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The Commonwealth of Massachusetts

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ANNUAL REPORTS  
OF THE  
METROPOLITAN DISTRICT  
WATER SUPPLY COMMISSION

FOR THE  
SIX YEARS ENDING  
NOVEMBER 30, 1940, 1941, 1942, 1943, 1944  
AND JUNE 30, 1945





# THE REPORTS OF THE METROPOLITAN DISTRICT WATER SUPPLY COMMISSION

*To the Honorable the Senate and House of Representatives of the Commonwealth of Massachusetts in General Court Assembled*

which have been presented by the Commission for each of the six fiscal years ending November 30, 1940, 1941, 1942, 1943, 1944, and June 30, 1945, have for the purpose of publication in a single volume been abbreviated and combined herein, as its

## FIFTEENTH, SIXTEENTH, SEVENTEENTH, EIGHTEENTH, NINETEENTH AND TWENTIETH ANNUAL REPORTS

### ORGANIZATION AND ADMINISTRATION

Eugene C. Hultman continued as Chairman of the Commission until his death April 22, 1945. William T. Morrissey succeeded him June 13, 1945, by virtue of his appointment as Chairman of the Metropolitan District Commission. Thomas D. Lavelle and Edward J. Kelley continued as Associate Commissioners. Mr. Lavelle's term expired August 13, 1941, when he was succeeded by Charles H. Brown. R. Nelson Molt continued as Secretary. Karl R. Kennison continued as Chief Engineer, with other engineering personnel as described in his report, attached hereto.

The offices of the Commission were continued at 20 Somerset Street, Boston, together with the Headquarters Office of the Engineering Department. Field offices were continued at the Administration Building near Winsor Dam in Belchertown and at other locations indicated in the accompanying report of the Chief Engineer.

Under the provisions of the Chapter 720 of the Acts of 1941, the General Court delegated additional duties to the Commission authorizing new construction in the North and South Metropolitan Sewerage Systems; and, with respect to this sewerage work only, enlarged the Commission by the addition of two members, the Director and Chief Engineer of the Sewerage Division of the Metropolitan District Commission and the Director and Chief Sanitary Engineer of the Division of Sanitary Engineering of the Department of Public Health, both ex officio.

The Commission during the War emergency cooperated with the gasoline and rubber conservation program of the Commission on Administration and Finance and in 1942 took from the highways about one-half of the motor vehicles in use in 1941 and turned in thirty-one vehicles to the Commonwealth's general motor pool. Also in structures under the Commission's control, all oil-burning furnaces were converted to coal or wood. The Commission also collected and sold about twenty-six tons of scrap iron and 1900 pounds of scrap rubber and has contributed to the collection of war materials a considerable quantity of scrap in addition to such sales.

### THE QUABBIN SUPPLY

The extension of the sources of supply to the Ware and Swift rivers was continued under the provisions of Chapter 375 of the Acts of 1926 and Chapter 321 of the Acts of 1927. Following the commencement of storage in Quabbin Reservoir in 1939 as previously reported, the Commission has completed Winsor Dam and a scenic highway crossing Quabbin Hill between Winsor Dam and Quabbin Dike. The reservoir has filled somewhat more rapidly than estimated and on June 30, 1945, the water level had reached Elevation 519.92, only about

8 feet below the masonry spillway crest. At this level, over 341 billion gallons are held in storage available to the District, and over 34 of the total 39 square miles are flooded.

The Commission's watershed reforestation program has been curtailed by inability to secure sufficient labor and much of the surplus stock in its nurseries was disposed of.

Diversion of the waters of the Ware River to Quabbin and Wachusett reservoirs was continued and commencing September 17, 1941, water has been drawn from Quabbin Reservoir to Wachusett Reservoir as needed.

Commencing in April, 1941, the Commission permitted the use by the United States Army Air Corps at Westover Field, Chicopee, of various areas in the Quabbin reservation, it being advised by the Federal Government that this was the only available place in the East for practice bombing sites. It also permitted the Air Corps to construct a temporary boathouse for the storage of crash boats for the duration of the war emergency at the Reservoir and permission was granted for the construction of the same with the provision that all sanitary requirements directed by the Chief Engineer be carried out. The Commission also permitted the use by the United States Army as a gunnery range of a portion of this reservoir bottom and of the old Prison Camp property in North Rutland. The Air Corps, in 1942, carried out its agreement to fence off the north end of the Prescott Peninsula without expense to the Commonwealth, thus providing a major item of protection against trespassers and isolation of target areas. Commencing December 8, 1941, Winsor Dam, Quabbin Dike and other structures and approaches were put under constant guard and the public excluded for the duration. Commencing in 1942, a detail of the Metropolitan District Police has been stationed in the Administration Building at Winsor Dam.

The Commission continued and practically completed its reforestation program, and fire lanes were kept clear above the flow line of Quabbin Reservoir. Various areas of hurricane-felled pine and hardwood have been cleared to reduce the fire hazard. Some work was done in 1945 on the control of gypsy moth infestations on the so-called Prescott Peninsula. The three boats of the Commission, the Enfield, Greenwich and Dana, were in use on the Reservoir for the transportation of workmen of the labor force, for fire protection and other duties. The Air Force, in the late spring of 1943, added to its fleet of boats on the Reservoir a forty-two-foot fire boat completely equipped with pumps and forest fire-fighting equipment and maintained the same during the season of open water. In addition, detachments were furnished by the Air Forces during the dry periods for fire-fighting. At the Commission's request, the Air Force, in 1944, secured additional fire-fighting equipment for the protection of the target areas. This equipment includes dual-wheeled fire trucks, auxiliary pumps, several thousand additional feet of hose and an amphibious jeep. This last piece of equipment is particularly adapted for fires on the numerous islands of the reservoir and makes accessible for fire fighting the whole shore line of the reservoir. In addition, during the season of fire hazard, the Air Force has stationed an observer in the tower on Quabbin Hill. In 1945, negotiations were instituted by the Commission with officials at Westover Field relative to claims for damages arising from fires on the watershed in the previous year due to bombing. These claims are still in process of settlement.

The Commission continued its force of local labor for the removal of bodies to Quabbin Park Cemetery and outside cemeteries. A total of 5,761 bodies were removed and this work was completed on October 4, 1944.

The Commission completed the two-way radio system centering in the fire lookout town on Quabbin Hill, which has made it possible to directly contact by air the Metropolitan District Commission's office building at 20 Somerset Street, Boston, as well as Sudbury and Wachusett dams and Shaft 8 of Quabbin Aqueduct. Mobile units installed in the work boat and patrol boat on Quabbin Reservoir and in six cruising cars, transferred to the Metropolitan Police, provide a system for constant communication covering the aqueducts and the Quabbin Reservoir area.

In 1943, the Commission requested the abandonment of about 17 miles of town and county roads within the area of the Ware River Watershed upon which there were no buildings remaining. These will be kept usable, however, to provide additional protection from forest fires.

### *Flood Protection*

The Quabbin Aqueduct carried away the crest of two flood flows in 1944. In June, there was a heavy rainfall on the watershed reaching a maximum of 11.82 inches in Hubbardston in a 24-hour period, which created sudden high water. The Barre Wool Combing Company at the time had under construction a new dam and the prompt operation of the Intake at Shaft 8 removed the possibility of all damage. Lower down on the river in Ware, while there was high water, no damage was suffered by any manufacturing plant. The warning of the Weather Bureau gave ample time to prepare for the hurricane of September 14. The Aqueduct proved ample to carry the high flow. The property under the control of the Commission suffered no serious damage. The wind damage did not approach that of the 1938 storm and no extensive areas of woodland were affected, although the rainfall reached a maximum of 7.84 inches in a 24-hour period. For further details see the attached report of the Chief Engineer.

The Commission conferred on several occasions in 1943 relative to a flood control reservoir at Barre Falls, Massachusetts, approximately 6 miles above the intake of the Commission at Coldbrook, as provided by Chapter 724 of the 76th Congress of the United States, 3rd Session. The Commission also went to Springfield and conferred personally with the Honorable Charles R. Clason, Congressman, relative to the use of the Ware River by the Commission and the possible effect of a floor control reservoir above the Intake Works of the Commission at Shaft 8 of the Quabbin Aqueduct. The Commission also conferred with the engineers from the District Office of the United States Army Engineers, in Providence, Rhode Island, with a view to protecting the interests of the Commonwealth by ensuring the cooperation of that office with the Commission in the preparation of its plans for the Barre Falls dam and reservoir.

### WACHUSETT WATERSHED PROTECTION

The Commission, under WPA agreements, under the provisions of Chapters 286 and 287 of 1939, has furnished the materials and engineering for the construction of sewerage systems in Rutland and Holden. The Holden system was completed and accepted by the Town on November 2, 1943, and the Rutland system on September 17, 1945. The main Rutland-Holden trunk sewer was continued in operation to divert into the Worcester sewerage system the sewage of the United States Veterans' Hospital, of the State Sanatorium in Rutland and of the towns of Holden and Rutland. Further studies for the protection of the Wachusett Watershed were continued, particularly for diverting the sewage of the towns of West Boylston and Boylston from the Watershed.

### HULTMAN AQUEDUCT

The pressure aqueduct, constructed by the Commission to bring the supply from the Wachusett Aqueduct Terminal Chamber to the District, was named the Hultman Aqueduct in memory of the late Eugene C. Hultman. The construction of this aqueduct was continued under the provisions of Chapter 501 of 1938. The federal grant, acceptance of which was authorized under this legislation, amounted to a total of slightly more than \$7,073,000. In October, 1940, the aqueduct was sufficiently completed so that it was possible to open it for the introduction of water from the Quabbin supply. The Commission, being of the opinion that the occasion was worthy of note and regarding it as important to the Metropolitan District as was the introduction of the Cochituate water in 1849 to the City of Boston, arranged for a dedication on October 23, by His Excellency, Governor Leverett Saltonstall. The program included

an inspection of the work at Quabbin Reservoir, the Ware River Intake Works of Quabbin Aqueduct, and the Pressure Aqueduct Intake Works at Southborough. After starting the flow in the aqueduct, the inspection continued to the gatehouse at Norumbega Reservoir in Newton where luncheon was served. Addresses were delivered by Chairman Hultman, Governor Saltonstall, Mayor Maurice J. Tobin of Boston, and Federal PWA Administrator John M. Carmody.

### *City Tunnel*

The Commission completed its Hultman Aqueduct to a point of connection with the Weston Aqueduct supply mains near the Charles River and to a shaft near the river from which the supply will be carried to Chestnut Hill by a pressure tunnel in the deep bedrock under the District, known as the City Tunnel. This extension must be completed in order for the Water District to reap the full benefit of adequate capacity to the center of distribution at Chestnut Hill and of the full pressure which will eliminate the necessity for pumping to the Southern High Service and the reliance upon old and inadequate pumping equipment. This Southern High Service supplied many important Army and Navy installations and war industries and the Commission exhausted every effort to remedy the critical situation by obtaining federal authority and assistance to proceed during the War with the construction of the City Tunnel. In spite of recommendations from His Excellency Governor Leverett Saltonstall, the Department of Public Health, Fire Chief Pope of the Boston Fire Department, General Terry of the First Corps area and from Chief of Staff John S. Barleon of the First Naval District Headquarters, and in spite of the endorsement of Regional Director Walter H. Wheeler of the War Production Board, the Commission, after continuing its efforts until late in 1942, was advised that the Federal Works Agency would not approve the project, as it was not considered essential to the War effort.

The Commission's forces spent a great deal of time in studies and designs intended to shorten the time of construction of the tunnel by the closer spacing of shafts. It has now completed its plans for the construction along the lines originally proposed and will proceed to complete the work as soon as funds are made available.

In addition to the City Tunnel, its extension to serve also the Northern High Service, a new distributing reservoir in the Blue Hills and other projects were included in a list of post-war projects for which preliminary studies have been undertaken in cooperation with the Emergency Public Works Commission, as provided in Chapter 517 of the Acts of 1943.

### REAL ESTATE ACQUISITIONS

The Commission has acquired for reservoir and construction purposes and sanitary protection in the Swift River watershed a total to date of approximately 80,949 acres of land; for sanitary protection and construction purposes in the Ware River watershed, a total of about 21,097 acres; and for construction purposes along the line of the Hultman Aqueduct, 563 acres. Areas leased to the Northeastern Timber Salvage Administration were released to the Commission and the logs removed from the ponds.

### WINSOR MEMORIAL

A memorial to former Chief Engineer Frank E. Winsor was dedicated on June 17, 1941. It is located on a promontary alongside the road overlooking the reservoir and Winsor Dam, and consists of a granite marker supporting a bronze bas-relief of Mr. Winsor.

### LITIGATION

The office of the Attorney General represented the Commission in the trials of various petitions brought against the Commission for damages occasioned by takings as well as proceedings in the Bills in Equity brought by the Arthur

A. Johnson Company and the Benjamin Foster Company relative to their claims for the construction of Quabbin Dike and Winsor Dam, respectively.

In 1943, all matters arising from Contract S1 with M. F. Gaddis, Inc., and the Employers Liability Assurance Corporation, Ltd., their surety, were closed and upon the payment of \$1,000.00 withheld by the Commission, said payment being authorized in writing by the Attorney General, and releases being duly received by the Commission, this complicated matter was closed.

In 1944, the petition of the Ludlow Manufacturing Associates was tried before a jury in the Superior Court for Hampden County, Springfield, Massachusetts, and a verdict was returned by the jury in the sum of \$239,582.90. This case is still pending as exceptions were taken by the Petitioner for adjudication by the Supreme Judicial Court.

The Supreme Judicial Court of the Commonwealth handed down an Opinion on May 7, 1945, in favor of the Commonwealth in the case of Benjamin Foster vs. Commonwealth of Massachusetts acting through its Metropolitan District Water Supply Commission. The case had been taken to said Court on Exceptions.

The Supreme Judicial Court of the Commonwealth on May 7, 1945, handed down its decision in the petition of Arthur A. Johnson Corporation vs. Commonwealth of Massachusetts, acting through the Commission. This decision upheld the finding of the Superior Court in favor of the Commission.

#### CONTRACTS

During the six fiscal years, the Commission executed 47 contracts for construction work and for the furnishing of equipment. See the accompanying report of the Chief Engineer for details. The Commission also executed on May 1, 1945, a contract with the New England Power Company for the sale to that company of electricity to be generated at the Winsor Dam Outlet Works, upon completion of the installation of power generating equipment.

#### SPECIAL INVESTIGATION

Under the provisions of Chapter 91 of the Resolves of 1941, the Commission was represented, by its Chief Engineer, on a special commission to investigate the use of the new Metropolitan supply by additional municipalities. The proposals of the Commission resulted in the passage of Chapter 543 of the Acts of 1943, which extended the limits of the District, cut previous standby charges in half and practically eliminated entrance fees. The interest aroused led to the appointment by His Excellency, Governor Saltonstall, of a committee from representative municipalities in the Metropolitan area to study the matter further. These studies were further promoted by His Excellency, Governor Tobin, and resulted in the proposal to establish a flat wholesale rate of \$40 per million gallons to all cities and towns in the Metropolitan area within reach of the distribution system, and to provide for the acquisition by the District of certain local works upon their abandonment for water supply purposes. The proposals of the Governor's committee were subsequently enacted as Chapter 587 of the Acts of 1945.

#### HONOR ROLL WORLD WAR II

The roll of the Commission's employees who joined the Armed Forces in World War II contains the following names:

Albrecht, George W.	Brown, Henry E.
Aubey, Millard H.	Brown Kirkwood B.
Babier, Ernest W.	Bunker, Raymond T.
*Bartlett, David B.	Bussey, Edward M.
Belknap, Harold A.	
Bennett, Kenneth	Callanan, Charles M.
Bliss, Hayward E.	Calver, Arthur W., Jr.
Brown, Edmund H.	Carey, Edmund T.

Carlson, Oscar  
 Chapin, Sumner R.  
 Chetwynd, Charles B.  
 Childs, Felix J.  
 Cifelli, Flaviano  
 Clark, Vern  
 Cobb, Edwin B.  
 Cole, Gardner E.  
 Cornell, Frank E.  
 Cruickshank, James  
 Crumb, Lloyd B.  
 Cushman, Frank M.  
 Czaga, Boleslaw

Dansereau, Harold  
 Davenport, Fred A.  
 Davidson, Warren E.  
 Davis, Robert H.  
 deLuccia, Charles A.  
 Delude, Albert L., Jr.  
 Dockham, Richard  
 Donovan, Frances G. (Miss)  
 Dorman, John W.  
 Dyer, Robert T., Jr.

Fernald, Joseph A.  
 Ferez, William  
 Fielding, John A.  
 Fiorini, Elmer B.  
 Fitzpatrick, Cornelius E.  
 Fulchino, Carmine E.

Gafney, James F.  
 Graves, Frederick L.  
 Green, Douglas V.  
 Griffin, Andrew J.  
 Gunning, Edward

Hagan, William A.  
 Harris, Raymond C.  
 Harrison, Richard E.  
 Hilly, William F.  
 Howland, Norman  
 Hudson, Richard C.  
 Hughes, Thomas J.  
 Hurd, Joseph Allan, Jr.

Jacobson, Carlton S.  
 Johnson, Herbert C.  
 Johnston, Robert S.

Kelley, Walter B.  
 Kempt, Warren  
 King, Gilbert M.  
 King, Matthew J.  
 Kulig, Joseph

\*LaFrance, Henry A.  
 Leighton, Raymond W.

