AD-A143 373 BUFFUMVILLE LAKE CHARLTON MASSACHUSETTS THAMES RIVER BASIN LITTLE RIVER WATERSHED DROUGHT CONTINGENCY PLAN (U) CORPS OF ENGINEERS WALTHAM MA NEW ENGLAND DIV

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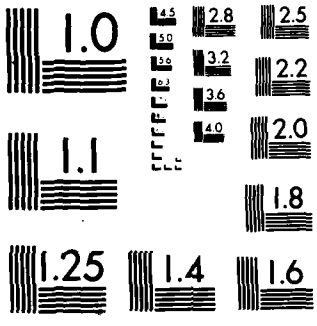


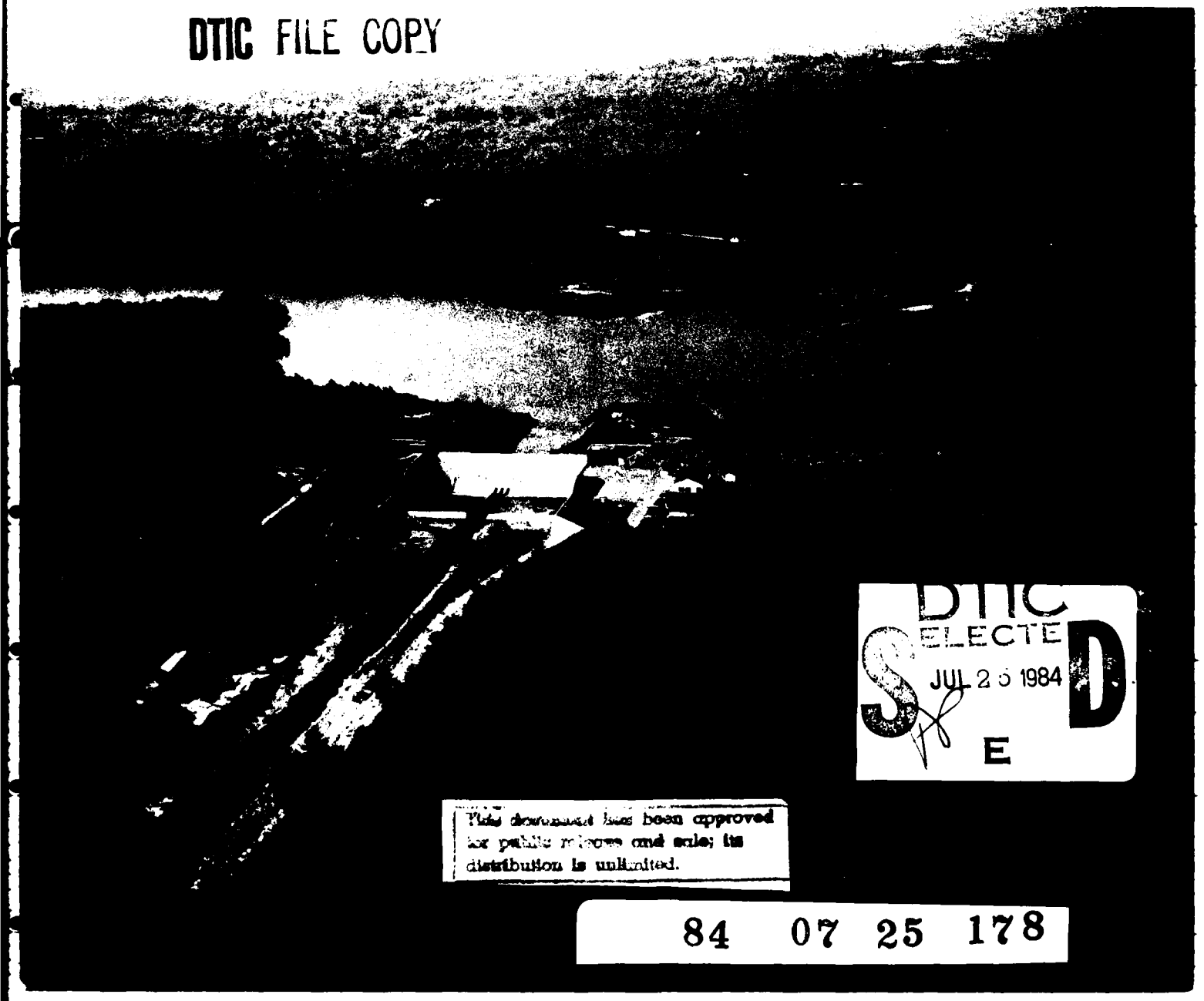
US Army Corps
of Engineers
New England Division

Drought Contingency Plan

November 1983

AD-A143 373

Buffumville Lake, Charlton, Massachusetts



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Buffumville Lake can provide up to 1,860 acre-feet, (606 million gallons) of reservoir storage water for drought emergency purposes. The water would be suitable for public supply after standard treatment methods. The untreated stored water may be acceptable for some industrial water supply uses.

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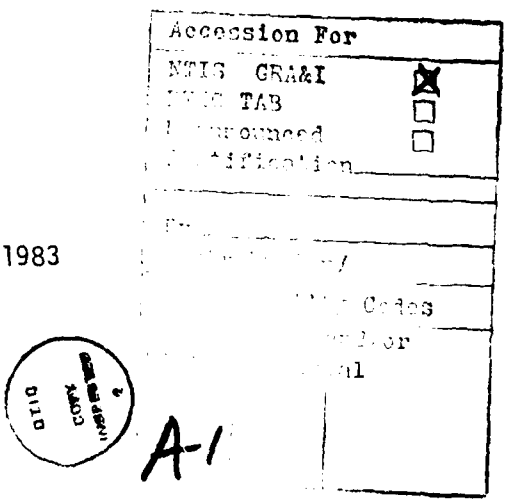
THAMES RIVER BASIN
LITTLE RIVER WATERSHED

DROUGHT CONTINGENCY PLAN
BUFFUMVILLE LAKE
CHARLTON, MASSACHUSETTS



NOVEMBER 1983

NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

DROUGHT CONTINGENCY PLAN
BUFFUMVILLE LAKE

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DROUGHT CONTINGENCY PLAN
BUFFUMVILLE LAKE

1. PURPOSE AND SCOPE

The purpose of this study and report was to develop and set forth a drought contingency plan of operation for Buffumville Lake that would be responsive to public needs during drought periods and identify possible modifications to project regulation within current administrative and legislative constraints. This evaluation was based on preliminary studies utilizing readily available information. The scope of this drought contingency plan includes a description of existing water supply conditions, the possibility of reallocation of reservoir storage within specified limits, evaluation of water quality, discussion of impacts on other project purposes, effects on the environment, and summary and conclusions.

2. AUTHORIZATION

The authority for the preparation of drought contingency plans is contained in ER 1110-2-1941 which provides that water control managers will continually review and, when appropriate, adjust water control plans in response to changing public needs. Drought contingency plans will be developed on a regional, basinwide and project basis as an integral part of water control management activities.

3. PROJECT AUTHORIZATION CONDITIONS

Buffumville Lake was authorized by the Flood Control Act of 18 August 1941 (Public Law 228, 77th Congress). In addition, Section 4 of the Flood Control Act of 22 December 1944 (Public Law 534, 78th Congress) authorized the development and use of reservoir areas for public recreation and other purposes.

4. PROJECT DESCRIPTION

Buffumville Dam, completed in 1958, is located on the Little River, 1.3 miles upstream of its confluence with French River in Charlton, Massachusetts. A map of the Thames River Basin is shown on plate 1.

