	X	X	X	X	X	X
N. secreta v. *apiculata* Patr.	X	X	—	X	X	X	X
N. seminulum Grun.	—	X	—	X	X	—	—
N. symmetrica Patr.	—	—	—	X	X	X	X
N. tripunctata (O.F. Muell.) Bory	X	X	X	X	X	X	X
Navicula tripunctata v. *schizonemoides* (V.H.) Patr.	—	—	—	—	—	X	X
Family Gomphonemaceae							
Gomphoneis herculeana (Ehr.) Cl.	X	—	—	—	—	—	—
Gomphonema clevei Fricke	X	X	X	X	X	X	X
G. olivaceum (Lyngb.) Kuetz.	—	—	—	—	—	X	X
G. parvulum (Kuetz.) Kuetz.	X	X	X	X	X	X	X
Family Cymbellaceae							
Amphora ovalis v. *pediculus* (Kuetz.) V.H. ex Det.	—	X	X	X	—	X	X
A. perpusilla (Grun.) Grun.	X	X	X	X	X	X	X
A. submontana Hust.	X	X	—	—	X	—	X
Cymbella affinis Kuetz.	X	—	X	X	X	X	X
C. minuta Hilse ex Rabh.	X	X	X	X	X	X	—
C. prostrata v. *auerswaldii* (Rabh.) Reim.	X	—	—	—	—	—	—
Reimeria sinuata (Greg.) Kociol. & Stoerm.	—	X	—	—	—	X	—
R. sinuata fo. *antiqua* (Grun.) Kociol. & Stoerm.	—	—	—	—	X	X	X
Family Nitzschiaceae							
Nitzschia amphibia Grun.	—	X	—	—	X	X	—
N. clausii Hantz.	—	—	—	—	X	—	—
N. dissipata (Kuetz.) Grun.	X	X	X	X	X	X	X
N. dissipata v. *media* Hantz.	—	—	—	X	X	X	X
N. frustulum Kuetz.	X	X	X	X	X	—	X
N. frustulum v. *perminuta* Grun.	X	X	X	X	X	—	—
N. frustulum v. *subsalina* Hust.	X	X	X	X	X	—	—
N. kuetzingiana Hilse	X	X	X	X	X	X	X
N. palea (Kuetz.) W. Sm.	—	X	X	X	X	X	X

Table 5.4-1.(continued). List of taxa of algae and aquatic macrophytes collected at zones on the Holston River, sluice and Horse Creek near Kingsport, Tennessee in 1990. (X = present; – = not present.)

	Holston R.					Horse Cr.	
	2	3	4	5	6	1	2
N. parvula Lewis	X	X	—	—	—	—	—
N. recta Hantz.	—	—	—	—	—	X	X
N. sinuata (W. Sm.) Grun.	X	—	—	—	—	—	—
N. sociabilis Hust.	—	—	X	—	—	X	X
Family Surirellaceae							
Surirella minuta Breb.	—	—	—	—	—	X	X
Phylum Euglenophyta							
Class Euglenophyceae							
Order Euglenales							
Family Euglenaceae							
Euglena sp.	—	—	X	—	—	—	—
Phylum Chlorophyta							
Class Chlorophyceae							
Order Tetrasporales							
Family Tetrasporaceae							
Tetraspora gelatinosa (Vauch.) Desvaux	—	—	X	—	—	—	—
Order Chlorococcales							
Family Scenedesmaceae							
Scenedesmus ecornis (Ralfs) Chodat	—	—	X	—	—	—	—
S. quadricauda (Turp.) Kuetz.	—	—	X	—	—	—	—
Order Chaetophorales							
Family Chaetophoraceae							
Stigeoclonium lubricum (Dillw.) Kuetz.	—	X	—	X	X	X	—
Order Oedogoniales							
Family Oedogoniaceae							
Oedogonium sp.	—	X	X	X	X	—	X
Order Siphonocladales							
Family Cladophoraceae							
Cladophora glomerata (L.) Kuetz.	X	X	X	—	X	X	X
Order Zygnematales							
Family Zygnemataceae							
Spirogyra sp.	—	—	—	—	—	—	X
Family Desmidiaceae							
Closterium sp.	X	X	X	—	—	—	—
Cosmarium sp.	—	X	—	—	—	—	—
Phylum Spermatophyta							
Subdivision Angiospermae							
Class Monocotyledoneae							
Family Zosteraceae							
Potamogeton crispus L.	—	X	X	—	X	—	—
P. nodosus Poiret	—	—	—	X	X	—	—

Table 5.4-1. (continued). List of taxa of algae and aquatic macrophytes collected at zones on the Holston River, sluice and Horse Creek near Kingsport, Tennessee in 1990. (X = present; -- = not present.)

	Holston R.					Horse Cr.	
	2	3	4	5	6	1	2
P. pectinatus L.	—	X	—	X	—	—	—
Family Alismataceae							
Alisma subcordatum Raf.	—	X	—	—	—	—	—
Family Hydrocharitaceae							
Elodea canadensis Michx.	X	—	X	X	X	—	—
Vallisnera americana Michx.	—	—	—	X	X	—	—
Family Cyperaceae							
Eleocharis erythropoda Steud.	—	—	—	—	X	—	—
Scirpus tabernaemontanii Gmel.	—	—	—	—	—	—	X
Family Pontederiaceae							
Heteranthera dubia (Jacq.) MacM.	—	X	—	—	X	—	—
Class Dictyledoneae							
Subclass Archichlamydeae							
Family Polygonaceae							
Rumex obtusifolius L.	—	—	—	X	—	—	—
Polygonum c.f. *punctatum* Ell.	X	—	—	—	—	—	—
Family Cruciferae							
Rorippa sylvestris (L.) Bess.	X	—	—	—	—	—	—
Subclass Metachlamydeae							
Family Acanthaceae							
Justica americana (L.) Vahl	—	—	X	—	—	X	X

5.4.2.2 Non-Insect Macroinvertebrates

Biological inventories are widely recognized as establishing necessary baseline data against which important comparisons with later investigations can be made to discern environmental changes. Traditionally, benthic non-insect macroinvertebrates have been chosen as reliable indicators of water pollution because many species exhibit sedentary habits, some taxa of which are long-lived with low reproductive rates, while others exhibit complex, easily interrupted reproductive life histories and different tolerances to stress. Together, the group possesses phylogenetic, physiological, behavioral and ecological diversity with a sensitivity to a wide range of ecological perturbations. Alterations in community composition and population sizes can disturb the food web and alter an aquatic ecosystem's ability to regulate water quality by eliminating microorganisms, nutrients, and suspended materials. Consequently, studies of benthic macroinvertebrates are an important component of synoptic surveys which are designed for environmental impact assessment (Academy, 1992).

Table 5.4-2 lists the species of non-insect macroinvertebrates which were collected at the Academy sampling stations during the 1990 survey. Water quality, as evidenced by increased species diversity, was improved at the downstream stations (Zones 5 and 6) as compared to the upstream zones. Overall, the 1990 survey documented improved conditions for macroinvertebrates compared to earlier surveys (Academy, 1992).

Table 5.4-2. List of taxa of noninsect macroinvertebrates collected July 1990 at zones on the Holston River, sluice and Horse Creek, Hawkins and Sullivan counties, Tennessee. (X = present; – = not present; * = consists of one or more undetermined crayfish taxa and not counted in the species totals.)

