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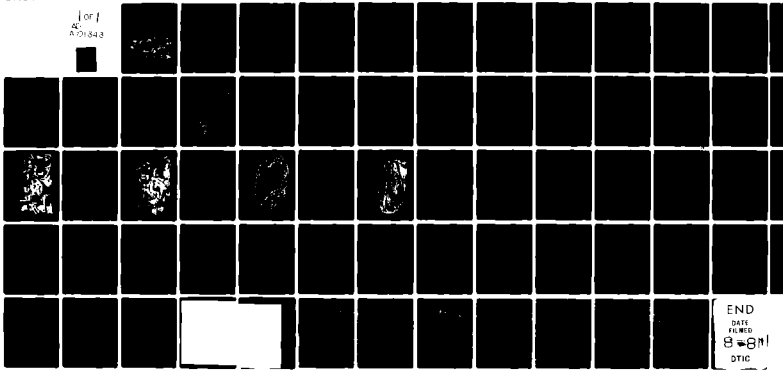

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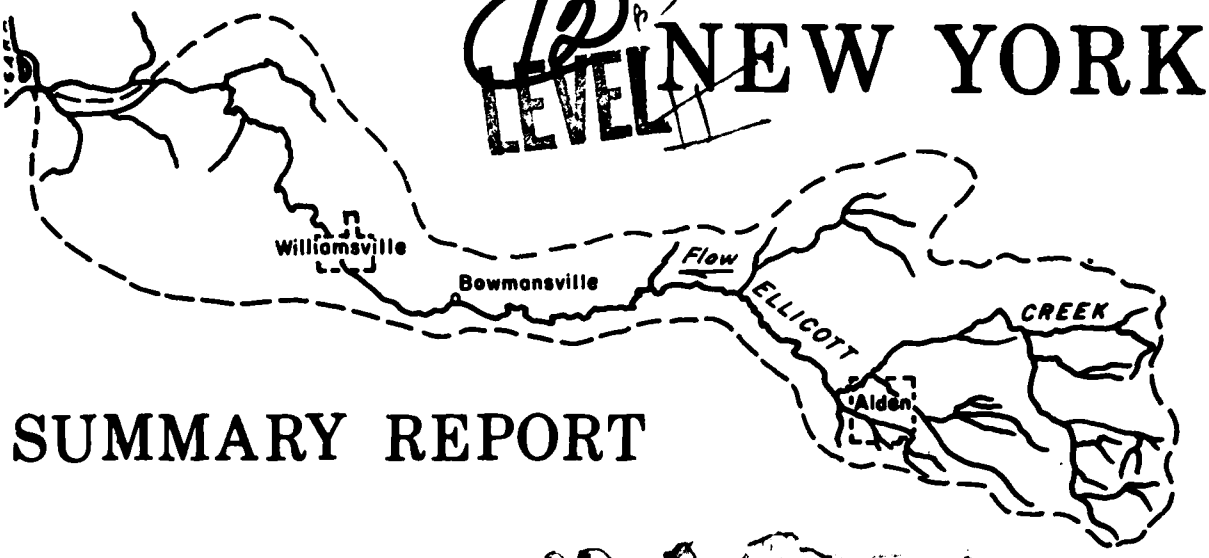
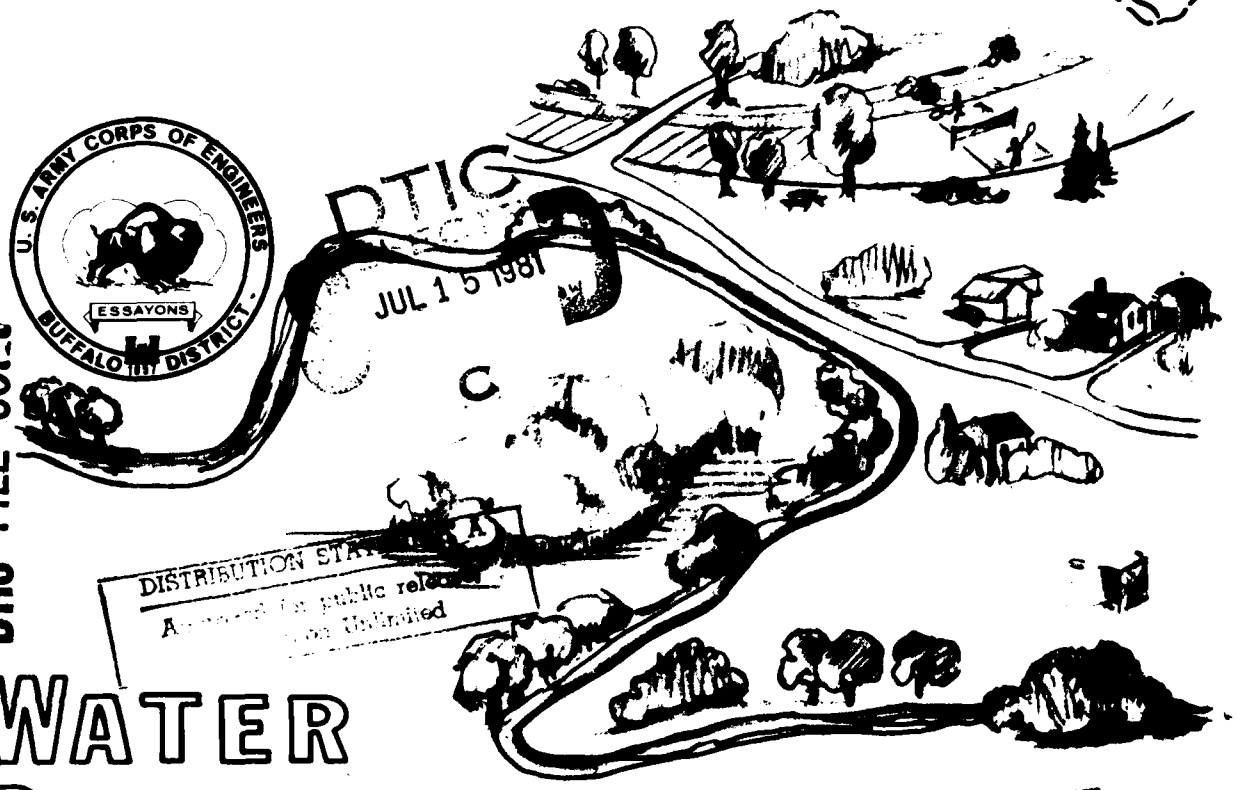


SUMMARY REPORT



WATER RESOURCES DEVELOPMENT

AUGUST 1973

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Water Resources Development
Ellicott Creek

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

Increasing population, urbanization and planned development with in the next few years by the State University of New York (SUNYAB), Urban Development Corporation (UDC), New York State Department of Transportation (DOT), and Planned Environment Systems incorporated require effcient use of water resources in the Ellicott Creek Basin. There is, therefore, an increasing demand for water supply, flood control, outdoor recreation, water quality, preservation of the natural environment, and fish and wildlife conservation. The report is a restudy of a survey report completed in 1970 that recommended construction of a dam--

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and multi-purpose reservoir at Sandridge with downstream channel improvement. The present study considers current and future problems, deisres and needs of residents and other interests in the Ellicott Creek Basin, projects, future needs, and recommends the most viable solution to meet the significant short and long term water resources and related needs.

ELLICOTT CREEK BASIN, NEW YORK
SUMMARY REPORT
FOR
WATER RESOURCES DEVELOPMENT

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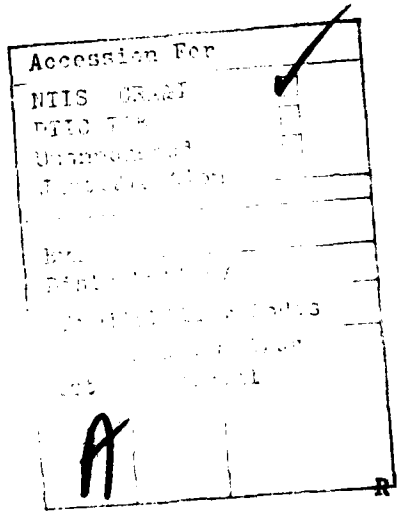
SUMMARY REPORT
ELLICOTT CREEK BASIN, NEW YORK (AUGUST 1973)

PEN AND INK CHANGES

Page No.	Change
23	In table at bottom of page. Change $1,007,000 to $1,077,000.
24,31	At the bottom of the page add "The requirement that local interests assume all costs in connection with fulfillment of the local flood protection requirements is subject to limitation set forth in Section 3 of the 1936 Flood Control Act. In accordance therewith, should their costs for lands and relocations exceed Federal costs for construction, local interests are entitled to reimbursement of one-half of the excess."
25	At the bottom of the page add "The total estimated first costs for the required local cooperation for the local flood protection measures, $6,233,000, exceeds the estimated Federal cost for construction, $3,925,000, by $2,308,000. Pursuant to Section 3 of the 1936 Flood Control Act local interests would be entitled to reimbursement of one-half of the excess, $1,154,000. Accordingly, total project costs apportioned to local interests would amount to a net $5,449,000. Federal first costs would amount to $4,295,000 plus $1,154,000, a total of $5,449,000.
32	Ninth line from the bottom of the page. Change $3,925,000 to $5,079,000.



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ELLICOTT CREEK BASIN, NEW YORK

SUMMARY REPORT

FOR

August 1973 WATER RESOURCES DEVELOPMENT

THE STUDY AND REPORT

Increasing population, urbanization and planned development within the next few years by the State University of New York (SUNYAB), Urban Development Corporation (UDC), New York State Department of Transportation (DOT), and Planned Environment Systems Incorporated require efficient use of water resources in the Ellicott Creek Basin. There is, therefore, an increasing demand for water supply, flood control, outdoor recreation, water quality, preservation of the natural environment, and fish and wildlife conservation. (See Appendix C of the Report). The report is a restudy of a survey report completed in 1970 that recommended construction of a dam and multi-purpose reservoir at Sandridge with downstream channel improvement. The present study considers current and future problems, desires, and needs of residents and other interests in the Ellicott Creek Basin, projects future needs, and recommends the most viable solution to meet the significant short and long term water resources and related needs.

PURPOSE AND AUTHORITY

Section 201 of the 1970 River and Harbor Act authorized construction of a dam and multi-purpose reservoir on Ellicott Creek at Sandridge with downstream channel improvement subject to completion of an investigation of all possible alternative methods to the dam and reservoir.

SCOPE OF THE STUDY

The study includes an investigation of 31 proposals to provide flood control and other benefits in the Ellicott Creek Basin. The proposals can be categorized into broad classifications of channelization, diversion, reservoirs, levees, floodplain management, public acquisition, do nothing, or a combination of the classifications. Costs and benefits have been evaluated for each proposal and the

social and environmental impact assessed. The study considers all water-oriented needs of the basin, both present and future. Detailed analyses of the plans investigated are presented in the technical report and appendices completed in 1973 by Acres American, Incorporated, acting as consultants for the Corps of Engineers in the restudy of Ellicott Creek Basin. The index of the technical report and appendices is attached to illustrate the contents.

STUDY PARTICIPATION AND COORDINATION

Public participation and coordination with other public agencies are very useful, necessary and important parts of a water resource development study. This study has greatly benefited from four workshop meetings, three general public meetings, five information meetings, several formal and informal meetings with State, County and Town officials and several informal meetings with individuals representing a group or themselves. Continuing contact and liaison have been maintained with all known affected interests. These interests include: New York State Department of Environmental Conservation; New York State Department of Transportation; State University of New York at Buffalo; Urban Development Corporation; Erie & Niagara Counties Regional Planning Board; Erie County; Genesee County; various towns; private corporations; The Sierra Club; The League of Women Voters; Amherst Conservation Council; and many other interested conservation and civic groups. Attendance at some of the public meetings by Congressman Conable and by representatives of Congressman Kemp and Senator Javits has been most gratifying and indicates the desire of the Congress to be aware of the needs and desires of people in the Ellicott Creek Basin.

The U. S. Bureau of Sports Fisheries and Wildlife, the U. S. Bureau of Outdoor Recreation, and the U. S. Environmental Protection Agency were consulted and their comments and suggestions are reflected in Appendix C.

THE REPORT

The report on the investigation of alternatives comprises a main report, seven Appendices (A-G), an Environmental Impact Statement, and this Summary Report.

The Main Report is a general non-technical presentation of the results of the study for the benefit of all readers, both engineers and non-engineers. The Main Report also contains plan implementation procedures, study conclusions and recommendations including required items of local cooperation.

The technical appendices (Appendices A-G), present supporting data and details of improvement plans. The appendices present greater detail to basic data, formulation, plan evaluation and cost sharing responsibilities. The appendices are the key documents for the technical reviewer.

The Environmental Impact Statement discusses the proposals considered, and reviews in detail the environmental effects of the four alternatives considered in depth. The Environmental Impact Statement also presents the environmental aspects if there is no Corps of Engineers project.

PRIOR STUDIES, REPORTS AND PLANS OF IMPROVEMENTS

In 1929, the Village of Williamsville, at a cost of about $64,000, executed a flood control project just upstream of the Williamsville Falls. The improvements consisted of: a new channel about 1,100 feet long with a bottom width of 70 feet; cleaning, deepening and widening the existing channel immediately upstream of the new channel for a distance of about 1,400 feet; and construction of a small gate controlled dam at the lower end of the new channel. The gates are normally closed to maintain a pool for scenic purposes and are opened as needed to provide extra channel capacity for flood flows.

In 1932, the Town of Amherst made channel improvements at a cost of $25,000, consisting of cleaning, deepening, and widening the creek upstream of the Williamsville village limit for a distance of about 2,800 feet. Later that year, the Village of Williamsville did some widening and levee work upstream of the town project. The cost was about $15,000 but the extent of the project is not known. These projects afforded protection to the land immediately adjacent thereto, and increased the efficiency of the flood control project described in the preceeding paragraph.

A preliminary examination of Ellicott Creek for flood control was completed in 1939. No work was recommended and the report was not published.

The Federal Government expended $75,700 in 1958 and 1959 for clearing and snagging a seven-mile reach of Ellicott Creek between Sheridan Drive and Niagara Falls Boulevard. Maintenance has been performed by local interests.

Erie County constructed a diversion channel between Ellicott Creek and Tonawanda Creek in 1965 at a cost of about $300,000. The diversion channel is located at the lower end of Ellicott Creek and extends across Ellicott Creek Park.

Since Ellicott Creek normally reaches peak flow stages earlier than Tonawanda Creek, the channel diverts part of the high flow on Ellicott Creek to Tonawanda Creek.

A flood plain information report on Ellicott Creek in the City of Tonawanda and in the Towns of Tonawanda, Amherst, Cheektowaga, and Lancaster was prepared by the Corps of Engineers in January 1968. The flood plain information report delineates the limits of the intermediate regional flood (a recurrence interval of about 100 years) and the Standard Project Flood (the most severe or upper limit of flooding expected to occur from the most adverse combination of weather conditions in the Ellicott Creek watershed). The Erie County Department of Public Works requested the report that shows flood outlines along Ellicott Creek from the mouth to a limit about 22 miles upstream near the village of Bowmansville. The report illustrates the danger of unwise development in areas subject to flooding.

A flood plain information report on Ellicott Creek in the area of Lancaster and Alden was prepared by the Corps of Engineers in October 1972. Flood plain information pamphlets are available at the Buffalo District Office.

A comprehensive study of the Erie-Niagara Basin, that includes Ellicott Creek, was made by the Erie-Niagara Basin Regional Water Resources Planning Board. The report, completed in 1969, recommended a multiple-purpose reservoir and downstream channel improvement on Ellicott Creek as part of their early-action program.

The Corps of Engineers, in a joint study with the State of New York, completed a report in May 1970 for flood control and allied purposes on Ellicott Creek. This report presented three viable alternatives for development of water and related land resources of the Ellicott Creek Basin. These alternatives were: major channel improvement in the downstream reaches of Ellicott Creek, a multiple purpose dam and reservoir at Sandridge, and a dam and reservoir at Sandridge in combination with minor downstream channel improvement in Ellicott Creek. The dam and reservoir with minor channel improvement was recommended.

The Ellicott Creek Basin is included in the area under study by the Great Lakes Basin Commission. The Comprehensive Great Lakes Basin Framework Study is not yet complete.

DESCRIPTION OF THE STUDY AREA

Ellicott Creek, located in western New York State, is the

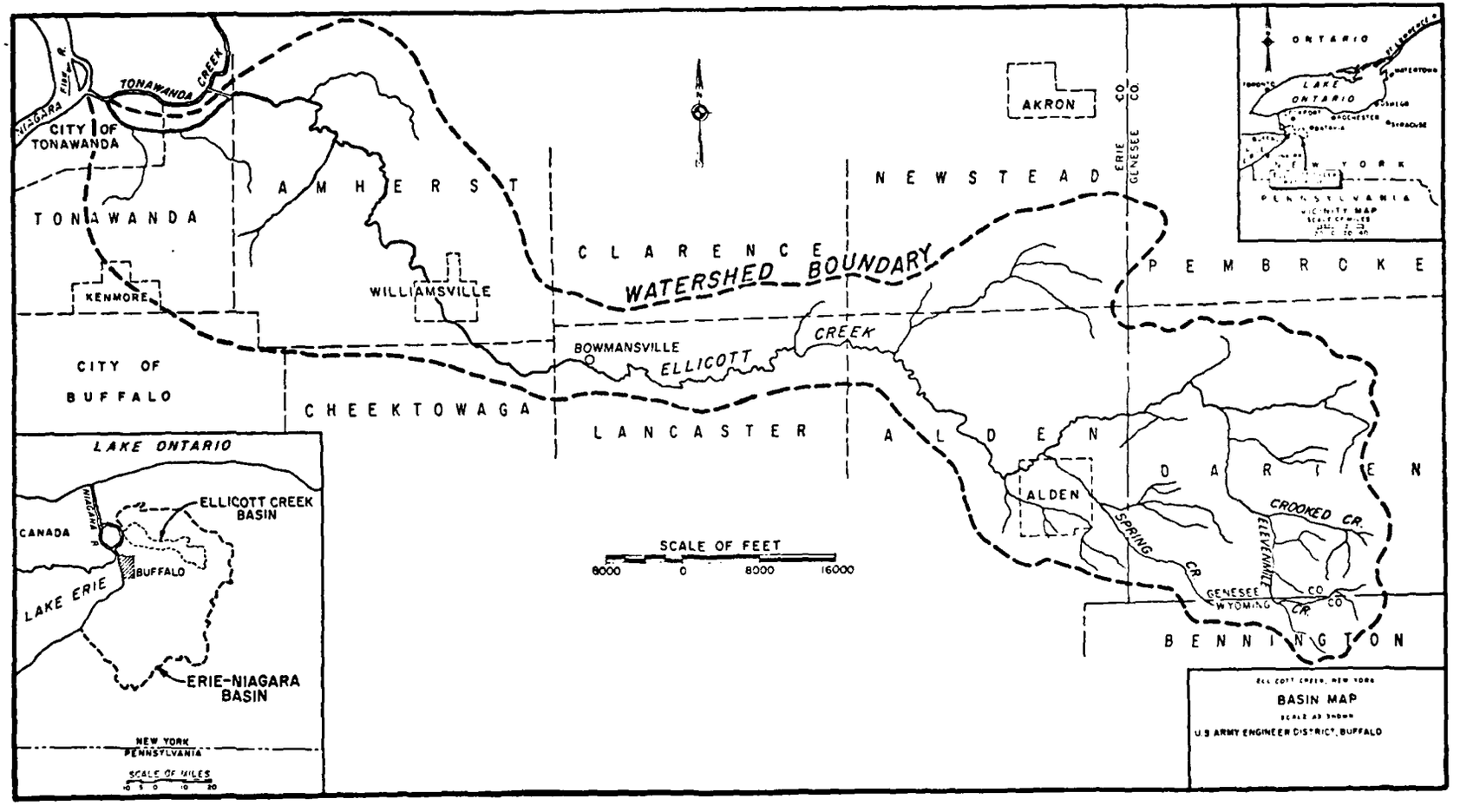
largest tributary of Tonawanda Creek and drains an area of about 110 square miles in Erie, Genesee and Wyoming Counties. The Ellicott Creek Basin and some principal locations are shown on the map following. The source of the principal tributary, Elevenmile Creek, is about 22 miles east of Buffalo, at an elevation of about 1,300 feet above mean sea level. It joins Crooked Creek to form Ellicott Creek, that flows in a northwesterly direction into the canalized section of Tonawanda Creek at an elevation of about 564 feet. The topography of the watershed varies from flat lands near the mouth to steep hills around the headwaters. Near the headwaters, the stream flows through steep valleys and is fed by small streams and gullies from the hillsides. Ellicott Creek then pursues a very meandering course and achieves a total length of approximately 47 miles in a basin about 27 miles long. Development in the basin ranges from urban and suburban in the lower portions to agricultural in the upstream reaches.