The project contains storage for flood control and recreation. The recreation pool at elevation 492.5 feet NGVD (11-foot stage)

contains 1,440 acre-feet equal to 1.02 inches of runoff. The flood control storage contains 11,280 acre-feet (3.7 billion gallons) equivalent to 8.0 inches of runoff from the 26.5 square mile drainage area. A capacity table is shown on plate 2, and a summary of pertinent data at Buffumville Lake is contained on plate 3.

Components of the project consist of a rolled earthfill embankment, outlet works, concrete spillway and dike. The outlet works are located in the center of the spillway and consist of three 3'-0" wide by 5'-6" high gated rectangular conduits, with inverts at elevation 481.5 feet NGVD. Flow through the outlets is controlled by three 3'-0" x 4'6" electrically operated slide gates. The piers between the gate passages are elongated on the upstream side to facilitate formation of a weir for controlling a permanent recreation pool at an 11-foot stage. A 610-foot long dike is constructed in a saddle at the south end of Pierpoint Meadow Pond. The top of the dike is at elevation 539 feet NGVD, equivalent to the top of dam.

5. PRESENT OPERATING REGULATIONS

a. Normal Periods. A permanent pool approximately 11 feet deep is maintained by a concrete weir and stoplog structure upstream of the center gate. This gate setting is normally 0'-2'-0.1'. If the pool should drop below the weir crest elevation during periods of low flows, releases may be made by one of the side gates.

b. Flood Periods. The Buffumville project is operated in concert with other projects in the basin to reduce downstream flooding in the Little, French and Quinebaug Rivers. Operations for flood may be considered in three phases: phase I - appraisal of storm and river conditions during development of a flood; phase II - flow regulation and storage of flood runoff at the reservoir, and phase III - emptying the reservoir during recession of the flood. The regulation procedures are detailed in the Master Water Control Manual for the Thames River Basin.

c. Regulating Constraints.

(1) Minimum Releases. A minimum release of about 10 cfs (6.5 mgd) is maintained during periods of flood regulation in order to sustain downstream fish life.

(2) Maximum Releases. The maximum nondamaging discharge capacity of the channel immediately downstream of Buffumville Lake is about 350 cfs. Releases at or near this rate can be expected whenever reservoir inflows exceed this value, and meteorologic and hydrologic conditions permit.

6. MONITORING OF HYDROLOGIC CONDITIONS

The Reservoir Control Center directs the reservoir regulation activities at 31 New England Division flood control dams, and continually monitors rainfall, snowcover and runoff conditions throughout the region. When any of these hydrologic parameters have been well below normal for several months and it appears that possible drought conditions might develop, the Corps Emergency Operations Center (EOC) will be so informed. The EOC will then initiate discussions with the respective Federal and State agencies and other in-house Corps elements to review possible drought concerns and future Corps actions.

7. DESCRIPTION OF EXISTING WATER SUPPLY CONDITIONS

a. General. The area of concern is the south-central portion of Massachusetts, including portions of Worcester, Hampden, and Middlesex counties. Table 1 contains information about public water suppliers in the area based on information provided by the Massachusetts Department of Environmental Management. Of the 36 communities in the study area, 31 are served by public systems. No data is available for those communities dependent on private individual supplies.

b. Water Supply Systems. The primary objective of this analysis was to accumulate available data regarding water supply systems in the vicinity of Buffumville Lake which could benefit from storage at the project, and to present the data in a manner portraying existing water supply conditions. Projections of future demands were not developed because this study addresses only modifications in the operational procedure at Buffumville Lake in order to provide storage for water supply purposes when drought conditions exist, and not to meet normal water supply demands at some future date.

c. South-central Massachusetts Water Suppliers. As noted in table 1, the data given for each water supplier included: community served, estimated population served by the system, source of supply (ground or

TABLE 1

MAJOR WATER SUPPLIERS - SOUTH CENTRAL MASSACHUSETTS

Company or Agency	Town Served	Est. Population Served -1980	Source of Supply (SW or GW)	1980 Demands Avg. Day (MGD)	1980 Demands Max. Day (MGD)	Safe Yield (MGD)	Comments
	Auburn						Supplied by Worcester(SW/GW)
Elm Hill Water District		600	GW	1.07	1.80	2.5	6 wells
Auburn Water District		9,501		0.027	0.041		Supplied by Worcester(SW/GW)
Woodland Water District		540					
Blackstone Water Dept.	Blackstone	6,158	GW	0.37	0.63	0.78	2 Wells, 1 standby
	Brimfield		No Public Water Supply				
Brookfield Water Dept.	Brookfield	1,400	GW	0.078	0.117	0.40	3 Wells
	Charlton		No Public Water Supply				
Douglas Water Dept.	Douglas	2,611	GW	0.18	0.46	0.50	1 wellfield, 1 well
Dudley Water Dept.	Dudley	5,840	GW	1.2	1.81	1.0	1 wellfield, 1 well
East Brookfield Water Dept.	E. Brookfield	1,200	GW	0.12	0.292	0.9	1 well
Mass. American Water Co.	Grafton	5,332	GW	0.64	1.02	2.0	4 wells
South Grafton Water Dist.		2,810	GW	0.18	0.24	0.55	2 wells
	Holland		No Public Water Supply				
Hopedale Water District	Hopedale	2,226	GW	0.38	0.42	0.42	wellfield
						0.10	Milford Water Co.(SW/GW)
Hopkinton Water Dept.	Hopkinton	5,700	GW	0.571	0.837	1.11	3 wells
Leicester Water Supply Dist.	Leicester	2,700	GW	0.185	0.333	0.402	5 wells
Hillcrest Water Dist.		350	GW	0.154	0.175	0.236	3 wells
Cherry Valley & Rochdale W.D.		4,400	SW	0.32	0.70	0.375	Henshaw Pond
Milford Water Co.	Mendon	450	SW/GW				Included in Milford Syst.
Milford Water Co.	Milford	27,607	SW/GW	2.54	3.81	3.00	1.40 SW - Echo Lake 1.60 GW - wells Includes Mendon - 450 served Hopedale - 1667 served
Mass. American Water Co.	Milbury	5,366	GW	1.16	1.62	3.11	4 wells
Oakwood Heights Water Dist.		200		0.0074	0.011		Mass. American Water Co.
Maple Hillside Water Dist.		311		0.018	0.028		Mass. American Water Co.
	Millville		No Public Water Supply				