	Holston R.					Horse Ck.	
Taxa	2	3	4	5	6	1	2
Phylum Porifera							
Class Demospongiae							
Order Haplosclerina							
Family Spongillidae							
Undet. sp.	X	X	X	X	X	—	—
Phylum Platyhelminthes							
Class Turbellaria							
Order Tricladida							
Family Dugesiidae							
Dugesia tigrina (Girard)	X	—	X	X	X	X	X
Cura foremanii (Girard)	—	X	—	X	—	—	—
Phylum Ectoprocta							
Class Phylactolaemata							
Family Plumatellidae							
Plumatella repens (Linnaeus)	X	X	X	X	X	—	—
Phylum Nematoda							
Class Adenophorea							
Undet. sp.	X	—	—	—	—	—	—
Phylum Nematomorpha							
Class Gordioidea							
Family Gordiidae							
Gordius sp.	X	—	—	—	—	—	—
Phylum Annelida							
Class Oligochaeta							
Order Tubificida							
Family Tubificidae							
Undet. sp.	—	X	X	—	—	—	—
Order Lumbriculida							
Family Lumbriculidae							
Lumbriculus variegatus (Muller)	X	X	X	X	X	X	—
Class Hirudinea							
Order Pharyngobdellida							
Family Erpobdellidae							
Erpobdella p. punctata (Leidy)	—	X	X	X	—	—	—

Table 5.4-2. (continued). List of taxa of noninsect macroinvertebrates collected July 1990 at zones on the Holston River, sluice and Horse Creek, Hawkins and Sullivan counties, Tennessee. (X = present; – = not present; * = consists of one or more undetermined crayfish taxa and not counted in the species totals.)

Taxa	Holston R. 2	Holston R. 3	Holston R. 4	Holston R. 5	Holston R. 6	Horse Ck. 1	Horse Ck. 2
Undet. sp.	—	—	—	—	—	—	X
Order Rhynchobdellida							
Family Glossiphoniidae							
Desserobdella phalera (Graf)	—	—	—	—	—	X	X
Helobdella triserialis (Blanchard)	—	X	X	—	—	—	—
Placobdella papillifera (Verrill)	X	X	—	—	—	—	—
Phylum Mollusca							
Class Gastropoda							
Order Mesogastropoda							
Family Viviparidae							
Campeloma decisum (Say)	—	—	X	X	X	—	—
Family Pleuroceridae							
Pleurocera uncialis hastatum (Anthony)	—	—	X	X	X	X	X
Leptoxis praerosa (Say)	—	—	—	—	X	—	—
Family Pomatiopsidae							
Pomatiopsis lapidaria (Say)	X	—	—	—	—	—	—
Order Stylommatophora							
Family Succineidae							
Succinea ovalis (Say)	—	—	—	—	X	—	—
Order Basommatophora							
Family Lymnaeidae							
Fossaria obrussa (Say)	X	X	X	—	—	—	—
Family Planorbidae							
Micromenetus dilatatus (Gould)	—	X	X	X	—	—	—
Family Physidae							
Physella heterostropha pomila (Conrad)	X	X	X	X	X	X	X
Family Ancylidae							
Laevapex diaphanus (Haldeman)	—	—	—	—	X	—	—
Ferrissia rivularis (Say)	X	X	X	X	X	X	X
Class Bivalvia							
Order Unionida							
Family Unionidae							
Fusconaia barnesiana (Lea)	—	—	—	—	—	—	*
Pleurobema coccineum (Conrad)	—	—	—	—	—	*	—
Villosa v. vanuxemensis (Lea)	—	—	—	—	—	*	—
Order Veneroida							
Family Sphaeriidae							
Pisidium sp.	—	X	X	—	—	—	—

Table 5.4-2. (continued). List of taxa of noninsect macroinvertebrates collected July 1990 at zones on the Holston River, sluice and Horse Creek, Hawkins and Sullivan counties, Tennessee. (X = present; – = not present; * = consists of one or more undetermined crayfish taxa and not counted in the species totals.)

	Holston R.					Horse Ck.	
Taxa	2	3	4	5	6	1	2
Musculium securis (Prime)	—	—	—	X	—	—	—
Sphaerium fabale (Prime)	—	—	X	—	—	—	—
S. striatinum (Lamarck)	—	—	X	—	—	X	X
Family Corbiculidae							
Corbicula fluminea (Muller)	X	X	X	X	X	X	X
Phylum Arthropoda							
Class Crustacea							
Order Isopoda							
Family Asellidae							
Caecidotea sp.	X	—	X	X	X	—	—
Order Amphipoda							
Family Hyalellidae							
Hyalella azteca (Saussure)	—	—	—	—	X	—	—
Family Crangonyctidae							
Crangonyx sp.	X	X	X	X	X	—	—
Order Decapoda							
Family Cambaridae							
Orconectes rusticus (Girard)	X	X	X	X	X	X	X
Cambarus bartonii (Fabricius)	X	—	—	X	—	X	X
C. longirostris Faxon	X	—	X	X	X	X	X
Total	17	16	21	18	17	11	11

5.4.2.3 Aquatic Insects

Aquatic insects are a particularly appropriate group to study in biological assessments of streams and rivers. Most insects have moderate generation times (e.g., several months to several years), so that they can serve as biological integrators of environmental conditions on time scales that are useful for assessing water quality. Since most insects are not highly mobile, their persistence at a given location can be used to evaluate the ecological suitability of particular sites. Because different insect taxa vary in their tolerance of particular kinds of water pollution, variations in their distribution and abundance can be used to interpret patterns of water quality. Thus, it is possible to use the relative abundance of various insect taxa as an indicator of water quality conditions (Academy, 1992).

Table 5.4-3 provides a list of the species of aquatic insects collected during the Academy's 1990 survey. One of the most striking results of this study was the large increase in the number of aquatic insect taxa obtained in the 1990 qualitative collections relative to previous surveys. Averaged across all zones, the number of taxa obtained in 1990 was about 2-3 fold greater than in previous years.

All indications are that the observed increase in the number of taxa collected during 1990 was due to improvements in water quality and habitat characteristics that provided suitable conditions for a larger variety of aquatic insects (Academy, 1992).

Table 5.4-3. Species list of insects found in the 1990 qualitative samples of Horse Creek and Holston River.

Zone:	2	3	4	5	6	HC1	HC2
Class Hexapoda							
Group Insecta							
Order Ephemeroptera							
Family Baetidae							
Baetis spp.	—	X	X	X	X	X	X
Family Oligoneuriidae							
Isonychia spp.	—	—	—	—	X	X	X
Family Heptageniidae							
Leucrocuta spp.	—	—	—	—	—	—	X
Stenacron spp.	—	—	—	—	X	X	X
Stenonema spp.	—	—	X	—	X	X	X
Family Leptophlebiidae							
Choroterpes spp.	—	—	—	—	—	X	X
Habrophlebiodes spp.	—	—	—	—	—	—	X
Family Ephemerellidae							
Serratella spp.	—	—	X	—	X	X	—
Family Tricorythidae							
Tricorythodes spp.	—	—	X	X	X	X	X
Family Caenidae							
Caenis spp.	—	—	X	—	—	X	X
Order Odonata							
Family Gomphidae							
Ophiogomphus sp.	—	—	—	—	—	—	X
Family Aeshnidae							
Aeshna sp.	X	—	—	—	—	—	—
Boyeria vinosa	—	—	X	—	X	X	X
Family Macromiidae							
Macromia sp.	—	—	—	—	—	X	—
Family Corduliidae							
Somatochlora sp.	—	—	—	—	—	—	X
Family Calopterygidae							
Calopteryx sp.	X	—	—	—	—	—	—
Hetaerina americana	—	—	X	—	—	X	X
Family Coenagrionidae							
Argia spp.	—	X	—	—	X	X	—
Enallagma spp.	—	X	X	—	X	X	X
Ischnura spp.	—	—	—	—	—	X	X
Order Plecoptera							
Family Perlidae							
Acroneuria sp.	—	—	—	—	—	—	X
Order Hemiptera							
Family Nepidae							

Table 5.4-3. (continued). Species list of insects found in the 1990 qualitative samples of Horse Creek and Holston River.