NATURAL RESOURCES

The Ellicott Creek Basin lies within the western portion of the Erie - Ontario lowland, bounded on the north by Lake Ontario and on the south by the Allegheny Plateau. Geotechnical aspects are covered in Appendix G. The generally flat to rolling lowland surface is interrupted by three east-west trending escarpments known as the Niagara, Onondaga and Portage Escarpments, the latter forming the northern edge of the Allegheny Plateau. The lowland belts, delineated by the escarpments, are named, from north to south, the Ontario Plain, the Huron Plain, and the Lake Erie Plain. From its headwaters on the Portage Escarpment, Ellicott Creek flows over the Lake Erie Plain for about two-thirds of its length before flowing northward across the Onondaga Escarpment onto the Huron Plain, just before joining Tonawanda Creek.

The bedrock underlying the western portion of the lowland consists of limestone, dolomite shale and sandstones. The bedrock surface is covered with glacial deposits. Along the northern edge of the basin, glacial deposits and the underlying limestone are being quarried to obtain concrete aggregates. Natural gas is obtained at some points in the basin in small quantities.

The average annual precipitation is about 35 inches varying from a minimum average of about 2.5 inches in February to about 3.3 inches in August. Average annual snowfall is about 80 inches with the greatest amount of about 22 inches occurring in January. Average annual temperature is about 47 degrees Fahrenheit. July is usually the warmest month, averaging about 70 degrees and January, the coldest month, averages about 23 degrees. Much of the lower Ellicott Creek Basin is in a flood plain. Land not now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TONAWANDA CREEK
CITY OF TONAWANDA
TONAWANDA
AMHERST
NEWSTEAD
AKRON
ERIE CO.
GENESEE CO.
CLARENCE
WATERSHED BOUNDARY
PEMBROKE
KENMORE
WILLIAMSVILLE
BOWMANSVILLE
ELLICOTT CREEK
CITY OF BUFFALO
CHEEKTOWAGA
LANCASTER
ALDEN
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ELEVENMILE CR.
GENESEE CO.
WYOMING CO.
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ONTARIO
LAKE ONTARIO
ROCHESTER
SYRACUSE
BUFFALO
NEW YORK
PENNSYLVANIA
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ELLICOTT CREEK BASIN
BUFFALO
LAKE ERIE
ERIE-NIAGARA BASIN
NEW YORK
PENNSYLVANIA
SCALE OF MILES
10 5 0 10 20
ELLICOTT CREEK, NEW YORK
BASIN MAP
SCALE AS SHOWN
U.S ARMY ENGINEER DISTRICT, BUFFALO

used for residential or commercial development, particularly in the upstream portion of the basin, is used for agriculture. Detailed information on climatology, precipitation, snowfall and temperature are given in Appendix B.

HUMAN RESOURCES, DEVELOPMENT, AND ECONOMY

Because of differences in census and watershed boundaries, basin population cannot be determined accurately. However, historic population trends in both Erie County and the Ellicott Creek Basin show a continuous growth. From 1940 to 1970 Erie County's population grew from about 798,000 to over one million, while the basin increase was a slightly lesser rate from about 700,000 to about 874,000. However, residential development in the town of Amherst has been particularly rapid in recent years and will be accelerated by a new State University campus being constructed partly in the flood plain in Amherst. By 1975, the daily population of the Amherst campus is expected to be more than 50,000 persons, including students, faculty and service employees.

Development along the lower first mile of Ellicott Creek is commercial and industrial. Then, through the remainder of the city of Tonawanda, the town of Tonawanda and the town of Amherst to the upper limit of Williamsville, development is essentially residential with varying degrees of intensity, interspersed with parks, golf courses, shopping centers, and vacant land. A large sparsely developed area on the left bank in Amherst has been acquired by the State University of New York for construction of the new campus mentioned previously.

Immediately upstream from Williamsville, the Ellicott Creek Basin was once entirely agricultural, but it is gradually changing to suburban residential development whose intensity is greatest near Buffalo. In the meantime, many farms have been combined into larger units for dairy and general farming or are dormant, with the buildings in use but the land uncultivated. Private enterprise is planning to construct a domed stadium just south of Ellicott Creek in the town of Lancaster. The same interests are planning peripheral development that would include a championship golf course, motels, apartments and shopping centers. Labor interests are planning to construct a Labor Hall of Fame in the same general area. The upstream portion of the basin is used mainly for agricultural purposes.

The Ellicott Creek Basin approximately parallels three railroads, the New York State Thruway, and two other major highways. A network of improved local roads provides good access to all areas of the basin. Buffalo International Airport, located partly within the

basin, provides regular airline service. In addition, there are two proposals for a Lockport Expressway, cutting across the basin, and other proposals for highways to service developments by the State University and Urban Development Corporation.

The downstream reaches of the Ellicott Creek Basin are located within the most dynamic portion of the Buffalo Metropolitan area. The communities of Amherst, Tonawanda and Cheektowaga have accounted for nearly two-thirds of the population growth in the Buffalo metropolitan area in recent years. Manufacturing employment in the area will probably increase by only one-third during the next sixty years, as increased production requirements will be met largely by improved technology rather than increases in manpower. Non-manufacturing opportunities are expected to expand about two and one-half times by 2020. All significant non-factory efforts in the metropolitan area should show substantial gains as the area and the nation continue to shift from a goods-producing to a service economy. The absolute decline of the agricultural sector as a job source in the Buffalo Metropolitan area from less than four percent in 1940, to just over one percent in 1960, and to about one-third of one percent by 2020, will reflect striking output-per-farmworker gains rather than a decline in volume of farm output.

The employment impact, direct and indirect, associated with the new State University of New York at Buffalo is essential to provide nearly 51,000 additional jobs in the Buffalo area by 1985, many of them in or adjacent to the Ellicott Creek Basin. Resulting concomitant demands for housing, are expected to total nearly 70,000 units by 1985. These needs for housing and related employment will stimulate the entire economy of the Buffalo Metropolitan area.

PROBLEMS AND NEEDS

As the Buffalo Metropolitan area expands, needs are being created for water supply and improved water quality. The expansion into the flood plain increases the potential flood problems and adds to the sediment loads caused by rapid runoff. The growing population has increasing needs for water-oriented recreational opportunities. A study completed by the Erie-Niagara Basin Regional Water Resources Planning Board in 1969 developed information on the overall needs of the area. In that study and in more detail in this study, consideration has been given to selection of proposals in the Ellicott Creek Basin to meet needs peculiar to the basin and to meet in part the more general needs of the area. In summary, there are needs for flood control, water supply, improved water quality, and recreational opportunities. There are no apparent needs in the basin for agricultural irrigation or development of hydroelectric power.

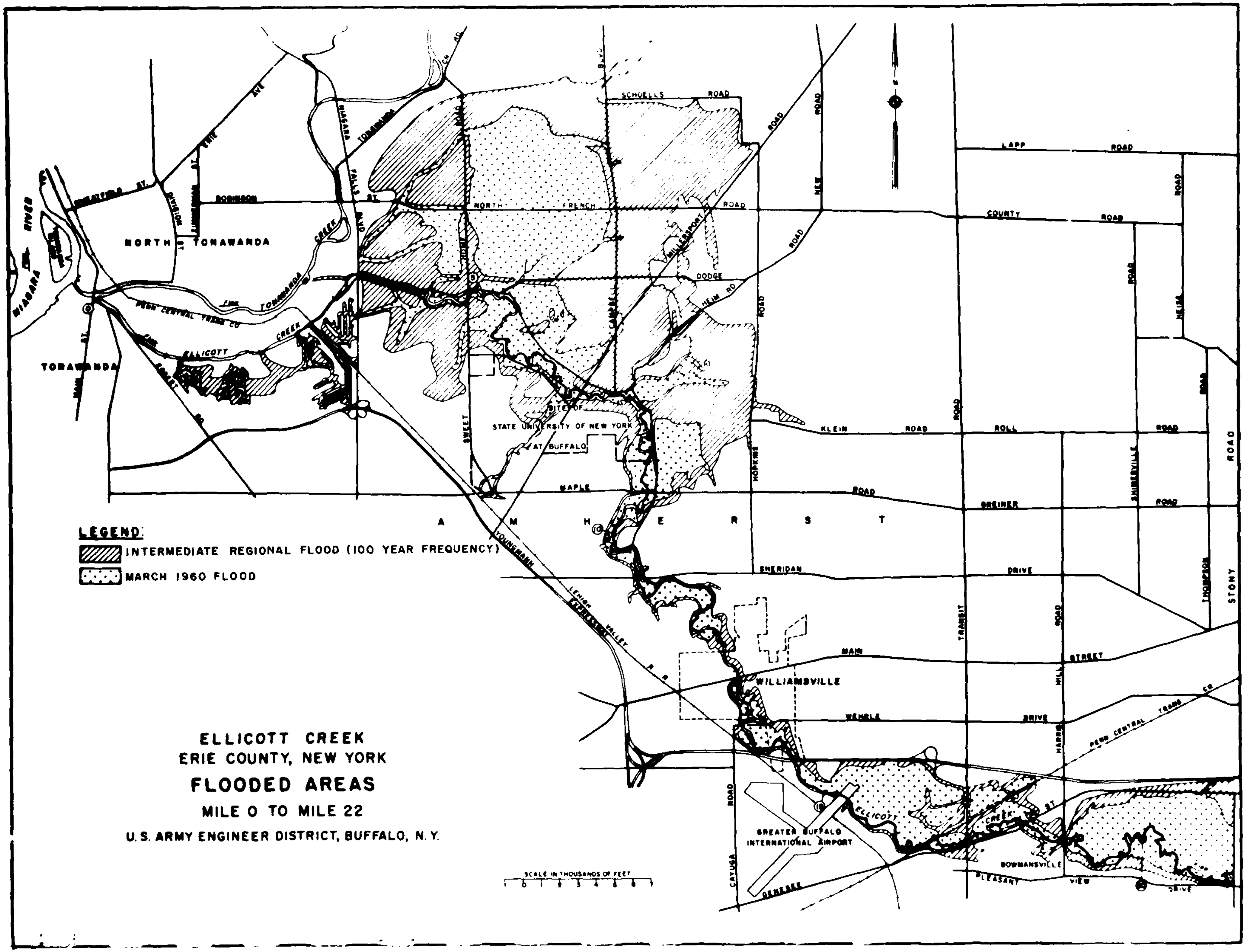
FLOODING

A flood in 1960 inundated about 3,220 acres in the Towns of Amherst and Tonawanda. The outline of this flood is shown on the map following. The flooded area, primarily residential, had a maximum width of about 3,000 feet. Further upstream in the Town of Cheektowaga, 450 acres were inundated, with a maximum flooded width of about 4,000 feet on mostly undeveloped land. About 890 acres of mostly undeveloped land were flooded in the Town of Lancaster. The 1960 flood has a recurrence interval of about 20 years. The discharge of the 1960 flood at Williamsville was estimated to be 4,860 cfs. The 100-year flood would have a discharge of about 7,100 cfs.

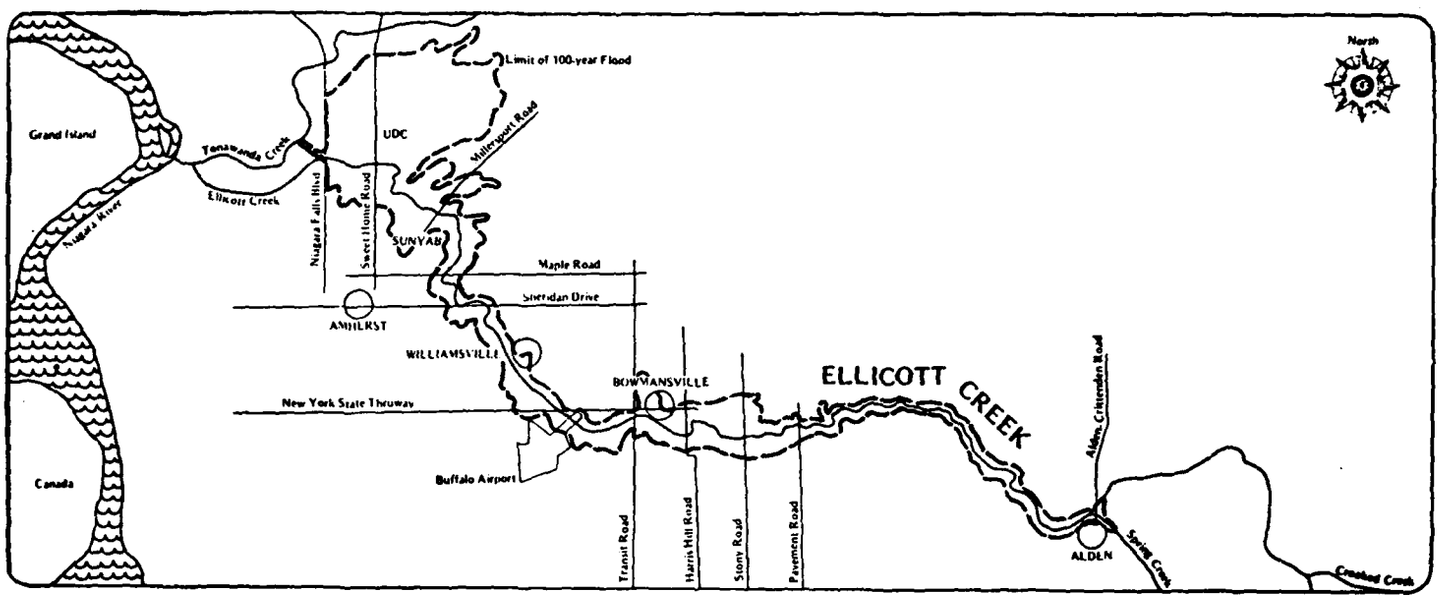
A preliminary survey of areas flooded in March 1960 downstream of Stony Road was completed in 1963 and the area between Sheridan Drive and Niagara Falls Boulevard was resurveyed in 1969 due to widespread new development. Property owners were interviewed to obtain data on actual damages at the 1960 flood level and estimated damages at higher and lower levels. Flood damages and benefits are covered in Appendix B.

Damages in a recurrence of the 1960 flood, referenced to March 1969 price levels and conditions of development are estimated at $2,027,000 in the reach between the mouth of the creek and Alden. Of this amount, $1,875,000 would occur in Amherst and Tonawanda affecting about 1,450 homes, ten commercial developments and a few utilities, churches, institutions and public highways and utilities. The limit of the 100-year frequency flood in that basin is shown on the map following.

Future flood damages were determined by projecting future basin development. New construction in the flood plain has already commenced and it is too late to implement flood plain management measures. Conversations with local groups indicate that if the present development were not taking place, the flood plain would still be developed, but by individuals on a haphazard basis. More than 1,500 housing development units are planned for construction on the UDC property. Flood control benefits were calculated for each considered plan of improvement. Benefits would result from a reduction in flood damages to existing development and to future development; damages are calculated by subtracting average annual damages with and without the considered improvements. The area subject to heaviest damage along the creek is in the lower reaches in the town of Amherst. Many new homes ranging in value from $30,000 to more than $50,000 have been constructed in the flood plain in recent years. The rate of development has been accelerated by the new State University Campus now being constructed and by UDC development. Total average annual flood control benefits for the improvement



ELLICOTT CREEK
ERIE COUNTY, NEW YORK
FLOODED AREAS
MILE 0 TO MILE 22
U.S. ARMY ENGINEER DISTRICT, BUFFALO, N.Y.



LIMIT OF 100-YEAR FLOOD ON ELLICOTT CREEK

plans considered in the study range in value from about $665,000 to about $762,000.

GENERAL RECREATION

Dramatic increases in population, urbanization, leisure time, income and mobility have greatly increased the demand for recreation in the United States in the past 30 years. Water recreation and the attractiveness of a stream for construction of picnic, camping and play areas nearby have become a valuable use of water. Historically, most water-oriented recreation activity in Western New York gravitated toward the Great Lakes shoreline because of the lack of similar opportunities at inland lakes and streams. Details of recreational needs are discussed in Appendix C.

An inventory of all public and private recreational resources in the study area was prepared as part of the Erie - Niagara Basin recreation investigation by the Division of Water Resources of the New York State Conservation Department. During the summer of 1966, a number of State and county parks were surveyed during peak usage periods to evaluate patterns of usage, origin of visitors, intensity of use, expenditures, and other salient factors. Besides providing useful numerical data to evaluate potential sites, the survey enabled qualitative assessment of the capability of regional recreation facilities. The inventory included facilities planned for construction in 1970. An eight-county region in western New York plus a part of Ontario, Canada, is considered to be the supply area. Since most day use outdoor recreation participation occurs within a two-hour drive, the study area considered met this criteria. The counties studied were Allegany, Cattaraugus, Chautauqua, Erie, Genesee, Niagara, Orleans, and Wyoming.

Bureau of Outdoor Recreation procedures of analysis were used to determine participation of western New York population in swimming, boating, picnicking and camping. Participation minus supply is defined as need and the following table summarizes these needs in terms of instantaneous participation on a typical summer day.

Regional recreation needs
(Recreation Days)

Activity	1970	1990	2000	2020
Swimming	87,600	108,500	156,000	206,000
Boating	29,700	37,600	56,200	74,500
Camping	3,400	10,500	26,600	42,500
Picnicking	(5,500)1/	8,000	38,000	68,000
Total Need	115,200	164,600	276,800	391,000

1/ Supply greater than demand

FISH AND WILDLIFE

Fishing opportunities in the Buffalo area are limited in quantity and low in quality. Low summer flows and poor water quality have reduced fish populations in most inland streams, and weather often restricts use of the Great Lakes. Studies of fishery requirements show that in 1960 the resource provided anglers with only 0.1 pound per fisherman-day, compared with a national average of 1.5 pounds. The spread of suburban growth and increased posting of private lands have similarly restricted hunting opportunities, although idle agricultural land has improved game production.