TABLE 1 (Cont'd)
MAJOR WATER SUPPLIERS - SOUTH CENTRAL MASSACHUSETTS

Company or Agency	Town Served	Est. Population Served - 1980	Source of Supply (SW or GW)	1980 Demands Avg. Day (MGD)	1980 Demands Max. Day (MGD)	Safe Yield (MGD)	Comments
Monson Water Dept.	Monson	5,000	GW	0.95	1.70	1.73	2 wells, 1 standby
North Brookfield Water Dept.	N. Brookfield	3,600	SW	0.47	1.13	2.50	North Pond
Whitinsville Water Co.	Northbridge	10,340	GW	1.14	1.65	2 55	2 wellfields, 1 emergency
Oxford Water Co.	Oxford	6,070	GW	0.702	1.163	2.0	3 wells
Palmer Fire District	Palmer	5,300	SW/GW	0.62	1.00	0.90	0.65 - 2 wells, 0.25 - Graves Brk. Res.
Bondsville Fire & Water Dist.		2,516	GW	0.274	0.46	0.50	3 wells
Three Rivers Fire Dist.		3,377	GW	0.32	0.52	0.58	2 wells
Thorndike Fire & Water Dist.		1,316		0.144	0.25		From Bondsville supply
Shrewsbury Water Dept.	Shrewsbury	20,407	GW	2.56	4.44	4.18	2 wells, Worcester system
Southbridge Water Supply Co.	Southbridge	16,665	SW	1.71	2.56	2.95	4 reservoirs
Spencer Water Dept.	Spencer	5,000	SW/GW	0.37	0.55	1.30	1.0 - 1 well, 0.30 - Shaw Pond
Sturbridge Water Dept.	Sturbridge	3,884	GW	0.674	1.21	1.22	2 wells
Manchaug Water Dist.	Sutton	850	GW	0.016	0.024	0.045	3 wells
Wilkinsonville Water Dist.		400	GW	0.10	0.15	0.282	1 well
Upton Water Dept.	Upton	2,215	GW	0.23	0.38	0.69	1 well, 1 wellfield
Uxbridge Water Dept.	Uxbridge	5,600	GW	0.67	0.97	2.1	3 wells
	Wales		No Public Water Supply				
Ware Water Dept.	Ware	7,200	GW	0.92	1.12	1.58	4 wells
West Warren Water Dist.	Warren	1,078	GW	0.3	0.6	0.60	1 well, 1 standby
Warren Water Dist.		2,644	GW	0.19	0.30	0.35	5 wells
Webster Water Dept.	Webster	14,200	GW	1.29	1.94	3.50	2 wells & wellfield
W. Brookfield Water Dept.	W. Brookfield	2,200	GW	0.25	0.52	0.58	2 wells
Westborough Water Dept.	Westborough	13,346	SW/GW	2.02	2.5	2.78	0.75 - Westborough Res. 2.03 - 5 wells
Worcester DPW	Worcester	161,799	SW/GW	25.67	35.90	29.0	26.80 - reservoir system 2.20 - wells (2)

Table 2
Population Projections - South Central Massachusetts

Town	Actual 1980	1985	1990	1995	2000	Percent Change 1980-2000
Auburn	14,845	15,050	15,250	15,475	15,775	6.3
Blackstone	6,570	6,725	6,825	6,925	7,025	6.9
Brimfield	2,318	2,508	2,681	2,794	2,875	24.0
Brookfield	2,397	2,575	2,625	2,675	2,750	14.7
Charlton	6,719	7,050	7,500	7,675	8,075	20.2
Douglas	3,730	3,850	3,925	4,100	4,200	12.6
Dudley	8,717	9,050	9,200	9,400	9,725	11.6
East Brookfield	1,955	2,050	2,150	2,200	2,300	17.6
Grafton	11,238	11,450	11,750	11,975	12,175	8.3
Holland	1,589	1,902	2,193	2,430	2,578	62.2
Hopedale	3,905	4,000	4,125	4,150	4,200	7.6
Hopkinton	7,114	8,300	9,400	9,700	10,000	40.6
Leicester	9,446	9,600	9,700	9,950	10,075	6.7
Mendon	3,108	3,350	3,450	3,625	3,725	19.9
Milford	23,390	24,700	26,000	26,300	26,600	13.7
Millbury	11,808	12,175	12,450	12,725	12,925	9.5
Millville	1,693	1,750	1,800	1,825	1,875	10.8
Monson	7,315	7,688	8,026	8,427	8,823	20.6
North Brookfield	4,150	4,225	4,300	4,325	4,375	5.4
Northbridge	12,246	12,450	12,650	12,950	13,225	8.0
Oxford	11,680	12,100	12,350	12,725	12,925	10.7
Palmer	11,389	11,731	12,048	12,265	12,424	9.1
Shrewsbury	22,674	23,650	24,225	24,925	25,400	12.0
Southbridge	16,665	16,775	16,875	16,975	17,125	2.8
Spencer	10,774	11,200	11,600	12,025	12,225	13.5
Sturbridge	5,976	6,325	6,575	6,725	6,975	16.7
Sutton	5,855	6,350	6,725	6,950	7,225	23.4
Upton	3,886	4,125	4,225	4,425	4,525	16.4
Uxbridge	8,374	8,575	8,675	8,750	8,850	5.7
Wales	1,177	1,326	1,475	1,596	1,671	42.0
Ware	8,953	9,311	9,600	9,782	9,939	11.0
Warren	3,777	3,800	3,850	3,975	4,025	6.6
Webster	14,480	14,625	14,875	15,100	15,200	5.0
West Brookfield	3,026	3,100	3,150	3,175	3,250	7.4
Westborough	13,619	14,275	14,825	15,625	16,050	17.9
Worcester	161,799	161,800	161,800	161,800	161,800	0.0
TOTAL	448,357	459,516	468,873	476,444	482,910	7.7

surface water), average day and maximum day demands for 1980, estimated safe yield of the source, and any further information available on the source of supply. An analysis of the adequacy of existing sources during drought conditions has not been performed. The information has been accumulated to present a summary of the existing water supply conditions for the south-central Massachusetts area.

d. Population Projections. Population projections for communities in south-central Massachusetts are given in table 2 to show population trends for each community potentially affected by a prolonged dry period. The projections were developed by the Massachusetts Office of State Planning for the "208" Areawide Wastewater Management Program, and updated in 1981. This information indicates areas of potential future growth in the south-central Massachusetts area.

8. POTENTIAL FOR WATER SUPPLY REALLOCATION

a. General. There are several authorities that provide for the use of reservoir storage for water supply at Corps of Engineers projects. They vary from the provision of water supply storage as a major purpose in new projects to the discretionary authority to provide emergency supplies to local communities in need. In addition, guidance contained in ER 1110-2-1941 directs field offices to determine the short-term water supply capability of existing Corps reservoirs that would be functional under existing authorities. Congressional authorization is not required to add municipal and industrial water supply if the related revisions in regulation would not significantly affect operation of the project for the originally authorized purposes.

b. Drought Contingency Storage. It has been determined that a portion of the existing storage at Buffumville Lake could be utilized for emergency drought contingency storage without having an adverse impact on the project's flood control function. Storage could be made available to a pool elevation of about 494.5 feet NGVD (13-foot stage). This represents a volume of about 1,860 acre-feet, equivalent to 606 million gallons or about 15 percent of the total reservoir storage. This volume is comprised of 1,440 acre-feet of permanent storage and 420 acre-feet of flood control storage. The 420 acre-feet represents an infringement of about 0.30 inch of runoff on the flood control storage.

Based on an all-season low flow duration analysis using 41 years of flow records for the gaging station on the Little River near Oxford, Massachusetts, it was determined that during a 10-year frequency drought period, the volume of runoff could: a) fill the reservoir from elevation 492.5 to 494.5 feet NGVD in a 58-day summer period provided no releases were made from the dam, or b) fill the reservoir to elevation 494.5 in a 114-day period if a continuous release of about 2.7 cfs of 1.7 mgd (0.10 cfs/sq. mi.) were maintained. However, the reservoir could be filled to elevation 494.5 in about a two-week period in May while continuously releasing about 5 cfs or 3.2 mgd. The water stored could be drawn directly from the reservoir or released downstream for municipal supply with proper treatment. Drought contingency storage versus flow duration at Buffumville Lake is shown graphically on plate 4.

c. Effects of Regulated Flows. As discussed, the curtailment of flows from Buffumville Lake during the drought emergency could adversely impact on the flowage rights of downstream riparian users. At this time, however, it is not possible to review all of the various drought emergency situations that could occur, nor is it within the scope of this report to identify all those with water rights. It is important to note that when a specific drought emergency does occur, the legal implications would have to be weighed.

9. WATER QUALITY EVALUATION

a. Water Quality Classification. The entire length of the Little River, downstream from Buffumville Lake is rated class B by the Massachusetts Division of Water Pollution Control (MDWPC). Class B waters are designated for the protection and propagation of fish, other aquatic life and wildlife; and for primary and secondary contact recreation. Public water supply after treatment is not one of the uses given in Massachusetts Water Quality Standards for class B waters. However, a water which meets class B standards could be made potable with standard treatment processes.