Zone:	2	3	4	5	6	HC1	HC2
Ranatra sp.	—	—	—	—	X	—	—
Family Belostomatidae							
Lethocerus uhleri	—	—	—	—	X	—	—
Family Corixidae							
Un. Corixidae	—	—	—	—	—	X	—
Corisella spp.	X	—	—	—	—	—	X
Sigara spp.	—	—	—	—	—	X	—
Trichocorixa spp.	X	—	—	X	X	X	—
Family Mesoveliidae							
Mesovelia mulsanti	—	—	—	—	—	X	X
Family Hydrometridae							
Hydrometra sp.	—	—	—	X	—	—	—
Family Veliidae							
Rhagovelia spp.	—	—	X	—	—	X	—
Family Gerridae							
Gerris spp.	X	—	—	—	X	—	X
Rheumatobates spp.	X	—	X	X	X	—	X
Trepobates spp.	—	—	—	—	X	X	X
Order Neuroptera							
Suborder Megaloptera							
Family Sialidae							
Sialis sp.	X	—	—	—	—	—	X
Family Corydalidae							
Corydalus cornutus	—	—	X	—	—	X	X
Nigronia sp.	—	—	—	—	—	—	X
Suborder Neuroptera							
Family Sisyridae							
Climacia sp.	—	X	—	—	—	—	—
Order Coleoptera							
Family Haliplidae							
Peltodytes sp. (A)	X	—	—	X	X	—	—
Family Dytiscidae							
Hydroporus sp. (A)	—	—	X	—	—	—	X
Laccophilus sp. (A)	X	—	—	—	X	—	—
Family Gyrinidae							
Dineutus spp. (A)	X	—	X	—	X	—	—
Gyrinus spp. (A)	X	—	—	X	X	—	—
Gyrinus spp. (L)	—	—	—	—	X	—	—
Family Hydrophilidae							
Berosus spp. (A)	X	—	—	X	X	—	—
Paracymus spp. (A)	—	—	—	—	X	—	—
Tropisternus spp. (A)	—	—	—	—	X	—	X

Table 5.4-3.(continued). Species list of insects found in the 1990 qualitative samples of Horse Creek and Holston River.

Zone:	2	3	4	5	6	HC1	HC2
Tropisternus spp. (L)	—	—	—	—	X	—	—
Family Scirtidae							
Cyphon sp. (L)	—	—	—	—	—	—	X
Family Elmidae							
Ancyronyx variegata (A)	—	—	X	—	X	—	X
Dubiraphia vittata (A)	—	—	X	X	—	X	X
Macronychus glabratus (A)	—	—	—	—	X	X	X
Macronychus sp. (L)	—	—	—	—	X	—	—
Optioservus spp. (L)	X	—	—	—	—	—	—
Stenelmis crenata (A)	—	—	X	X	X	X	X
Stenelmis sp. (L)	—	—	X	—	—	X	X
Family Psephenidae							
Psephenus herricki (L)	—	—	X	—	—	—	X
Order Diptera							
Family Tipulidae							
Tipula spp.	X	—	—	—	—	—	—
Antocha sp.	X	—	—	X	X	X	—
Hexatoma sp.	—	—	—	—	—	—	X
Limnophila sp.	X	—	—	—	—	—	—
Pilaria sp.	—	—	—	—	—	—	X
Family Chaoboridae							
Eucorethra sp.	—	—	—	X	—	—	—
Family Simuliidae							
Simulium sp.	X	X	X	X	X	—	X
Family Chironomidae							
Subfamily Tanypodinae							
Ablabesmyia mallochi	—	—	X	—	—	—	—
Clinotanypus sp. cf. *pinguis*	—	—	—	—	—	—	X
Conchapelopia sp.	X	—	—	—	—	X	—
Meropelopia sp.	X	—	—	—	—	—	—
Natarsia sp. A sensu Roback	—	—	—	—	—	X	—
Procladius sp.	—	X	—	—	—	—	—
Psectrotanypus (P.) *dyari*	X	—	—	—	—	—	—
Subfamily Orthocladiinae							
Cardiocladius obscurus	—	—	X	—	X	X	—
Corynoneura sp. near *taris*	—	—	—	—	X	—	—
Cricotopus bicinctus	X	X	X	X	X	—	—
Cricotopus sp. cf. *junus*	X	X	X	—	—	—	—
Cricotopus sp. cf. *tremulus*	X	X	X	—	—	—	—
Cricotopus triannulatus	X	—	—	X	—	X	X
Cricotopus trifascia	X	X	X	X	—	—	—
Cricotopus sylvestris	X	X	—	—	—	X	—
Hydrobaenus sp.	—	—	—	—	—	X	X

Table 5.4-3. (continued). Species list of insects found in the 1990 qualitative samples of Horse Creek and Holston River.

Zone:	2	3	4	5	6	HC1	HC2
Synorthocladius sp.	X	—	X	—	—	—	—
Thienemanniella sp. near *xena* Roback	—	—	X	—	X	—	X
Tvetenia discoloripes	—		X	—	X	—	—
Subfamily Chironominae							
Tribe Chironomini							
Chironomus sp.	—	X	—	X	—	X	X
Cryptochironomus sp.	—	X	X	X	X	—	X
Dicrotendipes fumidus	X	X	X	X	X	—	—
Dicrotendipes modestus	—	X	—	—	—	—	X
Microtendipes sp.	—	—	X	—	—	—	—
Phaenopsectra sp.	X	—	X	—	—	—	X
Polypedilum sp.	X	X	X	X	X	X	X
Stenochironomus sp.	—	—	—	X	—	—	—
Stictochironomus sp.	X	—	—	—	—	—	—
Tribe Tanytarsini							
Paratanytarsus sp.	—	—	X	—	—	—	X
Rheotanytarsus sp.	—	—	X	X	X	X	X
Tanytarsus sp.	—	—	X	X	—	X	X
Stratiomyidae							
Stratiomys sp.	—	—	—	—	—	—	X
Family Empididae							
Chelifera sp.	X	—	—	—	—	—	—
Hemerodromia sp.	—	X	X	—	—	—	—
Family Dolichopodidae							
Dolichopus sp.	X	—	—	—	—	—	—
Family Muscidae							
Un. Muscidae sp.	X	—	—	—	—	—	—
Order Trichoptera							
Family Hydropsychidae							
Cheumatopsyche spp.	X	—	X	—	X	X	X
Hydropsyche spp.	—	—	X	—	X	X	X
Family Hydroptilidae							
Hydroptila spp.	—	—	X	—	—	—	—
Family Brachycentridae							
Micrasema sp.	—	—	X	—	—	—	—
Family Leptoceridae							
Oecetis sp.	—	—	—	—	—	X	—
Triaenodes sp.	—	—	—	—	—	—	X
Total Taxa	35	17	40	23	38	38	51

5.4.2.4 Fish

The abundance and diversity of fish species are important factors in assessing the health of a body of water. Fish occupy the highest trophic level in the aquatic food chain and therefore are often used as an indicator of the overall health of the system.

During the 1990 Academy study, thirty-one species of fish were collected from the South Fork Holston River and Big Sluice zones and twenty-four species were collected in Horse Creek. Generally, the abundance of fishes and numbers of different species collected were greater at the zones on the Big Sluice, and the downstream zones when compared to the upstream zones near the Fort Patrick Henry Dam and Eastman. Variation in fish fauna and densities among the zones may be due to the effect of dam operations, the presence of industrial and municipal discharges and differences in available habitat (Academy, 1992).