WATER QUALITY CONTROL

Water quality requirements for streams in New York have been established by the New York State Water Resources Commission and more recently are being established by the Federal Environmental Protection Agency (EPA). Discharges to waterways in New York State require a minimum of secondary treatment, capable of removing at least 75 percent of the five-day BOD before discharge. In addition, the effluent must be treated to a degree that will permit maintaining the required minimum dissolved oxygen concentration established by stream classifications. More stringent requirements and standards are being established by the Federal Environmental Protection Agency (EPA); secondary treatment by 1977, and no discharge of critical pollutants in 1985. Most of the present requirements can be met by sewage treatment plants capable of secondary treatment. As requirements and standards increase, it will become necessary to modify treatment plants to provide tertiary treatment. The present water quality of Ellicott Creek is generally poor. The lower reaches of the stream are especially polluted, resulting partly from industrial and municipal wastes. Periodic low flow and regular input of raw or partially treated wastes is responsible in a large way for the poor water quality.

WATER SUPPLY

Water supply needs for the town and village of Alden, the town of Darien, and the village of Akron and town of Newstead are growing and present supply sources will not be sufficient to meet future requirements as discussed in Appendix C. Supplies to suburban areas closer to Buffalo are now being provided by the Erie County Water Authority from Lake Erie.

IMPROVEMENTS DESIRED

At a public meeting on Tonawanda Creek and its tributaries for flood control, held in Clarence Center, on 29 November 1960,

information was presented on the extent of damage caused by Ellicott Creek in and downstream from Williamsville. Provision of measures to reduce this damage was requested but no specific plan of improvement was suggested.

At a meeting held to present the Ellicott Creek flood plain information report in March 1968, Town of Amherst officials stated that they could not accept the report as an answer to their problems. They considered structural measures to be essential. They desired a reduction in incidence and amount of flood damage, provision of recreational opportunity, and improvement of water quality in the lower reaches of Ellicott Creek. All requested that any plan adopted be accomplished with a minimum adverse environmental effect.

Another public meeting was held in March 1970 to provide an opportunity for interested parties to present views on a proposal to build a dam at Sandridge. Strong support came from those who would benefit, primarily in the downstream areas and opposition from those who would be displaced by the project and others in the adjacent communities.

SELECTING A PLAN

The Erie-Niagara Basin Regional Water Resources Planning Board was established in 1963 to prepare a comprehensive plan for the development and management of the water and related land resources of the Erie-Niagara Basin. In 1970, the Board published a Basin Plan including the formulation of alternatives available with respect to municipal and industrial water supply, water quality management, irrigated agriculture, water-oriented recreation, fish and wildlife enhancement, flood plain management, and other alternatives. The Ellicott Creek watershed improvements proposed in the Board report included channel improvements, non-Federal flood damage reduction measures, and a multiple-purpose Sandridge Reservoir project. All of the data in the report supplemented by input obtained from the public were carefully considered in selection of a plan of improvement.

PLAN FORMULATION

The basic objectives of plan formulation are to develop a plan which will provide the best use, or combination of uses, of water and related land resources to meet all forseeable short- and long-term needs of the Ellicott Creek Basin. In pursuit of this general objective, the following specific planning principles and objectives guided formulation of the plan of improvement:

a. The plan must preserve to the maximum possible extent the quality of the natural and human environment.

b. The plan must be socially acceptable.

c. The plan must enhance the economic welfare of the local people and add to their security and well-being.

d. The plan must enhance national economic development by increasing the value of the Nation's output of goods and services and improving national economic efficiency.

e. The plan must fit integrally into an overall plan for water and related land resource management and development for the Erie-Niagara Basin.

f. The plan must be technically feasible to implement.

POSSIBLE SOLUTIONS

Several alternative possibilities for flood control can be considered but each can be classified and briefly described as:

Channelization to improve flow capability of creek.

Diversion channel - a type of floodwater by-pass channel to avoid channelization of creek.

Levees and flood walls as an alternative or complement to channelization.

Dam and reservoir to hold basin runoff for later, controlled release.

Public acquisition of the flood plain.

Flood plain management and floodproofing.

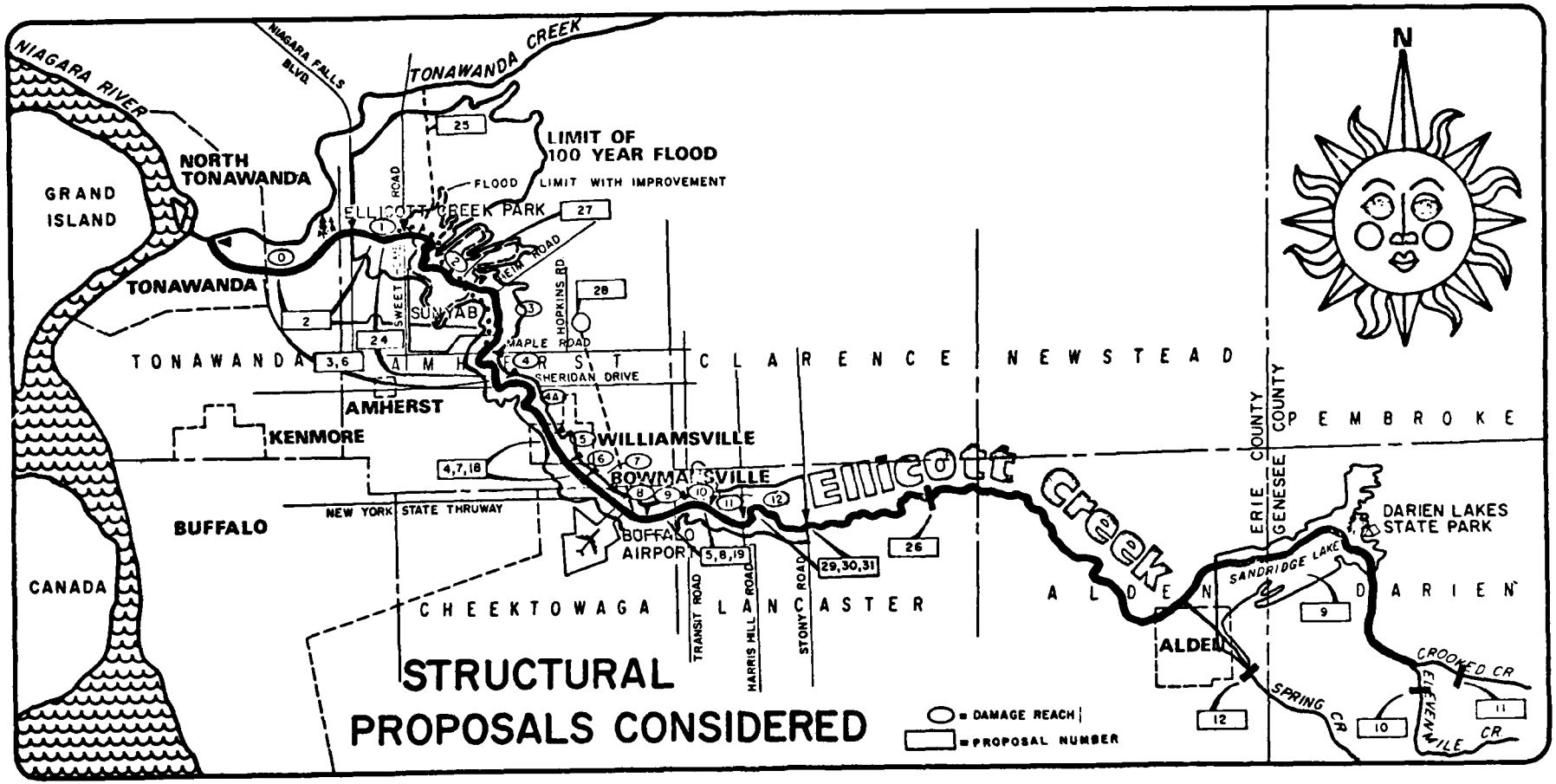
There were 31 proposals examined to provide flood control and other benefits in the Ellicott Creek Basin. A matrix analyzing the 31 proposals in view of the study objectives follows. Each of the proposals was evaluated in an initial screening process and those that appeared viable were studied in more detail not only from an engineering and economic viewpoint but with consideration of the environmental impact and public acceptance. Four channelization plans, three diversion channel plans, three levee and three floodwall plans, and eleven dam sites were investigated during the initial screening process. The general locations of the considered structural alternatives are shown on the map that follows. In addition, several non-structural alternatives were considered, as well as no action by

MATRIX OF CONSIDERED PROPOSALS ON ELLICOTT CREEK

Study Objective	Channelization		RESERVOIRS									
	Reaches 0, 1, 3	Reaches 0-4	Sandridge	Sandridge & minor channel improvement	Upstream	Control Dams w/Channel Improvement	Upground	BOWMANSVILLE	BOWMANSVILLE PLUS PAVEMENT ROAD DAM	BOWMANSVILLE WITH TERTIARY TREATMENT	Channelization	Levees and Floodwalls
Proposal National Economic Development	2 Considerable urban flood damage would be reduced. (20 yr. protection) B/C 2.60 +	3 Major amount of urban flood damage would be reduced. (100 yr. protection) B/C 1.32 +	9 Considerable urban flood damage would be reduced. Recreation and fish and wildlife benefits. B/C 1.05 +	13 Major amount of urban flood damage would be reduced. Recreation and fish and wildlife benefits. More costly than Plan 9 B/C 1.01 +	10, 11, 12 Similar to Plan 9 but smaller in size and cost but single purpose flood control B/C Not developed	26 Similar to Plan 13 B/C 0.83 0	28 Major urban flood damage reduced recreation potential B/C 0.51 —	29 SIMILAR TO PLAN 28 B/C 1.03 +	30 SIMILAR TO PLAN 29 B/C 0.92 +	31 SIMILAR TO PLAN 29 B/C 1.05 +	4, 5 Small localized amount of urban damage would be reduced B/C 4 = 0.34 B/C 5 = 0.20 — —	6, 7, 8 Protection the same as Plans 3, 4 and 5 B/C 6 = [illegible] 3 B/C 7 = 0.34 B/C 8 = [illegible] 20 — —
Environmental Quality	Adverse effect on natural environment. Creek length reduced, low protection — —	Same as plan 2 except greater protection — —	Adverse effect on natural and man made environment. Stream flow augmented to reduce stagnation water quality in lake [illegible] —	Same as plan 9 except creek length reduced — — —	Similar to Plan 9 but less impact —	Environmentally Poor — —	Little adverse effect on environment 0	ENVIRONMENTALLY POOR — — —	SIMILAR TO PLAN 29 BUT LESS ADVERSE IMPACT — —	SIMILAR TO PLAN 30 — —	Similar to Plan 2 but less impact —	More adverse effect on environment than channelization — — —
Social Well Being	About 2,000 acres protected and create a better sense of security for residents of about 1,100 homes +	Same as Plan 2 except more than 6,000 acres and about 1,300 homes would be protected plus some businesses and essential services +	Protection of 6,000 acres, [illegible] 3.5 square miles of drainage area controlled and some businesses and essential services. Many people would be relocated. 0	Same as Plan 9 except greater protection +	Similar to Plan 9 but less impact 0	Similar to Plan 13 0	Similar to Plan 13 0	SIMILAR TO PLAN 13 0	SIMILAR TO PLAN 13 0	SIMILAR TO PLAN 13 0	Similar to Plan 2 but much less protection +	Similar to Plan 3 +
Regional Development	Property exchanges would be easier and owner more apt to make improvements small business could be attracted to area +	Same as Plan 2 +	Same as Plan 2 plus beneficial effect to municipal water supply and stream flow, job opportunities + +	Same as Plan 9 + +	Similar to Plan 9 but no beneficial effect to municipal water or stream flow 0	Similar to Plan 13 +	Same as Plan 2 plus stream flow augmented +	SIMILAR TO PLAN 2 +	SIMILAR TO PLAN 13 + +	SIMILAR TO PLAN 2 +	Similar to Plan 2 but much less impact +	Same as Plan 2 +
Total Effect (–, 0, +)	Plan is viable [illegible] well being of people with minimal adverse effect on environment +	Same as Plan 2 except protection is greater +	Plan provides a multiplicity of benefits - but would adverse effect social well being and environment +	Same effects as Plan 9 w/added protection +	Plan probably not viable. —	Not as acceptable as Plans 9 or 13 —	Further study necessary 0	NOT AS ACCEPTABLE AS PLANS 9 OR 13 —	NOT AS ACCEPTABLE AS PLAN 13 0	PLAN PROBABLY NOT VIABLE —	Plan is not viable, adverse effect on environment —	Plan is not viable very offensive to people environment —

MATRIX OF CONSIDERED PROPOSALS ON ELLICOTT CREEK

Study Objective	Parallel Lakes Reach 1-4	Diversion Channels: Marine Park to Tonawanda Creek	Diversion Channels: Amherst	Flood Plain Management Reach 1-4	Flood Fronting Reaches 2 & 3 Williamsville	Evacuation	Public Acquisition	Flood Plain Management: Reaches 8, 9	Flood Plain Management: Reaches 12 Algen-Crittenden	Flood Proofing	NO CORPS PARTICIPATION
Proposal/ National Economic Development	24 Cost high compared to Plan 3 B/C 0.84 —	22 Considerable flood damage would be reduced. Recreational benefits. B/C 1.09 +	21 Major amount of flood damage would be reduced. Recreational opportunities B/C 1.15 +	14 Less impact than Plans 15, 16 0	17, 18 Same effects as Plan 19 B/C 17=1.89+ B/C 18=0.41 —	20, 21, 22 Cost high in light of possible benefits B/C N/A —	23 Protection can be provided cheaper with structural measures B/C 0.25 —	15 Minor reduction in flood damage No federal participation B/C N/A +	Minor reduction in flood damage Some recreational benefit possible No federal participation B/C N/A +	19 Reduction in flood damage if cost would be personal B/C 1.35 +	NO FLOOD DAMAGE REDUCTION B/C N/A 0
Environmental Quality	Environmentally Poor —	Adverse effect on natural environment some enhancement to man made environment and open space. Water quality problem —	Adverse effect on natural and man made environment open space use would be improved —	Same as Plans 15 and 16 0	Same as 19 —	Environmentally Good +	Environmentally Good +	No adverse effect on environment 0	Same as plan 15 0	Some adverse effect on man made environment. —	LACK OF COORDINATION NATIONAL ENVIRONMENT 0
Social Well Being	Similar to Plan 3 +	Houses land and businesses protected. Flooding still possible resulting in insecurity —	Same as Plan 25 except dependable flood control +	Similar to Plans 15 and 16 but greater +	Same as 19 +	Portable items would be saved from damage +	Residences would be saved from damage +	LESS 4,000 acres of land to few businesses and about 1,000 homes could avoid flood damage Create a better sense of security and well being +	Same as Plan 15 +	Properties protected and create a sense of security and well being +	PROPERTIES UN-PROTECTED WILL CREATE A CONTINUED SENSE OF INSECURITY —
Regional Development	A few jobs created +	Economic stability improved a few jobs created +	Same as Plan 25 +	Constrains local development —	Same as 19 —	Adverse effect — —	Adverse effect — —	Constrains local development —	Constrains local development —	Property exchange might be difficult utilities and transportation networks still subject to flooding —	ECONOMIC STABILITY UN-IMPROVED —
Total Effect (-, 0, +)	Environmentally unacceptable as compared to Plan 3 that could serve better and cheaper 0	A viable plan, little change to Ellicott Creek 0	More viable than Plan 25 +	Plan not viable land use plan and development too far advanced to implement 0	Some structural solutions are necessary for Plan 17 Plan 18 not viable 17=0 18=—	Probably socially unacceptable —	Probably unacceptable by public over investment in public lands —	Constrains local development no adverse effect on environment +	Same as Plan 15 +	Personal implementation necessary 0	NOT WISE TO DO NOTHING PROPERTIES CONTINUE TO DETERIORATE THEREFORE ECONOMICALLY OR BY OTHER MEANS —


NIAGARA RIVER
NIAGARA FALLS BLVD.
TONAWANDA CREEK
LIMIT OF 100 YEAR FLOOD
FLOOD LIMIT WITH IMPROVEMENT
NORTH TONAWANDA
GRAND ISLAND
TONAWANDA
ELLICOTT CREEK PARK
SWEET ROAD
HOPKINS RD
MAPLE ROAD
SHERIDAN DRIVE
SUNYAB
AMHERST
KENMORE
WILLIAMSVILLE
BOWMANSVILLE
NEW YORK STATE THRUWAY
BUFFALO
BUFFALO AIRPORT
CANADA
CHEEKTOWAGA
LANCASTER
TRANSIT ROAD
HARRIS HILL ROAD
STONY C ROAD
TONAWANDA
AMHERST
CLARENCE
NEWSTEAD
ERIE COUNTY
GENESEE COUNTY
PEMBROKE
ALDEN
DARIEN
DARIEN LAKES STATE PARK
SANDRIDGE LAKE
ALDEN
CROOKED CR
EIGHTEEN MILE CR
SPRING CR
Ellicott Creek
N
STRUCTURAL PROPOSALS CONSIDERED
= DAMAGE REACH
= PROPOSAL NUMBER

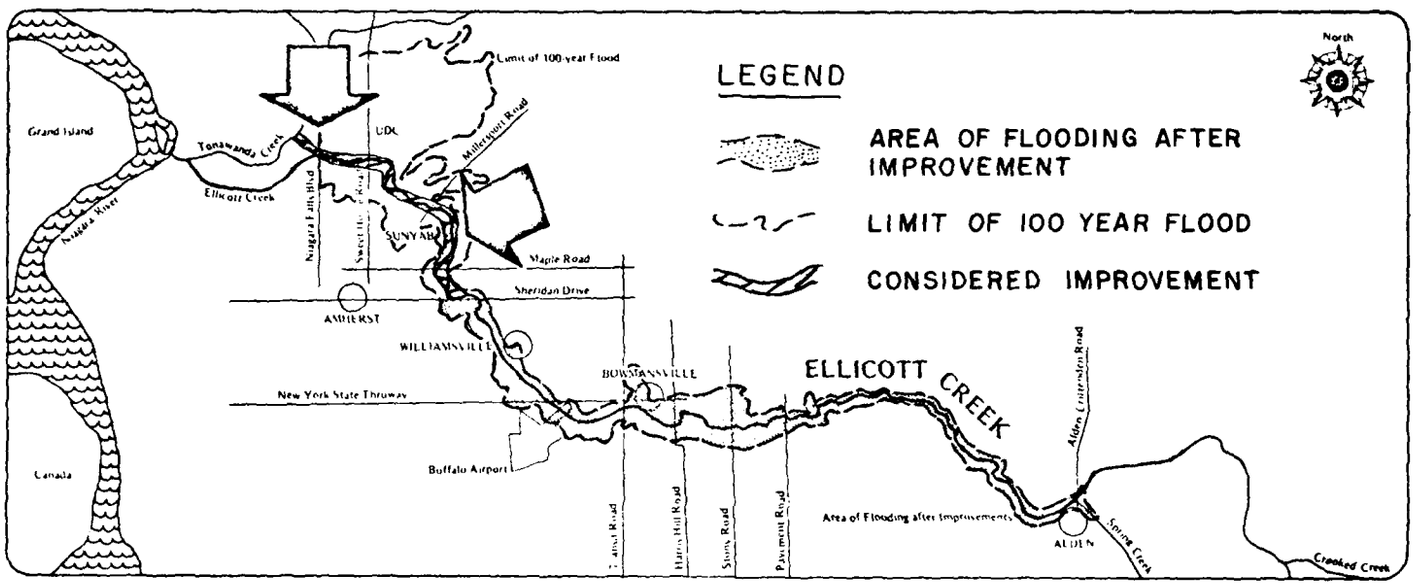
the Corps of Engineers. The 31 proposals are discussed in detail in the Phase I report of which a minimum number of copies are available at the Buffalo District Office.