Most Massachusetts class B waters are further classified as warm-water or cold-water fisheries, but no official designation has been made as to the type of fishery that can be sustained at Buffumville Lake. It is likely that Buffumville would be designated a warm water

fishery; the shallowness of the lake precludes anything but a warm water environment. Trout are reportedly found in the lake on occasion, but they are predominately due to the stocking that takes place by the Massachusetts Fisheries and Wildlife Division in the upstream reaches of Little River.

b. Existing Water Quality. There is little development in the Buffumville Lake watershed and the water quality at the project is generally good although there are some problems which could interfere with the water's use as a supply source. These are low pH levels, high color levels, and high nutrient levels which produce excessive aquatic plant growth.

An indication of the low level of development in the watershed is that the only significant point source discharge to the Little River upstream from the dam is the effluent from a small wastewater treatment plant which receives waste from the westbound Massachusetts Turnpike rest area at Charlton. Flow from the plant appears to present only a local water quality problem at the point of discharge, although the high levels of phosphate that occur downstream in Buffumville Lake may originate at this plant.

Low pH levels and high color level at the lake are due primarily to the natural swamps and marshes in the watershed although acid precipitation may contribute to the low pH levels. Waters having these characteristics can be made usable for public water supply with standard treatment processes.

Aquatic weed growth, predominately watermilfoil (Myriophyllum spp.,) has become a serious problem in Buffumville Lake, especially along the shoreline and at bathing areas. Excessive weed growth is encouraged by the shallowness of the impoundment, the availability of plant nutrients, and the fertility of the unstripped bottom of the impoundment which was formerly agricultural land.

Prolific growth of undesirable aquatic weeds has interfered with water based recreation activities. Unchecked growth has been a nuisance to fishermen, boaters, and swimmers. In addition, watermilfoils are a low grade duck food at best and provide only marginal benefits as a wildlife food.

Various alternative methods have been tried to control undesirable aquatic weed growth. A chemical treatment with liquid silvex was made at Buffumville in fall 1972. Undesirable weed growth was checked for a while as a result of this treatment, but favorable growing conditions required that three annual additional treatments be made, beginning in the spring of 1976, to insure effectiveness.

The excessive weed growth would not interfere directly with the use of the lake as a water supply source, but the use of herbicides might make the water unsuitable for public water supply and some industrial water supply uses. Although the Corps uses only EPA-approved silvex which breaks downs relatively quickly after application, there is likely to be a problem with the public's perception of the safety of the water for drinking.

c. Water Quality Requirements for Drought Storage. There are two requirements to be met. The waters must meet state standards for surface waters and must be of a quality suitable for domestic or industrial water supply use. A water which meets class B standards could be made usable for public water supply without unusual treatment processes; the water quality required for industrial water supply depends on the specific industrial process involved.

d. Effects of Drought Storage. The effect of increasing the pool at Buffumville Lake for drought storage would be to increase the aquatic weed problems at the lake. A larger lake with a lower flushing rate would retain nutrients longer and the flooding of the additional uncleared lands would add additional nutrients. The aquatic weed problem would increase unless the increase in depth made areas of the lake unsuitable for macrophyte growth. In that case, an aquatic weed problem could be replaced with an algae bloom problem. Algae blooms would cause further problems by adding unpleasant taste and odor to the water.

e. Water Quality Conclusions. The water at Buffumville Lake would be suitable for public water supply after treatment to remove color, iron, and manganese, disinfection, and possible removal of taste and odor. These are standard treatment processes. If herbicides have been applied to the lake within the past year, additional expensive treatment with activated carbon may be required to alleviate public concerns about a possible health threat, although no real threat may exist. The untreated stored water would be usable for some industrial processes and fire fighting.

10 DISCUSSION OF IMPACTS

a. General. Any action resulting in a temporary change of a reservoir's storage volume will have impacts on other project purposes which must be evaluated before a storage reallocation plan can be implemented. An evaluation has been made of the impacts resulting from drought contingency storage on the flood control purpose of this project. Effects on recreation, sedimentation and the aquatic and terrestrial environments as well as the historic and archaeological resources have also been addressed.

b. Flood Control. A review of the regulation procedures at Buffumville Lake was undertaken to determine the volume of water that could be made available for drought contingency purposes. The water would be stored by temporarily utilizing existing flood control storage. It is recognized that major floods occur in every season of the year, thus any use of flood control storage would be continually monitored to insure there would be no adverse impacts on downstream flood protection.

At Buffumville Lake the maximum pool elevation for drought contingency storage has been estimated to be elevation 494.5 feet, representing an infringement on the flood control storage of about 0.3 inch of runoff from the upstream 26.5 square mile drainage area.

Based on a 10-year event, the anticipated rate of pool level rise would exceed 0.02 feet per day over a 114-day period beginning in June. This condition assumes a flow of about 2.7 cfs (1.7 mgd) would be released downstream for the duration of the drought. Storage would probably take place during the months of June, July and August and would be drawn as needed in the following months. The storage may be held for a period of one month or longer at the 494.5 foot elevation before withdrawal.

c. Recreation. Water recreation resources, namely, the beach and boatramp at the Buffumville State Park will still be usable if the pool level rises to the 494.5-foot level.

d. Project Operations. Storing an additional two feet of water (13-foot stage) will be accomplished with stoplogs in the existing

weir located upstream of the center gate. A minimum continuous release will be made through one of the two remaining gates. This storage activity will require only minimal additional labor from project personnel.

An additional two feet of storage during the summer months is expected to have only a minor negative effect on shoreline trees and shurbs, since this area does not contain significant amounts of vegetation. Any tree kill or trash cleanup directly attributed to drought storage activities will be the responsibility of the user.

e. Effect on the Aquatic Ecocystem. The aquatic environment of the project area is located along the Little River in the Quinebaug River Basin. The Little River is classified by the Commonwealth of Massachusetts as a class B watercourse, which would be suitable for many uses including bathing and recreation, and it would provide for excellent fishing and wildlife habitat.

Buffumville Lake and Colicum Reservoir, adjacent to the lake, however, are unsuitable habitats for indigenous trout due to warm water lake-type conditions. But, feeder streams, such as Potter Brook, South Fork, and the Little River have been stocked with brook trout for put-and-take use. The lake and reservoir support a warm water fishery. Fisheries management is performed by the Massachusetts Division of Fisheries and Wildlife. In a recent experimental program, Buffumville Lake was stocked with sterile tiger muskies with the hope that this hybrid would control the pan fish populations and provide some sport fishing. Population sampling has found ten species in the lake including single brown trout, chain pickerel, largemouth bass, yellow perch, white perch, pumpkinseed, blue-gills, yellow bullheads, brown bullheads, and white suckers. The Little River is predominantly a warm water fishery downstream of the dam. Above the lake, 400-500 brown and brook trout are stocked in the Little River and the South Fork on a put-and-take basis.

Aquatic plants are common, particularly along the western shoreline. Milfoil, pickerel weed, and sedges are abundant in the lake and reservoir. Several groups of submerged tree stumps and standing dead trees are located on the lake's eastern shore. There are wetlands located south of Oxford Road on the west shore of the lake and near the

South Fork inflow along the southern shoreline. These potentially serve as valuable wetland wildlife habitat. Plate 5 shows a map of the reservoir area.