Lewis, Dale  
 Linnekin, Osborne R.  
 Lufkin, Alsander

MacLeod, James H.  
 Malo, Theophile J.  
 Marden, Douglas W.  
 Marshall, Laurence  
 Mason, Ronald L.  
 Martin, Lloyd D.  
 Martin, Richard H.  
 McCabe, James J.  
 McGuine, Thomas J.  
 McSweeney, Richard B.  
 Medowski, Tadeus  
 Meegan, Edward  
 Mossberg, Roland

O'Connell, Paul  
 O'Connor, Harry N.  
 O'Malley, Charles  
 O'Malley, William C.  
 O'Toole, Joseph

Pasanen, Otto O.  
 Paul, William C.  
 Phillips, Earle D.  
 Pike, Stuart D.  
 Potter, William W.  
 Proud, Ernest L.  
 Prudente, William  
 Prue, Francis L.

\*Quirk, William F.

Radasch, Paul E.  
 \*Reardon, William T.  
 Rice, Warner  
 Rich, Charles J.  
 Roberts, Carlton N.  
 Rockwood, Arthur  
 Rosen, Bernard D.  
 Rowe, Francis G.  
 Rusiecki, Theodore S.

Segur, Willard  
 Skerry, Clifford  
 Stead, William H.  
 Southworth, Edwin W.  
 Spurr, Jerome L.  
 Stone, Bernard W.  
 Swanson, A. David  
 Sullivan, Donald M.  
 Sullivan, Robert P.

Tedford, Ralph W.  
 Thornton, Donald  
 Thornton, Elliott  
 Trela, Stanley

\*Trowt, William A.

Vertic, John J.

Urban, Walter  
Urlass, Charles K.

Weaver, Lester R.  
Warren, Richard G.  
White, Merton R.  
Willey, Harold W.

Vaitikaitis, Francis J.

The supreme sacrifice was made by those whose names are marked with an asterisk, which indicates a gold star.

#### FINANCIAL

Appended hereto is a statement of the Commission's expenditures and disbursements for the last six fiscal years and from the date of its appointment.

Under the provisions of Chapter 541 of the Acts of 1943, the Commission submitted to the Budget Commissioner estimated expenditures for allotment periods for the fiscal years commencing with 1943.

#### REPORTS

The reports of the Chief Engineer which have been appended to the Commission's reports for each of the six fiscal years ending November 30, 1940, 1941, 1942, 1943, 1944, and June 30, 1945, have been similarly abbreviated for the purpose of publication and the combined report is appended hereto.

Some of the earlier of the six annual reports were submitted to the General Court over the signature of members of the Commission who have since died or whose term has expired. The last of the six reports was submitted to the General Court over the signatures of

WILLIAM T. MORRISSEY, *Chairman*

EDWARD J. KELLEY, *Associate Commissioner*

CHARLES H. BROWN, *Associate Commissioner*

## REPORT OF THE CHIEF ENGINEER

*To the Metropolitan District Water Supply Commission.*

GENTLEMEN:—The following is a report of the engineering department for the six fiscal years ending November 30, 1940, 1941, 1942, 1943 and 1944, and June 30, 1945. There are included certain statistical and other data covering the complete calendar years.

All important items of construction in the Quabbin Reservoir area and along the Quabbin Aqueduct and the new pressure aqueduct, recently named the Hultman Aqueduct, as far as the Charles River have been completed. Minor items on which miscellaneous work is continuing include the reforestation of the Quabbin Reservoir watershed lands, seasonal clearing ahead of the rising water level, access roads, fire lanes, fencing, and the hydro-electric power plants at Winsor Dam and at Quabbin Aqueduct.

That portion of the Quabbin Reservoir construction consisting of cemetery relocation was completed September 14, 1943. Pending the completion of all the construction works, the various completed portions have been maintained and operated.

Progress was made on the record plans of the completed work. Designs were practically completed for extending the Hultman Aqueduct to Chestnut Hill by means of a deep rock tunnel from the shaft which was sunk at the Charles River marking the easterly end of that portion completed in 1941 with Federal aid; and during the early war years, upon the advice of the Federal Works Agency representative, the designs were altered to include three additional shafts in Newton in order to hasten the construction and eliminate the necessity of pumping at Chestnut Hill Reservoir. However, none of this tunnel construction was done on account of the failure to receive Federal approval which was necessary under war conditions. This failure necessitated further modifications in the tunnel design, and the plans and specifications for this extension are now ready for advertisement, although the present post-war conditions point to a much higher cost than originally provided for.

On October 30, 1941, the Legislature authorized the Commission to design and construct five projects to provide for sewage disposal needs of the north and south Metropolitan Sewerage Districts. Commencing in 1942 work has been in progress on the designs and preparation of plans, particularly for the proposed sewage treatment plant on the South Metropolitan System at Nut Island.

### ORGANIZATION

Stanley M. Dore, Assistant Chief Engineer, continued to act as deputy chief. He also carried out important assignments in the collection and presentation of data in connection with contractors damage claims. Walton H. Sears continued as Mechanical Engineer, in charge of designs and specifications for plant and equipment. He completed special assignments in connection with water diversion damage claims. Charles L. Coburn continued as Principal Designing Engineer until his resignation January 26, 1942. Lawrence M. Gentleman continued as Associate Civil Engineer, except for a period of war work, April 26, 1941, to February 14, 1944, in charge of the detail work on design and contract and working drawings.

William W. Peabody continued as Division Engineer in charge of the Quabbin Reservoir and Aqueduct Division, and after August 10, 1942, of the entire field organization under the Reservoir and Aqueduct Division. He retired from the service of the Commission December 15, 1944. Coleman C. McCully continued as Division Engineer, in charge of the Wayland-Weston Division until its discontinuance, and his resignation from the service, April 30, 1941. Frederick W.



LOOKING ACROSS WINSOR DAM FROM THE EAST ABUTMENT



WINSOR DAM SPILLWAY



Gow continued as Division Engineer, in charge of the Southborough-Framingham Division until its discontinuance October 18, 1940, then in charge of the City Tunnel Division until its discontinuance on August 10, 1942, following which he temporarily succeeded the late Samuel E. Killam as Director and Chief Water Supply Engineer of the Water Division of the Metropolitan District Commission. Since his recall, December 1, 1944, he has continued as Division Engineer in charge of the Reservoir and Aqueduct Division.

The following consulting engineers were employed from time to time by the Commission; Charles T. Main, Inc., Boston; Metcalf & Eddy, Boston; the late Samuel M. Ellsworth, Boston; James F. Sauborn, New York; Greely & Hanson of Chicago and others.

The assignment of employees under the direction of the Chief Engineer at the end of each of the last six fiscal years was as follows:

	Nov. 30 1940	Nov. 30 1941	Nov. 30 1942	Nov. 30 1943	Nov. 30 1944	June 30 1945
Headquarters Office, Designing Division, 20 Somerset St., Boston . . . . .	67	38	29	29	37	37
Reservoir and Aqueduct div. Administration Bldg. at Winsor Dam, Belchertown . . . . .	51	36	13	18	21	20
Ware River Intake Building, Coldbrook City Tunnel Office, 107 Charles St., Auburndale . . . . .	23	23	18	18	11	11
Wayland-Weston Division . . . . .	72	43	30	22	23	23
	55	—	—	—	—	—
Total Engineering Force . . . . .	268	140	90	87	92	91

#### HEADQUARTERS OFFICE

*Watershed Real Estate.* Reports and recommendations to the Commission were continued with respect to the purchase of real estate for Quabbin Reservoir and for the sanitary protection of the Swift and Ware River watersheds. The total acquired to June 30, 1945, for Quabbin Reservoir, including the General Taking of 74,886 acres, is 80,949 acres, distributed as shown in the following tabulation:

#### LOCATION OF REAL ESTATE ACQUIRED FOR QUABBIN RESERVOIR

(Title vested in Commonwealth)

Barre . . . . .	22	Pelham . . . . .	6,925
Belchertown . . . . .	4,841	Petersham . . . . .	20,851
Hardwick . . . . .	5,375	Shutesbury . . . . .	4,516
New Salem . . . . .	29,786	Ware . . . . .	8,201
Orange . . . . .	55	Wendell . . . . .	377

Of this total settlements have been secured covering 79,227 acres. The total acquired for the Ware River watershed protection is 21,097 acres, of which settlements have been secured covering 19,814 acres.

An appended table shows all the real estate taking plans prepared and filed to date covering the entire Quabbin and Ware development. An accompanying table shows the readjustment of town and county lines.

*Hultman Aqueduct Real Estate.* Of a total of 563 acres of land taken in fee and easement for the purposes of the Hultman Aqueduct, including the City Tunnel, settlements have been secured covering 560 acres.

*Water Diversion Claims.* The preparation of data was continued for use of attorneys in water diversion cases. Assistance, including testimony of the Chief Engineer and others, was rendered in the defense of the last of these suits that was brought by the Ludlow Manufacturing Associates, in Hampton County, November 16 to December 14, 1944.

*Contract Damage Claims.* The preparation of data was continued for use of attorney in the suit brought by the Arthur A. Johnson Corp., and also in a suit brought by the Benjamin Foster Co. in September, 1940.

The final opinion of the Supreme Judicial Court of Massachusetts in the Johnson suit was delivered March 30, 1945, and overruled the exceptions taken by the petitioner to the Superior Court decision in favor of the Commonwealth made April 7, 1941, which decision completely exonerated the Commission of

## READJUSTMENT OF TOWN AND COUNTY LINES IN QUABBIN RESERVOIR AREA

Original Town and County	Acres Annexed To						Total Acreage in Discontinued Towns
	Belchertown	Hampshire County Pelham	Ware	Hardwick	Worcester County Fetersham	Franklin County New Salem	
Prescott, Hampshire	—	—	—	—	138	11,525	11,663
Enfield, Hampshire	1,699	1,368	4,695	—	—	3,500	11,262
Dana, Worcester	—	—	—	—	12,132	—	12,132
Greenwich, Hampshire	—	—	2,502	607	6,567	2,934	12,610
	1,699	1,368	7,197	607	18,837	17,959	47,667

any allegation of "constructive fraud" and found no breach of warranty through concealment of information in its possession as to the nature of the subsoil in borrow pits for the Quabbin Dike. The following quotation is from the Court's final decision: "He found that there was no breach of any express or implied warranty, and that neither the commission nor any of its representatives made any false representation or concealed any information whereby the petitioner was deceived or defrauded. \* \* \* The judge found that these plans and the shovel cuts as well furnished full information that the overburden was a glacial till containing boulders and that the excavation would be fairly difficult, and that the difficulty experienced by the petitioner in excavating the area was due to the presence of boulders in the glacial till and not to the fact that the term hardpan did not appear on the plans. It would almost seem to be common knowledge that the excavation of glacial till of the character revealed by the shovel cuts in this area would not be easy."

The final opinion of the Supreme Judicial Court of Massachusetts in the Foster suit was delivered May 7, 1945, and completely upheld the contentions of the Commission as to the interpretation of the contract provisions giving the engineer control over the work. The following quotation from the Court's opinion summarizes the matter: "The problems of the desirable degree of imperviousness of the core and of the thickness and the fineness of material required to produce that degree of imperviousness and where that material could be obtained in proper quantity and proportion were strictly engineering problems which under the contract were to be solved by the engineers. For a court to substitute its own lay opinions on such matters, however well it may think itself informed through evidence, for the opinion of the engineers in the field to whom the parties have entrusted such decisions would be directly contrary to the terms of the contract and in the long run likely to produce unsound results." Furthermore, since fraud was claimed in connection with the Engineer's decisions, it should be noted that the opinion stated: "There is no finding that any of the decisions complained of was arbitrary, capricious, or tainted by compulsion or fraud."

*Record Drawings.* Record drawings were completed of the Spot Pond bypass, Fells Reservoir enlargement, Western Aqueduct siphons, Assabet Bridge lining, Rutland-Holden trunk sewer, Holden sewer system, Rutland Sewer system, Quabbin Aqueduct except real estate, and Norumbega Reservoir. Work on the record drawings of the Hultman Aqueduct was practically discontinued after V-E day to allow the force to concentrate on plans for post-war construction.

*Hydrographic Data.* Gaging stations were continued in cooperation with the United States Geological Survey on the Ware River at Colebrook, on the East Branch of the Swift River at the regulating dam, on the Connecticut River at Thompsonville, Connecticut, and on the Chicopee River at Indian Orchard; last gaging station replaces that at Bircham Bend which was destroyed by the flood of September, 1938.

### *Contracts and Specifications*

Plans and specifications were prepared for the following contracts which were executed during the six fiscal years. That portion of the work indicated as being done under PWA contracts was included under two Federal grants, PWA Docket No. Mass. 1520-F, Mass State Project D-202, and PWA Docket No. Mass. 1551-F, Mass State Project D-208:

*Contract 67,* a PWA contract, for improving the access road to Shaft 9 of Quabbin Aqueduct in the Town of Barre. Six bids were received August 8, 1940, ranging from \$1,546.61 to \$2,000.00. The contract was executed August 27, with George E. Duteau, Springfield, Mass., the lowest bidder.

*Contract 83-A,* a PWA contract, for electric work in connection with alterations in the Spot Pond Pumping Station, required in connection with the Spot Pond By-Pass in the Town of Stoneham. Five bids were received September

5, 1940, ranging from \$1,048.00 to \$2,335.00. The contract was executed September 20, with the John J. Reddington Electric Service Company, Boston, Mass., the lowest bidder.

*Contract 84*, a PWA contract, for constructing the head house at Shaft 4 of the Southborough Tunnel to house the six 72-inch Dow-disc operating valves on the new pressure aqueduct. Five bids were received September 12, 1940, ranging from \$104,986.53 to \$125,616.40. The contract was executed September 18, with John F. Griffin Co., Cambridge, Mass., the lowest bidder.

The tunnel unwatering pump chamber at the bottom of the shaft is designed to use the same 900 H.P. motor as is used for a similar purpose at the bottom of Shaft 1 of Quabbin Aqueduct.

*Contract 94*, a PWA contract, for sinking a caisson to sound ledge for the Charles River shaft of the pressure aqueduct, Shaft 5, in the Town of Weston. Thirteen bids were received February 5, 1940, ranging from \$215,548.45 to \$390,267.50. Four were from New York contractors, one from Pennsylvania, one from New Jersey and the remainder from Massachusetts. The contract was executed February 20, with John MacDonald Construction Company, Newton, Mass., the lowest bidder.

*Contract 96*, a PWA contract, for constructing a chlorine storage house and appurtenances and furnishing and installing emergency chlorine equipment at Norumbega Reservoir in the Town of Weston. Twenty bids were received February 1, 1940, ranging from \$48,387.00 to \$76,357.00. The contract was executed April 5, with the Chandler Construction Company, Boston, Mass., the lowest bidder.

*Contract 97*, a PWA contract, for furnishing a Diesel engine-driven pumping unit for Bear Hill Service at the Spot Pond Pumping Station. Five bids were received March 21, 1940, ranging from \$14,236.00 to \$17,077.77. The contract was executed April 22, with Ralph P. Hall, Inc., Boston, Mass., the lowest bidder.

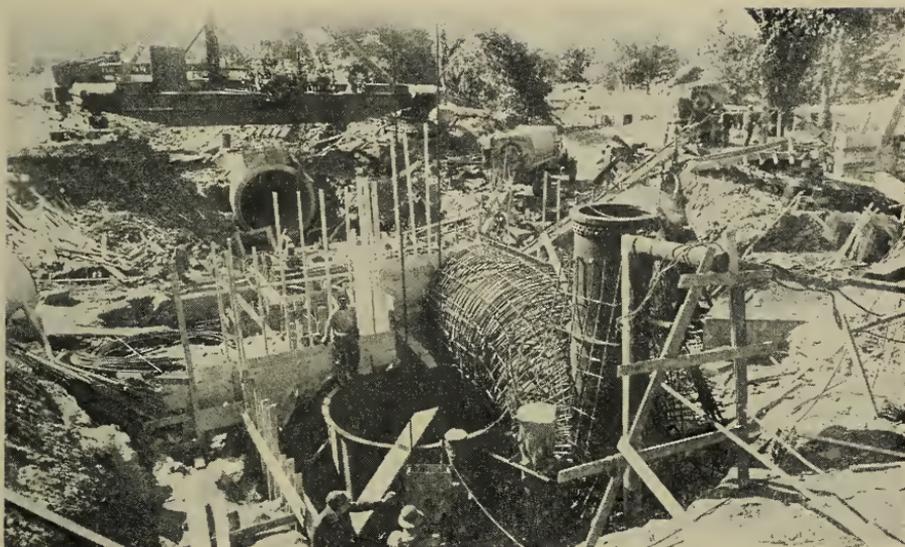
*Contract 99*. A PWA contract, for enlarging the Fells Distribution Reservoir of the Northern High Service in the Town of Stoneham and cities of Malden and Melrose. Eleven bids were received December 21, 1939, ranging from \$134,380.93 to \$199,156.85, all from Massachusetts contractors except one from New Jersey. The contract was executed January 9, 1940, with the Middlesex Construction Company, Framingham, Mass., the lowest bidder.

*Contract 101*, a PWA contract, for bronze tablets marking structures built under the Federal loan in the towns of Barre, Belchertown, Marlborough, Ware, West Boylston and Weston. Three bids were received January 11, 1940, ranging from \$397.68 to \$1,094.17. The contract was executed January 30, with the Dimond-Union Bronze Works, Boston, Mass., the lowest bidder.