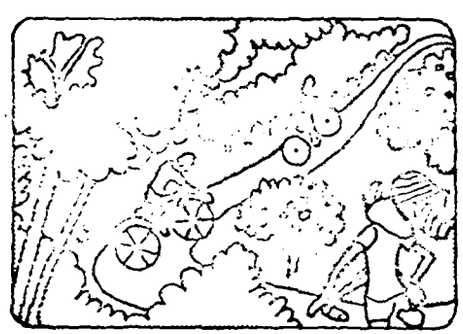
As a result of the investigation of the foregoing alternatives, it was concluded that four viable possibilities should be presented to the public for their discussion, comment, and possible acceptance. The four alternatives were: major channel improvement, a diversion channel, Bowmansville Lake, and Sandridge Lake and minor channel improvement. Illustrations of the four alternatives follow.

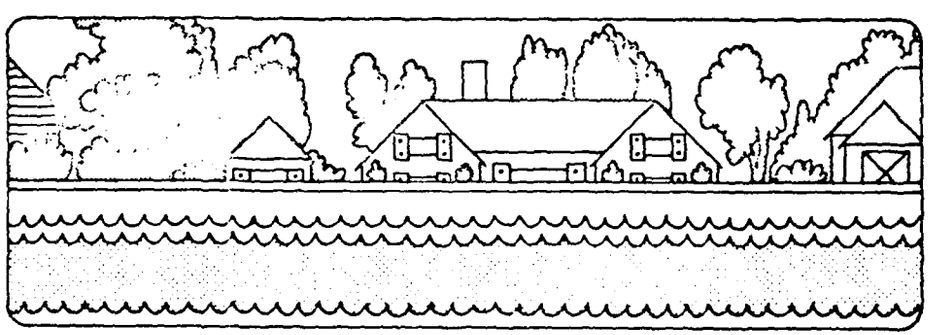
The major channelization alternative would include major realignment, widening and deepening of Ellicott Creek to increase flow capacity varying from 7,600 cfs at Sheridan Drive to 8,700 cfs at Niagara Falls Boulevard for 100-year flood protection. The work would be in the lower seven miles of the Creek between Sheridan Drive and Niagara Falls Boulevard. The Ellicott Creek Park by-pass channel would require enlargement. Three additional culverts under Tonawanda Creek Road are necessary and the Sweet Home Road Bridge would require replacement. Three highway bridges, two foot bridges and more than fifty local storm drains would require modification. This alternative, least costly of the four, would resolve flood problems in the most flood-prone areas and possesses a very favorable benefit to cost ratio. Recreational opportunities would be available through creation of several pocket parks in areas where greatly needed. The adverse impact from the plan would be the ecologic damage to the creek and vegetation and there would be no improvement to augment low-flows in the creek.

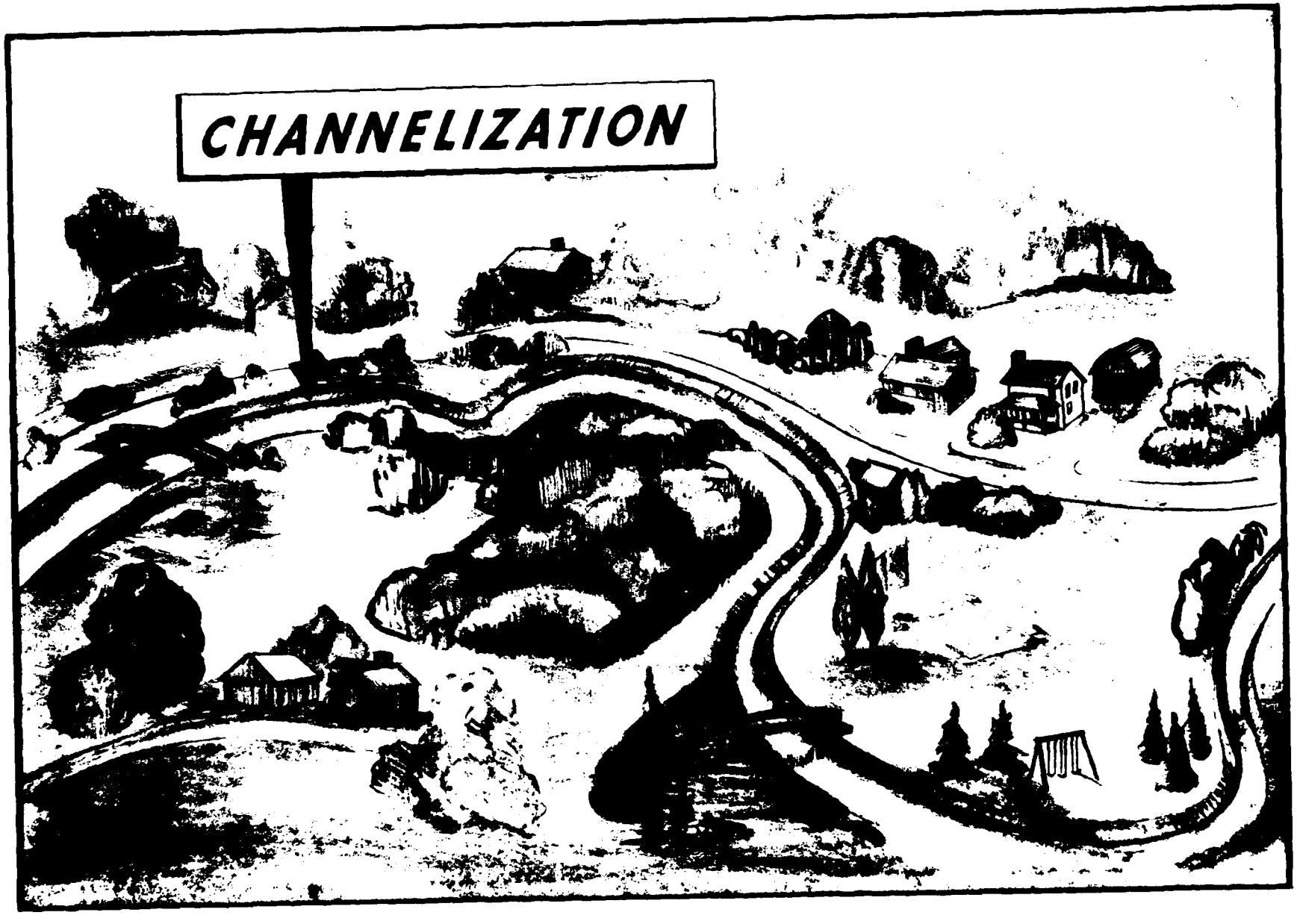
The diversion channel alternative would include construction of a grass-lined diversion channel about 3.4 miles long from a point just downstream of the Maple Road Bridge over the creek to a point about 2,000 feet downstream of the Sweet Home Road Bridge. Between the start and Millersport Highway, the diversion channel would be on the Audubon Golf course and State University of New York land adjacent to and south of the creek. Between Millersport and the confluence, the diversion channel would be primarily on UDC property north of the creek. The diversion channel would carry water only in those periods when flows near Maple Road exceed approximately 2,000 cfs which is estimated to occur about once every two years. For the 100-year flood design conditions at this location, the existing Ellicott Creek would carry a flow of about 2,600 cfs while the remaining flood discharge, 5,000 cfs, would take its course along the diversion channel. Creek channel improvements would be required between Sheridan Drive bridge and the upstream limit of the diversion channel, a distance of about