An increase in the impoundment for the proposed contingency storage would temporarily raise the water level by approximately two feet during late summer-early fall and throughout the storage period. This would temporarily inundate a small area of stream habitat along the Little River and South Fork, the wetland areas and along the lake's shoreline. The two-foot rise probably would not have more of a significant adverse effect than has occurred with past flood control operations. The increase in storage should not impact the reproduction of most warm water species (generally occurring during spring and early summer) in the lake, and the Little River downstream of the impoundments. The fishery may actually benefit from the small amount of nutrients expected to be introduced into the lake. Because of the generally good relief in the topography in the area, the two foot rise would not back up significantly into the inflow waters of the South Fork and Little River above the impoundment. Should the contingency storage be required for prolonged periods, continuous use or for repetitive frequent use, the impacts on the existing wetlands and the potential that new wetlands may be created would have to be assessed.

f. Effects on the Terrestrial Environment. There are five forest types at Buffumville Lake, the predominant one being a white pine-northern red oak-white ash mix. The second largest forest stand is one of white pine and the third largest is a northern red oak-basswood-white ash composition. The two smallest forest types are white oak and aspen, respectively. Red maples, black cherry, birch and hemlock area associated species. Though the forest cover exists around the lake, except where access to the lake is provided for private ways, the dam and other public areas like the beach site and ramps, the forested-tree line is several feet back from the pool's edge and generally a little higher. Raising the impoundment elevation for short seasonal periods should not affect this vegetation. The potential effects on a new shoreline would include sloughing, erosion, and root exposure due to prolonged operation. These effects would have to be assessed.

g. Effects on Wildlife. Wildlife that has been observed in the area include red fox, raccoon, porcupine, woodchuck, snowshoe hare, cottontail rabbit, beaver, skunk, muskrat, and gray squirrel. Upland bird species include woodcock and ruffed grouse. Several species of ducks have been seen on Buffumville Lake including mallards, black ducks and wood ducks. Canadian geese stop in the area during their migrations. It is not anticipated that temporarily raising the lake level two feet as a drought contingency would significantly affect wildlife habitat. Impacts to wetlands and the ducks using them would have to be assessed. However, should the water levels inundate wetlands for prolonged periods the impacts on wetlands and user species would have to be assessed. No impact to deer populations is expected since it is unlikely there is a resident deer population in the project area due to its limited size above the normal pool elevation. It is likely that occasional migrants move through the area, but they would not be affected by the higher pool level.

h. Historic and Archaeological Resources. There are two recorded prehistoric sites within the project area, at the shore of the permanent pool. These, and any other unrecorded sites below elevation 494.5 feet NGVD would be impacted by maintenance of a drought contingency pool. Additionally, two recorded 19th century farmstead sites and a sawmill site are below the 500-foot contour and may be affected by a drought contingency pool.