Table 5.4-4 list the species of fish collected during the 1990 survey. Historically, the numbers and diversity of fishes collected in the South Fork Holston River have increased dramatically since earlier surveys, most notably at zones downstream of Kingsport. Demonstrable improvements in water quality are reflected by increases in the variety of fishes collected during the most recent surveys. In 1965, the river downstream of Kingsport supported only three species of fish, whereas in 1990, nineteen fish species were recorded. Water quality improvements, such as increases in dissolved oxygen, are also indicated by the return of relatively sensitive gamefish to

Table 5.4-4. Occurrence of species of fish in samples by various collecting techniques from stations on the Holston River, South Fork Holston River, and Horse Creek, in the vicinity of Kingsport, Tennessee, July 1990. Collecting techniques are: backpack electroshocking (B), electroshocking from boat (E), gill nets (G), traps (T), trot-lines (R), dip nets (H), seines (S), and angling (A). Zone designations are for left bank only (L), right bank (R), and the upper reaches of the zone (U).

	Station/Zone								
Species	2	3L	3R	4	5L	5U	6	HC1	HC2
Dorosoma cepedianum	G	-	-	B	-	-	-	-	-
Onchorhynchus mykiss	A	-	-	-	-	-	-	-	-
Campostoma anomalum	B	-	-	BS	BH	TB	B	B	B
Cyprinella galactura	-	-	-	B	-	-	-	-	B
Cyprinella spiloptera	-	-	-	-	-	-	B	B	B
Cyprinus carpio	-	-	H	-	-	E	-	-	-
Luxilus chrysocephalus	TG	-	-	S	-	TGH	T	TB	B
Nocomis micropogon	-	-	-	-	B	-	B	-	-
Notropis amblops	-	-	-	-	-	-	-	B	B
Notropis leuciodus	-	-	-	-	-	-	B	-	-
Notropis sp. (sawfin shiner)	-	-	-	-	B	-	-	-	-
Notropis stramineus	-	-	-	-	-	-	-	B	-
Notropis telescopus	-	-	-	BS	B	H	-	B	B
Pimephales notatus	-	-	-	S	-	-	-	-	HB
Rhinichthys atratulus	-	-	-	B	H	B	B	B	-
Carpiodes carpio	-	-	-	-	-	EG	-	-	-
Catostomus commersoni	BGH	B	B	S	-	B	-	B	B
Hypentelium nigricans	-	B	-	BS	B	B	B	B	B
Moxostoma erythrurum	-	-	-	-	-	-	-	T	-
Ameiurus natalis	-	BT	BH	BH	BH	BGL	BT	H	-
Gambusia affinis	-	-	BH	-	-	H	-	B	B
Ambloplites rupestris	-	B	-	BTSH	BH	BRT	BGT	B	B
Lepomis auritus	-	-	-	T	-	BT	B	B	B
Lepomis macrochirus	B	-	B	B	-	ET	-	TB	B
Lepomis megalotis	BG	-	B	B	B	AE	B	B	B
Lepomis microlophus	-	-	T	-	-	-	-	-	-
Micropterus dolomieu	G	-	-	B	BH	B	B	-	-
Micropterus punctulatus	G	-	-	S	-	-	-	B	B
Micropterus salmoides	B	-	-	-	-	-	-	-	-
Etheostoma blennioides	-	-	-	B	-	-	B	B	B
Etheostoma camurum	-	-	-	-	-	-	B	-	-
Etheostoma rufilineatum	-	-	-	BS	-	-	B	B	HB
Etheostoma simoterum	BH	B	BH	BS	B	B	B	B	HB
Percina caprodes	-	-	-	-	-	-	-	B	-
Cottus carolinae	B	-	-	HB	B	B	B	B	HB
Number of species	12	5	8	20	12	17	17	22	19
		10			19				

the area. The South Fork Holston River now supports a population of fishes that includes small-mouth bass, rock bass, bluegill and yellow bullhead catfish (Academy, 1992).

5.4.3 Wildlife Resources

The river banks along the South Fork Holston, Big Sluice and Horse Creek provide suitable habitat for a variety of bird species. While no biological surveys have been conducted to specifically document the presence of birds on the South Fork Holston or Big Sluice, data are available for a marsh which borders Horse Creek. This marsh is approximately one mile northwest of the proposed facility. The proposed facility location does not offer the habitat needed by these birds. However, it is conceivable that the species of birds frequenting the marsh might also visit the shorelines of the nearby surface waters.

Table 5.4-5 lists the species of birds observed at the marsh. Fifteen of the 29 species observed during the study were judged to be permanent residents of the area. These included the American goldfinch (Spinus tristis), robin (Turdus migratorius), grackle (Quiscalus quiscula), meadowlark (Sturnella magna), mockingbird (Mimus polyglottos), mourning dove (Zenaidura macroura), song sparrow (Melospiza melodia) and starling (Sturnus vulgarus) (Coats, 1976).

Table 5.4-5. Bird Species Observed at Meadowview Marsh, April 8, 1976 to May 24, 1976

Common Name	Scientific Name	Permanent Resident (P) or Migratory (M)
American Bittern	Botaurus lentiginosus	(P)
American Goldfinch	Spinus tristis	(P)
American Kestrel	Falco sparverius	(P)
American Robin	Turdus migratorius	(P)
American Woodcock	Philohela minor	(M)
Barn Swallow	Hirundo rustica	(M)
Blue-Wing Teal	Anas discors	(M)
Chimney Swift	Chaetuna pelagica	(M)
Common Gallinule	Gallinula chloropus	(M)
Common Grackle	Quiscalus quiscula	(P)
Common Snipe	Capella gallinago	(P)
Eastern Kingbird	Tyrannus	(M)
Eastern Meadowlark	Sturnella magna	(P)
Green Heron	Butorides virescens	(M)
Killdeer	Charadrius vociferus	(P)
Long-Billed Marsh Wren	Telmatodytes palustris	(M)
Mallard	Anas platyrhynchos	(P)
Mourning Dove	Zenaidura macroura	(P)
Northern Mockingbird	Mimus polyglottos	(P)
Purple Martin	Progne subis	(M)
Red-Winged Blackbird	Agelaius phoeniceus	(P)
Rough-Wing Swallow	Stelgidopteryx ruficollis	(M)
Song Sparrow	Melospiza melodia	(P)
Sora	Porzana carolina	(M)
Starling	Sturnus vulgarus	(P)
Swamp Sparrow	Melospinza georgiana	(P)
Tree Swallow	Iridoprocne bicolor	(M)
Virginia Rail	Rallus limicola	(M)
Wood Duck	Aix sponsa	(M)

Migratory ecies were also observed. These included woodcock (Philohela minor), teal (Anus ors), chimney swift (Chaelura pelogica), green heron (Butorides virescens), ple martin (Progne subis), sora (Porzana Carolina) and wood duck (Aix spansa) (F ns, 1966).

Other spe ncluding both permanent residents and migratory birds were observed cc cted nests and produced young at the marsh. These birds included mal rd (latyrhynchos), red-winged blackbird (Agelaius phoeniceus) and virginia llu ola) (Coats, 1976).

5.4. Tl ned, Endangered or Special Concern Species

Accordin State of T nnessee Department of Environment and Cons vation, Ecologica ices Divisi and the U.S. Fish and Wildlife Service, there are no recorded ened or en angered species in the vicinity of the proposed project site (Christie, and Barcla). Species of aquatic and terrestrial wildlife which have been docu ted as bei present in the Kingsport area are identified in previous sections of chapter e tled Aquatic Resources and Wildlife Resources.