MAJOR CHANNEL IMPROVEMENT

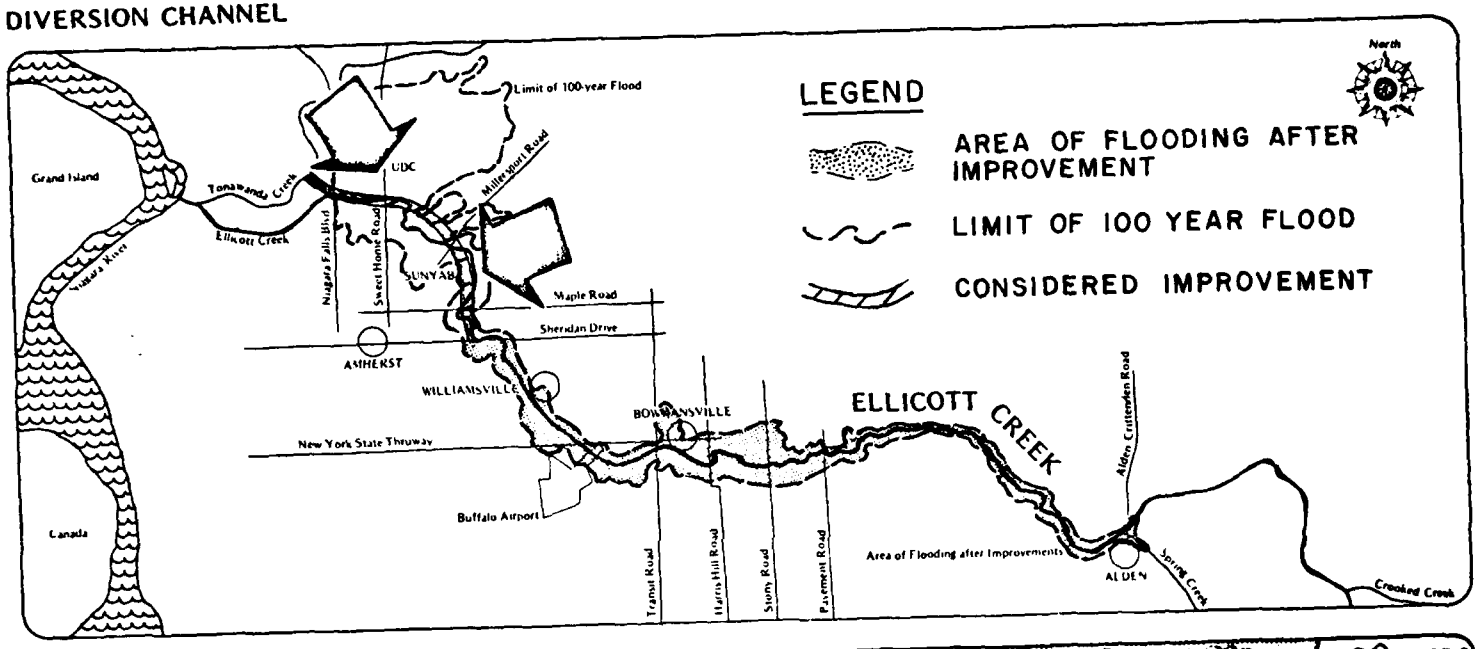


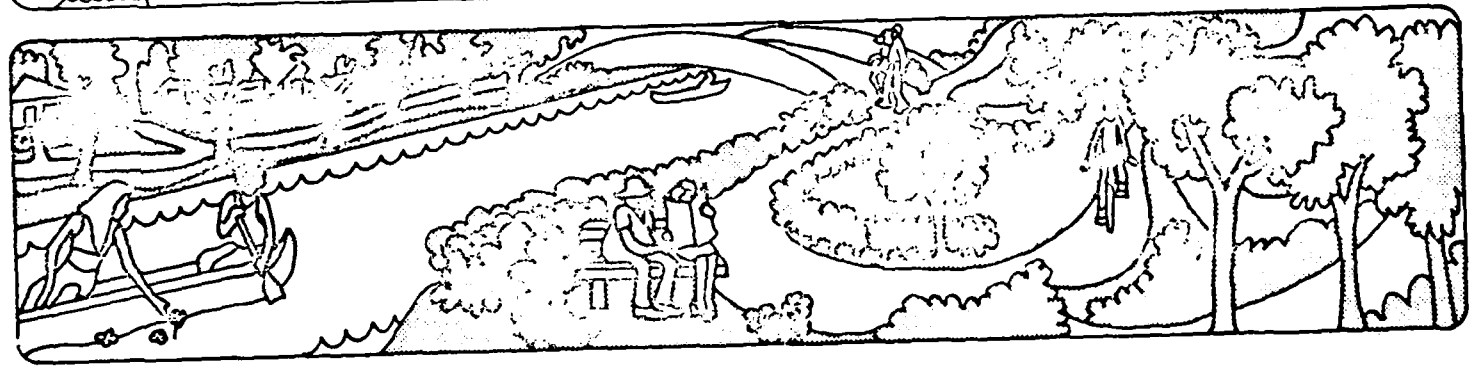


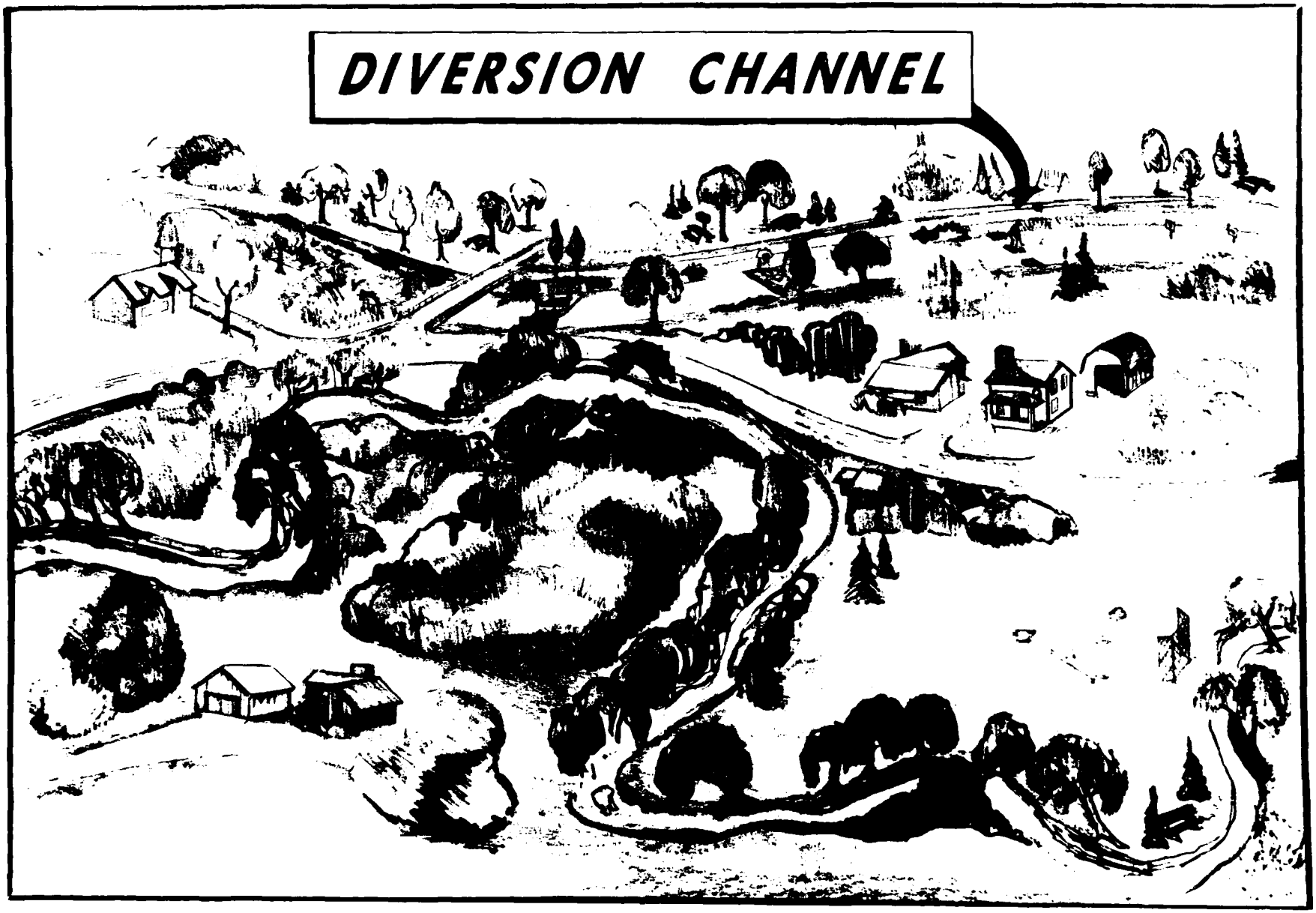



CHANNELIZATION

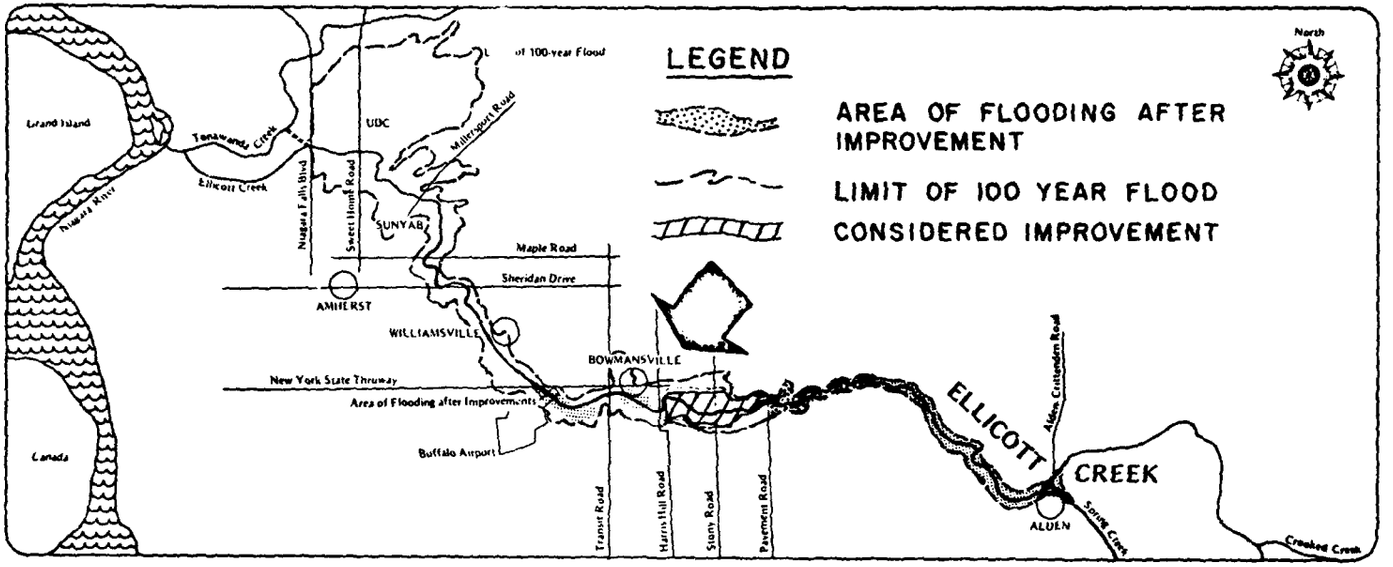
DIVERSION CHANNEL

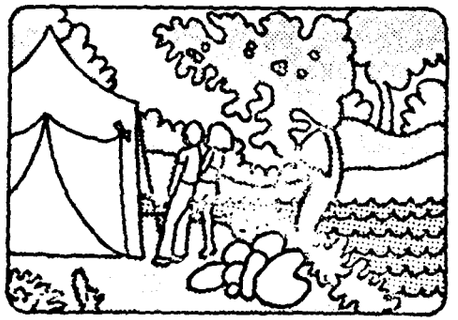


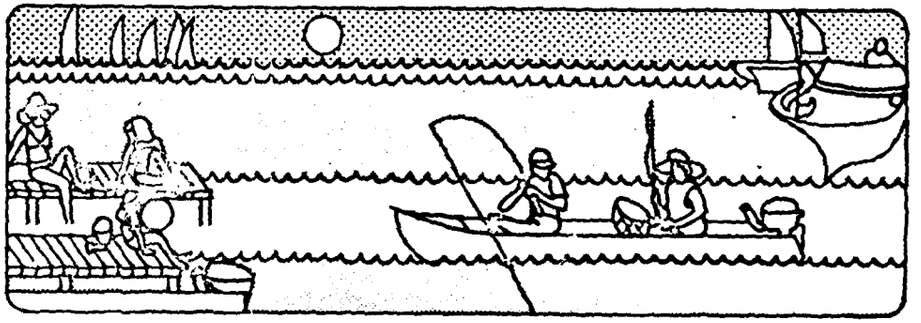


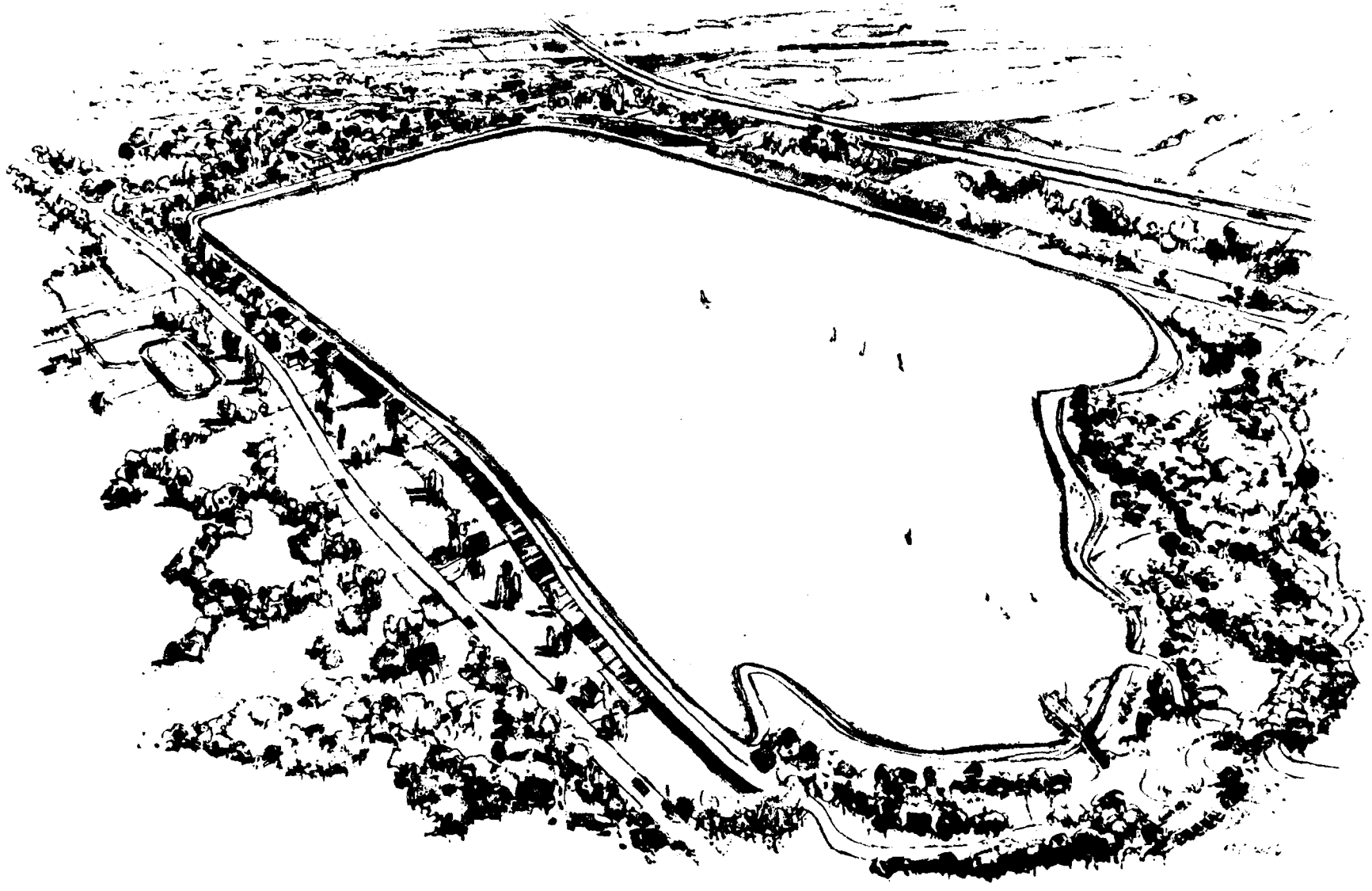

DIVERSION CHANNEL

BOWMANSVILLE LAKE



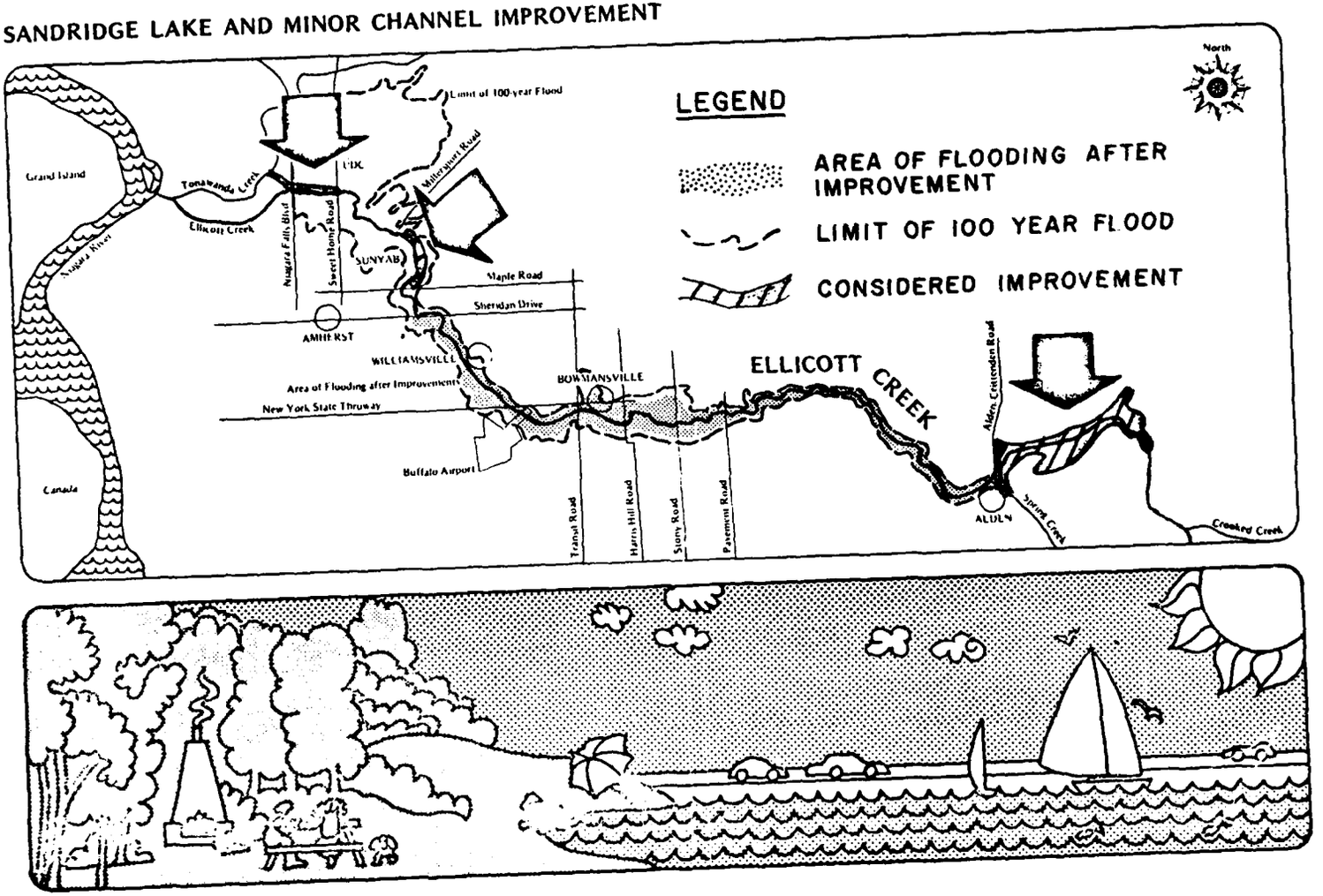






BOWMANSVILLE LAKE

SANDRIDGE LAKE AND MINOR CHANNEL IMPROVEMENT



SANDRIDGE LAKE

8,000 feet, and between the lower end of the diversion channel to the Niagara Falls Boulevard Bridge, a distance of about 5,000 feet. Three highway bridges would need modification and about 11 crossings, depending upon final plans of the UDC, will be required. The by-pass alterations to Ellicott Creek Park would be identical to those needed for the major channel improvement proposal. The improvement would provide slightly more flood protection than the major channel improvement, be less destructive to the environment compared to the major channelization plan, and provide a strip park about 150 feet wide alongside the diversion channel on the north side of the creek. A bikeway, picnic spots, and a small boating area would be developed and since the diversion channel would be essentially dry for most of the year, it would provide an additional open space recreational area. The proposal has ample economic justification, slightly less than the major channel improvement proposal, and is the most accepted plan by local interests. The deficiencies in the alternative are its inability to augment low-flows in the creek, the ecological damage that would result in the two reaches of the creek where improvements are necessary and the little amount of water-oriented recreation to be provided compared to the Bowmansville or Sandridge alternatives.

The Bowmansville Lake alternative would provide a major impoundment on Ellicott Creek just upstream of Harris Hill Road near the community of Bowmansville. The impoundment, referred to as Bowmansville Lake, would be created by construction of levees on three sides with a maximum levee height of 35 feet. The lake would be about two miles long, cover about 1,000 acres, and have a maximum depth of 10 feet. The improvement would control runoff from almost two-thirds of the basin and provide 100-year protection in Amherst. Some of the advantages to the alternative are: flood damage would be reduced in the total area downstream of the dam, the plan has the most favorable benefit-cost ratio and the lake would provide a water-oriented recreation center a short distance from a heavy populated area. The disadvantages of the proposal would be: permanent loss to other use of land inundated, the loss of wildlife habitat, loss of Stony Road as a thoroughfare, the displacement of about 53 families and the alternative would not augment low flows in the creek. The alternative was not acceptable to local interests and New York State would not support the recreation aspect.

The Sandridge Lake and minor channel improvement would provide 100-year protection in Amherst and would include construction of an earth-fill dam on a north-south axis across Ellicott Creek about 1,500 feet east of the Alden-Crittenden Road and channelization of Ellicott Creek between Maple Road and Millersport Highway and between Sweet Home Road and the confluence with Ellicott Creek Park Diversion Channel. In addition, four bridges and the Ellicott Creek Park Diversion Channel

would require modification to pass flood flows. The dam would be about 8,200 feet long and have a maximum height of about 53 feet above the level of the creek bed. The lake would be more than three miles long, have a maximum depth of about 45 feet, and cover about 2,100 acres. Included in the multi-purpose lake would be a 425-acre fish and wildlife conservation pool with maximum depth of about five feet. The U. S. Fish and Wildlife Service in cooperation with the New York State Division of Fish and Wildlife studied the Sandridge Lake proposal to determine the estimated benefits (See Appendix C) for fish and wildlife recreation that would accrue if the Sandridge dam were constructed. A summary of average annual benefits is presented in the following table.

Average annual fish and wildlife benefits for Sandridge Lake

Fish	Fisherman-days	Unit value	Annual benefits
Muskellunge	19,700	$5.00 1/	$98,500
Bass	59,100	1.50	88,600
Total	78,800		$187,100

Downstream fishing benefits: 1,850 fisherman-days @ $1.50 = $2,800
Nature Visitors: 32,000 visitor-days @ $.50 = $16,000
Total average annual benefits = $205,900
Updated value (x 1.15) Nov 1972 = $236,700

1/ Muskellunge is a highly prized game fish.

Population centers that could benefit from water supply storage in a reservoir on Ellicott Creek are the town of Alden, the village of Alden, the town of Akron and the town of Newstead. Supplies to suburban areas closer to Buffalo are now being provided by the Erie County Water Authority from Lake Erie. However, water supply was considered as one function of the multi-purpose reservoir. Future needs of Alden, Darien, Akron and Newstead cannot be met with existing supply. The water needs for potential users are based on population or population equivalents. The water supply needs for potential users of the Sandridge Lake and dam alternative are shown in the following table. Although the water supply needs have been determined in these communities, they have not indicated a specific desire to receive their supply from the considered Sandridge Lake.

Water supply needs for potential users of Sandridge Lake

Community	Total Water Supply Needs 1/ 2/ 2000	2020
	mgd	mgd
Town and Village of Alden	6.2	9.5
Town of Darien	0.9	1.1
Sandridge Recreation Facilities	1.0 3/	1.2 3/
Darien Lakes State Park	1.0 3/	1.2 3/
Village of Akron and Town of Newstead	2.4	3.0

1/ Based on water treatment plant design for peak-day use. Average daily use equals one-half peak-day use.
2/ Includes 10% for treatment plant use.
3/ Only during recreation season (June through September).

The Federal EPA reviewed data outlined in Appendix C regarding water quality benefits. Based upon new established standards, EPA concluded that no water quality benefits should be credited to low flow augmentation. Required improvements to sewage treatment plants will greatly improve the water quality. Their letter is included in Appendix C.

As with most multi-purpose dams and lakes, there are several advantages and disadvantages. Some of the advantages are: flood damage would be reduced in the total area downstream of the dam, a large water-oriented recreation center would be provided with a fish and wildlife sanctuary, streamflow could be augmented during periods of low flow, and water supply would be possible. In Amherst, pocket parks would be provided in the realigned creek areas. Some of the disadvantages to the Sandridge dam and Lake are: 82 families would be displaced, several hundred acres of agricultural land would be inundated, a cemetery would have to be relocated, a unique fossil bed might be endangered, ecological damage done by minor channel improvement, and a marginal benefit-cost ratio. A multi-objective matrix, a justification of project purposes, and an apportionment of cost table for the four alternatives follow. Plans of improvements and estimates of costs can be found in Appendix D.

PLAN SELECTION

The four alternatives described above were presented at the late stage public meeting on 2 May 1973 and views and comments expressed regarding the plans were carefully weighed and considered in selection of a plan to be recommended for construction. Accordingly, the plan selected was the diversion channel. On 5 June 1973, Governor Nelson A. Rockefeller reaffirmed the New York State support for Sandridge Lake and Ellicott Creek minor channel improvement. Even though the Governor of New York State supports the Sandridge

dam and lake with minor channel improvement, the diversion channel alternative is considered to be more environmentally sound and economically viable. The diversion channel would cause less social upheaval, provide flood protection immediately and provide recreation opportunities in a populated area. Water supply and low flow augmentation could be met separately if desired. Details of plan selection can be found in Appendix E.

PUBLIC INVOLVEMENT

Public involvement has been given a major emphasis in the Ellicott Creek Study. Since the restudy began in June 1972, there have been three public meetings, four workshops and at least five information type meetings. In addition, a considerable amount of time has been spent in less formal meetings in the Buffalo District Office, at State and County offices, in correspondence, and in telephone conversations. The communication with the public has been augmented with visual aids, brochures, information sheets, the press, radio and television. The meetings have been held in three general locations: Amherst, Lancaster and Alden. At each of the meetings, it was apparent that those who favored a particular plan were the principal beneficiaries and those opposed were those who would be adversely affected. Most of the emphasis at the meetings was regarding the flooding in Amherst and how best to reduce or eliminate the problem. Copies of the transcripts of the public meetings are available at the Buffalo District office.

At each meeting, everyone was given an opportunity to express themselves regarding the various improvement plans presented. In general, people residing in the Alden area were opposed to the Sandridge dam and lake, and those in Lancaster were opposed to the Bowmansville Lake. The Urban Development Corporation, the State University of New York at Buffalo, and the New York State Department of Transportation were specifically opposed to the diversion channel proposal. Others indicated their views in less specific terms. The Department of Environmental Conservation indicated that the diversion channel would not be desirable.

Those in favor of Sandridge dam and lake with minor channel improvement contended that in addition to alleviating flooding in Amherst, the improvement would provide water supply, improve water quality in Ellicott Creek, and provide a water-oriented recreation opportunity. Those opposed to this proposal contended that the need for water supply is not clearly established, the improvement in water quality can and should be accomplished by other means, the need for recreation and method of evaluating benefits is questionable and the people in the Sandridge area should not be required to solve the flood problem in Amherst by taking valuable farmland, disrupting a cemetery and relocating 82 homes.

Few, if any, favored Bowmansville Lake as a first choice to meet the needs of the Ellicott Creek Basin, even though it has the greatest benefit-cost ratio and would not require channel improvement work in Amherst. Those opposed to the proposal stated that it would be hazardous to the nearby school, the recreation aspect would not be of the same quality as Sandridge, the recreation facilities are not needed, the need for improvement in water quality would not be met, 53 homes would be relocated, and land taken from the tax rolls.

There was little discussion about the major channelization proposal, even though it would be the least costly alternative. Most of the objection to the plan was related to the environment and the destructive effect on the naturalness of Ellicott Creek. The improvement plan would not provide measures to improve water quality and would provide very little water-oriented recreation. Of all alternatives considered, the major channel proposal was the least discussed and assumed to be unacceptable to most of the public.

Those in favor of the diversion channel contended that a minimum of environmental damage would be done to the natural beauty of Ellicott Creek, flooding would be alleviated in Amherst by solving the flood problem where it exists, and recreation areas would be provided where needed. The deficiencies in the plan are that very little water-oriented recreation would be provided and the water quality of the creek would not be improved. The Urban Development Corporation and the State University of New York contend that it would deprive them of use of land for other purposes and not be compatible with their plan of development. Others, such as the New York State Department of Transportation and Town of Amherst object to the cost that they would incur compared to other alternatives.

THE SELECTED PLAN

The following paragraphs discuss the physical features, the anticipated accomplishments and effects, and significant design and construction information on the diversion channel.