*Contract 102*, a PWA contract, for alterations to property of the Commission, formerly known as the Sauer House in Belchertown, near the Administration Buildings. Nine bids were received June 6, 1940. This contract consisted of four items: Item 1, for linoleum, \$80.50, executed August 3, with the Springfield Floor Covering Center, Springfield; Item 2, for plumbing, \$615.00, executed July 11, with R. G. Harrington, Ware; Item 3, for heating, \$578.00, executed July 11, with The Mutual Plumbing and Heating Company, Amherst; Item 4, for electrical work, \$251.00, executed August 3, with the Springfield Electrical Company, Inc., Springfield, each bidder the lowest for the item in question.

*Contract 103*, a PWA contract, for furnishing a work boat for use on Quabbin Reservoir. Five bids were received October 10, 1940, ranging from \$12,975.00 to \$16,711.00. The contract was executed October 25, with the Quincy Adams Yacht Yard, Inc., Quincy, Mass., the lowest bidder.

The bids on this contract were received as the result of a readvertisement. Previously on September 12, 1940, four bids were received, ranging from \$8,985.00 to \$18,711.00. The contract was awarded to the lowest bidder, who defaulted on his bid bond; and all other bids were rejected and the contract readvertised.



CONTRACT 74. CONSTRUCTING THE CONNECTION BETWEEN UPTAKE SHAFT 4  
AND THE CUT AND COVER AQUEDUCT



CONTRACT 94. SINKING CAISSON FOR CHARLES RIVER SHAFT, HULTMAN  
AQUEDUCT



This 46-foot boat, the "Enfield", was designed in cooperation with Marine Architect George Owen of the Massachusetts Institute of Technology for a top speed of 12 statute miles per hour

*Contract 105*, a PWA contract, for furnishing and installing lightning protection systems on the Commission's Buildings in the towns of Barre, Belchertown, Hardwick, Marlborough, Rutland, Southborough, Weston and West Boylston. Four bids were received May 29, 1941, ranging from \$4,135.00 to \$9,420.00. The contract was executed June 4, with the Boston Lightning Rod Company of Boston, Mass., the lowest bidder.

*Contract 106*, a PWA contract, for improvement of access roads in the Quabbin Reservoir area in the towns of Hardwick, Petersham, New Salem and Belchertown. Five bids were received May 16, 1940, ranging from \$28,298.71 to \$38,562.39. The contract was executed June 5, with A. R. Montuori & Co., Fitchburg, Mass., the lowest bidder.

*Contract 107*, a PWA contract, for constructing buildings on Quabbin Hill in the town of Ware. Two bids were received November 7, 1940, for \$71,165.00 and \$81,141.00. The contract was executed December 2, with H. P. Cummings Construction Company, Ware, Mass., the lower bidder.

These buildings were designed in cooperation with Consulting Architects Densmore, LeClear and Robbins. The main building houses the two-way radio equipment connected by direct wire from the administration building. It includes a tower, extending to a height of 81 feet above the summit, which supports the radio mast, provides a lookout for spotting fires in the reservoir areas, and an observation point for the general public. There is also a public toilet building east of the summit and conveniently near the Quabbin Hill parking area.

*Contract 108*, a PWA contract, for constructing docking facilities consisting of a utility wharf and ramp, in a protected bay at the east end of Winsor Dam in the Town of Ware. Four bids were received September 12, 1940, ranging from \$18,117.75 to \$25,100.95. The contract was executed September 27, with J. J. Callahan, Boston, Mass., the lowest bidder.

*Contract 109*, a PWA contract, for furnishing and installing a two-way radio system for use in the protection of the District's watersheds and aqueducts in the towns of Ware, Belchertown, Pelham, Barre, Clinton and Southborough. Five bids were received, October 17, 1940, ranging from \$20,341.92 to \$28,301.25. The contract was executed October 30, with Kenworthy & Taylor, Inc., of Everett, Mass., the lowest bidder.

The system includes points of communication in the building on the summit of Quabbin Hill, in patrol automobiles operating in the watershed area, at the Ware River intake works, Wachusett Dam and Sudbury Dam, and permits communication with the existing Metropolitan District police installations in Boston.

The equipment consists of five fixed stations in the towns of Belchertown, Ware, Pelham, Barre, Clinton and Southborough, and nine mobile units comprising six patrol cars, two boats and one fire truck.

*Contract 110*, a PWA contract, for completing the excavation of the Charles River Shaft of the new pressure aqueduct in the town of Weston. Seven bids were received August 29, 1940, ranging from \$261,282.57 to \$412,293.00. All were from Massachusetts contractors except one from Maryland. The contract was executed September 13, with C. & R. Construction Company, Boston, Mass., the lowest bidder.

*Contract 111*, a PWA contract, for constructing the superstructure of the outlet works at Winsor Dam in the Town of Belchertown. Six bids were received October 3, 1940, ranging from \$47,788.23 to \$62,219.50. The contract was executed October 18, with Chandler Construction Company, Inc., Boston, Mass., the lowest bidder.

*Contract 112*, a PWA contract, for constructing a spillway at the top of Shaft 2 of Quabbin Aqueduct in the Town of Holden. Twelve bids were received August 29, 1940, ranging from \$6,671.05 to \$12,768.70. The contract was executed September 16, with the Wachusett Engineering Company, Inc., Fitchburg, Mass., the lowest bidder.

*Contract 113*, for making core borings for subsurface investigations along the line of the proposed pressure tunnel from the Charles River Shaft, in the counties of Middlesex, Norfolk and Suffolk. Six bids were received July 23, 1940, ranging from \$14,839.30 to \$27,918.90. They were from contractors in New York, Pennsylvania and Indiana. The contract was executed August 6, with Riley Engineering and Drilling Company, Brooklyn, New York, the lowest bidder.

*Contract 114*, for making core borings for subsurface investigations at additional shaft sites on the line of the proposed City Tunnel in the City of Newton. One bid was received August 24, 1942, for \$4,200.00. The contract was executed August 27, with B. F. Smith & Co., Inc., of Boston, Mass., the only bidder.

*Contract 116*, a PWA contract for the construction of a building for storage and for public toilets in Quabbin Park Cemetery in the Town of Ware. Five bids were received October 17, 1940, ranging from \$10,735.00 to \$12,584.00. The contract was executed October 25, with Chandler Construction Company, Inc., Boston, Mass., the lowest bidder.

This building was designed in cooperation with the late Frederick Kingsbury, Consulting Architect.

*Contract 118*, for the construction of stone masonry posts and walls and other miscellaneous work at Winsor Dam and Quabbin Dike in the towns of Belchertown and Ware. Two bids were received October 15, 1942, for \$4,979.30 and \$9,459.80. The contract was executed October 22, with A. R. Montuori of Fitchburg, Mass., the lower bidder.

*Contract 119*, for furnishing and setting two granite pylons, one in the traffic circle at each end of Winsor Dam in the towns of Ware and Belchertown. Four bids were received April 24, 1941, ranging from \$4,588.00 to \$7,900.00. The contract was executed May 13, with W. C. Canniff & Sons, Inc., Boston, Mass., the lowest bidder.

*Contract 120*, for drilling a well for the water supply of the buildings on Quabbin Hill constructed under Contract 107 in the Town of Ware. Two bids were received August 8, 1940, for \$800.00 and \$1,820.00. The contract was executed August 15, with R. E. Chapman Company, Oakdale, Mass., the lowest bidder.

*Contract 124*, a PWA contract, for the construction of a transmission line between the Winsor Dam Outlet Works in Belchertown and the Utility Building on the top of Quabbin Hill, in the Town of Ware. Three bids were received January 16, 1941, ranging from \$15,142.00 to \$17,940.00. The contract was executed February 3, with George W. Ellis Company, Inc., Boston, Mass., the lowest bidder. The contract had been previously advertised and bids opened December 5, 1940. The same three bidders submitted bids ranging from \$15,697.00 to \$32,152.00, which were rejected as being too high.

*Contract 125*, for constructing in the Town of Belchertown on the ramp in front of the administration building leading from the seaplane hangar into Quabbin Reservoir, a marine railway and equipment for the launching and hauling out of boats and seaplanes. One bid was received August 21, 1941, for \$8,000.00. The contract was executed August 25, with the Berke-Moore Company of Newton, Massachusetts, the only bidder.

*Contract 127*, for furnishing and installing the switchboard equipment in the District's Sudbury Dam power plant in the Town of Southborough required in conjunction with the operation of the gate house constructed under Contract 84. Three bids were received July 17, 1941, ranging from \$2,263.00 to \$2,439.00. The contract was executed July 18, with A. C. Senecal Co., Westboro, Mass., the lowest bidder.

*Contract 129*, a PWA contract, for constructing a drainage pipe line across the pressure aqueduct in the Town of Weston. Eleven bids were received February 12, 1941, ranging from \$475.00 to \$1,447.00. The contract was executed March 6, with John Williams, Dorchester, Mass., the lowest bidder.

*Contract 130*, a PWA contract, for grading, loaming and grassing and the improvement of access roads in the vicinity of the pressure aqueduct works in the towns of Marlborough, Southborough and Weston. Five bids were received May 1, 1941, ranging from \$6,706.61 to \$8,862.98. The contract was executed May 5, with the Lee Crane Service, Inc., Boston, Mass., the lowest bidder.

*Contract 148*, for the sale and purchase of electric energy to be developed at Winsor Dam in the Town of Belchertown. This contract, executed May 1, 1945, was negotiated with the New England Power Company. Its principal provision is for the sale of electricity at the Outlet Works at 22,000 volts, for 6.25 mills per Kwh. from 7:00 A.M. to 11:00 P.M., Monday to Friday, inclusive, and during at least seven hours on Saturday.

*Contract 149 (A, B, C, D, E, F)*, for furnishing and delivering a waterwheel, generator, switchgear, transformer, substation and appurtenances in the Town of Belchertown. Bids were received May 31, 1945:

(A) Two bids were received for the 700 H.P. single-runner vertical hydraulic turbine, for \$27,953.00 and \$29,497.00. The contract was executed June 25, with S. Morgan Smith Co., York, Pa., the lower bidder.

(B) Three bids were received for the 1500 Kva. 2400-volt generator, ranging from \$17,192.00 to \$17,861.00. The contract was executed June 16, with the Electric Machinery Mfg. Co., Minneapolis, Minn., the lowest bidder.

(C, E, F) Two bids were received for the switchgear, substation and storage battery ranging from \$15,008.00 to \$15,294.36. The contract was executed June 21, with the General Electric Co., Lynn, Mass., the lower bidder.

(D) Three bids were received for the 1500 Kva. 22000 to 2400-volt transformer, ranging from \$4,299.00 to \$4,770.00. The contract was executed June 25, with the Erie Electric Co., Buffalo, N. Y., the lowest bidder.

In addition, plans and specifications were prepared for six minor PWA equipment contracts numbered 95, 104, 121, 122, 123 and 128, for furnishing valves, cranes and other equipment required for the pressure aqueduct, for the enlargement of Fells Reservoir, and for Bear Hill Service at the Spot Pond Pumping Station, all of which were executed.

Some of the more important items are:

One 20-ton hand operated bridge crane at the Winsor Dam Outlet Works.  
One 20-ton hand operated bridge crane at the Hultman Aqueduct Control Works, equipped with a 7½-ton auxiliary electric hoist to serve the deep dry well and pump chamber at the bottom of Shaft 4. One Diesel engine-driven 5 m.g.d. capacity pump at the Spot Pond pumping station, for Bear Hill Reservoir Service.

### *Designs*

Studies and designs were continued of structures proposed to be constructed but not yet placed under contract, as follows:

*Winsor Dam.*—Designs were completed in cooperation with the late Frederick Kingsbury, Consulting Architect, for improvements at the entrances to Administration Road.

*Power Development.*—Supplementing the designs completed for the Winsor Dam Outlet Works, studies were continued of the development of power in the new station at the outlet works of Quabbin Aqueduct and of the benefit of the new supply to the power development in existing stations.

*Quabbin Aqueduct.*—Studies were made of the installation of gates at the bottom of Shaft 4 which will make it possible to prevent excessive waste over the spillway at Shaft 2, so that even in extreme floods practically the entire diversion from the Ware River intake works can be discharged into Quabbin Reservoir at Shaft 11A. One-way shutters of an improved type were designed

and were purchased in 1940, and installed in the headworks at Shaft 11A, which is the outlet from the aqueduct into Quabbin Reservoir for the diversions from the Ware River. Designs were completed of ventilating equipment and other accessories required for the installation in 1941 in the service building at Shaft 8 of the gasoline-driven electric generator previously used in the Commission's laboratory in Enfield. Designs were completed for a catwalk outside the Ware River Intake Building to facilitate the removal of debris from the course rocks. The necessary material was purchased and installed in 1945.

*Quinapoxet River Diversion.*—Studies were completed in 1940 relative to diverting into Quabbin Aqueduct at Shaft 2 the waters of the Quinapoxet River for storage in Quabbin Reservoir. Such diversion was found to be uneconomical and the Quinapoxet River will be allowed to flow into the Wachusett Reservoir as at present.

*Wachusett Watershed Protection.*—Designs were completed in 1942 of improvements and additions to the Rutland Sewer system and of a sewage ejector station to permit the extension of the Holden sewer system to low areas not formerly included. Studies were made in cooperation with the Quabbin Reservoir and Aqueduct Division of a system for diverting from the watershed of Wachusett Reservoir the sewage of West Boylston and Boylston.

*Wachusett Service Building.*—Studies and designs were completed in 1941 in cooperation with the Quabbin Reservoir and Aqueduct Division for alterations in the property of the Commission formerly known as the Spa Building near the south abutment of Wachusett Dam to make provisions for public toilets for the housing of maintenance personnel and for the installation of radio equipment for the use of the Metropolitan police. Six bids were received January 29, 1942, ranging from \$10,475.00 to \$14,571.00. They were rejected as being too high, and no construction was undertaken.

*Hultman Aqueduct—City Tunnel.*—As already described in this report, designs were practically completed for the City Tunnel from Shaft 5 at the Charles River to Chestnut Hill to eliminate as soon as possible the necessity of pumping to the Southern High Service. Various shaft sites were studied and borings were made to determine the depth and character of the bedrock not only along the line of the tunnel to Chestnut Hill but also along a portion of a proposed future tunnel loop under the water district which would extend northeasterly from the unwatering pump chamber at the bottom of Shaft 5, because the requirements for unwatering this future tunnel loop have an important effect on the depth of this shaft and of the Tunnel. Sufficient progress was made on studies for additional borings now needed so that a contract for these subsurface investigations was advertised for the opening of bids on July 3, 1945. Designs were made for water supply connections from the shaft heads, particularly from the top of Shaft 8 at Chestnut Hill. Studies were made of the hydraulics of the proposed future tunnel loop and its relation to the design of the City Tunnel; and studies were made to coordinate the City Tunnel plans with a possible future extension of the distribution tunnel to the northern high service to eliminate the necessity of pumping at Spot Pond.

*Distributing Reservoirs.*—Studies and preliminary designs were made for modification of, and new connections to, existing distributing reservoirs, which must follow the completion of the City Tunnel; also for an additional distributing reservoir in the Blue Hills reservation which would be a much needed appurtenance of the tunnel.

*Barre Falls Flood Control Project.*—In connection with the flood control project, which the federal government is planning at Barre Falls in the Ware River watershed, the Chief Engineer of the Commission was appointed as a member of an advisory board to assist the State Planning Board in its studies and recommendations to His Excellency the Governor on this and other similar Massachusetts projects. Studies were commenced in 1945 of the Barre Falls Project





and of the extent to which the federal proposals conflict with the interests of the Commission in the diversion of the flood flows of the Ware River into Quabbin Aqueduct.

*Neponset Valley Investigation.*—The Chief Engineer of the Commission was appointed as a member of an advisory board of engineers for the Joint Board appointed by the Legislature in 1944, consisting of the Metropolitan District Commission and Department of Public Health studying methods to improve the conditions of the Neponset River. The Board was continued by the 1945 legislature, and the Metropolitan District Water Supply Commission included therein. Studies were commenced of the possibility of diverting into the Charles and Neponset rivers, water from some of the Water District's old sources which will be surplus upon completion of the Quabbin development and the Hultman Aqueduct.

*Enlargement of Metropolitan Water District.*—Studies were made and considerable data assembled for, and assistance rendered to, the subcommittees on finance and on technical matters of the Special Committee appointed in 1944 by His Excellency the Governor to consider the greater use of the sources of the water supply of the Metropolitan Water District.

Assistance was also rendered to various committees of the General Court in their consideration of the Special Committee's proposals. This resulted in a further amendment of the General Laws affecting the conditions of entrance into the Metropolitan Water District and encouraging new cities and towns to join. This was accomplished mainly by reducing the annual assessments, commencing in 1946, to a flat rate of \$40 per million gallons by the annual issue of so-called water-use-development bonds which, in effect, delay the too rapid reduction of the water debt and correct a situation caused primarily by the previous financing of the new Quabbin development with bonds of too short a term considering the permanent character of the works.

### *Sewerage Projects*

Studies were commenced in 1942 on the five projects listed in Chapter 720, Acts of 1941, and amended by Chapter 705 of the Acts of 1945, for the improvement of the Metropolitan Sewerage Systems.

*Project 1—Nut Island Treatment Works.*—Sufficient progress was made on the designs for the proposed sewage treatment plant at Nut Island so that plans and specifications for the fill and appurtenances necessary to prepare the site were practically completed, and the contract was advertised for the opening of bids on September 27, 1945. Prior thereto and following a public hearing by the Division of Waterways of the Department of Public Works on March 20, 1945, all necessary permits were granted by that department and by the United States Engineer Office. Following a public hearing on August 13, 1945, the plans for the project were approved by that department on August 15, 1945.