5.5 Community Resources

5.5.1 Land Use

Bristol, TN and VA, Johnson City TN, and Kingsport TN comprise what is called the Tri-Cities area located in Northeast Tennessee. Bristol is located in Sullivan County, TN and Washington County, VA, Kingsport is located in Sullivan and Hawkins County, TN, and Johnson City is located in Washington County, TN. The area is a mountainous region with forests. Rivers in the area are the Roan, Clinch, and the North and South Forks of the Holston. The Tennessee Valley Authority operates four dams in the area, Fort Patrick Henry, Boone, South Holston, and Watauga. Parts of the Jefferson National Forest, Warriors Path State Park (TN), and Natural Tunnel State Park (VA) are located within 20 miles of the proposed project site.

Major businesses in the region are agriculture, glass manufacturing, book making, chemical, fibers, plastics, explosives, and paper production.

There are 9 universities and colleges in the area, with the largest being East Tennessee State University located in Johnson City.

5.5.2 Zoning

Eastman is zoned Heavy Industrial by Sullivan County and General Industrial by the City of Kingsport. The area immediately surrounding Eastman is zoned varying classes of Industrial, Business, or Residential. Figure 5.5-1 shows the general zoning classifications on the Eastman plant site and the surrounding area.

5.5.3 Socioeconomic Resources

In 1990 the population of Kingsport was 37,988, and Sullivan County's population was 148,800. Caucasians comprise 94.3% and 97.9% of the population in Kingsport and Sullivan County, respectively. In 1991 per capita income for Sullivan County residents was $16,583, slightly higher than the Tennessee per capita income ($16,478) and lower than the United States per capita income ($19,091)(1994). According to the Tennessee Dept. of Economic and Community Development, the total employment for Sullivan County is 71,400. From 1982 to 1991, 103 projects for new plants or expansions were completed in Sullivan County totaling $2.13 trillion. Retail sales in 1992 were $1.24 trillion for Sullivan Country and $879 billion in Kingsport.

Aside from manufacturing and retail, agriculture accounts for much economic activity in Kingsport and Sullivan County. Major agricultural products from Sullivan County are tobacco, small grains, and strawberries. Other natural resources found in the area are limestone and timber.

Kingsport's public school system consists of 7 elementary schools, 2 middle schools, and 1 senior high school with total enrollment of 5,900. There are 6 private schools, 2 vocational-technical schools, and 3 colleges in the area.

The City of Kingsport maintains a 92-officer police force and a 95-person fire department. In addition, the city provides water supply, sewage treatment, and solid waste disposal.

Table 5.5-1 gives other socioeconomic information on Kingsport and the surrounding area.

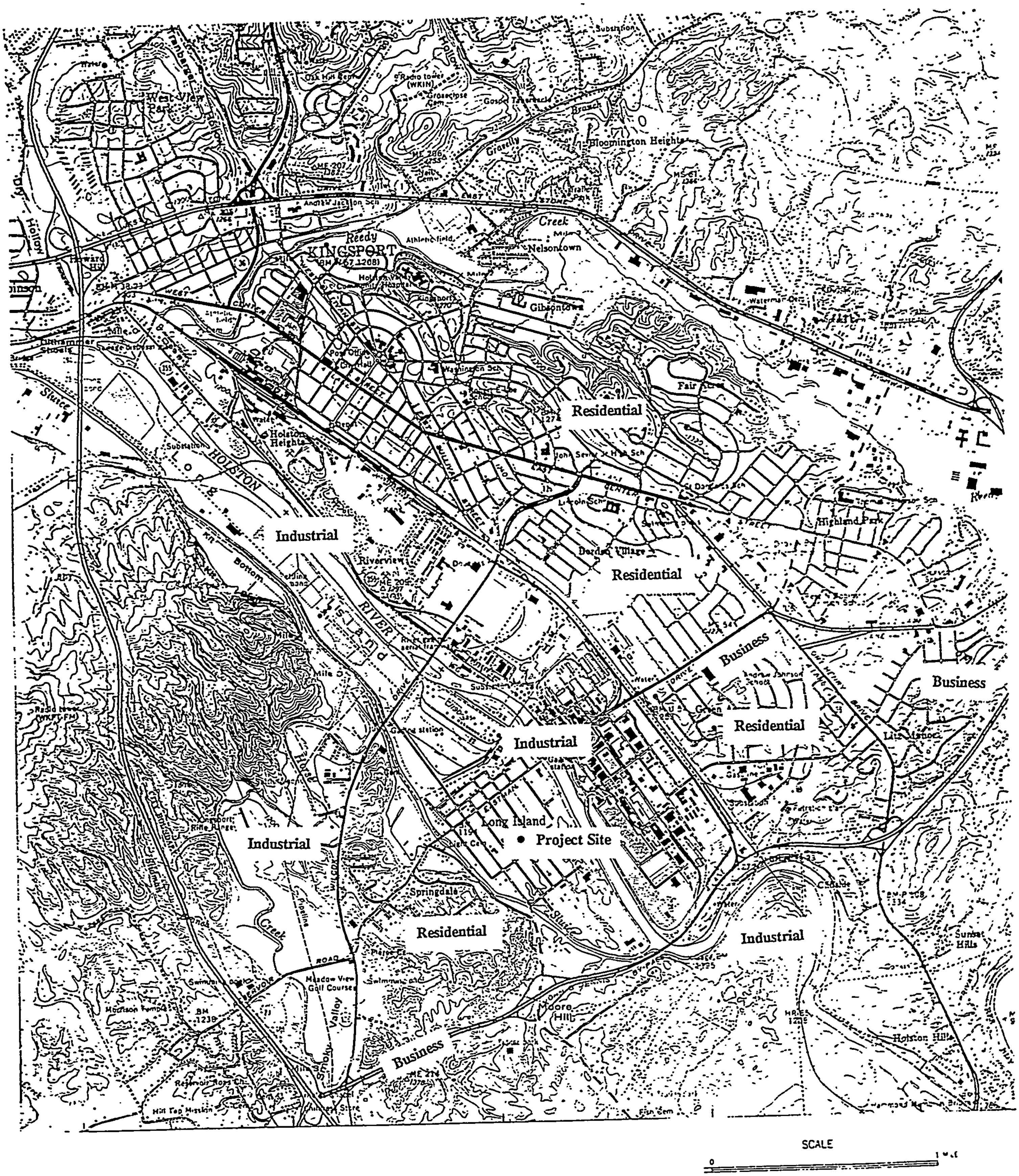

Figure 5.5-1. General Zoning Districts

Table 5.5-1. Miscellaneous information on Kingsport

(Tennessee Community Data 1993)

	Number	Related Info
Hospitals	3	Beds = 885
Doctors	338	
Dentists	54	
Nursing Homes	7	Beds = 965
Churches	138	
Parks	15	
Golf Courses	3	
Swimming Pools	5	
Country Clubs	1	
Theaters	10	
Bowling Alleys	2	
Hotels & Motels	12	
Largest Meeting Room Capacity	1,100	
Restaurants	94	
Banks and Savings & Loans	13	
Newspapers	2	
Television Stations	5	
Radio Stations	20	

Eastman Chemical Company is a major employer in Kingsport, Tennessee with a large work force. Approximately 13,000 people are currently employed (approximately one-third the population of Kingsport). According to 1992 statistics (Eastman):

- Eastman had a total annual payroll of $654 million in 1992.
- Eastman paid $35.3 million in taxes to the local and state governments.
- Four-hundred-twenty-five million dollars of materials and services were purchased from local firms including coal from Virginia and Kentucky.
- Eastman contributed approximately $2 million to communities where it had facilities including $643,000 to the Kingsport area. About half of that amount was given to colleges and universities in those areas.