DESCRIPTION

The major component of the plan is a 3.4 mile long diversion channel in Amherst, through SUNYAB and UDC property to carry flows that exceed Ellicott Creek's existing capacity. Two reaches of the creek, 8,000 feet above and 5,000 feet below the diversion channel would also need to be widened. The proposal is designed for both flood protection in Amherst and strip parks alongside the diversion channel for recreation.

PLAN ACCOMPLISHMENTS AND OTHER EFFECTS

The effectiveness of the selected plan can mostly be measured in the plan's ability to alleviate flood damage in the Town of Amherst and to provide a much needed recreation area in a location soon to be densely populated.

The plan selected would be instrumental in alleviating flood damage in the Town of Amherst along Ellicott Creek downstream of Sheridan Drive. Average annual damages, on November 1972 price levels, would be reduced about $690,000. This amount reflects no residual damages along Ellicott Creek in the vicinity of the diversion channel but takes into account the possibility of residual damage along the diversion channel itself.

The evaluation of recreation benefits ascribable to the diversion channel improvement plan is based upon a method used in a U. S. Army Corps of Engineers Study of the Red Run Drain and Lower Clinton River, Michigan, completed in 1970. The methodology was supplemented and verified by a field demand analysis of the Ellicott Creek Basin. The League of Women Voters and the Amherst Planning Board indicated that the proposed recreation facilities would be used to capacity as soon as they become available because of the need for local recreation in the area. This argument is reasonable because of the expected increase in population in the area to result from UDC development and enlargement of facilities of the State University of New York at Buffalo. The diversion channel will create a long ribbon park suitable for bikeways, hiking, nature trails and picnicking. At the downstream end of the diversion channel, canoeing and ice skating will be made available. The slopes of the diversion channel at the upper end will be used for sledding in the winter. Projective study of population, income, leisure time and transportation studies were also made to determine expected use of the facilities to be provided. In consideration of the above, the total estimated average annual recreation days were estimated to be about 427,000. The amount of recreational features can be modified depending on the desires of local government. The diversion channel plan has economic justification even without the recreation benefits.

As indicated previously, the diversion channel plan of improvement would not provide for increase of low-flows. However, separate measures were investigated to accomplish this by pumping water from Tonawanda Creek to the upper reaches of Ellicott Creek to provide low-flow augmentation. The preliminary estimate of first cost for the work was about $8,000,000. The amount of

tangible benefits ascribable to low-flow augmentation to Ellicott Creek has not been determined.

None of the alternatives as presently desired would provide complete protection for the 100-year flood because of the preliminary nature of the information on topography, design, and costs. However, consideration will be given to complete protection from the 100-year flood during final design of the project improvements. The diversion channel gives the most complete protection because it eliminates the flooding in the developed area.

Flood plain management will be a required commitment from local governments having jurisdiction of the Ellicott Creek flood plain. Technical assistance for flood plain management will be available from the Corps of Engineers if the communities request assistance and funds are available. Part of the assistance would include an evaluation of flooding potential as it relates to flood plain use and management practices.

DESIGN FEATURES

The diversion channel improvement plan would consist of two main features, the diversion channel itself and two reaches of channel improvement work in Ellicott Creek. The diversion channel section is approximately 3.4 miles long and extends from just below Maple Road to a point 2,000 feet downstream of Sweet Home Road. The channel would be trapezoidal and have a bottom width of 90 feet and depth of 10 feet. The diversion channel would be designed to receive water from Ellicott Creek when flow in the creek exceeds approximately 2,000 cfs, which is estimated to occur about once every two years. For the 100-year flood design conditions at the upstream end of the diversion channel the existing Ellicott Creek would carry a flow of about 2,600 cfs, while the remaining flood discharge, 5,000 cfs, would take its course along the diversion channel. About one-half the length of the diversion channel would be on the south side of the creek and the remainder on the north side. Between Sheridan Drive and Maple Road, the existing channel would be increased to a width of 120 feet and two 800 feet long high-velocity sections would be required. One of the high-velocity sections would have a bottom width of 60 feet and the other, a width of 40 feet. The purpose is to raise the channel bottom and water surface to the elevation of the unimproved channel upstream.

In addition to the channel work, described above, the existing diversion channel connecting Ellicott Creek with Tonawanda Creek would require enlargement by installation of three additional 106" x 166" Lo-Hed concrete pipes under Tonawanda Creek Road. Modifications are also required to the Niagara Falls Boulevard,

North Forest Road and Maple Road Bridges and new bridges are required on North Forest Road, Sweet Home Road, Lockport Expressway, Millersport Highway, Campbell Boulevard, and about six to eight diversion channel crossings are wrequired within the UDC development area. A final plan of their development is necessary to determine the number and type of crossing required and for use in design stage of project development.

A 150-foot width of landscaped area will be provided on the north side of the diversion channel for a two-mile length. The landscaping will consist principally of plantings of grass and trees for rest areas, picnic areas and nature trails. A bikeway would be incorporated in the diversion channel along its entire length. A small boating area will be provided in the lower 5,000 feet of the diversion channel that would be used for skating in the winter. Since the major portion of the diversion channel would be essentially dry for most of the year, it would be grass lined and provide an open space and recreation area. No permanent structures could be built in the channel and any improvements would not obstruct water flows. Movable items could be placed there.

ENVIRONMENTAL ASSESSMENT

Any structural measure to control the natural forces of floodwaters has an effect on the environment, some beneficial and some adverse, some temporary and some permanent and irreversible. Therefore, if structural measures for flood control are implemented, a tradeoff between beneficial and adverse effects must be considered and evaluated in selection of a plan of improvement. All effects cannot be quantified and identified with a monetary value, some are subjective, intangible, and no monetary value can be assigned. Some of the beneficial effects of the diversion channel are: a maximum reduction of the flood plain at the project site, provision of a strip of park land through Amherst, solution of a problem in the lower basin without inconveniencing the population of the upper basin, preservation of the naturalness of the stream. Also, a great number of people would be freed of the anxiety of recurring damage to their property, the possibility of being evacuated and the traumatic experience that accompanies flooding. The adverse effects of the diversion channel plan would be: probable irreversible destruction of aquatic and terrestrial habitats along the channelized reaches (almost equivalent to those required for Sandridge dam and minor channelization improvement but less than major channelization), loss of private and State-owned property (about 100 acres including 11 residences), destruction of terrestrial habitat by the diversion channel proper (equivalent to building a a road through a partially wooded area), and loss of some trees and some recreational facilities in Ellicott Creek Park. Also, the traffic pattern in the UDC development would be affected. In summary, the diversion channel would reduce flooding in Amherst at the lowest

environmental price of the four structural alternatives presented at the late-stage public meeting. A draft Environmental Impact Statement for the diversion channel plan has been prepared and copies are available at the Buffalo District office.

PLAN ECONOMICS

The objective of the economic analysis is to evaluate the project to insure that at least one dollar of benefit will accrue for each dollar spent on construction, operation and maintenance of the project.

COSTS

Costs are estimated using the latest unit values applicable to the area where construction will occur. Supervision, administration, engineering, and design costs were estimated using guidelines furnished by the Office of the Chief of Engineers. Operation and maintenance costs are based on experience with similar projects. Where applicable, these costs are amortized to yield annual charges. This amortization is at an interest rate of 5-1/2 percent over a period of 100 years. A number of economic and physical factors limit the economic life of any project; however, the economic life of 100 years is generally considered the upper limit for analysis. Justification involved in predicting the more remote future and the increasing likelihood that any benefits and costs occurring beyond the limit would be largely offsetting.

A summary of first costs and annual charges for the diversion channel alternative are shown in the following two tables.

Summary of First Costs for Diversion Channel Plan
Ellicott Creek, New York

Item	Cost
Lands and damages	$1,233,000
Relocations	4,762,000
Channels	2,438,000
Energy dissipator	144,000
Storm drain crossings	105,000
Creek channel crossings	126,000
Drainage facilities	338,000
Recreation facilities	694,000
Engineering and design (1)	632,000
Supervision and administration	426,000
Total	$10,898,000

(1) Exclusive of $175,000 expended on restudy of alternatives.

Average Annual Charges for Diversion Channel Plan
Ellicott Creek, New York

Item	Cost
First Cost (1)	$10,898,000
Investment Cost (2)	11,173,000
Interest & Amortization (3)	617,000
Operation & Maintenance	26,000
Total average annual cost	$ 643,000

(1) One year for construction - no interest during construction except for interest on non-Federal cost for new bridges. November 1972 price levels

(2) Reflects two year construction period for new channel crossings.

(3) 5-1/2 percent interest rate 100-year life.

BENEFITS

Tangible project benefits are the benefits directly resulting from project construction. The benefits are quantitatively defined by various methods. Flood control benefits consist of reduction in flood damages to existing and future development, and were derived from use of damage-frequency curves by determining the difference in annual damages under natural conditions of flooding and conditions modified by construction of the diversion channel project. Recreation benefits were based on estimated visitation and use of the recreation facilities to be provided. Final recreation benefits will be determined as plans are developed with local interests. The following table summarizes the benefits attributable to the diversion channel project.

Summary of Benefits for Diversion Channel Plan
Ellicott Creek, New York

Item	Present	Future	Total
Flood Control	$228,000 (1)	$462,000	$690,000
Recreation	387,000	-	387,000
Total	$615,000	$462,000	$1,007,000

(1) Conditions as of 1969.

Not included in economic justification, but of considerable importance are intangible benefits. Reduction of flooding would reduce the chance of disease or loss of life due to high waters. Property exchange would be easier if the buyer knew the property was protected from floods. Social and physical well-being of individuals would be enhanced because of recreation opportunity.

JUSTIFICATION

A project is economically justified when the quotient of benefits divided by costs is greater than 1.0, or when unquantifiable benefits offset the difference between the quotient and 1.0. This is usually expressed as a ratio of benefits to costs. For the diversion channel plan, annual benefits of $1,077,000 and average annual charges of $643,000 result in a benefit-cost ratio of 1.67. Each of the project purposes are justified separately. For flood control, annual benefits of $690,000 and average annual charges of $576,700 result in a benefit-cost ratio of 1.20. For recreation, annual benefits of $387,000 and average annual charges of $66,300 result in a benefit-cost ratio of 5.84. Final recreation benefits and costs will be determined as plans are developed with local interests.

DIVISION OF PLAN RESPONSIBILITIES

For local flood protection, local interests are required to;

a. Provide without cost to the United States all lands, easements and rights-of-way necessary for the construction and maintenance of the project;

b. Hold and save the United States free from all claims for damages incident to construction and operation of the project;

c. Take over, maintain and operate the project, after completion in accordance with regulations prescribed by the Secretary of the Army;

d. Accomplish, without cost to the United States, all relocations of highways, highway bridges, buildings, utilities and special facilities;

e. Prescribe and enforce regulations to prevent encroachment on channels and on rights-of-way necessary to proper functioning of the project; and

f. Provide leadership in preventing unwise use of flood plains by use of appropriate flood plain management techniques to reduce flood losses.

For recreation in non-reservoir projects, the current policy is that local interests contribute 50 percent of the first cost of recreation facilities and bear all costs for maintenance, operation and replacement. It is also required that a competent and properly constituted public body regulate the use, growth and development of the facilities with the understanding that the facilities be open to all on equal terms.

COST ALLOCATION

Costs were allocated to flood control and recreation in accordance with the general policy requirements outlined above. A summary of first costs and cost allocation is presented in the following table.

Cost Allocation

Purpose	First Cost of Construction	Operation, Maintenance and Replacement Cost
Flood Control	$10,158,000	$21,000
Recreation	740,000	5,000
Totals	$10,898,000	$26,000

COST APPORTIONMENT

The State of New York, Erie County, and the Town of Amherst are presently the only non-Federal public bodies expected to be required to share costs and/or responsibilities. The apportioned costs are indicated in the following table, and include initial construction investment cost, and operation and maintenance cost.

Cost Apportionment

Item	Federal	State	County	Town	Total
Construction Costs	$	$	$	$	$
Flood Control	3,925,000	5,318,000	915,000(2)	-	10,158,000
Recreation (1)	370,000	-	-	370,000	740,000
Total	4,295,000	5,318,000	915,000	370,000	10,898,000
Annual Operation and Maintenance Costs					
Flood Control	700	20,300	-	-	21,000
Recreation (1)	-	-	-	5,000	5,000
Total	700	20,300	-	5,000	26,000

(1) Based on present plan. Subject to final coordination and development with local interests during design stages.

(2) Based on estimated cost of county bridges.

FEDERAL RESPONSIBILITIES

The Federal Government would construct the diversion channel and channel work associated with it, protect the abutments of the Niagara Falls Boulevard, North Forest Road and Maple Road Bridges, construct energy dissipator, and relocate power transmission towers for the flood control portion of the project.

If the project is authorized and funded for construction, the Federal Government would finalize design, advertise for bids, award the contract, pay the Contractor (or Contractors), approve the final constructed flood control project and inspect the project along with non-Federal interests who bear the responsibility of maintenance to insure that the project is adequately maintained.

For recreation facilities, the Federal Government would provide one-half the cost of initial recreation facilities. The Federal Government would coordinate with non-Federal interests responsible for constructing recreation facilities to insure that they are adequate and do not interfere with the effectiveness of the flood control project. Further, the Federal Government would periodically inspect operation of recreation facilities to insure that they are installed and made available and open to all on equal terms.

NON-FEDERAL RESPONSIBILITIES

Non-Federal interests would furnish all lands, easements and rights-of-way for construction of the project, and construct new bridges required associated with construction of the flood control works. They would be responsible for annual maintenance of the flood control project. In addition, they would be required to implement flood plain management measures.

For recreation, non-Federal interests would provide one-half the cost of initial recreation facilities pay all cost for annual maintenance, operation and replacement and administer operation of recreation facilities to permit use by all on equal terms, and prevent encroachment of facilities on channel capacity to pass flood flows.

Assurances of local cooperation, described briefly above and in the first part of this section of the report, would be required during advanced engineering studies.

PLAN IMPLEMENTATION

The procedure for converting the proposed plan of improvement to a reality can be summarized as follows:

The District Engineer will transmit his findings including the

draft environmental impact statement and recommendation to the Division Engineer, North Central, U. S. Army Corps of Engineers, for review.

Upon completion of this review, the Division Engineer will issue a public notice to interested parties advising them of the report findings and informing them that the report will be considered by the Board of Engineers for Rivers and Harbors, Washington, DC. Interested parties will have an opportunity to present written views on the report for consideration by the Board. Following action by the Board, their report and the proposed report of the Chief of Engineers will be submitted to the Governor of New York and to interested Federal agencies for comments.

Following State and interagency review, the final report of the Chief of Engineers would be forwarded by the Secretary of the Army to the Congress, subsequent to his seeking the comments of the Office of Management and Budget regarding the relationship of the project to the program of the President. A change in authorization from the previously authorized project for the Sandridge Dam and minor channel improvement to an authorized project for the diversion channel would then be required to be acted upon by the Congress. This procedure would include appropriate review hearings by the public works committees. If a project for a diversion channel is authorized, the Chief of Engineers would then have to include funds in his budget request for design and construction. If the Congress appropriates the necessary initial funds, formal assurances of local cooperation would be requested from non-Federal interests. Plans, specifications and an engineering estimate of cost would then be prepared by the District Engineer, bids would be invited, and a contract awarded.

Following completion of the project, local interests would be responsible for operation, maintenance and replacement.

If Congressional authorizations and appropriations are received when requested, preconstruction planning (advanced engineering and design) is estimated to take one year and construction one year. On the basis of these estimates, including the time that must elapse during the review, authorization and initial funding phases, the diversion channel project would not be complete for at least three years after the submission of this report. Legislation has been prepared for early-action work on the lower end of Ellicott Creek. If passed, this could shorten the time period for benefits to accrue to the project.

VIEWS OF NON-FEDERAL INTERESTS

The views of non-Federal interests toward the selected plan have been both favorable and unfavorable, with most opposition coming from UDC, SUNYAB, and the Amherst Town Board. At the late stage public meeting held on 2 May 1973, it was evident that the position of various interests had not changed from previous meetings and workshops. About 350 people were in attendance including Federal, State, and local officials. There were also representatives of various civic groups, conservation groups, the press and private interests. About 40 people spoke and more than 125 written statements were received, some before the meeting, some at the meeting and some since the meeting.

Most of the opposition to the diversion channel plan came from State and Town interests. The late stage meeting was co-chaired by Colonel Robert L. Moore, District Engineer of the Buffalo District Corps of Engineers, and Mr. E. A. Karath from the Albany Office of the Department of Environmental Conservation. Mr. Karath stated that the diversion channel would not be desirable but the Department would reserve final judgment until the restudy of alternatives was completed. As yet, the Department has not expressed their final views except through the letter from Governor Rockefeller. The New York State Department of Transportation expressed opposition to the diversion channel because of the cost of new structures involved. The State University of New York at Buffalo consistently opposed the diversion channel because of the land required, the adverse aesthetic impact on the campus, the cost of roads and bridges, and the plan would not improve water quality. The Urban Development Corporation stated that they cannot support a diversion channel because it would not achieve water quality for Ellicott Creek in Amherst. The Towns of Amherst, Cheektowaga and Tonawanda were not explicit but stated they favored a dam or an upstream impoundment. The Governor of the State of New York furnished a statement after the late stage meeting stating preference for the Sandridge Dam with minor channel improvement. Subsequently, the Amherst Environmental Coalition, a coalition of organizations concerned with a desirable environment in Amherst, in a letter to the Governor stated their opposition to the Governor's position.

Both Congressman Kemp and Congressman Conable favor the diversion channel as do the Erie and Genesee County Legislatures. The Towns of Alden, Darien, Lancaster, and Pembroke also favor the diversion channel. Several Conservation Groups including the Sierra Club, Isaac Walton League, Erie County Citizens Groups, Corfu Grange, Town of Amherst Conservation Advisory Group, Housewives to End Pollution, and East Pembroke Grange, also favor the diversion channel. The League of Women Voters and the Erie and Niagara County Regional Planning Board favor the diversion channel over any other plans. In addition, several individuals furnished written statements in support of the diversion channel. Those who favored the diversion channel indicated that it would cost less, be environmentally acceptable, provide adequate flood

protection with a minimum of social upheaval, and be economically sound.

COORDINATION

General coordination has been maintained with all Federal, State and County agencies believed to have an interest in the study. A summary of results of the coordination is included in the following paragraph. The correspondence is included in Appendix C.

The Fish and Wildlife Service, U. S. Department of the Interior, furnished a planning aid letter in which they expressed mixed feelings on the diversion channel, stating it would provide no fish and wildlife benefits and there would be some destructive effects in the 13,000 feet of channelization. They stated that because the diversion channel bottom would be grass instead of concrete that it would be a plus. Possible fishing opportunity in the backwater in the lower reach of the diversion channel and the recreational features incorporated in the plan would provide opportunity for nature study and bird watching. The Bureau of Outdoor Recreation, U. S. Department of the Interior, stated that they were unable to perform a review because of other commitments. The Soil Conservation Service, U. S. Department of Agriculture, did not offer any comments. Several meetings were held with officials of the United States Environmental Protection Agency to discuss water quality in Ellicott Creek. The New York State Department of Environmental Conservation, the Urban Development Corporation, Department of Transportation and County agencies reviewed and commented on various portions of the report affecting their interests.