The plan is outlined in a flow diagram attached hereto, and is designed to remove floating solids and grease, to reduce the amount of suspended solids by detention in sedimentation tanks, for about 1½ hours at the design rate of 112 m.g.d., preceded by about 20 minutes' aeration, to materially reduce bacterial pollution of the harbor and shore waters by chlorination of the effluent during the recreational season, and to digest the sludge and utilize the gas therefrom for low-lift pumping and other plant needs. The digested residue from such a plan is in the form of innocuous humus, and designs are in progress for the disposal of as much of this as is practicable in the form of low-grade fertilizer, and of the remainder through a new deep sea outfall, with provision for taking the digested residue from any future similar treatment plant on the Boston Main Drainage System, which may be built by the City of Boston at or near its Calf Pasture or Moon Island works. Other designs not shown on the flow diagram provide for the construction of diffusers over the outlets of the existing outfall discharge lines so that the treated effluent will be well mixed with the harbor waters at the point of disposal.

The contract was prepared for the making of subsurface investigations to obtain information in addition to that previously available at and near the foundations proposed for the Nut Island works. Bids were opened May 11, 1945. Only one informal bid was received and since this anticipated paying maximum rates of wages allowed under existing Federal regulations, which were lower than the minimum prescribed by the State Commissioner of Labor and Industries, it was impossible to proceed. The necessary investigations were made with a boring rig constructed and manned by the Commission's own forces. Soundings offshore were also made which show that the necessary filling of the site could not be satisfactorily made with material dredged in the vicinity.

*South Metropolitan Sewage Records.*—For about two years, twenty-four-hour composite samples have been collected at about 8-day intervals for analysis of the amount of suspended solids to be expected. Through the courtesy of the Department of Public Health, these samples were analyzed at the Lawrence Experiment Station until the latter part of February 1945, thereafter at the Commission's Park Road Laboratory at Weston.

*Projects 4 and 5—Charles River Basin Storm Overflow Conduits.*—In connection with the marginal conduits on either side of the Charles River and the projected storm overflow relief conduits, inspections and studies were initiated in 1944. Inspections were made of overflows and water courses on both sides of the Charles River.

*Boston Marginal Conduit.*—A recording level gage was installed in the Fens Gatehouse in 1944 to assist in studying the performance of the conduit and its overflows under different tidal conditions. The Parks Division of the Metropolitan District Commission has cooperated fully in these studies and, following recommendations by the Commission's Chief Engineer, a contract was awarded by the Division to revamp the Fens Gatehouse at the entrance to the Boston Marginal Conduit. This work included the reconstruction of the tide gates to the Charles River Basin and the installation of electric motors for the satisfactory operation of the sluice gates controlling the flow entering the gatehouse from the Stony Brook conduits of the City of Boston. Large quantities of floating debris were removed at the Fens Gatehouse, and the difficulties in operation will continue until adequate means are provided for the mechanical removal of such debris from the larger Stony Brook conduit, particularly in times of high rates of storm run-off in this conduit.

*Cambridge Marginal Conduit.*—Recording level gages were installed in the Charles River Dam gatehouse on the Cambridge Marginal Conduit and on the Bridge Street Sewer in June, 1945, to assist in studying the performance of the conduit. The Parks Division has cooperated to the fullest extent in carrying out recommendations of the Commission's Chief Engineer with respect to the control of the gates so as to materially lessen the overflow from the Cambridge Marginal Conduit into the Charles River Basin.

#### *Progress of Contracts*

The following construction work was not included in any of the three field divisions but on account of its location was carried out under the supervision of the headquarters office.

*Contract 83.*—Contract 83, for constructing the Spot Pond By-Pass was continued to completion. In addition to 298 sections already laid under this contract, 71 sections of 60-inch steel-cylinder reinforced concrete pipe were laid, the last section of which was placed January 16, 1940, to complete the line 4,357.4 feet in length. The average number of pipe sections placed per day was two. The connection to the existing 60-inch cast-iron line feeding Spot Pond was completed February 28, and the connection at the north end of the by-pass to the 48-inch line out of Spot Pond near the pumping station April 24. Refill closely followed pipe laying, and after all pipe was laid the line was caulked by hand and the inside mortar joints placed by hand and troweled. The 60-

inch line was satisfactorily tested for water tightness as soon as the connections were completed. Very satisfactory results were obtained; namely, 31 gallons per day per inch of interior pipe diameter per mile of pipe at full working hydrostatic head.

Excavation behind sheet piling for the control chamber for the new supply lines was commenced March 4, 1940, just north of the pumping station. Rock excavation around the existing pipes where blasting could not be permitted, slowed up progress in excavating but this was completed and the concrete mat poured on May 6. The existing 48-inch mains at this location were then taken out and reset to include gate valves, check valve and automatic Dow-disc valve, all of which are housed in the control chamber. After the pipe was set and put into temporary operation, the concrete walls were built in three lifts and finally the roof was poured June 21. The contract was accepted as substantially complete July 15, 1940, except for minor items, and all work was completed early in 1941.

The final estimate dated April 9, 1941, was for \$141,894.22. The contractor's force in 1940 averaged 13 men, the maximum being 21 for the week ending December 23, 1939.

The only major item of plant added was a one-yard speed crane hired from time to time to handle heavy castings at connections.

The total work done and materials furnished under the principal items of Contract 83 are as follows:

Earth excavation and refill . . . . .	12,270 cu. yds.
Rock excavation . . . . .	4,200 " "
Furnishing and laying 60-inch pre-cast concrete pipe . . . . .	4,357 lin. ft.
Furnishing and laying miscellaneous cast-iron pipe and specials . . . . .	117,700 lbs.
Reinforced concrete . . . . .	300 cu. yds.
Miscellaneous concrete . . . . .	280 cu. yds.
Portland cement . . . . .	1,380 lbs.
Miscellaneous iron and steel . . . . .	40,000 lbs.
Caring for and setting metal work furnished by the Commission . . . . .	158,000 lbs.
Permanent fencing . . . . .	4,260 lin. ft.

Important work was done under this contract by the Security Fence Company, subcontractor for fencing.

*Contract 83A.*—Work under Contract 83A, for electric wiring of the alterations in the Spot Pond Pumping Station, was started October 9, 1940 and completed May 2, 1941, at which time a final inspection of the automatic operation of the valves and appurtenances in connection with Spot Pond By-Pass was made.

The final estimate, dated June 4, 1941, was for \$1,095.00. The contractor's force averaged two men for three weeks.

*Contract 85.*—Contract 85, for furnishing and delivering precast steel-cylinder reinforced concrete pressure pipe in the towns of Southborough, Framingham, Wayland, Natick and Weston, was continued to completion. At the beginning of 1940, only 9.6 per cent of all the 12-foot 6-inch pipe and 10.7 per cent of all the 11-foot 6-inch pipe remained to be delivered. All deliveries were completed February 9, except for certain special filler pieces, the necessary measurements for which were delayed by the operations of the laying contractors until June 13, 1940.

The final estimate dated October 15, 1940, was for \$4,198,409.03. The contractor's force averaged 50 men, the maximum being 322 for the week ending December 2, 1939.

*Contract 99.*—Contract 99, for enlarging the Fells Distribution Reservoir, involved the construction of three earth dams of fairly large size and two smaller ones. It included the breaching of one of the original dams so as to connect the existing reservoir with one of the two new basins created. It included also two concrete gate structures in the two largest new dams to provide for unwatering the new basins and to provide also for possible connection to a future deep pressure tunnel distribution loop. Construction began promptly with the excavation to Bedrock along the dam center line. The rock surfaces were thoroughly cleaned and a concrete cut-off wall poured, consisting of a blanket 8 to 10 feet

wide with two parallel projecting fins. Above the concrete the cut-off was constructed of impervious material from borrow areas in the vicinity, rolled in place by a sheep's-foot roller. The remainder of each embankment outside the core was constructed of pervious material purchased by the Contractor from gravel pits in Stoneham and Woburn. On the upstream slope screened gravel and riprap and on the downstream slope loam or soil were placed as the embankment was built up. An access gravel roadway was built around the new basins and across the top of all the dam protected on either side by boulder guard rail and surfaced with an application of sand and tar, one-half gallon to the square yard. The basins in the enlargement were excavated to ledge or to clean sound material by the removal of all loam, subsoil, roots, etc., so that they could be put into use with a minimum of delay. To this end the exposed ledge areas were washed clean and such areas near the dam embankments which contained seams were covered with gunite.

The work of placing impervious embankment was started May 13, 1940, and pervious embankment May 31, and all these embankments were completed August 26. Soil dressing and seeding was completed October 10 and gravel surfacing of the roadway September 23. Placing of screened gravel on the upstream face was started June 7, and all the riprap completed September 26. Concreting operations were started April 24 and completed September 6. Connections from the new isolated basin to the old gate chamber and to a sluice gate in one of the new dams for possible future connection were made by using some of the 60-inch cast-iron pipe removed under contract 77 from the old connections to the Weston Aqueduct head chamber.

The final estimate, dated December 17, 1940, was for \$145,115.80.

The principal items of plant were as follows:

- 4 Power shovels
- 4 Caterpillar bulldozers
- 1 Trench digger
- 1 Power grader
- 1 Sheep's-foot roller

Miscellaneous air compressors, pumps, trucks, etc.

The total work done and materials furnished under the principal items of Contract 99 were as follows:

Clearing . . . . .	20 acres
Stripping . . . . .	18,620 cu. yds.
Earth excavation . . . . .	7,000 cu. yds.
Rock excavation . . . . .	2,310 cu. yds.
Rolled impervious embankment . . . . .	31,460 cu. yds.
Consolidated impervious embankment . . . . .	13,600 cu. yds.
Soil dressing . . . . .	1,500 cu. yds.
Riprap . . . . .	3,500 cu. yds.
Concrete . . . . .	1,290 cu. yds.
Portland Cement . . . . .	2,090 barrels
Fencing . . . . .	6,000 lin. ft.

Important work was done under this contract by the American Chain Link Fence Company, subcontractor for fencing.

*Contract 101.*—Work under Contract 101 consisted of furnishing and erecting bronze tablets in the towns of Barre, Belchertown, Marlborough, Ware, West Boylston and Weston. Eight tablets were delivered and erected.

The final estimate, dated July 16, 1940, was for \$397.68.

*Contract 103.*—Work under Contract 103 consisted of furnishing, equipping and delivering a work boat for use on Quabbin Reservoir. The keel was laid in October, 1940, and the boat was delivered by truck from Quincy to Belchertown on April 16, 1941. It was launched the next day, following which satisfactory performance tests were made.

The final estimate dated June 24, 1941, was for \$13,461.00.

*Contract 105.*—Work under Contract 105, for furnishing and installing lighting protection systems on the Commission's buildings, was commenced July 7, 1941, and was completed before the end of the year except for certain minor tests.

The final estimate dated January 22, 1942, was for \$4,335.00. The contractor's force averaged 4 men for 10 weeks.

*Contract 109.*—Work under Contract 109, for furnishing and installing a radio system, was started November 18, 1940, at the Ware River intake works station. Work at all stations in Ware, Belchertown, Pelham, Barre, Clinton and Southborough was completed and satisfactory final tests were made September 10, 1941.

The final estimate dated November 27, 1941, was for \$20,988.60.

*Contract 113.*—Work under Contract 113, for making core borings in the counties of Middlesex, Norfolk and Suffolk, was started in August, 1940. It consisted of making about 6,000 feet of core borings along the line of the proposed future distribution tunnel loop to supplement borings made under Contract 58 along the two branches of the loop which will drain toward the Charles River shaft. About 4,730 feet of core borings were completed in 1940 and 1,460 feet in 1941, making the total under the contract 6,190 feet.

The final estimate dated April 18, 1941, was for \$13,553.46. The contractor started with two boring rigs and ended with three, using a maximum of five. His force averaged eight men for 26 weeks.

#### WAYLAND-WESTON DIVISION

The Wayland-Weston Division continued in charge of the field work in connection with Section 4, 5 and 6 of the pressure aqueduct and of their construction, including the Norumbega high-level distributing reservoir and the additional pipe lines in the Weston Aqueduct siphons. All work was done in cooperation with the Framingham office of the Water Division of the Metropolitan District Commission, Israel P. Aubey, Superintendent. This division was discontinued April 30, 1941, upon the completion of all construction work, and the maintenance of this easterly half of the aqueduct was turned over to the City Tunnel Division.

#### MISCELLANEOUS OFFICE WORK

Periodical estimates for Contracts 78, 79, 80, 81, 89 and 96, and final estimates for Contracts 73, 78, 79, 81, and 89 were prepared. Proposed plans for real estate settlements were prepared, and other miscellaneous plans included those for additional land takings and for a considerable area in the vicinity of Dudley Pond. Estimates of the capacity of the upper and lower basins of Norumbega Reservoir were made. Geologic profiles along the pressure aqueduct were drawn. Record drawings of the reservoir and portions of the aqueduct were in progress.

#### MISCELLANEOUS FIELD WORK

Lines and grades were given for Contracts 73, 78, 79, 80, 81, 89, 96 and 129. Surveys were made for miscellaneous properties along the pressure aqueduct line including additional real estate takings, and for a profile along the finished aqueduct line. A small labor force was employed on miscellaneous work including the setting of stone bounds, the grouting of foundations of the embankments of Norumbega Reservoir, clearing the margins of the Reservoir, landscaping and constructing drains. Geological studies were continued.

#### PROGRESS OF CONTRACT

*Contract 73.*—Contract 73, for constructing inverted pipe siphons on the Weston Aqueduct, was continued to completion in the spring of 1940. The work consisted of finishing several items of work which could not be done while the ground was frozen.

The final estimate dated July 19, 1940, was for \$261,467.58. The Contractor's force was 12 men in the first week of May, 1940.

*Contracts 78 and 79.*—Contracts 78 and 79, for constructing Sections 4 and 5, respectively, of the cut-and-cover pressure aqueduct, were continued to completion. Contract 78 was accepted as substantially complete on July 15, 1940,

and Contract 79 on June 3. The placing of the 11-foot 6-inch diameter steel-cylinder reinforced concrete pipe, in sections 16 feet long and weighing from 40 to 50 tons each, continued on Section 4 by the method previously described, with a gantry crane, until December 21, 1939, when the last 16-foot length was laid. A closure piece placed January 12, 1940, completed the pipe laying. During the period from December 1 to 21, 1939, 341 sections were laid in 20 working days of eight hours, the average being 17 and the maximum 32 on December 5.

During the winter, work continued on the caulking and mortaring of the pipe joints, the building of concrete valve chambers, manholes, culvert headwalls and miscellaneous structures and the setting of blowoff gates and air valves. The work of final grading, loaming, seeding and fencing was resumed about the middle of April, 1940.

Water for testing was pumped into the line from the Framingham water supply. Very satisfactory results were obtained, namely, 22.2 gallons per day per inch of interior pipe diameter per mile of pipe at full working hydrostatic head. The entire length built under Contracts 78 and 79 was tested at one time between temporary dished steel bulkheads at the west end of Section 4 and at the east end of Section 5. To determine the proportion of leakage between the two contracts a current meter was installed in an orifice in a temporary wooden partition between two sections.

The final estimate on Contract 78, dated November 7, 1940, was for \$551,629.18. The final estimate on Contract 79, dated September 30, 1940, was for \$522,335.25. The contractor's force averaged 112 men, the maximum being 360 for the two weeks ending December 16, 1939.

The total work done and materials furnished under the principal items of Contracts 78 and 79 are shown in an accompanying table.

The following subcontractors did substantial amounts of work under these contracts.

American Chain Link Fence Co	Fencing
Pneumatic Concrete Corp.	Guniting and mortar lining

*Contract 80.*—Contract 80, for constructing the Norumbega high-level distributing reservoir, was continued to completion. Excavation of ledge for the twin aqueduct line across the bottom of the reservoir basin was completed April 6, 1940, two shifts were being used commencing December 18, 1939, and three shifts January 15 to February 24, 1940. Excavation of ledge for the gate-house foundation was completed February 24 with a similar arrangement of shifts. The concrete substructure was completed early in May. The ledge from these excavations was used as riprap on the several dams. Steel framework for the gatehouse superstructure was completed June 22, and the masonry walls of granite ashland exterior and tile interior on July 11, and the roof of precast slab and slate roofing about August 10. Installation of water piping, electrical work, emergency power unit, electric crane and other power equipment was practically complete August 22.

Four 30-foot sections of collapsible steel forms were used in constructing the twin aqueduct. The lower barrel was completed before the upper barrel was started. Concreting was commenced March 1, 1940, and completed May 3. A drain was constructed extending through the upper barrel in order to provide drainage during construction, and subsequently. This furnishes some obstruction to flow and can and should be removed at some future time whenever necessary to increase the carrying capacity of the aqueduct. Erection of the 8-foot fence and access gates was started June 28 and completed August 22. Uncompleted portions of the several dams where earthwork had been stopped for the winter were finished and the outer slopes loamed and seeded and the inner slopes rippedraped. An access road was constructed to connect the gatehouse with Oak Street, Weston.

The final estimate dated May 13, 1941, was for \$574,183.69. The contractor's force in 1940, averaged 59 men for 47 weeks, the maximum being 146 for the week ending March 30, 1940.

The total work done and materials furnished under the principal items of Contract 80 are as follows:

Clearing . . . . .	67 acres
Stripping . . . . .	82,690 cu. yds.
Earth excavation . . . . .	218,810 " "
Rock excavation . . . . .	30,150 " "
Consolidated pervious embankments . . . . .	39,470 " "
Rolled semi-impervious embankments . . . . .	29,950 " "
Rolled impervious embankments . . . . .	45,560 " "
Miscellaneous unconsolidated embankments . . . . .	42,540 " "
Crushed stone and screened gravel . . . . .	4,850 " "
Riprap . . . . .	8,480 " "
8-foot 6-inch twin line concrete conduit . . . . .	1,057 lin. ft.
Miscellaneous concrete . . . . .	3,470 cu. yds.
Reinforced concrete . . . . .	2,180 cu. yds.
Portland cement . . . . .	9,335 barrels
Stone masonry . . . . .	127 cu. yds.
Permanent fencing . . . . .	13,090 lin. ft.