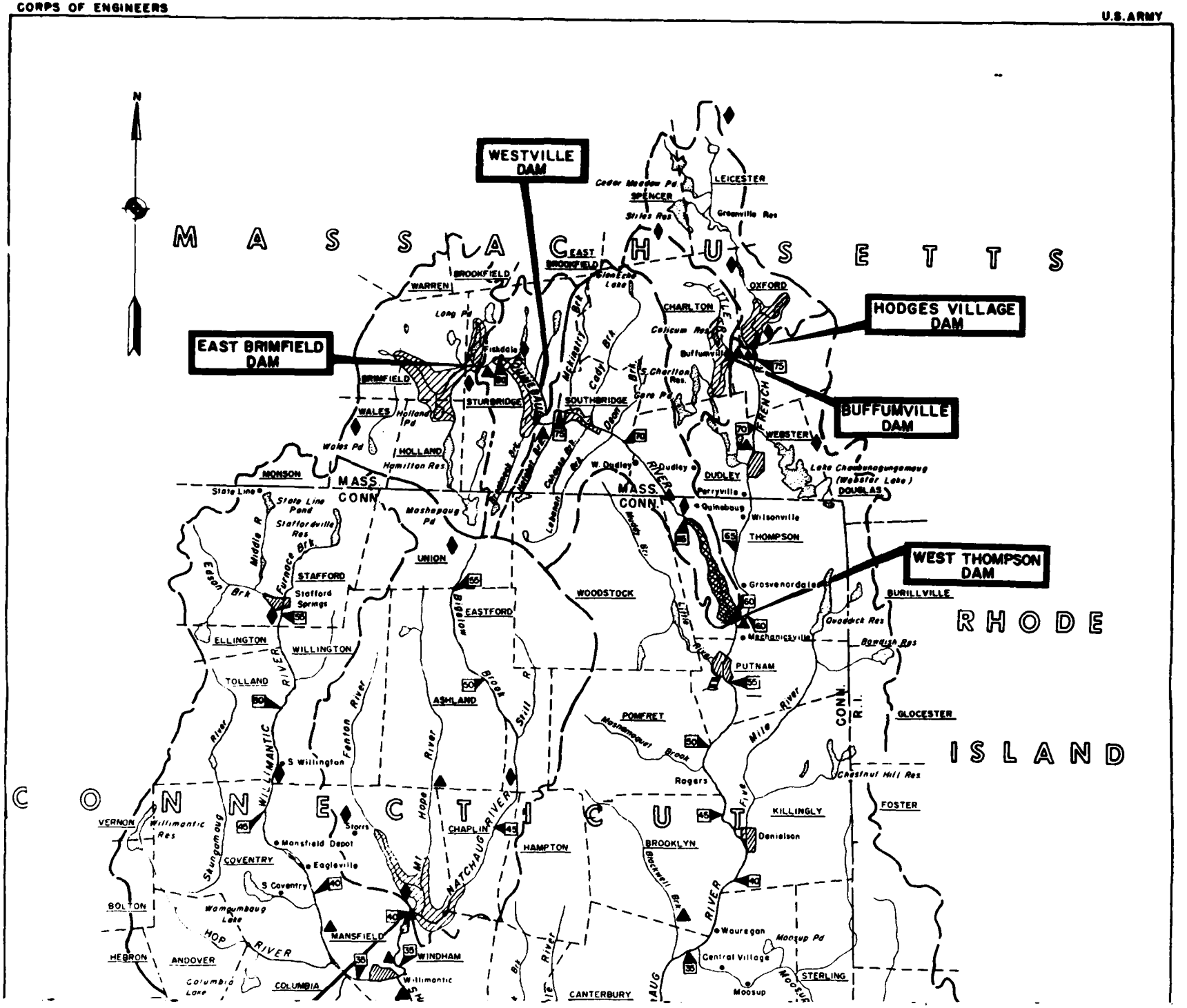
11. SUMMARY AND CONCLUSIONS

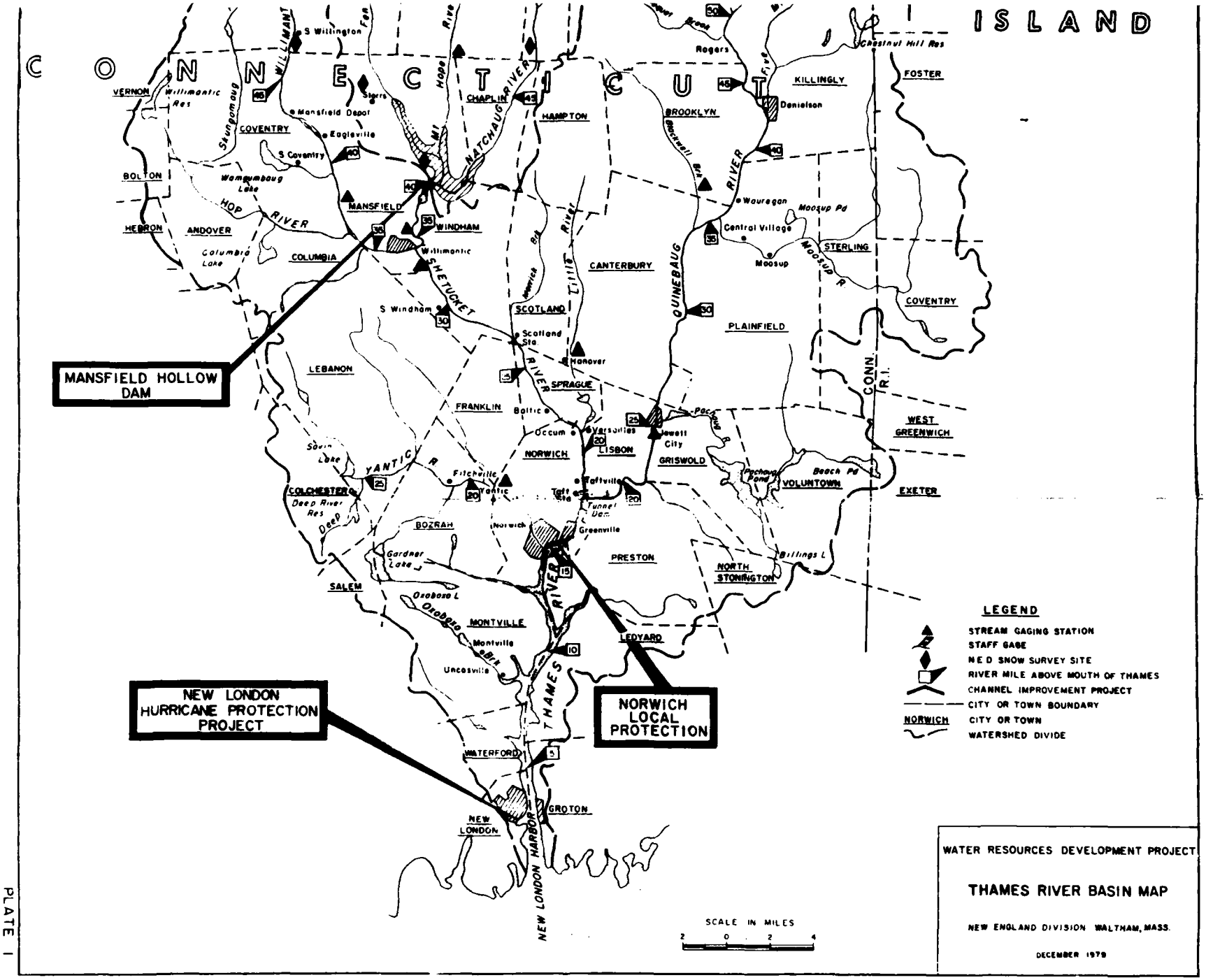
Hydrologic studies indicated it would be possible to provide up to approximately 1,860 acre-feet, equivalent to 606 million gallons of reservoir storage for drought emergency purposes, without having a significant adverse impact on the project's flood control effectiveness. An evaluation of the effects of this drought contingency plan on the various other project features, as well as on certain environmental aspects, has revealed some impacts.

The water at Buffumville Lake would be suitable for public supply after standard treatment methods. However, if herbicides have been applied within the past year, additional expensive treatment might be required before the public would accept the water as safe even though no real threat from the herbicides may exist. The untreated stored water may be acceptable for some industrial water supply uses or related activities.

CORPS OF ENGINEERS

U.S.ARMY




MANSFIELD HOLLOW DAM
NEW LONDON HURRICANE PROTECTION PROJECT
NORWICH LOCAL PROTECTION
LEGEND
STREAM GAGING STATION
STAFF GAGE
N E D SNOW SURVEY SITE
RIVER MILE ABOVE MOUTH OF THAMES
CHANNEL IMPROVEMENT PROJECT
CITY OR TOWN BOUNDARY
NORWICH CITY OR TOWN
WATERSHED DIVIDE
SCALE IN MILES
2 0 2 4
WATER RESOURCES DEVELOPMENT PROJECT
THAMES RIVER BASIN MAP
NEW ENGLAND DIVISION WALTHAM, MASS.
DECEMBER 1979
PLATE I
CONNECTICUT
RHODE ISLAND
THAMES
NEW LONDON HARBOR
CONN. R.I.

BUFFUMVILLE RESERVOIR
AREA AND CAPACITY
DRAINAGE AREA = 26.5 SQ. MI.

ELEV. M.S.L.	STAGE FEET	AREA ACRES	CAPACITY AC.FT.	CAPACITY INCHES
	Permanent Storage			
481.5	0	51	0	0
482.5	1	60	55	0.04
483.5	2	68	120	0.08
484.5	3	76	190	0.13
485/5	4	85	210	0.15
486.5	5	150	390	0.28
487.5	6	158	540	0.38
488.5	7	167	700	0.50
489.5	8	176	880	0.62
490.5	9	184	1060	0.75
491.5	10	192	1240	0.88
492.5	11	200	1440	1.02
	Flood Control Storage			
492.5	11	200	0	0
493.5	12	209	300	.14
4.5	13	218	420	.30
495.5	14	228	640	.45
496.5	15	237	870	.62
497.5	16	246	1110	.79
498.5	17	256	1360	.96
499.5	18	266	1620	1.15
500.5	19	276	1900	1.35
501.5	20	286	2180	1.54
502.5	21	296	2470	1.75
503.5	22	306	2770	1.96
504.5	23	316	3080	2.18
505.5	24	326	3400	2.41
506.5	25	336	3730	2.64
507.5	26	346	4070	2.88
508.5	27	356	4420	3.13
509.5	28	367	4780	3.38
510.5	29	377	5160	3.65
511.5	30	388	5540	3.92
512.5	31	399	5930	4.20
513.5	32	410	6340	4.49
514.5	33	422	6750	4.78
515.5	34	433	7180	5.08
516.5	35	444	7620	5.39
517.5	36	456	8060	5.71
518.5	37	468	8530	6.04
519.5	38	479	9000	6.37
520.5	39	490	9480	6.71
521.5	40	501	9980	7.07
522.5	41	513	10500	7.45
523.5	42	524	11000	7.80
524.0	42.5	530	11280	8.00

NOTES:
Gate Sill Elevation = 481.5'
Spillway Crest Elevation = 524.0'
1" Runoff = 1,410 Acre-Feet

PLATE 2

PERTINENT DATA
BUFFUMVILLE LAKE

LOCATION — Little River, Charlton, Massachusetts

DRAINAGE AREA — 26.5 square miles

STORAGE USES — Flood Control, Recreation

RESERVOIR STORAGE

	Elevation (ft msl)	Stage (feet)	Area (acres)	Capacity: Acre-Feet	Capacity: Inches on Drainage Area
Inlet Elevation	481.5	0.0	51	0	0.0
Permanent Pool	492.5	11.0	200	1,440	1.02
Spillway Crest	524.0	42.5	530	11,280(net)	8.0(net)
Maximum Surcharge	534.3	52.8	740	-	-
Top of Dam	539.0	57.5	790	-	-

EMBANKMENT FEATURES

Type	Rolled earth with rock protection
Length (ft)	3,255
Top Width (ft)	20
Top Elevation (ft msl)	539
Height (ft)	66
Volume (cy)	350,000

PIERPONT MEADOW DIKE

Type	Rolled earth with rock protection
Length (ft)	610
Top Width (ft)	12
Top Elevation (ft msl)	539.5
Height (ft)	15

SPILLWAY

Location	420 feet from right end
Type	Concrete, ogee weir
Crest Length (ft)	220
Crest Elevation (ft msl)	524
Surcharge (ft)	10.3
Maximum Discharge Capacity (cfs)	29,800
Stilling Basin	209' wide x 91' long
Spillway Design Flood	
Peak Inflow (cfs)	36,500
Peak Outflow (cfs)	29,800