STATEMENT OF FINDINGS

Information and data utilized in the study were evaluated in light of the total public interest, as well as the views of other agencies and the public relative to various alternatives affecting the balance of values in accomplishing flood damage reduction in the Ellicott Creek Basin. The possible consequences of these alternatives, considering engineering feasibility, environmental effects, economic factors, and social well-being were studied and analyzed. Consideration was given to eliminating, minimizing, or ameliorating possible adverse environmental, social, and economic effects including:

a. Water pollution;

b. Destruction or disruption of man-made and natural resources, aesthetic values, community cohesion, and the availability of public facilities and services;

c. Adverse employment effects and tax on property value losses;

d. Injurious displacement of people, businesses, and farms; and

e. Disruption of desirable community and regional growth.

Recognizing that any action involves certain adverse consequences, it is felt that the adverse effects of the recommended plan are nonetheless justified by other considerations as discussed above. In light of these findings, it is felt that the action proposed in the recommendations is based upon consideration of all appropriate courses of action for achieving the stated objectives; that the action is fully consistent with national policy, laws, and administrative directives; and that on balance the total public interest is best served by its implementation.

SUMMARY AND CONCLUSIONS

Population increases in the Buffalo Metropolitan Area have caused a rapid increase in residential and commercial development in the suburbs of Buffalo, including areas adjacent to flooding along Ellicott Creek, particularly in the town of Amherst. The increase in development in the Amherst area has been stimulated by construction of a new campus for the State University of New York and a housing development by the Urban Development Corporation. The overall development has further increased the need for flood protection and recreation opportunities. During the public participation process associated with the restudy of Ellicott Creek, it was apparent that many believe that developers in the town of Amherst have been unwise in constructing homes and other buildings in the Ellicott Creek flood plain. As a result, it was determined that implementation of flood plain management measures would be required as a supplement to any structural plan of improvement. Information on non-structural alternatives is contained in Appendix F.

The Ellicott Creek Study has considered effective alternatives for development and control of water resources in the Ellicott Creek Basin to meet present and future needs for water supply, water quality, flood control, environmental improvement, fish and wildlife and general recreation.

Throughout the study, the public and other agencies have been part of the decision-making process as to the alternative that would meet the immediate need of flood control and flood plain management without precluding modification to meet other needs and purposes in the future. The decision was not easy mainly because of the social and ecological factors involved. However, the diversion channel best meets the present need of the Ellicott Creek Basin because of its flexibility. The diversion channel will provide substantial flood damage reduction in Amherst where most urgently needed. The plan, with use of a grass-lined diversion channel, will provide and reserve a recreation corridor in

an area that will be heavily populated. The diversion channel is justified on its own and the recreation facilities need or need not be developed unless the local people and non-Federal interests desire to provide them. If the recreation facilities are constructed, the Federal Government will share in the first cost of construction.

In recognition of the authorization for the restudy of Ellicott Creek to consider alternatives to the Sandridge Dam and minor channel improvement, it was concluded that the diversion channel represents an acceptable alternative that is more environmentally sound, economically justifiable and will provide flood protection immediately with a minimum of social upheaval. All other basin needs can be met separately and the diversion channel should become the authorized project for construction in lieu of the Sandridge Dam with minor channel improvement. Ellicott Creek Basin is also included in the area under investigation in the Buffalo Metropolitan Area Study. In that study, consideration will be given to water quality, wastewater management and restoration measures for the entire Metropolitan Area.

RECOMMENDATIONS

It is recommended that the diversion channel be authorized for construction, in lieu of a multiple-purpose reservoir at the Sandridge site near Alden, NY, and approximately three miles of channel improvement along Ellicott Creek mostly in the town of Amherst, by the Corps of Engineers in general accordance with the plan presented in this report at an estimated first cost of $10,738,000 for construction and $26,000 annually for operation and maintenance, with such modifications as in the discretion of the Chief of Engineers might be advisable, provided that, prior to initiation of construction, local interests furnish assurances to the Secretary of the Army that they will:

a. Provide without cost to the United States all lands, easements and rights-of-way necessary for construction and maintenance;

b. Hold and save the United States free from all claims for damages incident to construction;

c. Take over, maintain and operate, after completion, in accordance with regulations prescribed by the Secretary of the Army;

d. Accomplish, without cost to the United States, all relocations of highways, highway bridges, buildings, utilities and special facilities;

e. Prescribe and enforce regulations to prevent encroachment on channels and on rights-of-way necessary to proper functioning of the work; and

f. Effect flood plain management by:

(1) Regulate structural development within the 100-year floodway in those areas not protected by the project as developed by the Corps of Engineers;

(2) Regulate future development within any possible residual 100-year flood outline;

(3) Requiring future development outside the 100-year flood outline but within the Standard Project Flood (SPF) outline to be constructed so that the first floor elevation is at or above the SPF level;

(4) Requiring floodproofing of structures to the SPF elevation in lieu of raising them; or

(5) Combining the two methods, raising structures to the SPF elevation or floodproofing structures to the SPF elevation, that is, raise some and floodproof the remainder.

g. Regulate the quality of the water in the project channels by establishing and enforcing water quality standards commensurate with Federal, State, and local standards.

With regard to recreation facilities:

a. Contribute 50 percent of the first cost of recreation facilities presently estimated at $370,000;

b. Bear all cost for maintenance, operation and replacement of same presently estimated at $5,000 annually; and

c. Establish rules to control the use, growth, and development of the recreation facilities, with the understanding that public facilities will be open to all on equal terms.

The net cost to the United States for the recommended improvements for flood control is estimated at $3,925,000 for initial construction and $700 annually for inspection, and the net cost to the United States for the recommended improvements for recreation is estimated at $370,000.

It is further recommended that improvement for flood control be undertaken whenever the required local cooperation is furnished and funds become available. The required local cooperation for recreation facilities can be furnished separately upon completion of planning and when funds for this purpose become available.

ROBERT L. MOORE
Colonel, Corps of Engineers
District Engineer

NCDPD-PF (Aug 73) 1st Ind
SUBJECT: Ellicott Creek Basin, New York

DA, North Central Div., CE, Chicago, Ill. 60605 11 March 1974

TO: HQDA (DAEN-CWP-C) WASH DC 20314

I concur in the conclusions and recommendations of the District Engineer.

W. O. BACHUS
Brigadier General, USA
Division Engineer

TECHNICAL REPORT
ELLICOTT CREEK BASIN, NEW YORK

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PHASE 2 VOLUME 2 - APPENDICES
- APPENDIX A - HYDROLOGY AND HYDRAULIC DESIGN
- APPENDIX B - FLOOD DAMAGES AND BENEFITS
- APPENDIX C - CONSERVATION BENEFITS
- APPENDIX D - PLANS OF IMPROVEMENTS AND ESTIMATES OF COST
- APPENDIX E - PLAN SELECTION
- APPENDIX F - NON-FEDERAL ALTERNATIVES
- APPENDIX G - GEOTECHNICAL ASPECTS
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ELLICOTT CREEK BASIN, NEW YORK
SUMMARY REPORT
FOR
WATER RESOURCES DEVELOPMENT

TECHNICAL REPORT

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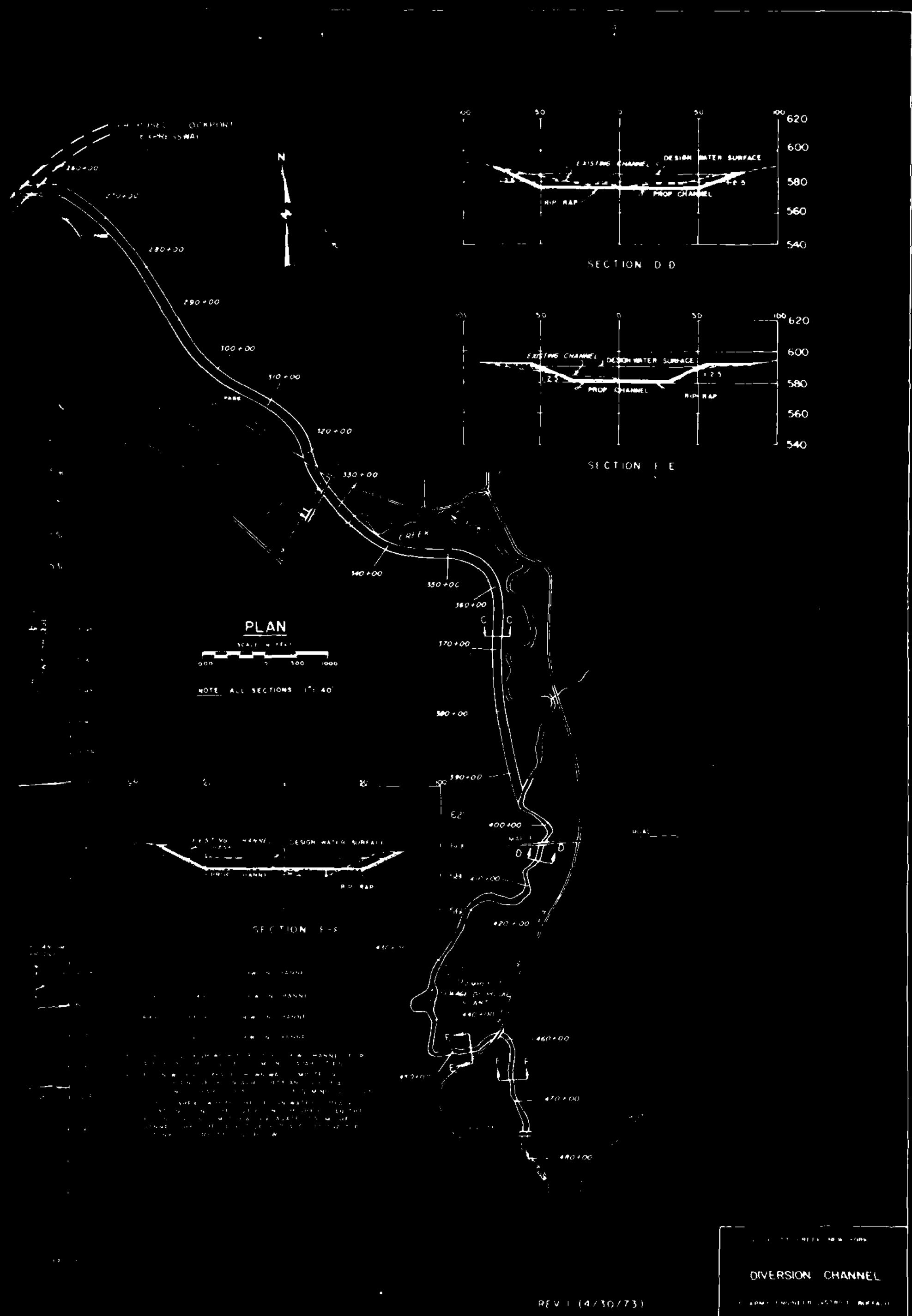
ENVIRONMENTAL IMPACT ASSESSMENT
(BASIS FOR THE DRAFT ENVIRONMENTAL IMPACT STATEMENT)

PHASE I REPORT
(AVAILABLE AT THE BUFFALO DISTRICT OFFICE)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600
580
560
540
SECTION E-E
PLAN
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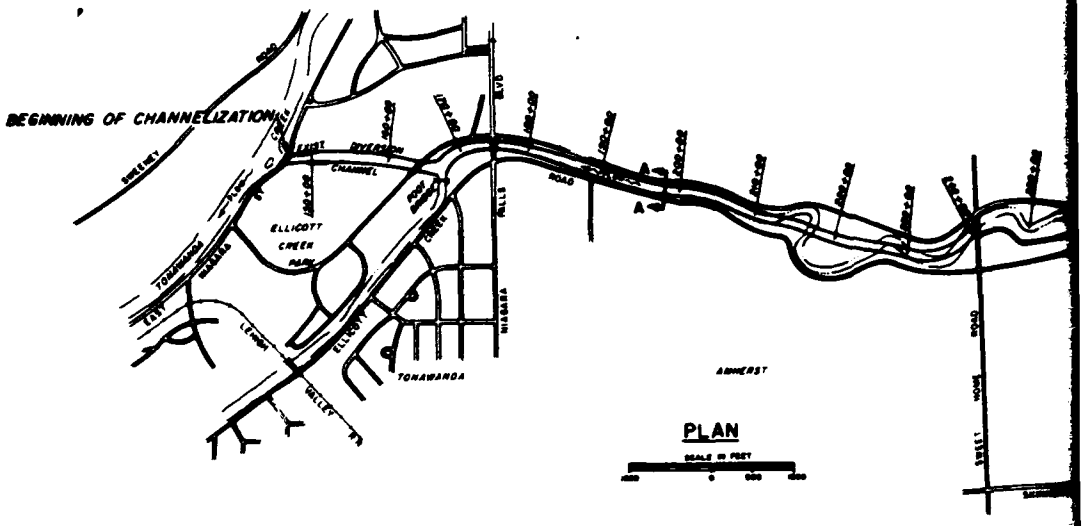
SECTION F-F
CREEK
DIVERSION CHANNEL
REV 1 (4/30/73)

PLATE 5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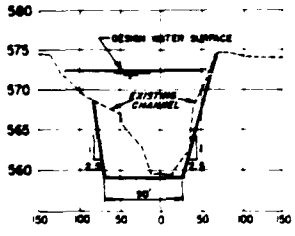
TONAWANDA
AMHERST
PLAN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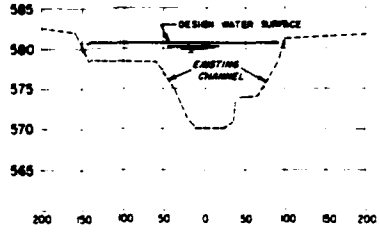
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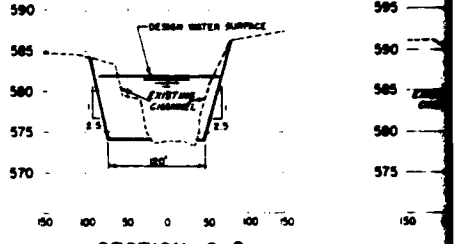
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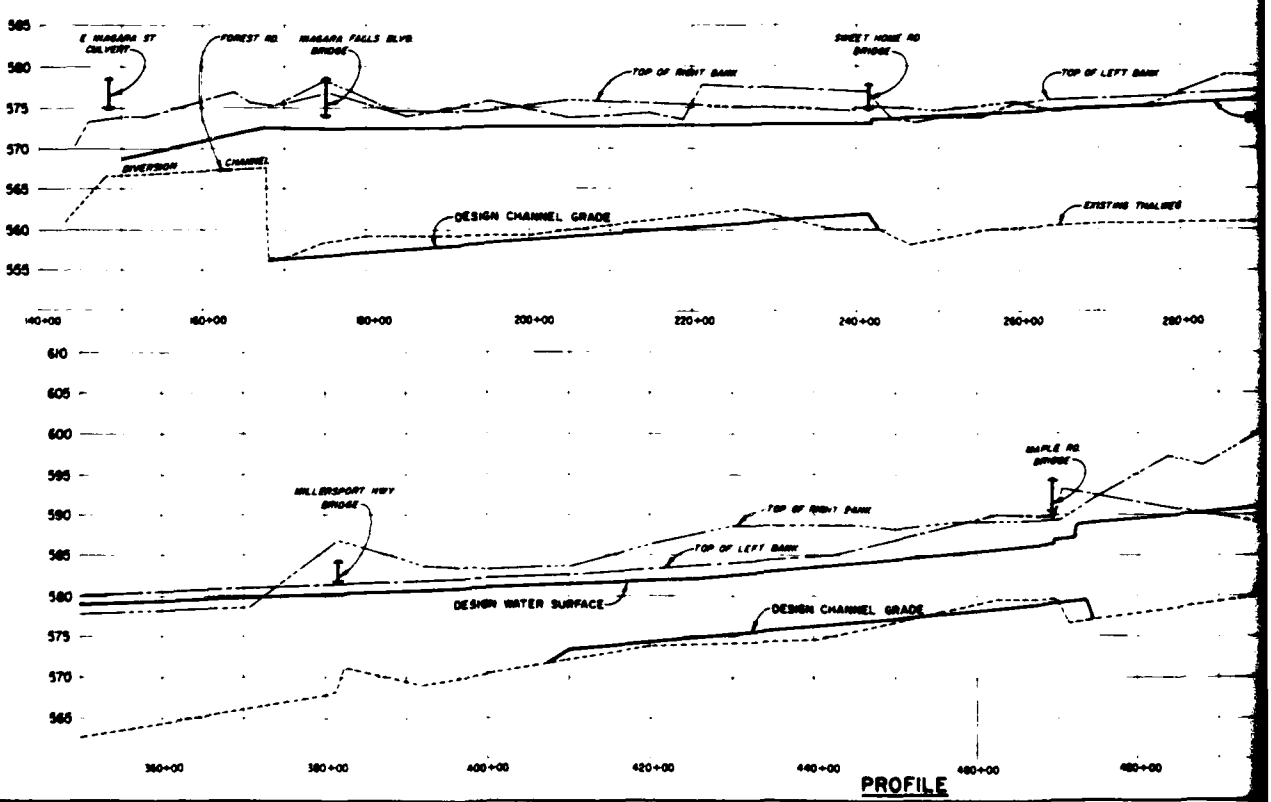
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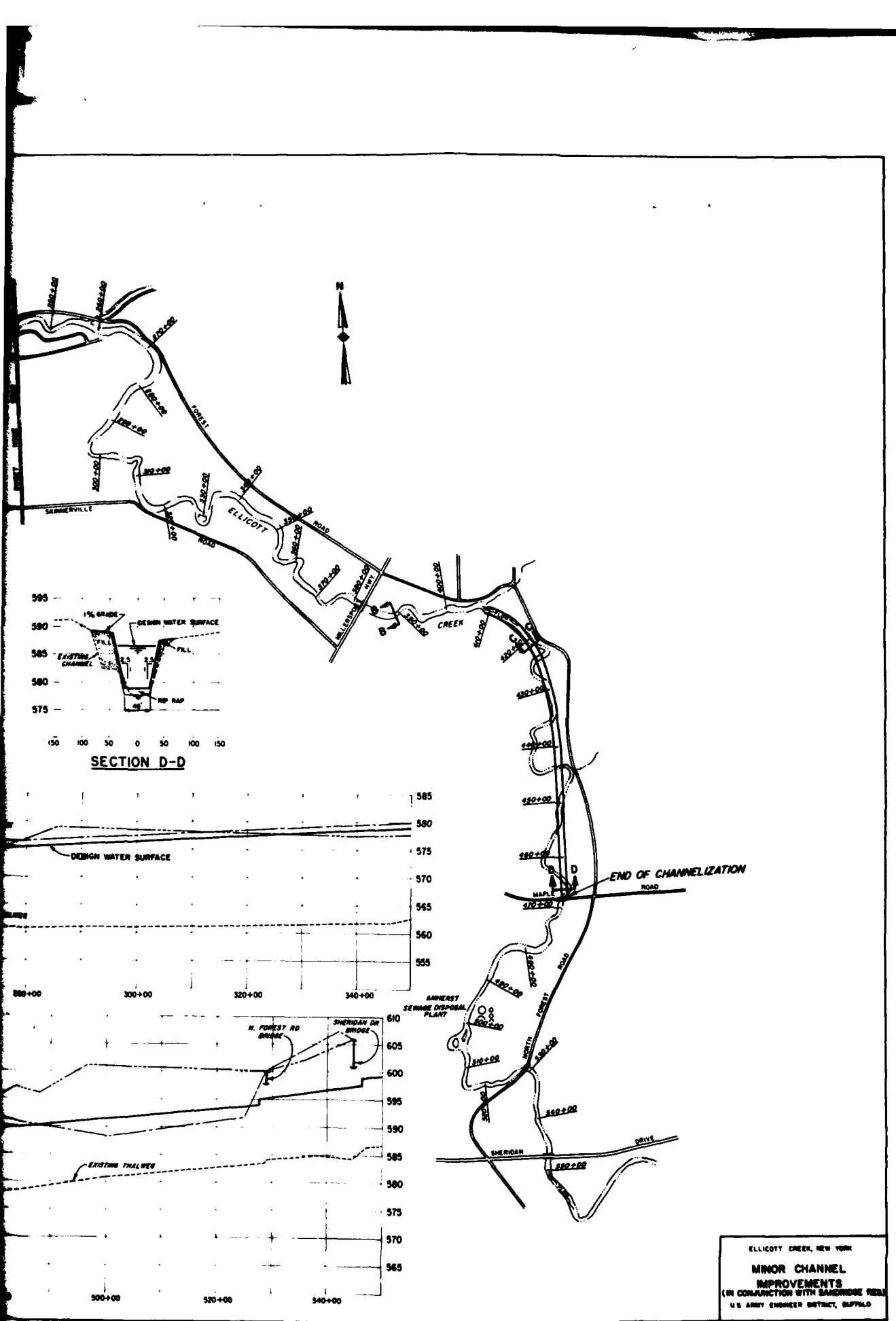
FOREST RD
NIAGARA FALLS BLVD BRIDGE
SWEET HOME RD BRIDGE
TOP OF RIGHT BANK
TOP OF LEFT BANK
DIVERSION CHANNEL
DESIGN CHANNEL GRADE
EXISTING THALWEG
MILLERSPORT HWY BRIDGE
MAPLE RD BRIDGE
DESIGN WATER SURFACE
PROFILE