The following subcontractors did substantial amounts of work under this contract.

Edward J. Baker Company . . . . .	Fencing
Eagle Cornice & Skylight Works . . . . .	Slate roofing and cooper work
Federal American Cement Tile Co. . . . .	Precast roof slabs
National Gunite Constr. Co. . . . .	Guniting and mortar lining
B. L. Whittmore . . . . .	Electrical work
E. T. Ryan Iron Works . . . . .	Bronze windows and doors

*Contract 81.*—Contract 81, for constructing Section 6 of the cut-and-cover pressure aqueduct, was continued to completion. The death of Mr. Gaddis early in 1940 placed a severe handicap upon the contractor's organization and although an attempt was made to continue the work, satisfactory progress could not be secured and on November 21, 1940, the contract was declared defaulted and the work was taken over by the Employer's Liability Assurance Corp., the Surety on the contractor's performance bond.

Work under all items was carried on throughout the winter of 1940, steam being used to keep the ground thawed in advance of pipe laying. Concrete and stone work were protected by heating the aggregates and by using salamanders in canvas enclosures. The placing of the 11-foot 6-inch steel-cylinder reinforced concrete pipe in sections 16 feet long and weighing from 40 to 50 tons was continued by the method previously described, with two cranes operating close to the edge of the trench. The laying of the 11-foot 6-inch pipe was completed May 14, and of the 7-foot pipe July 8, the respective total lengths being 15,225 and 2,203 feet. The inside mortar joints of the larger pipe were, with few exceptions, placed by the gunite method and steel-trowelled for finish, and those of the smaller pipe were placed by hand.

The connection between the 7-foot line and the existing supply mains from the Weston Aqueduct line were made between September 3 and 27, following which the 7-foot line was immediately put into service as part of the distribution system. Leakage tests of the temporary bulkhead at the end of the line next to the Charles River Shaft were satisfactorily completed and the work accepted January 31, 1941.

The final estimate dated March 13, 1941, was for \$615,154.67.

Additions to the contractor's plant included three caterpillar-tractor bulldozers, miscellaneous trucks, air compressors, pumps, etc.

The total work done and materials furnished under the principal items of Contract 81 are shown in an accompanying table.

The following subcontractors did substantial amounts of work under this contract.

American Chain Link Fence Co. . . . .	Fencing
National Gunite Contracting Co. . . . .	Guniting and mortar lining
Walsh Holyoke Steam Boiler Works . . . . .	Plate steel pipe connections

*Contract 89.*—Contract 89, for constructing mortar lining in the old steel pipe siphons of the Weston Aqueduct, was continued to completion in 1940. Just before the close of the previous year the contractor had cut six access holes in the 90-inch steel pipe of the Sudbury River Siphon. Cleaning of the inside of the steel pipe started at the east end, at Chamber No. 2, and proceeded westerly to Chamber No. 1 by using a 1/8-inch water jet under 900-pounds pressure,

supplemented where necessary by wire brushes and steel scrapers. Cleaning the Sudbury River Siphon was completed December 21, 1939, and the cleaning of the Happy Hollow Siphon was then started and completed December 29. The average force engaged in cleaning and removal of waste was 16 men. The  $\frac{3}{8}$ -inch mortar lining was placed by machine which projected the mortar centrifugally at high velocity, the revolving head operating at the axis of the pipe, the machine operated by electric power progressing along the pipe ahead of the lining at a controlled rate of speed, varied to fit the requirements. The mortar was fed by a short screw-feed conveyor into the distributing head, thence through fixed ports from which it was picked up by vanes rotating at 1,000 revolutions per minute and thrown against the pipe wall. A set of slowly revolving trowels smoothed and finished the lining after placing. A batch of the mortar consisted of 270 pounds of dry fine beach sand, three sacks of Portland Cement and 10 gallons of water mixed outside the pipe and delivered to the buggy in the pipe at one of the access openings. After the passage of the machine it was necessary to smooth up around the rivet heads in the circumferential joints partly by hand with steel trowels and partly with a smaller coating machine. The 3,622 feet of Sudbury River Siphon was lined January 3 to 20, 1940, and the 1,141 feet of Happy Hollow Siphon January 22 to 26, 1940. The total length, which included 12,335 square yards, was placed in 126 hours actual working time at the average rate of about 38 linear feet, or 98 square yards, per hour. The rate of travel of the machine varied from 23 to 60 feet per hour, and the force employed in the lining operations from 43 to 53 men. The curing of lining was completed February 28, 1940. All work, including testing the pipe, erecting about 16,350 feet of fence, miscellaneous repairs in the four existing siphon chambers and sand blasting and painting the exterior of the existing pipe arch over the Sudbury Reservoir, was practically completed March 8, 1940.

The final estimate dated June 28, 1940, was for \$42,940.85. The contractor's force in 1940 averaged 14 men, the maximum being 48 for the week ending January 13, 1940.

The principal items of plant were as follows:

One large and one small coating machine.

One air-operated and two battery-operated motor buggies.

Three 1-cu. yd. gasoline-driven mixers.

Other miscellaneous equipment.

The total work done and materials furnished under the principal items of Contract were as follows:

Cleaning the old steel pipe . . . . .	12,580 sq. yds.
Mortar lining . . . . .	12,450 sq. yds.
Permanent fencing . . . . .	16,340 lin. ft.

Important work was done under this contract by the Centrline Corporation, subcontractor for mortar lining.

*Contract 96.*—Contract 96, for constructing the chlorine storage house and appurtenances and furnishing and installing emergency equipment at Norumbega Reservoir, was started in April, 1940. The storage building is located about 230 feet southeasterly from the Norumbega gatehouse and the work included the laying of pipes for water, chlorine, ammonia and steam heat and wires for electric power and control in two concrete conduits between the two buildings. Work began with clearing the site and excavating the foundations. The first concrete was placed April 26. The concrete in the building was completed June 4, and the concrete conduits with removable precast covers August 7. Electric wiring, plumbing, heating generating and roofing was started late in April. A room partitioned off with a glass block wall was constructed August 13 at the Norumbega gatehouse to house the emergency chlorine and ammonia apparatus which was completely installed October 19, 1940. The contract was completed early in 1941, when satisfactory tests of the chlorine equipment were made.

The final estimate dated May 31, 1941, was for \$54,795.38. The contractor's force averaged 7 men, the maximum being 13 for the weeks ending May 18 and June 15, 1940.

*Contract 129.*—Contract 129, for constructing drainage pipe in the Town of Weston, was started March 24 and completed March 29, 1941. This drain crosses over the pressure aqueduct at a point just west of Park Road and was required under the terms of a real estate agreement.

The final estimate dated June 30, 1941, was for \$475.00. The contractor's force averaged 7 men.

#### SOUTHBOROUGH-FRAMINGHAM DIVISION—CITY TUNNEL DIVISION

The Southborough-Framingham Division until October 18, 1940, and thereafter the City Tunnel Division, continued in charge of the field work in connection with Sections 1, 2 and 3, the westerly half of the pressure aqueduct, and of their construction, and was in charge of the construction of the Charles River Shaft and of the field work in connection with the proposed City Tunnel for distribution east of this shaft. On May 1, 1941 this division took over the maintenance of the entire aqueduct line and Norumbega Reservoir. All work west of Sudbury Reservoir was done in cooperation with the Clinton Office of the Water Division of the Metropolitan District Commission, Harold J. Toole, Superintendent, succeeding E. R. B. Allardice, retired. All work in the vicinity of Sudbury Reservoir and easterly to the Charles River was done in cooperation with the Framingham office of said division, Israel P. Aubey, Superintendent. The City Tunnel Division was discontinued as a separate field division on August 10, 1942, and thereafter the office in Auburndale was continued as a branch office under the single Reservoir and Aqueduct Division.

#### MISCELLANEOUS OFFICE WORK

Periodical and final estimates were prepared for Contracts 74, 75, 77, 84, 94, 100, 110, 114, 127 and 130. Miscellaneous plans prepared included topography at the various shaft heads, profile of the proposed City Tunnel to include three possible additional shaft sites and miscellaneous real estate plans. Land taking plans were prepared covering property at the shaft heads and easements required to be taken from the Boston & Albany Railroad. Work was in progress on record plans of the pressure aqueduct. Plans were prepared in cooperation with the Town of Weston covering the town's crossing of the pressure aqueduct at Park Road with its new 12-inch steel main.

#### MISCELLANEOUS FIELD WORK

Lines and grades were given for Contracts 74, 75, 77, 84, 94, 110, 114 and 130. Surveys were made of miscellaneous properties along the pressure aqueduct line and for the location of bore holes and for profiles along the line of the proposed City Tunnel. Surveys of the revised location of the City Tunnel and topographic surveys of spoil areas at the three additional shaft sites were made. Topographic surveys for drainage were made in connection with the settlement of damages to real estate adjoining Norumbega Reservoir. Surveys were continued along the pressure aqueduct for use in preparing record plans. Surveys were made and test pits dug for information to be used in the design of the Nut Island sewage treatment plant. Miscellaneous photographs of real estate and construction work were taken, and many enlargements were prepared for use in litigation.

Miscellaneous aggregate and concrete samples were taken during construction operations for purposes of testing. Geological studies were continued, including detailed mapping of the Southborough Tunnel and of the Charles River Shaft and the examination of this shaft as the excavation progressed. They also included seismograph investigations in certain areas along the north loop of the proposed City Tunnel where seismic profiles of the depth of overburden in certain critical areas were taken with the cooperation of Reverend Daniel Linehan of Weston College. These profiles were made to assist the sub-surface investigations by core borings under Contract 113, but were found somewhat unreliable due in a large part to sudden changes in sub-surface terrain, and to the presence of decomposed rock overlying the sound bedrock.

The work of maintenance along the pressure aqueduct included setting stone bounds, planting shrubbery received from the Belchertown nursery, and grouting with bentonite the foundations under one of the low embankments of Norumbega Reservoir. Repairs were made of various properties of the Commission used for storage purposes.

An average force of 7 men was employed for 6 weeks in 1941 on work under the Federal grant. On other miscellaneous work a small labor force was employed a portion of each year.

#### PROGRESS OF CONTRACTS

*Contract 74.*—Contract 74, for constructing the Southborough Tunnel, Section 2 of the pressure aqueduct, was substantially completed July 15, 1940, and all work was completed under the contract September 25. The contractor's machine shop at Shaft 2 was destroyed by fire January 12, 1940, and immediately rebuilt. The contractor continued to obtain his electrical power from the District's Sudbury Dam power station until September 15. The total power consumption at Shafts 1, 2 and 3 for the year was 1,574,800 kilowatt hours, and at Shaft 4, 336,000 kilowatt hours, the total for the duration of the contract being 3,134,800 kilowatt hours at Shafts 1, 2 and 3, and 819,400 at Shaft 4. The contractor continued the use of sewage tanks at the shaft heads. At the completion of the work the tanks at Shaft 1, 2 and 3 were entirely emptied of their contents and filled with gravel and the 10,000 gallon tank at Shaft 4 was left for the use of the contractor on Contract 84. The tunnel excavation continued exceptionally dry. The work was remarkably free from serious accidents and there were no fatalities. Tunnel excavation continued by the full-face method, the additional length excavated from Shaft 1 was 241 feet, until December 17, 1939; 370 feet in the west heading from Shaft 2, until December 19. No additional tunnel support was required. The tunnel excavation was completed on December 19, 1939, when Commissioner Hultman threw the firing switch at the top of Shaft 2 for the last blast.

At the beginning of the year 1940, the surface plants at Shafts 2 and 3 of the concrete tunnel lining operations were under construction. Both plants were similar in design, each consisting of a line of 9 steam heated aggregate bins extending out from the shaft head and holding the fine aggregate and two sizes of coarse aggregate. These bins were filled by truck from the stock piles located at the shaft site. In an enclosed trap tunnel beneath the bins were three, 14-cubic-foot scale hoppers that travelled on overhead rails and emptied onto a belt conveyor running to the top of the shaft. From this conveyor the aggregate was emptied into a 10-inch pipe running down the shaft to an air operated gate by which the aggregate was dumped into 1-cubic-yard batch boxes on small flat cars.

Bulk cement was unloaded from freight cars at the Southborough depot siding into a cement hopper by an unloading screw-and-bucket conveyor. It was transported in covered trucks to a 2,000-barrel cement bin at each shaft. The cement was then moved by screw conveyor to a vertical 10-inch pipe, dropping to a small auxiliary hopper at the bottom of the shaft from which it was weighed and loaded into a separate compartment in the batch box. A train of 5 cars with 2 batches each was hauled to the 28-cubic-foot electrically-operated mixer, located about 100 feet from the forms. The concrete was discharged from the mixer into a pistonless air gun and shot through a 6-inch shooting line into the top of the form,

Collapsible circular forms were used in 20-foot sections with a row of 4 inspection ports spaced around the circumference every 5 feet in length. In general, 5 of these forms were assembled at a time for placing concrete. Two hundred feet of forms were used with each mixer so that the usual schedule of placement called for placing concrete starting at midnight and continuing until the 100-foot form was filled, usually at or before noon, cleaning the rock invert,

moving the mixer, trimming and taking care of water, then moving the previously filled 100 feet of forms from 4 P. M. to midnight, ready for the next concreting. The forms were collapsed and telescoped by means of a form jumbo.

The mixer fed from the Shaft 3 plant started January 4, 1940, placing concrete near the bottom of Shaft 4 and continuing back toward Shaft 3 until the shaft was reached March 25, the average daily progress being 58 feet. Here the mixer and the form jumbo were turned around and started again about two thirds the distance from Shaft 3 to Shaft 2 on April 2, working back towards Shaft 3, and completed on June 7, with an average daily progress in this stretch of 61 feet. The total distance concreted by this plant was 8,869 feet. The mixer fed from Shaft 2 was similarly operated commencing to concrete first near the bottom of Shaft 1 on February 12, and completed the run to Shaft 2 April 26, with an average daily progress of 72 feet, and then started the final run May 6, and completed June 22, with an average daily progress of 35 feet. The total distance concreted by this plant was 6,989 feet. After the tunnel lining was brought as close to the shafts as possible, about 110 feet, the mixer was brought to the surface and concrete mixed there and lowered into the tunnel, especial forms being required for the closure on to the shaft lining previous placed.

The special section at the bottom and top of the downtake shaft, shaft 1, were completed March 12 and May 29, respectively, with transit-mixed concrete. Special work at the unwatering shaft, Shaft 4, was started May 10 with placing of steel lining in the pump chamber in the bottom of the shaft. The work in this shaft was carried on continuously, the shaft concrete following the steel lining. Wooden forms were used in the uptake shaft in the dry well with special forms for the Venturi meter section. All work in this shaft was completed September 18, 1940. Special features at the top of Shaft 3, consisting of a spillway into Sudbury Reservoir and provision for future water supply connections, was started July 15 and completed September 21.

Grouting of the tunnel was carried out in two operations commencing after the concrete was allowed a 28-day moist curing. First the tunnel was completely grouted under low pressure during which a maximum pressure of 50 pounds per square inch was used until each connection was filled to refusal. A compressed air pressure grouting machine mounted on a rubber-tired truck was towed through the tunnel by an electric battery tractor. The mixture used in grouting depended upon the known condition of the rock and the reaction observed at each connection and varied from a neat mixture of 1 cubic foot of cement and 30 gallons of water to a mixture which included sand in the proportion of 3 sand and 1 cement. For the high pressure grouting 1 cubic foot of cement to 40 gallons of water was generally used, the maximum pressure being 350 pounds per square inch. Grouting was completed September 9, and leakage in the entire length, 3 miles, was reduced to approximately 28 gallons per minute.

The final estimate dated September 27, 1940, was for \$2,933,832.49. The contractor's force in 1940, averaged 258 men, the maximum being 389 for the week ending May 29, 1940.

No important items of plant were added.

The total work done and materials furnished under the principal items of Contract 74 were as follows:

Earth excavation in shafts . . . . .	730 cu. yds.
Rock excavation in shafts and in tunnel within 50 feet of shaft . . . . .	10,375 " "
Excavation in tunnel except within 50 feet of shaft . . . . .	142,500 " "
Pumping from shafts and tunnels . . . . .	54,580 mil. ft. gals.
Drainage channels for shafts and tunnel . . . . .	16,635 lin. ft.
Concrete masonry for shafts . . . . .	3,705 cu. yds.
Concrete masonry in tunnel . . . . .	57,150 cu. yds.
Other concrete masonry . . . . .	1,700 cu. yds.
Steel linings for Shaft 4 . . . . .	206,900 lbs.
Steel support in tunnel . . . . .	237,530 lbs.
Timbering in shafts and tunnel . . . . .	159 M ft. B. M.
Mixing and placing grout . . . . .	10,390 cu. yds.
Portland cement . . . . .	120,100 bbls.
Refilling and embanking . . . . .	31,660 cu. yds.