5.5.4 Transportation

Eastman has excellent transportation facilities. It has its own rail service and operates 5 diesel locomotives over 37 miles of company track and makes approximately 5,000 railcar movements per week. Highway access to the plant is good due to its connection via John B. Dennis Highway to I-181 leading into I-81. Eastman also has readily available access to other major roads, such as State Roads 36 (Ft. Henry Dr.), 126 (Wilcox Dr. and Memorial Blvd.), and 93 (John B. Dennis Hwy.) and U.S. Highway 11W

(Stone Dr.). Figure 5.5-2 shows rail access into Eastman while Figure 5.5-3 shows the major highway accesses. Eastman also owns and operates more than 525 motor vehicles, 240 trailers and tankers, and 560 forklifts. There are more than 28 miles of paved roads within the plant area. For business travel, Tri-Cities Airport is located less than 30 miles away from the plant site, also shown on Figure 5.5-3. American Eagle, Delta, and USAir flights are available at the airport.

During an average operating day there are approximately 7,600 employees and 2,500 contractors located on site. To accommodate this number of employees Eastman has a parking capacity of 10,990 outside and 1,255 inside plant spaces. In addition, the number of tractor-trailer spaces at the plant is between 450 and 500.

5.5.5 Noise

Eastman has actively monitored noise emissions at selected Eastman perimeter locations since 1980. Since the perimeter boundaries have changed significantly on Long Island (where the proposed Liquid Phase Methanol demonstration unit site is to be located), three new metering sites were added for the 1993 survey. Site number 16, shown on Figure 5.5-4, and approximately 500 ft from the LPMEOH site would be the location most affected by the proposed Liquid Phase Methanol demonstration unit.

There have been no noise complaints from Eastman facilities on Long Island in the past two years. However, there have been sporadic complaints regarding other parts of the plant site, particularly during construction, start-ups, or emergency shut downs. Each of these complaints has been investigated and corrective actions taken, such as installation of lagging, silencers, or enclosures or initiating repairs of equipment. The proposed demonstration site is buffered from the community on all four sides. An

Eastman parking lot borders the proposed site on the north and the existing Eastman manufacturing facility borders the south, west and east sides of the proposed site.

5.5.6 Visual Resources

Eastman is located on the south side of Kingsport. The Kingsport City limits cut through the plant site. Kingsport has restaurants, shopping centers, schools, churches, residential areas, gas stations, and other businesses indicative of any small to mid-size city in the U.S. Many manufacturing industries are located in Kingsport and in Sullivan County immediately surrounding the plant site. Among these are AFG, Holston Defense, Air Products and Chemicals, Inc., Mead Paper, and Arcata Graphics. Bays Mountain Nature Preserve and Planetarium, a Kingsport city park is located on Bays Mountain, south of the plant site. The major visual resource at Bays Mountain is the view from a firetower on top of the mountain; however, the firetower faces northwest, and Eastman cannot be seen from it.

Located on the Eastman plant site itself are manufacturing buildings, office buildings, laboratories, pilot plant areas, tank farms, cooling towers, distillation towers, stacks for boilers, and other structures common at chemical, plastic, and fibers manufacturing facilities. The entire plant site can be seen from various elevated locations within a few miles of the site, with some of the more prominent features being the stacks for the plant's powerhouses.

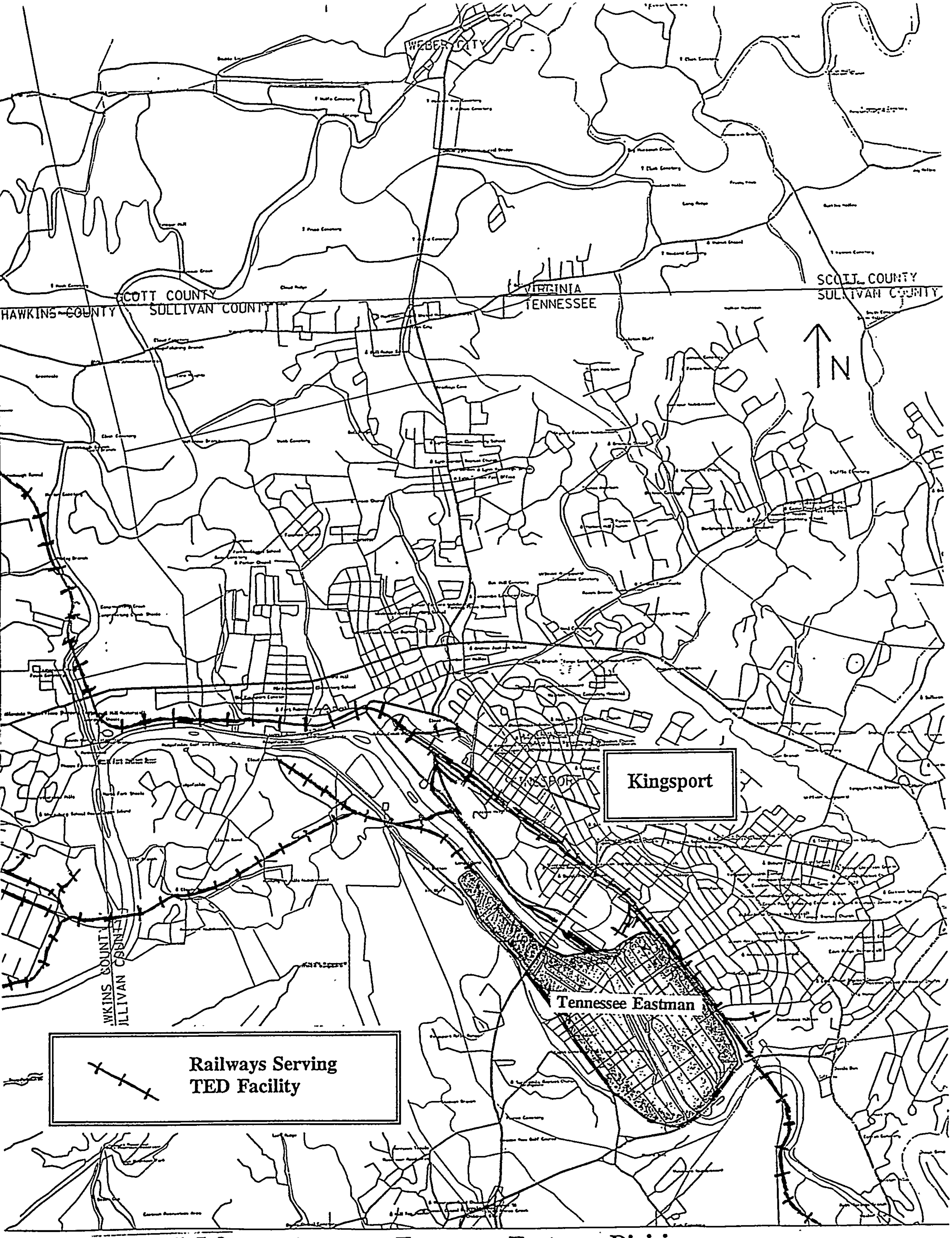

Figure 5.5-2 Rail Access to Tennessee Eastman Division

5.5.7 Cultural Resources

The proposed project site is located within the Eastman manufacturing, which has operated in Kingsport since 1920. The proposed project site is located on Long Island, a tract of land bordered by the South Fork of the Holston River and the Big Sluice.

Sites within one mile of the proposed project site listed in the National Register of Historic Places are shown in Table 5.5-2 (National Register, 1989).