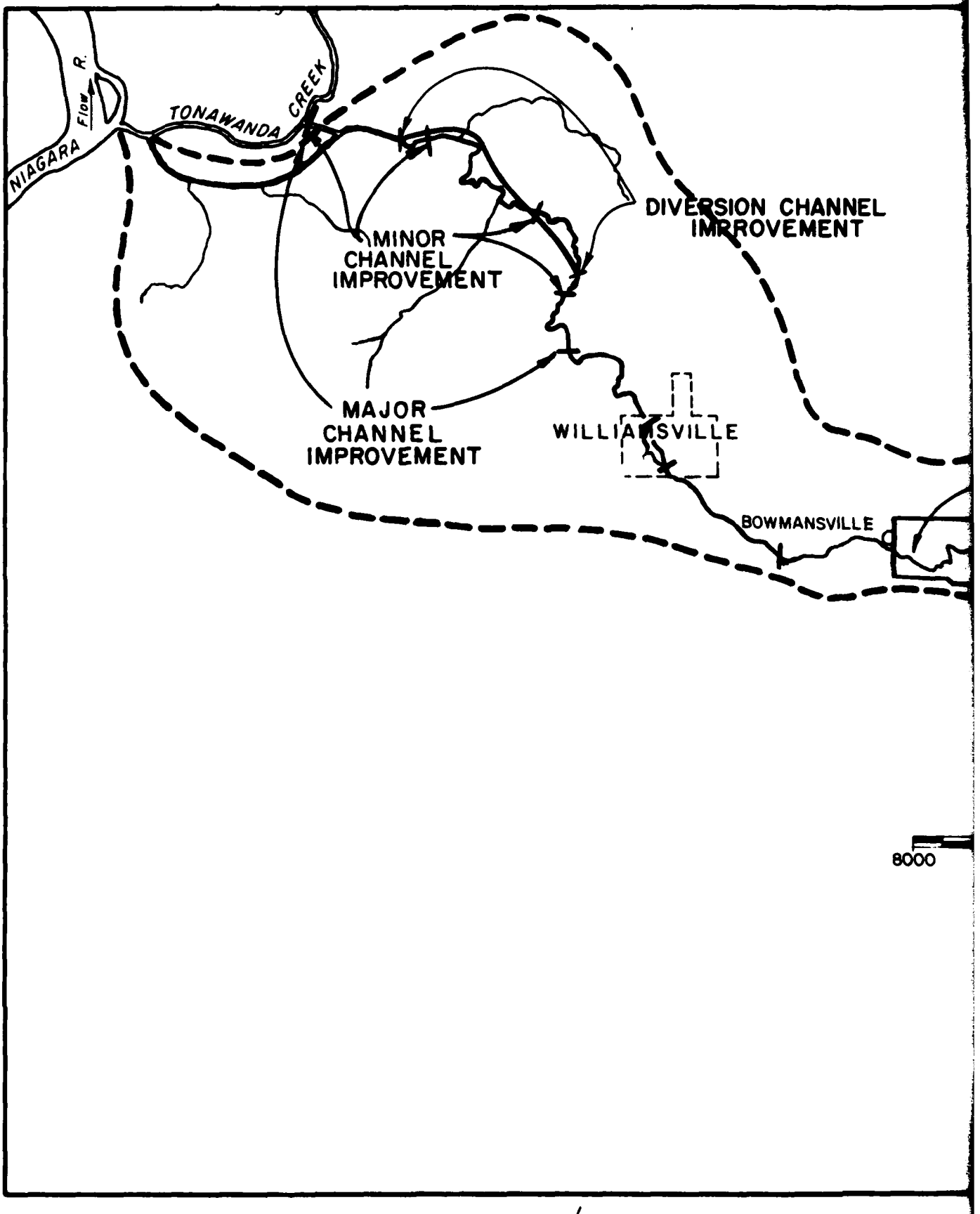
ELLICOTT CREEK, NEW YORK

MINOR CHANNEL IMPROVEMENTS

(IN CONJUNCTION WITH SANDRIDGE REEL)

U.S. ARMY ENGINEER DISTRICT, BUFFALO

PLATE 6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TONAWANDA CREEK
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MINOR CHANNEL IMPROVEMENT
MAJOR CHANNEL IMPROVEMENT
WILLIAMSVILLE
BOWMANSVILLE
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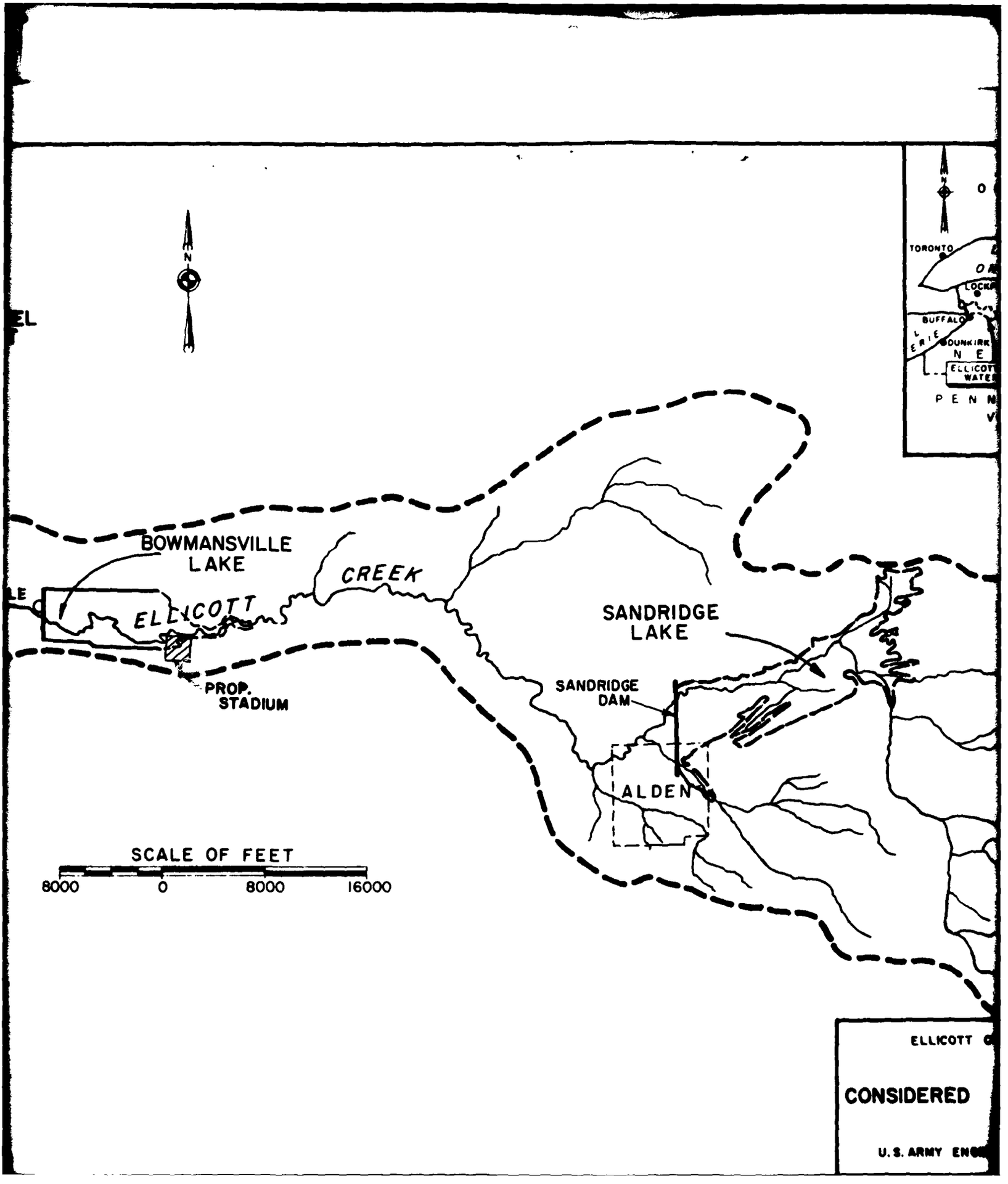
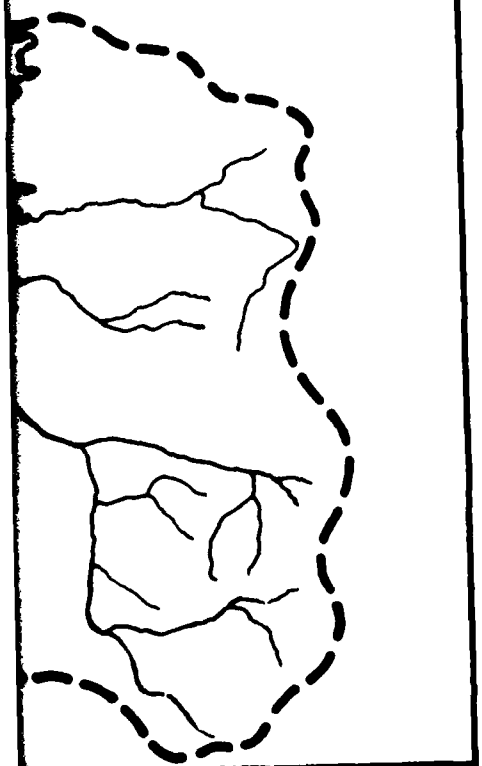

N
TORONTO
BUFFALO
DUNKIRK
BOWMANSVILLE
LAKE
CREEK
ELLICOTT
SANDRIDGE
LAKE
PROP.
STADIUM
SANDRIDGE
DAM
ALDEN
SCALE OF FEET
8000
0
8000
16000
CONSIDERED

VICINITY MAP
SCALE OF MILES
20 0 20 40

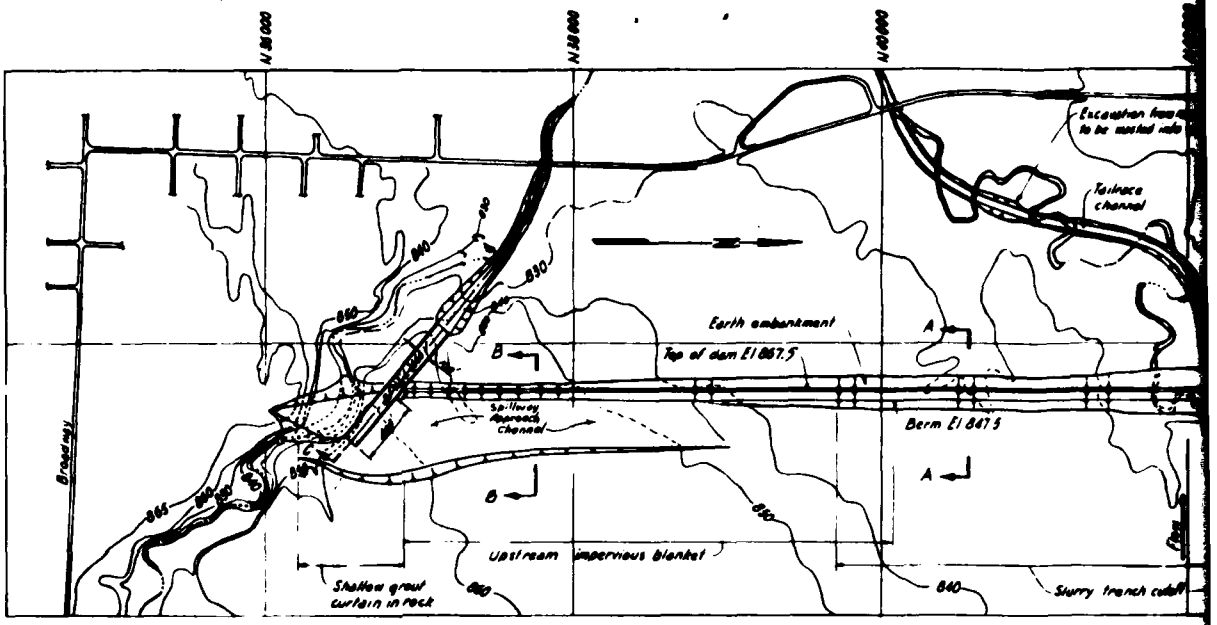


ELLICOTT CREEK, NEW YORK

ERED IMPROVEMENTS

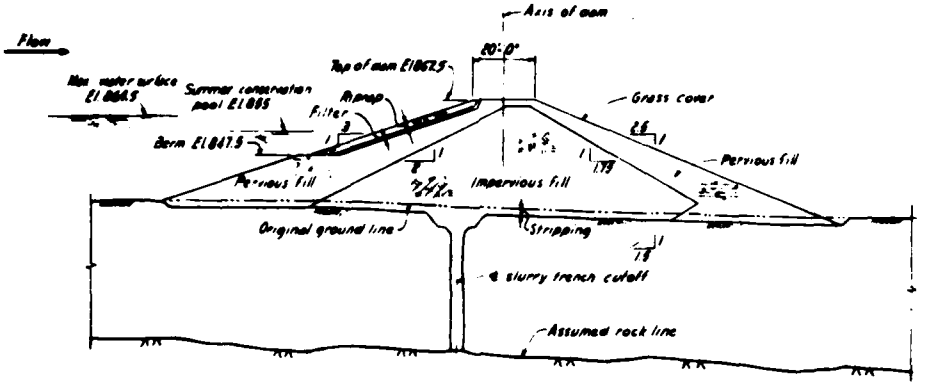
MY ENGINEER DISTRICT, BUFFALO

PLATE 7

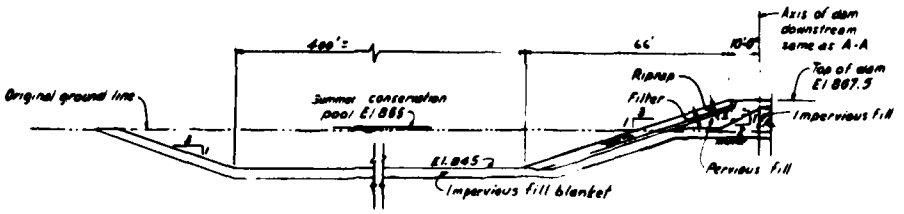


PLAN

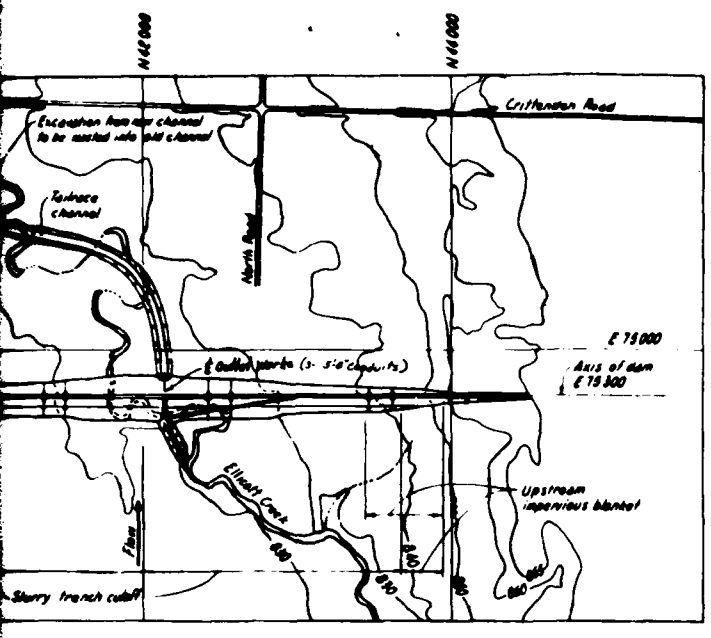
Scale 0 400 800 feet

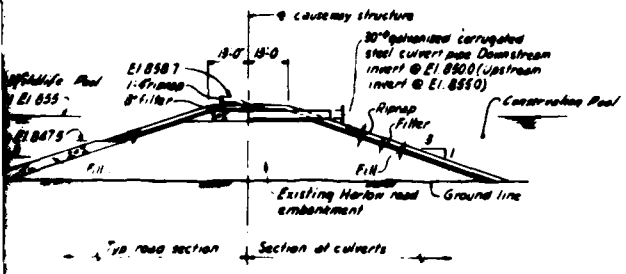


SECTION A-A

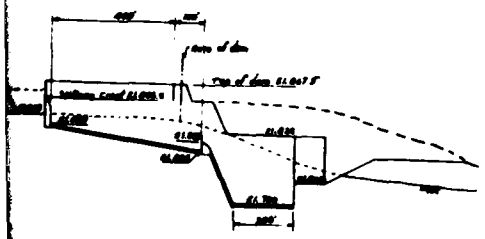


SECTION B-B





HARLOW ROAD
(Overflow Section)



SECTION C-C

Scale 0 20 40 Feet
Except as shown

ELLICOTT CREEK, NEW YORK

SANDRIDGE DAM PLAN AND SECTION AND HARLOW ROAD SECTION

U.S. ARMY ENGINEER DISTRICT, BUFFALO

PLATE 8