*Contract 75.*—Contract 75, for constructing Section 1 of the cut-and-cover pressure aqueduct, was continued to completion. The placing of the 12-foot 6-inch diameter steel-cylinder reinforced concrete pipe in sections 12 feet long

and weighing approximately 46 tons each, continued by the method previously described, with a locomotive crane in the trench. A total of 123 sections, or 1,445 feet, were laid during 1940, making a total of 800 sections, or 9,564 feet. Excavation was completed February 1, 1940. The last section of pipe was delivered March 22, and the last section placed June 14, after the removal of the tracks for the locomotive crane. The last few sections of pipe were placed at the easterly end by rolling the pipe down a ramp adjacent to Shaft 1 of the Southborough Tunnel on to greased skids set on rails on the concrete base and sliding it westerly to the pipe previously placed. The average number of sections placed, on each day on which pipe was actually placed, was 4. The maximum in any one day was 10. Refill over the aqueduct was completed August 16, and loam dressing October 2. Final caulking and placing mortar on the inside joints was completed June 27.

At the pressure aqueduct intake works the construction work for diverting crane brook was resumed in June, 1940, and completed July 15. The reconstruction of the open channel above the intake works to form an equalizing basin was continued by raising the embankments and the road on the north side of the basin during June and July, and stripping and regravelling the slopes to the increased height. The construction of the masonry diversion dam was continued to completion on February 6, 1940. The concrete substructure of the intake building was completed September 21, and work on the superstructure suspended during the winter. The building was of stone masonry exterior and tile interior. Steel frame and slate roofing was completed June 12. The special steel plate connection from the intake to the aqueduct contained provisions for future extension of the pressure aqueduct line to Wachusett Reservoir and was completed June 21, and the special connection with similar provision at the downtake shaft of the Southborough Tunnel, Shaft 1, was completed August 14. Permanent fencing along the aqueduct consisting of approximately 23,300 feet was started May 14 and completed October 3, 1940.

The test for leakage was made between temporary dished steel bulkheads at the two ends of Section 1. Very satisfactory results were obtained; namely, 7.1 gallons per day per inch of interior pipe diameter per mile of pipe at low working hydrostatic head.

The final estimate dated January 29, 1941, was for \$521,806.66. The contractor's force in 1940, averaged 49 men, the maximum being 159 for the week ending June 8, 1940.

No important items of plant were added.

The total work done and materials furnished under the principal item of Contract 75 are shown in an accompanying table.

The following subcontractors did substantial amounts of work under this contract:

American Chain Link Fence Co.	Fencing
Pneumatic Concrete Corporation	Guniting and mortar lining
Walsh Holyoke Steam Boiler Works	Plate steel pipe connections

*Contract 77.*—Contract 77, for constructing Section 3 of the cut-and-cover pressure aqueduct, was continued to completion. The work was continuous except for the period from February 15 to March 23, 1940, when all operations were suspended. It was accepted as substantially complete on September 15 and all work was completed under the contract November 30, 1940. The placing of the 11-foot 6-inch diameter steel-cylinder reinforced concrete pipe in sections 16 feet long and weighing from 40 to 50 tons each, continued by the method previously described, with a gantry crane astride the trench. A total of 123 sections, or 1,445 feet, were laid during 1940, making a total of 800 sections, or 9,564 feet. Excavation was completed February 1. The last section of pipe was put in place January 4. Backfill was completed May 11 and final caulking and mortaring of the joints June 4. Loam dressing, seeding and grassing was completed July 17.

The connection to the existing supply lines of the Weston Aqueduct was started April 16, 1940, by unwatering two of them, lines Nos. 2 and 3 and di-

verting the entire supply through No. 1. Of the 60-inch cast-iron pipe removed from lines 2 and 3, 12 lengths were sent to Stoneham and used in the construction of the enlargement to Fells Reservoir under Contract 99. The 84-inch steel-cylinder reinforced concrete pipe comprising the main connection from the new pressure aqueduct to the Weston Aqueduct was placed June 27 and final caulking completed July 19. All the necessary changes in lines 2 and 3 including the special steel plate connections to the 84-inch line were completed October 9 and the water then shut off from line 1 and diverted through the reconstructed lines 2 and 3, behind a temporary bulkhead in the connection to line 1 and to the pressure aqueduct. Work then proceeded on the removal of cast-iron pipe sections in the old line 1, and the construction of special steel plate connections and valves at this point. Some cleaning up and minor work remained to be done at the end of 1940, and the reconstructed line 1 had not yet been put back into service. Work on the special steel plate connections to the uptake shaft of Southborough Tunnel, Shaft 4, was commenced on July 13, 1940, and the six 72-inch main control valves were placed during the next two weeks. Fencing along the aqueduct, consisting of approximately 35,000 feet was started April 16 and completed September 27.

The test for leakage was made between temporary dished steel bulkheads at the two ends of Section 3. Very satisfactory results were obtained, namely, 12.2 gallons per day per inch of interior pipe diameter per mile of pipe at full working hydrostatic head.

The final estimate dated January 29, 1941, was for \$496,597.43. The contractor's force in 1940, averaged 44 men, the maximum being 171 for the week ending May 18, 1940.

No important items of plant were added.

The total work done and materials furnished under the principal items of Contract 77 are shown in an accompanying table.

The following subcontractors did substantial amounts of work under this contract.

American Chain Link Fence Co.	Fencing
Pneumatic Concrete Corporation	Guniting and mortar lining
Walsh Holyoke Steam Boiler Works	Plate steel pipe connections

*Contract 84.*—Contract 84, for constructing the head house and appurtenances at Shaft 4 of the Southborough Tunnel, was started September 19, 1940. The work consisted of constructing a masonry building on foundations most of which were placed under Contracts 74 and 77. The erection of structural steel was started November 19, and practically completed during the first season. The stone masonry was started November 22 and protected during the cold weather by closing the building with tarpaulin and heating with salamanders until the setting was completed January 18, 1941. Interior brick and tile masonry was set along with the outer stone masonry, lagging behind in general about 1½ stone courses. The roof purlins were covered with wire mesh for subsequent guniting and the precast roof slabs placed February 7. The copper roofing was completed May 1. The inside roof members were gunited and the rebound cleaned up March 21. The electrical work included wiring in the dry shaft and underground pump chamber for tunnel unwatering. This work was completed and the switchboard tested May 12. A temporary power connection from the generating plant on the Sudbury Dam was made April 10 and removed July 16, 1941.

The work of installing the tunnel unwatering pump at the bottom of the shaft commenced April 17 and was completed June 2. The entire work, including the adjustment of Venturi meter recording panels for the large meter on the by-pass to Weston Aqueduct, special valve mechanisms, air blower for ventilating the unwatering pump chamber, grading of the grounds and construction of display fountain, was completed September 26, 1941.

The final estimate dated October 1, 1941, was for \$100,673.01. The contractor's force averaged generally 10 to 12 men.

*Contract 94.*—Contract 94, for sinking a caisson to sound ledge for the Charles River Shaft, No. 5, of the pressure aqueduct, was started in February, 1940. The work consisted of sinking from the bottom of a shallow open cut close to the Charles River a reinforced concrete caisson 43 by 20 feet to sound ledge, and constructing near the top of the shaft, connections to the east end of the pressure aqueduct built under Contract 81. The caisson contained three large wells. The central well was 12 feet in diameter inside the steel lining and will later form the 9-foot diameter dry well for access to the tunnel unwatering pump chamber at the bottom of the shaft. The two outer wells were 9 feet 8 inches in diameter inside the steel linings, which linings will later be extended for a suitable bond the sound ledge and these wells will later form the two 9-foot diameter downtake shafts, one to the Chestnut Hill branch and the other to the northerly branch of a possible future distribution City Tunnel loop. The contractor started assembling his equipment February 9, cleared the site and started open-cut excavation February 12. About 150 gallons per minute were pumped from lines of well points sunk from the original surface and from a berm, and about 400 gallons per minute from a gravel-packed deep well sunk about 47 feet. A foot of screened gravel was placed on the bottom of the open cut for a bearing surface for the caisson shoe, which was set March 23 at Elev. 32. The first 7-foot lift of concrete was completed April 9. Excavation in the caisson was started April 11 by means of men loading a clamshell bucket and was continued by this method to Elev. 10.5, where on April 28 the incoming water was more than the pumps could handle in spite of additional well points driven in the working chamber floor. The contractor then decided to install air. While the compressed air plant was being installed excavation was continued with a clamshell bucket digging under water until Elev. 11 was reached May 21, the excavation being interrupted from time to time for the pouring of additional concrete lifts.

The first shift under air commenced work May 31, 1940, under a pressure of 15 pounds per square inch. The maximum pressure reached when ledge was encountered was 29 pounds. Air was discontinued June 19, after the caisson had been sealed off with the shoe at Elev.—35.50. Open excavation in bedrock continued to Elev. -80.5 on July 2. After trimming and scaling and placing of timber at danger points in the shaft sides, the pouring of concrete lining in the excavated shaft started July 10 and continued until the closure was made to the bottom of the caisson September 4. On July 25, excavation in the shaft was resumed and continued to Elev. -104.5, which was reached August 2.

During the caisson-sinking operations in open air, the contractor averaged 2.16 feet per day, the maximum being 5.36. During the caisson sinking under air the average progress was 2.38 feet per day, the maximum being 3.0. During the shaft extension into rock below the caisson in open air, the average progress was 3.04 feet per day and steel and concrete lining in the three wells was placed at an average rate of two feet per day. Grouting in the shaft was carried on continuously from September 18 to 26, starting in the lower connections and progressing upward, using a mix of  $1\frac{1}{2}$  bags of cement to 50 gallons of water.

Concrete foundation mats for the control valves and aqueduct connections at the top of the shaft were placed during August. The placing, assembling and welding of valves and steel plate work was completed October 5, and the concrete envelope and mortar lining October 23. Connections to the end of the pressure aqueduct line constructed under Contract 81 are located north of the shaft, and those to a possible future second line are on the south side of the shaft. All work was completed October 28, 1940.

In order to provide for future work at the site, including the future tunnel contract, with a minimum of interference and also in order to reduce liability of damage to the equipment, one of the 60-inch valves nearest the shaft head was removed and a temporary blank flange was substituted. The bonnet and disc were removed from two other valves, and the fourth valve which was in such a position that it did not materially interfere with the shaft head frames was protected by heavy timbering.

The final estimate dated February 7, 1941, was for \$190,396.32. The contractor's force averaged 24 men, the maximum being 74 for the week ending June 8, 1940.

The principal items of plant were as follows:

- 1 Hoist
  - 3 Cranes—65, 45 and 30-foot booms and clamshell buckets
  - 1 60-horsepower Diesel crane, 60-foot boom
  - 1 Caterpillar-tractor bulldozer
- Miscellaneous pumps, compressors, trucks, concrete mixer, etc.

The total work done and materials furnished under the principal items of Contract 94 were as follows:

Construction of shaft down to Elev. -50	
Earth excavation	2,600 cu. yds.
Rock excavation	300 cu. yds.
Concrete	2,025 cu. yds.
Reinforced steel	148,000 lbs.
Steel pipe	143,000 lbs.
Shaft excavation below Elev. -50	
Excavation	1,390 cu. yds.
Concrete	450 cu. yds.
Steel plate lining	52,630 lbs.
Steel plate pipe outside limits of shaft	82,600 lbs.
Concrete outside limits of shaft	975 cu. yds.
Portland cement other than for shaft above Elev. -50	2,190 bbls.
Reinforcing steel other than for shaft above Elev. -50	119,560 lbs.
Coring for and setting valves furnished by Commission	149,620 lbs.

*Contract 110.*—Work under Contract 110, for extending the Charles River shaft of the Pressure Aqueduct, consisted of continuing the excavation of the shaft to its full depth below the limit reached under Contract 94, constructing the preliminary lining of the three walls and excavating for the future pump chamber and tunnel headings at the bottom of the shaft. Under the terms of the contract, it was necessary for the contractor to use two head frames. Erection of these was started September 28, 1940, and completed October 21. Actual rock excavation in the shaft started October 23 and was interrupted by a strike from November 20 to 29. The method of excavation was to drill the rock, each round having 40 holes about 8 feet deep, load, shoot and muck by hand into 1¼-cubic yard buckets which were dumped at the top into trucks which hauled the muck to the spoil area. Due to delay in the delivery of steel plate interlining, it was impossible to concrete the lining as the excavation progressed so that temporary timber support was required. The entire depth of the shaft from Elev. -80, the limit of the concrete lining placed under contract 94, was supported with timber. Due to delays in the delivery of steel lining, it was not possible to replace the concrete lining as the excavation progressed. In order not to unduly delay the prosecution of the work, the excavation was continued to the bottom of the shaft and the steel and concrete lining placed from the bottom up. The potential hazard in such a depth of unsupported shaft necessitated the placing of temporary timber support for the entire depth. The excavation and timbering continued until January 4, 1941, when an elevation of -279 was reached, a few feet below the bottom of the lining under this contract. Preparations were immediately made to start placing the concrete. Forms were set for the two future waterway shafts, which have no steel lining at the bottom. Bituminous-lined and galvanized pipes to be encased in the concrete for various requirements of the contract and steel lining of the central future dry well were set in place and provisions made for controlling the leakage of water. The first concrete was placed January 19. Transit-mixed concrete was used. Temporary timber support was removed as the work progressed up the shaft. After the first 44 feet of concrete lining were completed, excavation was resumed at the bottom of the shaft and extended into the future underground pump chamber and the two tunnel headings required for the future distribution tunnel loop. The placing of concrete in the shaft and excavation at the bottom were then carried on simultaneously, except that excavation was suspended temporarily during the actual pouring of concrete. The tunnel heading to the northeast was turned March 4, and to the east toward Chestnut Hill April 1. The connection of the steel linings and embedded pipes to the existing linings

previously built at Elev. -80 was made and the final concrete placed May 31, previous to which all excavation in the heading at the bottom of the shaft stopped and was not renewed. Excavation in the northeast heading had progressed about 115 feet, and in the easterly branch to Chestnut Hill about 206 feet, the tunnel invert at these locations being Elev. -312.5. In order to support the excavation in the underground pump chamber during the period which will ensue before resumption of work under a future contract, timber support was placed during the week ending June 7. Pumping from the shaft was then stopped, the head frame and all other buildings and structures at the site removed, and a cover built over the top of the shaft, all of which was completed June 21, 1941.

The final estimate dated July 10, 1941, was for \$205,194.97. The contractor's force averaged 56 men, the maximum being 92 during the week ending December 14, 1940.

The contractor used two 5-ton hoists, one 10-ton crane, one caterpillar tractor bulldozer, two 500 c.f.m. compressors, and 40-foot steel forms of 9-foot diameter, in addition to miscellaneous pumps, trucks, small tools, etc.

The total work done and materials furnished under the principal items of Contract 110 are as follows:

Excavation for shaft and tunnel . . . . .	7,440 cu. yds.
Concrete masonry . . . . .	2,700 cu. yds.
Timbering . . . . .	137 M.ft. B.M.
Portland cement . . . . .	4,460 barrels
Steel plate lining . . . . .	257,490 lbs.
16" to 24" bituminous lined steel pipe . . . . .	780 lin. ft.

*Contract 114.*—Work under Contract 114, for making core borings for subsurface investigations at additional shaft sites on the line of the proposed City Tunnel, was commenced August 27, and completed December 3, 1942. 524 feet of core borings were made. The contractor used a maximum of six and a minimum of two men.

The final estimate dated December 3, 1942, was for \$3,707.42.

*Contract 127.*—Work under Contract 127, for furnishing and installing switchboard equipment in the District's power plant at Sudbury Dam, was started December 9, 1941. In addition to installing a switchboard, a cable was laid from the pressure aqueduct control building to the Weston Aqueduct head house. The work was completed January 6. The contractor used an average of two men.

The final estimate dated March 22, 1942, was for \$2,405.00.

*Contract 130,* for grading, loaming and grassing in the vicinity of Shaft 4 of the pressure aqueduct, and for the improvement of access roads in the towns of Marlborough, Southborough, and Weston, was started May 5, 1941, with the preparation of the surface of the access road to the pressure aqueduct intake works and of the access road to Norumbega Reservoir, and with excavation in the vicinity of Shaft 4. Work progressed simultaneously at the three locations. Loam for dressing in the vicinity of Shaft 4 was hauled from the Commission's stock pile in Framingham. The two access roads were completed May 14, and the grading, loaming and seeding at Shaft 4, May 20. The work of the contract was considerably increased by the requirements of loaming in the vicinity of the Norumbega Reservoir gatehouse where an additional 1200 cubic yards were hauled and spread. All work under the contract was completed May 28, 1941.

The final estimate dated August 4, 1941, was for \$9,999.00. The contractor's force averaged 23 men, the maximum being 31 for the week ending May 17. The contractor used one gas-driven shovel, two road graders, two 12-ton gas-driven rollers, two bulldozers and eleven 1½ to 5-ton trucks.