OUTLET WORKS

Type	Three, rectangular concrete conduits
Conduit Inside Dimensions (ft)	3.0 wide x 4.5 high
Conduit Length (ft)	44
Service Gate Type	Slide gate, electric power driven
Service Gate Size (ft)	3.0 x 4.5
Emergency Gate Type	Stoplogs
Downstream Channel Capacity (cfs)	280 (Growing season); 350 (Non-growing season)
Maximum Discharge Capacity with pool at Spillway Crest Elevation (cfs)	1,820
Weir	Control weir at center gate

PERMANENT POOL

Length (ft	15,730
Shoreline Length (ft)	36,530
Area (acres)	265

LAND ACQUISITION

	Elevation (ft msl)	Stage (feet)	Area (acres)
Fee Taking	510.0	28.5	488
Easement	529.0	47.5	273
Clearing	494.5	13.0	220

MAXIMUM POOL OF RECORD

Date	March 1968
Stage (ft)	28.4
Percent Full	44

UNIT RUNOFF

One Inch Runoff (acre-ft)	1,410

OPERATING TIME

Open/Close Gates	1 ft/min. (manual operation: 140 turns/inch

PROJECT COST

Through September 1977	$2,999,000

DATE OF COMPLETION — 1958

MAINTAINED BY — New England Division, Corps of Engineers
Recreation facilities are maintained by the Commonwealth of Massachusetts

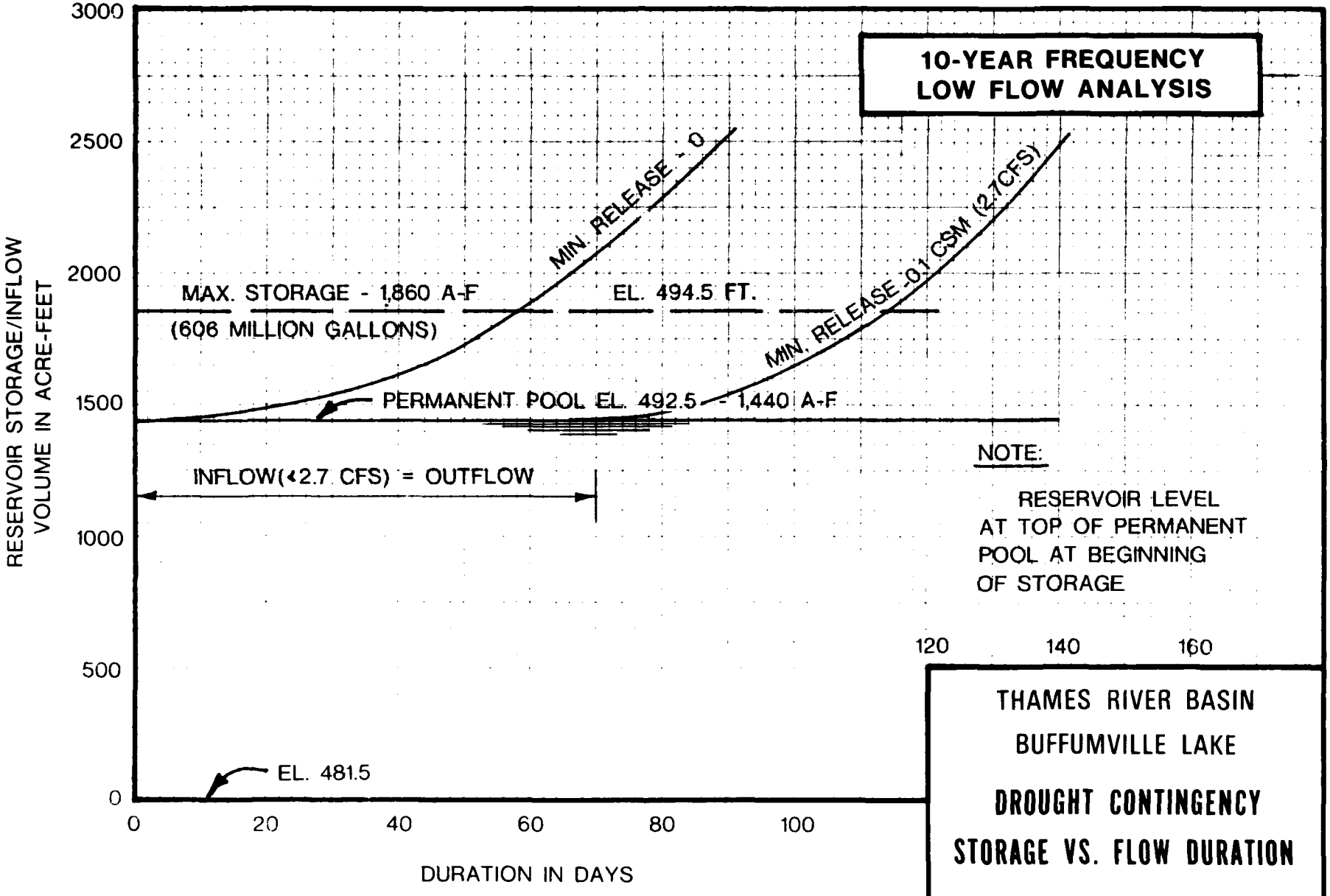
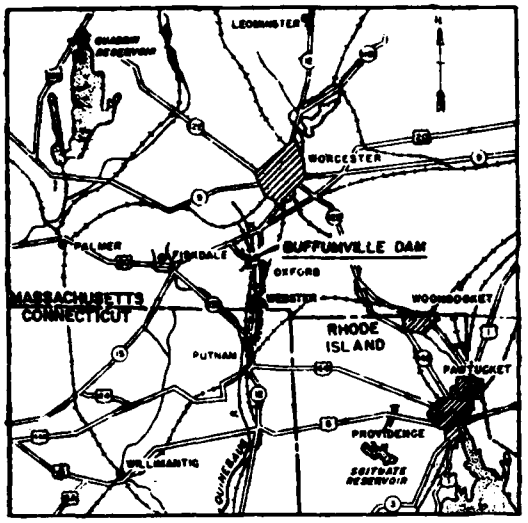
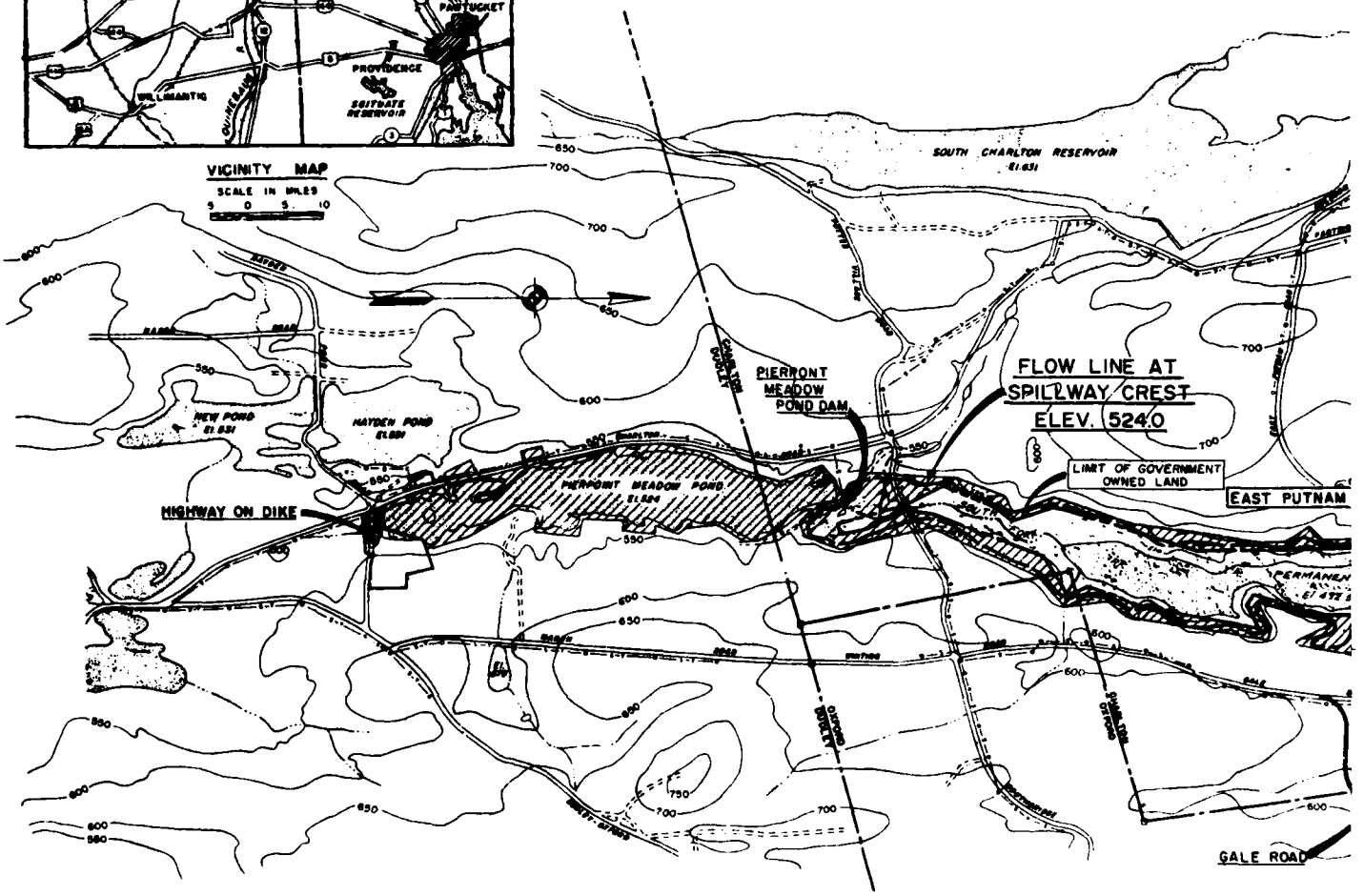