A paper written about Long Island indicates that American Indians, mainly Cherokees, traveled across the island and that the island was used as a neutral zone for settling disputes between tribes (Bernard, 1987). White men moved to the island in 1810 after the land was ceded in a treaty. During the 1800s and early 1900s, it is believed the island was used for agricultural purposes. Beginning in the 1920s, plots of land were sold. Some of the new owners continued to farm their property while others built homes and worked in the plants of a growing Kingsport industrial community. One of these plots was an 11.2 acre plot sold to R.F. and C.W. Carter in 1926.

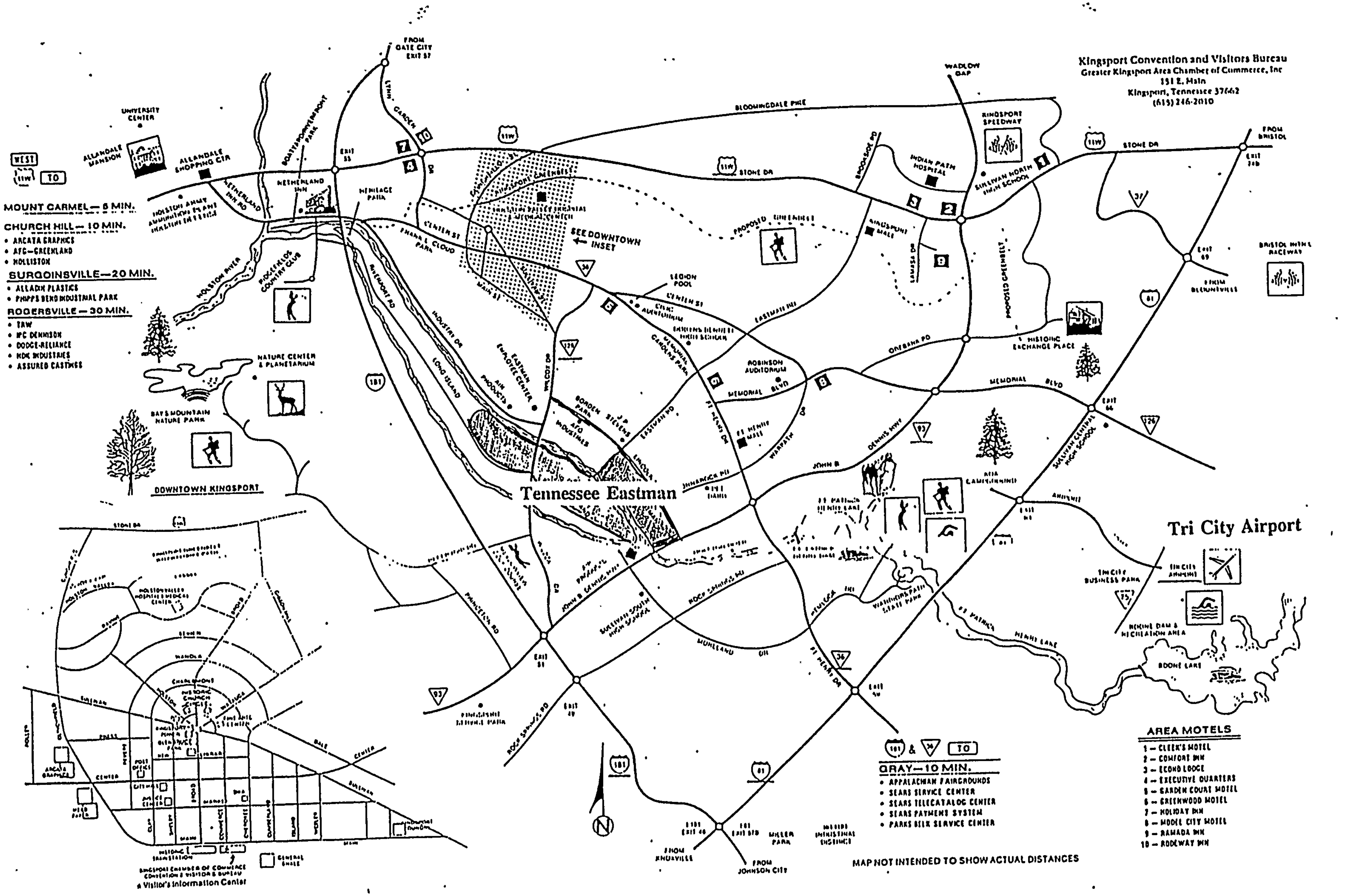

Figure 5.5-3 Interstates and Other Major Roadways in Kingsport

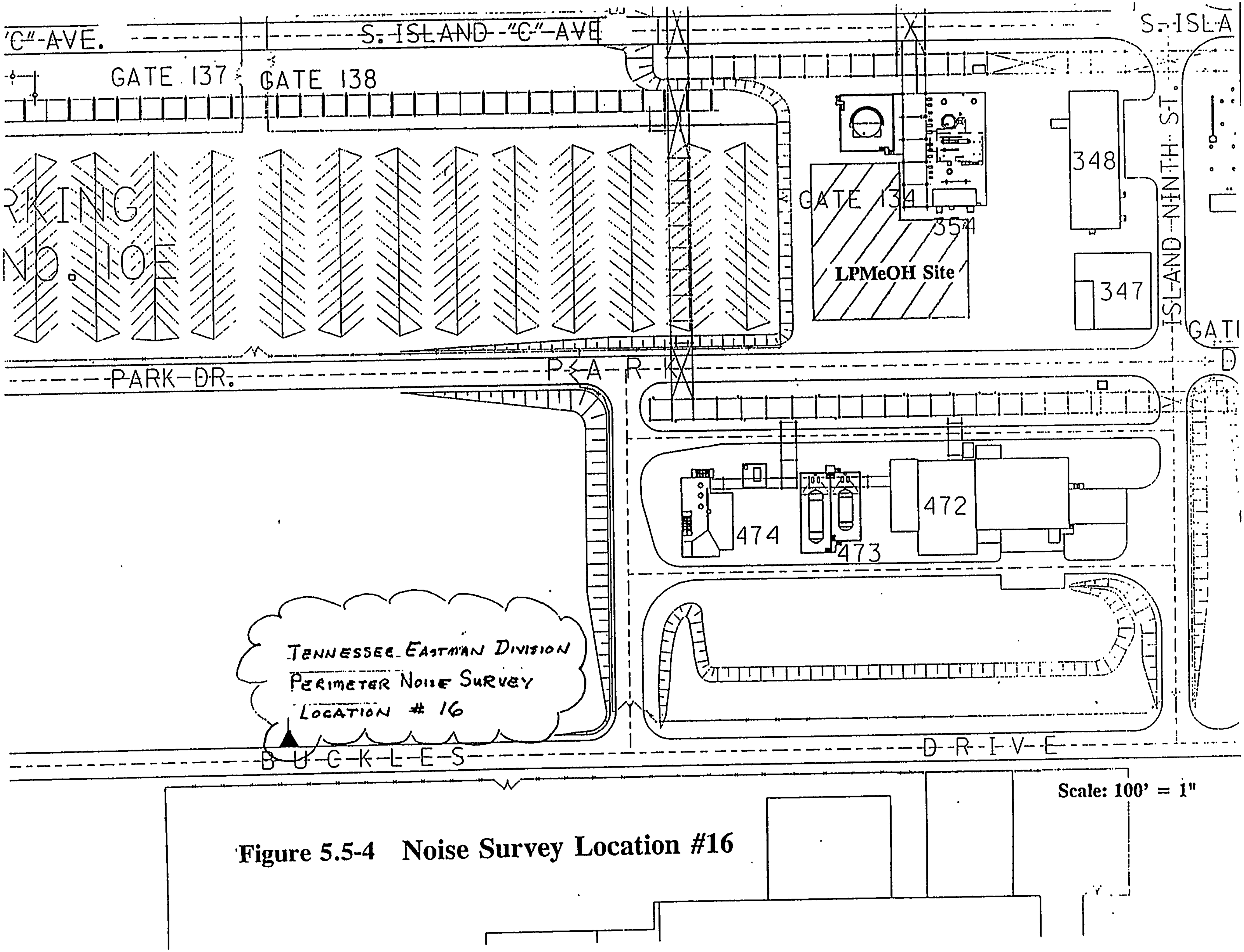

Figure 5.5-4 Noise Survey Location #16

Table 5.5-2. Sites Listed in the National Register of Historic Places

Site	Location	Date Listed
Church Circle District	Center of Kingsport, along Sullivan St.	4/11/73
Clinchfield Railroad Station	101 E. Main St., Kingsport	4/24/73
J. Fred Johnson house	1322 Watauga Ave., Kingsport	4/11/73
Roseland	South of Kingsport on Shipp St.	4/2/73
Stone-Penn House	1306 Watauga St. Kingsport	11/15/84
Long Island of the Holston	South Fork of the Holston River, Kingsport vicinity	10/15/66

This plot was sold to Tom C. Childress who immediately sold it to the then-Tennessee Eastman Corporation (TEC) in 1941. TEC graded and seeded the property and the property was called the "Big Field." The proposed demonstration site is located on this plot. Other manufacturing development within 200 ft of the proposed demonstration site include four chemical manufacturing facilities, one of which is Eastman's existing methanol plant and an employee parking lot.

A major archaeological find was unearthed on Eastman property in 1979, 1980, and 1981 by a local amateur archaeologist (Yancey, "Local man...", 1981). The archaeological site is located nearly a mile from the proposed project site in a rock shelter near the start of the Big Sluice, shown in Figure 5.5-5. Artifacts found at the archaeological site indicate it was visited by man as early as 10,000 B.C. and included 750 projectile points, 11 skeletons, seven fireplaces, and 8,000 pottery fragments