#### RESERVOIR AND AQUEDUCT DIVISION

The Quabbin Reservoir and Aqueduct Division continued until August 10, 1942, in charge of the work in the Quabbin Reservoir area, including topographic and real estate surveys, cemetery removals and reforestation, of all work in the Ware River watershed and along the Quabbin Aqueduct, of improvements in the Wachusett watershed, and of the construction, as WPA projects sponsored by



WINSOR MEMORIAL, OVERLOOKING WINSOR DAM FROM THE QUABBIN HILL ROAD



QUABBIN RESERVOIR, LOOKING NORTHERLY FROM THE ADMINISTRATION BUILDING



QUANTITIES INVOLVED IN CONTRACTS FOR LAYING THE PRESSURE AQUEDUCT SURFACE PIPE

Contract Number	75	77	78	79	81
Aqueduct Section Number (Section 2 is in tunnel Contract 74)	1	3	4	5	6
Diameter of Pipe	12'-6"	11'-6"	11'-6"	11'-6"	11'-6"
Gross Length of Pressure Aqueduct Including Valves and Steel Plate Specials	9,665*	16,565**	17,800	18,000	15,270***
Gross Length of Branch Lines Including Valves and Steel Plate Specials		120			2,305
Total Work Done and Materials Furnished Under Principal Items of Contracts					
Stripping	25,115	32,020	36,750	35,860	39,430
Earth Excavation	209,380	208,940	356,553	228,400	212,610
Rock Excavation	15,500	13,940	3,080	9,830	31,430
Refill and embankment	156,740	203,340	290,930	520,040	215,890
Soil Dressing	22,440	44,020	43,080	52,320	38,260
Crushed Stone and Screened Gravel	4,370	2,130	3,010	4,240	5,390
Caring For and Laying 12'-6" Precast Concrete Pipe Furnished by the Commission	9,565	—	—	—	—
Caring For and Laying 11'-6" Precast Concrete Pipe Furnished by the Commission	—	16,525	17,830	18,000	15,225
Caring For and Laying 7'-0" Precast Concrete Pipe Furnished by the Commission	—	75	—	—	2,205
Concrete Foundations and Anchorage for Pipe	9,935	9,550	10,620	11,990	14,750
Reinforced and Miscellaneous Concrete	1,525	2,020	625	615	845
Reinforcing Steel	196,580	163,900	79,160	115,020	265,140
Portland Cement	19,080	17,790	15,910	17,590	23,890
Steel Plate Pipe and Specials	65,810	103,200	6,205	8,465	97,560
Structural Steel	66,210	78,040	12,370	50,110	64,110
Stone Masonry	183	81	65	57	69
Permanent Fencing, Type "B"	32,530	35,380	53,290	51,210	13,690

\* Does not include 15 ft. of Surface Conduit in Contract 74 for Tunnel under Sudbury Reservoir.

\*\* Does not include 19 ft. of Surface Conduit in Contract 74 for Tunnel under Sudbury Reservoir.

\*\*\* Does not include 1366 ft. Twin Conduit, etc., through Norumbega Reservoir in Contract 80, nor 40 ft. of Surface Conduit in Contract for Charles River Tunnel Shaft.

the Commission, of sewer systems for the towns of Rutland and Holden. Commencing August 10, 1942, a single field division, the Reservoir and Aqueduct Division, took over supervision of all field work with two branch offices, one at the Ware River intake works covering work in the Ware watershed and on the Quabbin Aqueduct and one at Auburndale covering work on the Hultman Aqueduct and the City Tunnel and all field work in the Metropolitan area, including that on sewerage projects. The division continued the maintenance of the Rutland-Holden Sewer, and the operation of the water analysis laboratory in Belchertown, the Ware River intake works in Coldbrook and the Wachusett outlet works in West Boylston. Upon the completion of construction, Quabbin Park Cemetery, and the supply section of Hultman Aqueduct, including Norumbega Reservoir, were maintained and operated.

The Metropolitan Police continued to be housed in the Administration Building at Belchertown.

#### *Miscellaneous Office Work*

Periodical estimates for Contracts 52, 82, 93, 102, 106, 107, 108, 111, 112, 116, 118, 120, 124 and 125, and final estimates for Contracts 52, 66, 67, 72, 82, 93, 102, 106, 107, 108, 111, 112, 116, 118, 119, 120, 124 and 125 were prepared. Work was continued on revisions and additions to real estate plans. Rainfall, temperature and river flow records were kept at the established stations. Accompanying tables show the monthly rainfall during 1940 to 1945 inclusive, at stations on the Ware and Swift watersheds. Plans and studies were continued of methods of disposing of sewage in the towns of Boylston and West Boylston in the Wachusett watershed. Plans of the proposed general Ware taking were completed for the towns of Barre, Rutland and Hubbardston. Work was continued on the record plans of highways, structures and real estate holdings in the watersheds and along the aqueducts. Studies and plans were made for access roads in the reservoir area, for a transmission line to Quabbin Hill Building, for remodeling and constructing buildings for maintenance use at Quabbin Reservoir, including two new residences on Blue Meadow Road, and for altering property of the Commission near the south abutment of Wachusett Dam to provide for public toilets, housing of radio equipment and police maintenance. The Belchertown office continued its records of the affairs of the four former towns of Dana, Enfield, Greenwich and Prescott, issued vital statistics and records as requested, and investigated all cases of welfare and old age assistance.

Miscellaneous work was completed in connection with the Ludlow Manufacturing Associates' diversion damage case and assistance rendered to the Commission's attorneys during the trial of the case in Springfield.

#### *Miscellaneous Field Work*

Lines and grades were given for construction, and cross sections, profiles and other miscellaneous surveys were made in connection with work on Contracts 52, 66, 67, 82, 93, 106, 107, 108, 111, 112, 116, 118, 119, 120, 124 and 125, and with work on the WPA sewer projects in Holden and Rutland. Considerable topography was taken in connection with drainage studies in the Ware watershed, studies and designs for improving the access roads to Winsor Dam, and studies for the diversion of the sewage of West Boylston and Boylston in the Wachusett watershed. Field work in 1942 included surveying and inspecting the construction of approximately 16,250 feet of boundary fence north of Prescott peninsula, completed October 10, 1942, by the U. S. War Department, and miscellaneous surveys in other locations in the reservoir area while the Commission has permitted that department to use, also the surveying of lines for fences, fire lanes and clearing at the north end of the Prescott peninsula under a WPA program sponsored by the Federal government. Work was continued on the surveying of taking lines, of the relocated town liens, of areas in the reservoir bottom requiring reclearing ahead of the rising water level and of potential hazards to navigation as the water rises. The work of setting stone bounds to locate taking lines and outlying properties of the Commission was continued.

In 1941, weirs were installed on four brooks on the intervening drainage area between Winsor Dam and Bondsville. Stone suitable for the construction of the Quabbin Hill buildings were selected from roadside walls and hauled to the building site. Stone and other material for the work under Contract 118 were hauled to the various construction sites. Foundations for the pylons built under Contract 119 were constructed. Work was commenced in 1944 on the construction by force account of two residences on Blue Meadow Road for maintenance use at Quabbin Reservoir. Lumber and other materials were salvaged from various Commission-owned buildings on the watersheds for use in their construction. A sewer line was constructed to connect them to the main disposal line from the Administration buildings. The first of these two buildings was completed sufficiently to be ready for occupancy on November 6, 1945. One additional storage building was constructed in 1944 from one of the former C.C.C. camps on Route 9. The sewage disposal area at the Administration Building septic tank was extended in 1944. All vehicular repairs were taken care of at the repair shop in the west garage of the Administration Building and at the Ware River intake service building. Commencing June 17, 1940, the Quabbin Hill buildings were maintained for use of the public except for the period of the war emergency between December 9, 1941, and April 9, 1946.

Monthly inspections and reports were continued of conditions found at all shaft heads along the Quabbin Aqueduct. The chlorinator station on Mill Brook below the Central New England Sanatorium was maintained. The Department of Public Health continued its cooperation with this division in the analysis of samples of water. Surveys for the proposed City Tunnel extension of Hultman Aqueduct were continued. In 1945, real estate taking plans were prepared for the entire tunnel length.

Sewage level gages were maintained on the South Metropolitan sewer commencing in 1943, on the Neponset Valley sewer for a short period in 1944, at the Fens Gate Chamber of the Boston Marginal Conduit since June 23, 1944, and at the Charles River Dam Chamber of the Cambridge Marginal conduit since June 20, 1945. The field work included surveys and subsoil investigations for Sewerage Project No. 1 at Nut Island, soil analysis at the Park Road laboratory, the collection of flow data and the collection and analysis of sewage samples in the South Metropolitan trunk sewer, and the running of levels and the taking of flow data on Sewage Projects Nos. 4 and 5 on the Charles River Basin Marginal conduits. Work was continued on the reconstruction and equipment of the laboratory at Park Road.

*Reforestation.*—The general program of reforestation was continued with stock from the Commission's nurseries. In the spring of 1940, 100 pounds of white pine seed, 150 pounds of red pine and 25 pounds of white ash were planted; in the fall of 1940, 100 pounds of white pine seed; in the spring of 1941, 100 pounds of red pine and 10 pounds of hemlock. In addition, 25 bushels of hardwood tree seed were collected locally. Broad planting, including the percentage of survival to date, is summarized in the accompanying 6-year table.

Survival to date of the plantings in previous years, including replacements, is as follows:

1935 . . . . .	65%	1938 . . . . .	90%
1936 . . . . .	40%	1939 spring . . . . .	75%
1937 . . . . .	90%	1939 fall . . . . .	60%

The summary of stock in the nursery on June 30, 1945, in addition to about 1,000 miscellaneous trees and shrubs, is as follows:

Five-year seedlings (5-0) . . . . .	1,900,000
Six-year seedlings (6-0) . . . . .	1,900,000
Seven-year seedlings (7-0) . . . . .	2,000
Five-year transplants (3-2) . . . . .	85,250
Six-year transplants (2-4) . . . . .	700,000
Seven-year transplants (2-5) . . . . .	2,900,000
Nine-year transplants (2-2-5) . . . . .	400
<b>Total . . . . .</b>	<b>7,487,650</b>

## BROAD PLANTING UNDER THE PROGRAM OF WATERSHED REFORESTATION

Species	Type of Transplants	1940	1941	1942	1943	1944	1945
<b>QUABBIN WATERSHED</b>							
Nursery work	.		Apr. 9 to May 21 14 men	Apr. 2 to May 19 14 men	Apr. 12 to Sept. 30 7 men	Apr. 12 to July 15 6 men	Mar. 30 to May 15 7 men
Average Force	.		Apr. 10 to May 29 38 men	Apr. 13 to May 25 61 men	Apr. 22 to June 11 12 men	Apr. 26 to June 7 25 men	Apr. 3 to May 23 20 men
Average Force	.		1,260	1,200	300	500	425
Acres Planted	.	965	1,260	1,200	300	500	425
Cost per M for planting	.	\$9.00	\$7.06	\$8.04	\$8.11	\$8.16	\$9.65
Survival to date	.	90%	90%	90%	90%	80%	75%
White pine	.	442,625	381,500	349,600	182,775	135,025	166,225 seedlings.
Red pine	.	522,675	379,725	670,000	150,425	610,000	103,300
Scotch pine	.	5,025		272,350			370,225 5-yr.
White spruce	.	143,250		164,150			
Red spruce	.	22,000	270,275	70,000			
Norway spruce	.	68,575	57,050	10,525			
European larch	.	70,860	8,600	150,725			
Hemlock	.	16,270		8,150 3-yr.			
White ash	.	33,900	5,750		41,900 5-yr.		
Black walnut	.		68,800				
Sugar maple	.		800	520			
Hickory	.			12,250			
	.			7,900			
<b>WARE WATERSHED</b>							
White pine	.	255,000	80,000				50 5-yr.
Red pine	.	301,000	110,000				50 5-yr.
White spruce	.	200,000	25,000				
Red spruce	.	100,000	25,000				
Norway spruce	.	100,000					
European larch	.	100,000					
Hemlock	.						
Arbor Vitae	.				30,000		
	.				200		

On account of the difficulty in securing adequate labor, the work of reforestation was curtailed commencing in 1943, and a quantity of surplus stock sold.

Some work was done on gypsy moth control for 9 days in June, 1945, by roadside spraying on the Prescott Peninsula with arsenate of lead solution.

*Landscape Planting.*—The work of general landscaping was continued with local labor and for the most part with shrubs purchased from nursery stock or collected from local sources. It included the clearing of vistas and hurricane-felled timber along the Quabbin Hill Road, the release cutting of sprout growth in the pine plantations along the Daniel Shays Highway, and replacement and new planting and maintenance of trees and shrubs in the vicinity of the Administration Building, Winsor Dam, Quabbin Dike, Winsor Memorial and the entrance to Quabbin Park Cemetery.

*WPA Clearing Project.*—During 1941 a project was undertaken for reclearing reservoir areas ahead of the rising water level and for clearing fire lanes and hurricane felled timber on the watershed area, with labor furnished by the Federal Work Progress Administration and equipment furnished by the Commission. Work commenced March 21, 1941, with 24 men from Ware on clearing fire access roads and continued until May 14. Work was resumed April 25 with 9 men from Athol and 32 men, a few days later, from Warren, and continued until July 23, at which time the project was discontinued after about 100 acres of reservoir bottom had been recleared, and 2.4 miles of fire lanes and about 17 acres of hurricane debris cleared. The average force was 18 men, the maximum being 56 on April 29, 1941.

*Floating Equipment.*—The Commission has three engine-powered units, the 46-foot "Enfield", constructed under Contract 103 and launched April 17, 1941; the 26-foot "Greenwich", launched June 11, 1940, and the smaller 16-foot "Dana". These boats were continued in use for the transportation of workmen and equipment to various sections of the reservoir for taking water samples and general utility work.

*Experimental Grazing.*—On May 13, 1940, ten sheep were delivered from the Middlesex Fells Division of the Metropolitan District Commission and pastured below Quabbin Dike in experimental grazing areas. The flock now totals 50, on June 30, 1945. About 90 pounds of wool was sheared in 1941, 130 in 1942, 140 in 1943, 243 in 1944, and 286 in 1945.

*Fire Protection.*—Fire fighting equipment was maintained in readiness for service at all times, one fire truck being stationed at Pelham Hill, at or near the Reservoir Intake to Quabbin Aqueduct, one near the Ware River Intake Works, and the remainder of the fire fighting equipment at the Administration Building. During the six fiscal years, the equipment and personnel responded to calls for assistance at forest fires, mostly on property of the Commission, as follows:

	1940	1941	1942	1943	1944	1945
Quabbin Area						
Number of fires . . . . .	3	3	2	5	12	3
Acres burned . . . . .	78	—	152	107	1870	125
Ware Watershed						
Number of fires . . . . .	2	9	3	4	6	0
Acres burned . . . . .	20	725	156	9	284	—

Commencing in 1943 the U. S. Army bombing and gunnery range detachment with their fire fighting equipment was particularly effective in rendering aid. In May 1944, the army kept a considerable quantity of fire-fighting equipment in readiness at the Army boathouse on old Route 21.

Work was commenced in 1940, in mapping the location of future fire access roads. Local labor was employed in reclearing fire stops along the property taking line, burning hurricane timber and brush which had been previously cut and piled, clearing fire protection strips along access roads and along the Daniel Shays Highway, repairing abandoned roads to make them accessible for fire equipment, and constructing water holes. In cooperation with the weather bureau of the United States Department of Agriculture, a fire weather observation station was set up on Commission property and readings taken three times a day, April 8 to November 26, 1940.



progress necessitated the hiring by the Commission of a power trench excavator and pipe layers on August 21, 1941. This  $\frac{3}{4}$ -cubic-yard trench hoe was used continuously 5 days a week after that date with a material increase in progress. In 1942, the average weekly WPA labor force was 35 men, the maximum being 97 during the week ending December 17, 1941. The Commission's labor force on this work in that year averaged 7 men. The Federal Works Progress Administration discontinued all work in the Worcester District on April 30, and no work was done on the Holden System by the WPA labor force after the week ending February 3, following which the Commission continued the Holden Sewer construction to completion with its own labor force.

In 1940, 8,615 linear feet of 8-inch sewer pipe and 529 feet of 10-inch sewer pipe were laid and 48 manholes constructed. The weekly average rate of laying was 176 feet and the maximum 736 feet. In 1941, 9,690 linear feet of 8-inch and 10-inch vitrified clay pipe and 456 feet of 10-inch cast iron pipe was laid, at an average rate of about 195 feet per week, the maximum being 540 feet for the week ending October 1, 1941. The average progress in 37.5 weeks by hand labor was 151.4 feet per week and during 14.5 weeks by hand labor with the trench hoe was 383.6 feet. A length of 996 linear feet or sheeted trench and 457 linear feet of 6-inch vitrified clay pipe underdrain was used to complete excavation and facilitate pipe laying. The sheeting was removed during backfilling operations. In 1942, 6,808 linear feet of 8-inch vitrified clay pipe was laid at an average rate of 315 feet per week for about 22 weeks, the maximum rate being 630 feet during the week ending January 7, 1942. There was also laid a total of 506 linear feet of 8-inch and 702 linear feet of 10-inch cast iron pipe, 91 feet of 6-inch underdrain, and 47 manholes. Timber sheeting was required for 1,500 linear feet of trench. Excavation for the Sunnyside Pumping Station was started June 13 1942, and the concrete poured between September 3 and October 27. In 1943, approximately 0.06 mile of sewer and one manhole was constructed, making a total of 5.61 miles and 134 manholes in the completed system. The Sunnyside Pumping Station was completed ready for operation in June. The average weekly WPA labor force prior to February 3 was 8 men, the maximum being 17 during the week ending December 5, 1942. The Commission's labor force averaged two men for 34 weeks. The system was accepted and put into operation by an agreement with the town, dated November 2, 1943.

*Rutland Sewer System.*—Work was begun April 26, 1940, under the Commission's agreement with the Town of Rutland for the construction of 16,200 ft. of sanitary sewers including 55 manholes, in cooperation with the Federal Works Progress Administration, and with the equipment furnished by the Commission. All lines and grades were given and the construction work superintended. In 1940, 4,122 linear feet of 8-inch sewer pipe and 2,832 feet of 10-inch cast-iron pipe were laid and 14 manholes constructed. The weekly average rate of laying was 224 feet and the maximum 622 feet. The average number of men employed on this WPA project was 62 and the maximum 88. In the following year work was prosecuted principally from December, 1940, to May 14, 1941. 1,360 linear feet of 8-inch vitrified clay pipe were laid averaging about 20 feet per week, the maximum being 236 feet for the week ending January 29, 1941, and 3,922 feet of 10-inch cast-iron pipe were laid, the average rate being 227 feet per week and the maximum being 531 feet for the week ending March 26, 1941. Nineteen manholes were completed and 1,480 square feet of highway resurfaced. A length of 237 linear feet of sheeted trench and 247 linear feet of 6-inch vitrified clay pipe underdrain was used to complete excavation and facilitate pipe laying. The sheeting was removed during backfilling operations.