10-YEAR FREQUENCY
LOW FLOW ANALYSIS
RESERVOIR STORAGE/INFLOW
VOLUME IN ACRE-FEET
3000
2500
2000
1500
1000
500
0
MAX. STORAGE - 1,860 A-F
(606 MILLION GALLONS)
EL. 494.5 FT.
MIN. RELEASE - 0
MIN. RELEASE -0.1 CSM (2.7CFS)
PERMANENT POOL EL. 492.5 - 1,440 A-F
INFLOW(<2.7 CFS) = OUTFLOW
EL. 481.5
NOTE:
RESERVOIR LEVEL
AT TOP OF PERMANENT
POOL AT BEGINNING
OF STORAGE
0
20
40
60
80
100
120
140
160
DURATION IN DAYS
THAMES RIVER BASIN
BUFFUMVILLE LAKE
DROUGHT CONTINGENCY
STORAGE VS. FLOW DURATION

PLATE 4

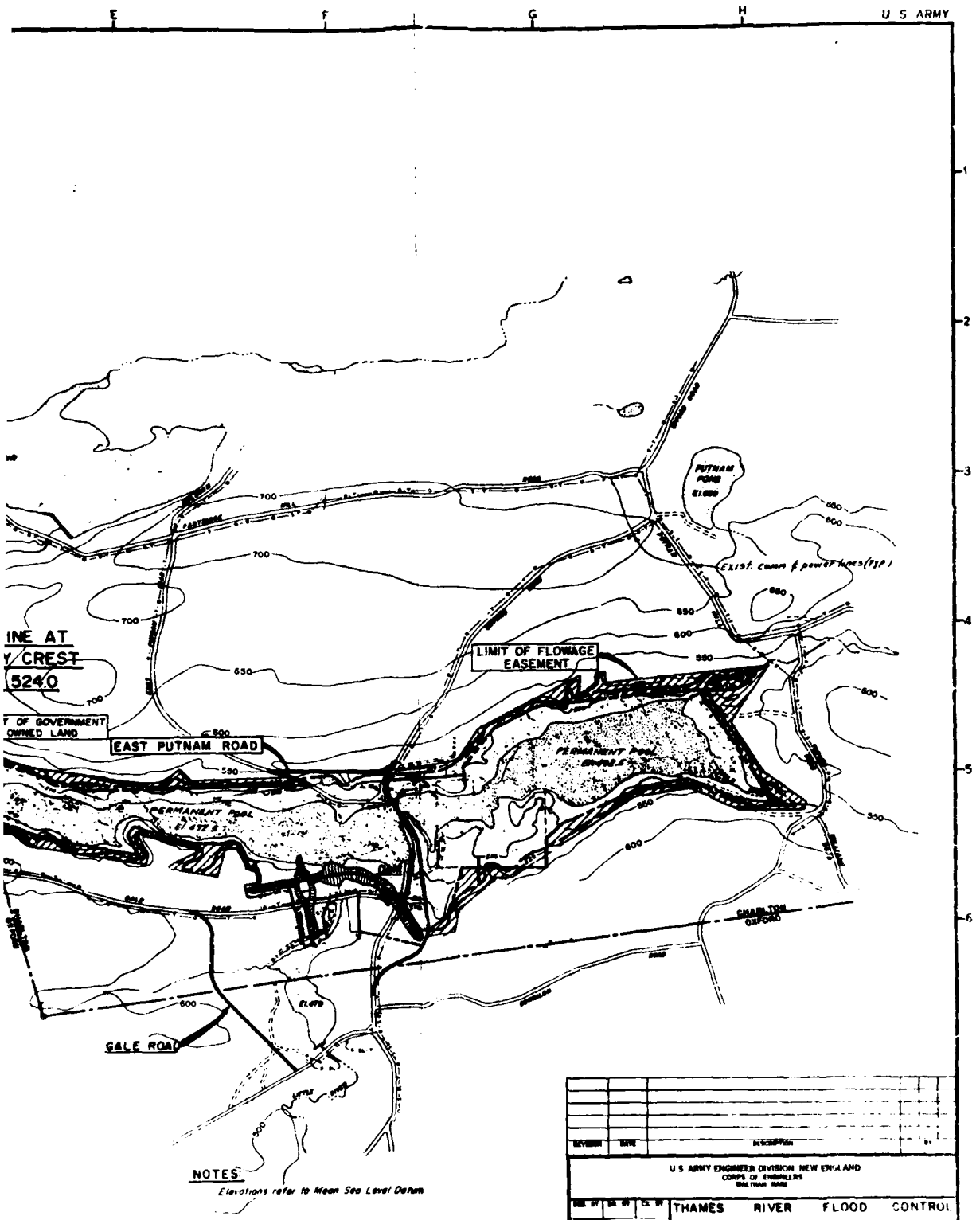
CORPS OF ENGINEERS



VICINITY MAP
SCALE IN MILES
5 0 5 10



RESERVOIR PLAN
SCALE IN FEET
400 0 400 800



U S ARMY ENGINEER DIVISION NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DESIGNED	DRAWN	CHECKED
SUBMITTED		
CHIEF, NED DIV SECTION / PROJECT ENGINEER		
APPROVAL RECOMMENDED	APPROVED	DATE
CHIEF, P & D BRANCH	CHIEF TRANSPORTATION DIVISION	

THAMES RIVER FLOOD CONTROL
BUFFUMVILLE RESERVOIR
RESERVOIR MAP
LITTLE RIVER MASSACHUSETTS

SCALE

SHEET

PLATE 5

END

FILMED

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