(Yancey, "Dean found...", 1981). Artifacts from the site were turned over to the University of Tennessee and Eastman provided an $11,000 grant to the university to complete studies on the site (Edwards, 1981). A masters' thesis and two papers in the Tennessee Anthropological Newsletter have been written about the site (Faulkner, 1994).

There are several recreational areas located in Kingsport and the surrounding area. Most of these facilities are located within two miles of the proposed project site. Among these are:

- The Kingsport City and some Sullivan County schools, most of which have playgrounds, playing fields, basketball courts, and/or tennis courts.
- Three golf courses - Meadowview, Warriors' Path, and Ridgefields Country Club.
- Netherland Inn and Complex
- The Kingsport city parks, including Bays Mountain Nature Center and Planetarium
- The Exchange Place
- Warriors' Path State Park
- The Eastman ball fields (adjacent to plant site) and recreation area at Bays Mountain.

5.6 Energy Resources

The Eastman site has 24 boilers in four powerhouses that generate steam for process requirements and electricity generation. Twenty-one of the boilers are coal-fired while the remaining three are natural gas-fired. Together they produce an average of 3.4 million lb/hr of steam. Approximately 67%, or 2.3 million lb/hr, of this steam is used for process requirements, such as heating, turbine drives, and vacuum systems.

Eastman generates much of the electricity required for its manufacturing processes, maintenance activities, distribution systems, laboratories, and office areas. Approximately 1.1 million lb/hr of steam is used to generate 120 MW of electricity for the facility. In addition, the facility purchases an average of 11-12 MW from the local power company, Kingsport Power.

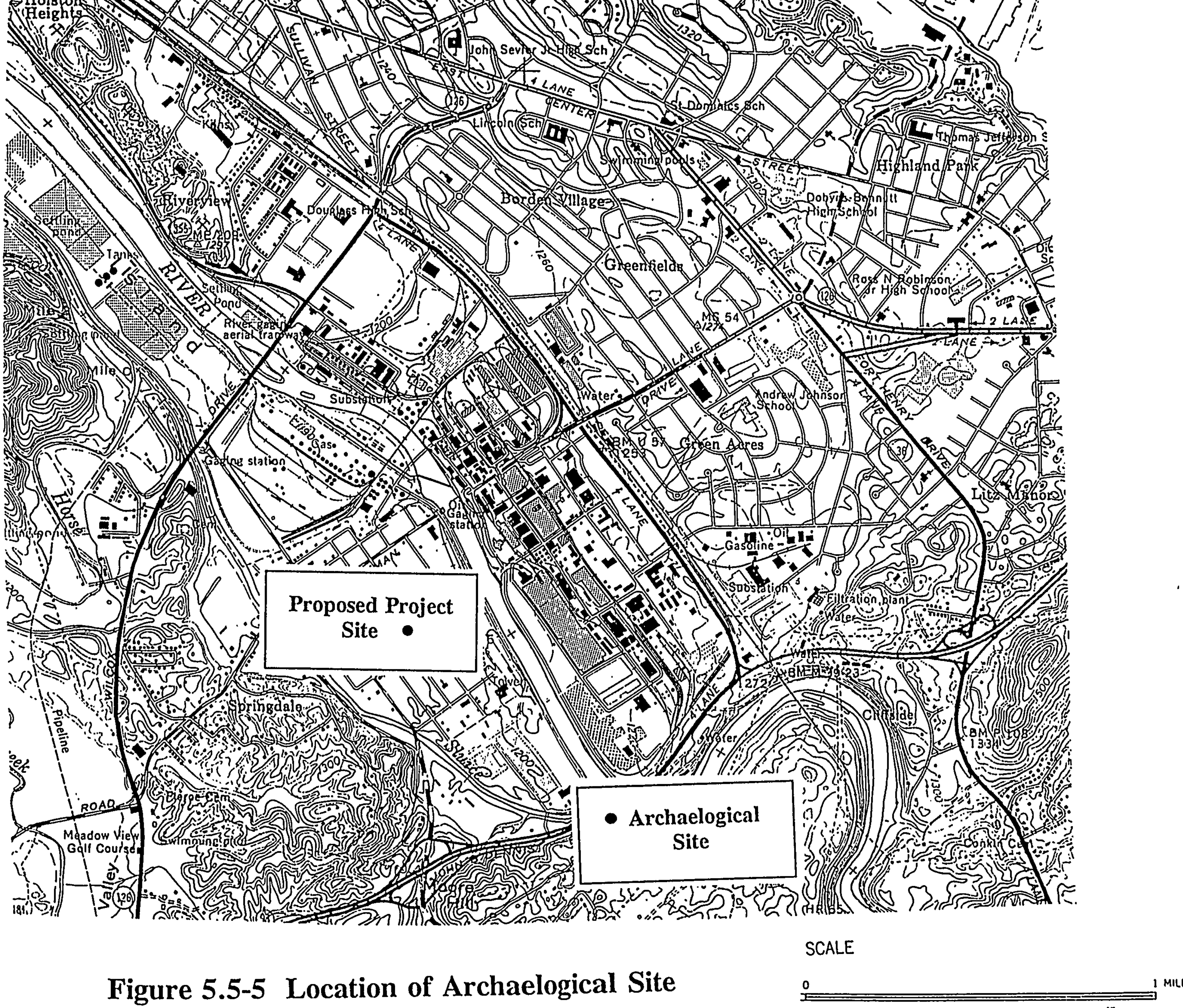

Figure 5.5-5 Location of Archaelogical Site

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