No WPA force was employed for the period from May 14 to November 8, 1941, except for occasional small cleanup and clearing crews due to a drastic cut in WPA forces. The average WPA force was 54 men during 37 working weeks. The maximum weekly force was 144 men during the week ending December 25, 1940. Work on this contract was resumed on November 8, 1941, when a small force of 14 men were available. In 1942, 5,971 linear feet of 8-inch vitrified clay pipe was laid at an average weekly rate of 153 feet per

week for 39 weeks, the maximum being 517 feet during the week ending June 23, and 2,537 linear feet of 10-inch cast iron pipe at an average weekly rate of 284 feet per week for about 9 weeks, the maximum rate being 567 during the week ending June 3. 246 feet of 8-inch cast iron pipe were laid and seventeen manholes completed. No timber sheeting nor underdrain were required. The average weekly WPA labor force was 12 men, the maximum being 27 during the week ending January 28, 1942. The Commission's labor force on this work in 1942 averaged 4 men.

In 1943, approximately 0.33 mile of sewer and 17 manholes were constructed. The pipe laid during the year consisted of 1,850 linear feet of 8-inch and four feet of 10-inch vitrified clay pipe. The average weekly WPA labor force prior to the shut down April 30, was 10 men, the maximum being 19 during the week ending February 24. The Commission's labor force averaged six men for 50 weeks. No labor was furnished by the WPA after April 30. In 1944, approximately 0.11 mile of sewer and 1 manholes were constructed, making a total of 4.49 miles and 81 manholes in the completed system. The measuring station at the Rutland-Holden boundary line was completed, meter installed, and a continuous record kept commencing April 14. All construction work was completed September 21, and the entire line was cleaned, flushed and inspected. The pipe laid during the year consisted of 511 linear feet of 8-inch and 46 feet of 10-inch vitrified clay pipe. The Commission's labor force averaged about five men for 44 weeks.

#### *Laboratories*

*Soil Testing Laboratory.*—Tests of materials for embankment construction and acceptance tests on aggregates and other materials were continued in the former division office in the so-called Chandler house on January 16, 1940, when the laboratory was moved to the administration building in Belchertown. On September 16, 1940, the soil testing equipment which had been transferred to the Natick Laboratory was returned to the Administration Building. Sampling from the settle core was continued periodically through the ports of the observation wells in Winsor Dam and Quabbin Dike and material was tested for size gradation and porosity to determine the extent of consolidation. The wells were reinforced as required against buckling.

General assistance was rendered by the laboratory staff in connection with the damage suit brought by the Arthur A. Johnson Corporation and at the hearings for the damage suit brought by the Benjamin Foster Company. The work included opening about 50 test pits in borrow areas.

Spelter tests were made of zinc and other acceptance tests for the large quantity of fencing required along the pressure aqueduct and elsewhere.

The soil testing laboratory was discontinued December 20, 1941. In 1942 the equipment was moved to the building of the Commission in Weston, formerly the Samuel C. Bennett Estate, which has been equipped as a field laboratory for the dual purpose of studying and testing soils and of studying and analyzing sewage samples in connection with the sewerage projects in the metropolitan area.

*Water Analysis Laboratory.*—The taking and analyzing of samples from the Ware, Swift, Quaboag and Chicopee rivers was continued and general assistance was rendered by the laboratory staff in connection with the diversion damage suits brought by the Boston Duck Company, the Palmer Mills, Inc., and the Ludlow Mfg. Associates. The chemical and bacteriological analysis of the regularly scheduled samples from Quabbin Reservoir and tributary streams in the Swift and Ware watersheds was continued. Samples at the reservoir stations were taken generally at the bottom, top and at each even 10-foot depth.

Samples of drinking water supplies used by the United States Army were tested frequently as requested. Commencing January 1, 1943, all work of analysis of water samples has been under the general supervision of Clarence H. Reed, Assistant Superintendent of the Sudbury Section of the Metropolitan District Commission.

### *Quabbin Aqueduct Operation*

The Quabbin Aqueduct Reservoir intake works at Shaft 12, the Ware River intake works at Shaft 8, and the outlet works at Shafts 1 and 11A were kept ready for operation with the fine racks in place at Shafts 12 and 8. A rack of shallow depth on the invert at the bottom of Shaft 9 was also maintained and found to be effective in permitting the removal of some debris from this easily accessible portion of the tunnel. The pond back of the Ware intake dam was drained from July 17 to November 3, 1940, and thoroughly cleaned of debris which consisted mostly of matted root masses which had been brought down during the unprecedented flood of September, 1938, and which had badly clogged the intake racks during the subsequent periods of diversion. Thereafter it was drained each summer and cleaned of debris. A boom for the diversion of floating debris from the siphon spillway intakes was installed October 7, 1944.

The entire Wachusett Outlet Works were unwatered October 28 to November 18, 1944, for the first time since the original construction, and minor repairs made to the eroded channel downstream from the control gates. At the same time alterations were made in the sill of one of the stop shutterbays and all stop shutters were cleaned and painted and replaced in the grooves.

On September 7, 1943, a successful test was made of the emergency operation of adequate controls at Shaft 12. The tunnel was entered at Shafts 4, 8 and 12 at intervals for the purpose of inspection, and all linings were found in good condition.

The installation of an emergency gasoline-driven generator in the service building at Shaft 8 was commenced November 17, 1941, and completed February 18, 1942. At the top of Shaft 2 a spillway was constructed under Contract 112, as hereinafter described. At Shaft 1, the 900-horsepower motor for driving the tunnel unwatering pump was removed January 4, 1940, and shipped to the pump manufacturer to be fitted to the pump to be used at Shaft 4 of the Southborough Tunnel on the new pressure aqueduct for unwatering the tunnel, similar to the corresponding pump at the Wachusett outlet works. In 1940, the 144x90-inch Venturi meter in the shaft was re-equipped with pressure recorders adapted to the change from the previous gravity flow in the aqueduct to the pressure condition now obtained following the installation of control gates under Contract 65.

### *Inspection and Repair of Large Control Valves*

A thorough inspection was made of several large control valves of the Dowdise type used to control the flow at shafts 8 and I of Quabbin Aqueduct and at the Winsor Dam outlet works under severe high head conditions. The inspection was made to determine the extent of wear or damage to the valves from pitting which is caused by cavitation wherever very high velocities are encountered, which combined with irregularities in the conduit shapes cause local high vacuum conditions reducing the pressure below the vapor pressure of the water.

At Shaft 8, there is one main valve, 6-foot diameter, and three auxiliary valves, 5-foot diameter. The latter are used only occasionally. The conditions are particularly severe because the design, with the valves at the top of the helical-vaned shaft, involves an extremely high vacuum. The operation has continued since 1930. The helical lining has been inspected from time to time and no deterioration has ever been noted. A nozzle contraction below the main 6-foot valve is designed to prevent the highest vacuum in the shaft top from extending up through the interior of the valve itself. No damage was found to the valve body casting or to the valve seat. Some deterioration from pitting was found in the nozzle casting below the valve at a point near a very sharp curve and repairs were easily made by welding.

At Shaft 1 there are two 6-foot valves in series, one acting as a guard gate. They have been put to severe use on several occasions for discharging at full capacity from Quabbin Reservoir to Wachusett Reservoir, frequently for a

month at a time without interruption. Here, too, the design includes a nozzle just down stream from the valve itself which is designed to prevent too high a vacuum where it can do damage. No pitting was found. During the unwatering operations repairs were made to correct some erosion of the channel, and ripped slopes were repaired.

At the Winsor Dam outlet works there are two by-pass valves, one four feet and one two feet in diameter, which due to the war's delay in installing the proposed waterwheel have been operated under severe throttling conditions for a long period. Cavitation was discovered in both these valves and repairs are in progress. However, the principal purpose for which the larger four-foot valves was required has already been served, namely, to carry the entire flow of the river during and immediately following the construction of the Winsor Dam diversion tunnel plug under Contract 52, when the available head was relatively very small.

#### *Hultman Aqueduct Operation*

Commencing July 28, 1943, water was discharged directly from Wachusett Reservoir to the northern high service by continuous draft from the Norumbega Distributing Reservoir through the 7-foot diameter by-pass into the Weston Aqueduct supply mains and by replenishing Norumbega reservoir from the equalizing basin between the Wachusett Aqueduct terminal chamber and the pressure aqueduct intake during the day in the hours of operation of the Wachusett Power Plant.

Normally water was run into the Norumbega Reservoir from 8:30 A.M. to 4:30 P.M. daily except weekends when the control works were left open under a lower draft from Saturday morning to Monday morning.

Occasionally, under increased draft, the flow in the aqueduct was continuous throughout the week.

The Hultman Aqueduct intake works in Marlboro, the control works at Shaft 4 below the Sudbury Dam, and the Norumbega Reservoir gatehouse and emergency chlorinating plant were maintained with the fine racks in place at the intake.

#### *Progress of Contracts*

*Contract 52.*—Contract 52, for constructing the embankment of Winsor Dam, was continued to completion. The placing of riprap continued intermittently and was completed July 2, 1940. Soil dressing was resumed May 6 and completed June 18. Miscellaneous work at the intake gatehouse was completed June 22. The plugging of the stream control tunnel was continued to completion February 2, 1940, and the temporary opening through the lower intake fill was plugged with concrete, permanently establishing the sill of the lower intake at Elev. 427. Placing of the conduit on the fill in the stream control tunnel downstream from the plug was continued. The 72-inch steel pipe was all placed and the joints caulked January 28, the concrete envelope completed March 11, and the mortar lining May 6. The work of sealing off the downstream entrance and constructing an access conduit was started February 5, and completed May 14. Excavation for the foundation and walls of the outlet works building continued through December 18, 1939, after which the concrete foundations were constructed, including columns, beams and floor slabs, in readiness for the superstructure under Contract 111. The 60-inch control valve at the end of the main conduit laid on fill in the stream control tunnel was set in place January 18, 1940, and all other valves and piping completed June 15. All work at the outlet building was completed July 2. Soil dressing and seeding of the area near the toe of the dam was completed July 3. The access road to the outlet works, with a traffic circle on the rim of the outlet channel, was completed July 1. The road alongside the spillway and spillway channel, including boulder guard rails along the rim of the spillway excavation and the east and west access roads, were all completed early in July. Miscellaneous grading at the outlet channel was commenced April 9, and included a system



WINSOR DAM, LOOKING WESTERLY FROM BRIDGE OVER SPILLWAY CHANNEL



QUABBIN RESERVOIR, LOOKING NORTHEASTERLY TOWARD THE MIDDLE BRANCH  
FROM QUABBIN HILL ROAD



of rubble drainage gutters and walls against the high ledge face of the original stream control tunnel portal and berms and cobble gutters to take care of the drainage of the high slopes of the outlet channel. These drainage works were completed June 30, 1940.

Work on the main spillway channel was continued throughout the winter with the work of excavating, sealing of ledge and shaping up the bottom and slopes at the south end of the channel near the river. Gravel for the sub-base under the riprap on the slopes was spread and graded as the excavation and shaping up progressed. Riprap previously stored from the ledge excavation in the channel was placed through January and February. Soil dressing of the earth slopes was resumed May 6, 1940, and all loaming and seeding was completed early in July. Building of the rubble retaining walls along the spillway channel was discontinued during the winter, from December 16 to May 8, and completed about the middle of May. The setting of stone masonry in the spillway weir was continued and practically completed December 16. Cleaning and grouting of the weir was continued until January 27, 1940, suspended until April 15, and continued through May 7, when all masonry work on the weir was completed. Miscellaneous work was done during the spring at the spillway bridge, including the placing of concrete deflection walls on the sides of the channel downstream from the bridge. The ramp to the boathouse and seaplane hangar was completed in April and May down to an elevation approximately 50 feet below the reservoir flow line. All the work of cleaning up was completed July 12, 1940.

The final estimate, dated September 10, 1940, was for \$2,439,727.82. The contractor's force in 1940 averaged 74 men, the maximum being 147 for the week ending December 9, 1939.

The total electrical energy used during 1940 was 35,585 kilowatt hours, making a total on the contract of 10,640,285 kilowatt hours.

The following subcontractors did substantial amounts of work under this contract.

Lane Construction Corp.  
National Gunité Company

Bituminous macadam road surface  
Lining 68-inch pipe in tunnel.

The total work done and materials furnished under the principal items of Contract 52 are as follows:

Earth excavation . . . . .	244,350 cu. yds.
Rock excavation . . . . .	134,420 " "
Consolidated pervious embankment . . . . .	39,000 " "
Rolled impervious embankment . . . . .	1,950 " "
Embankment by full-hydraulic method . . . . .	3,440,445 " "
Miscellaneous embankment . . . . .	195,960 " "
Selected coarse material . . . . .	139,570 " "
Crushed stone or screened gravel . . . . .	34,440 " "
Light riprap . . . . .	124,730 " "
Heavy riprap . . . . .	22,700 " "
Paving . . . . .	2,900 " "
Soil dressing . . . . .	71,060 " "
Gravel sub-base for roads . . . . .	11,920 " "
Broken stone base for roads . . . . .	3,410 " "
Broken stone surface for roads . . . . .	4,280 tons
Bituminous material . . . . .	77,930 gallons
Stone walls . . . . .	3,420 cu. yds.
Furnishing and placing grout . . . . .	950 " "
Portland cement . . . . .	27,900 barrels
Concrete, Class A . . . . .	4,610 cu. yds.
Concrete, Class B . . . . .	4,950 " "
Concrete, Class C . . . . .	2,270 " "
Reinforcing steel . . . . .	329,074 pounds
Stone masonry . . . . .	1,320 cu. yds.
Steel pipe for 68-inch conduit . . . . .	382,900 pounds
Miscellaneous metal work . . . . .	313,020 "
12, 18 and 24-inch tile pipe . . . . .	9,000 lin. ft.

*Contract 66.*—Contract 66, for constructing regulating dams on the Middle and East branches of the Swift River, was continued to completion December 15, 1939, the work consisting of final cleaning up and burning of debris.

The final estimate dated September 14, 1940, was for \$188,965.86.

*Contract 67.* Contract 67, for improving the access road to Shaft 9 of Quabbin Aqueduct, was started September 5, 1940. The work consisted of repairing damage done by abnormal floods in 1936 and 1938 and improving road surface

ing and drainage. The contractor completed the total length of resurfaced roadway of about 575 feet of 2½-inch top course of broken stone surfacing and asphalt penetration September 17, 1940.

The final estimate, dated November 7, 1940, was for \$1,428.96. The contractor's force averaged six men, the maximum being nine on September 12, 1940.

*Contract 72.*—Contract 72, for clearing a portion of the site of Quabbin Reservoir, was continued to completion December 15, 1939, the work consisting of removing and burning stumps, disposing of sawdust piles and cleaning up.

The final estimate, dated September 14, 1940, was for \$476,374.54. The contractor's force during this short period of completion averaged 16 men, the maximum being 24 for the week ending December 2, 1939.

*Contract 82.*—Contract 82, for constructing Administration Road over Quabbin Hill, was continued to completion except for suspension of operations during the winter from December 16, 1939, to April 11, 1940. Berm ditches were excavated outside the slopes and in various cuts and excavations were made for additional side drains. Pipes were laid and ditches backfilled with trap rock. Stone fill bleeders in the slopes of cuts, cobble gutters and stone riprap and paving were placed at various locations to improve the drainage where needed, and loam and macadam berms were built on the road shoulders at various high fills to prevent erosion of the slopes. Boulder guard and multiple-cable type highway guard were placed and final cleaning up completed June 5, 1940.

The final estimate dated August 10, 1940, was for \$228,550.64. The contractor's force in 1940 averaged 31 men for twelve weeks, the maximum being 50 for the week ending May 18, 1940.

The total work done and materials furnished under the principal items of Contract 82 were as follows:

Roadway earth excavation . . . . .	73,620 cu. yds.
Ledge excavation . . . . .	21,335 " "
Ordinary borrow . . . . .	47,420 " "
Crushed stone . . . . .	22,530 tons
Bituminous material . . . . .	156,580 gallons
Gravel borrow . . . . .	26,520 cu. yds.
Highway guard . . . . .	12,940 lin. ft.
Trench excavation . . . . .	5,744 cu. yds.
Loam borrow . . . . .	13,390 cu. yds.

*Contract 93.*—Contract 93, for completing the East Branch Baffle, was continued to completion January 6, 1940, the work consisting of miscellaneous earth excavation, placing of pervious fill, screened gravel and riprap and final cleaning up.

The final estimate dated February 21, 1940, was for \$25,102.08. The contractor's force during this short period of completion averaged 26 men for six weeks, the maximum being 38 for the week ending December 9, 1939.

*Contract 102.*—Contract 102, for remodeling property of the Commission known as the Sauer House, consisted of four items. Work was completed under Item 1, for linoleum, September 7; under Item 2, for plumbing, September 18; under Item 3, for heating, August 15; under Item 4, for electrical work, September 17. This work was done with a force of two men. The total cost of all items was \$1,524.50.

*Contract 106.*—Work under Contract 106, for the improvement of access roads in the Quabbin Reservoir area, consisted of the construction by regrading and surfacing of about 1.4 miles of existing road, 10 feet wide, from the existing Greenwich-Hardwick Road to the East Branch regulating dam and the extension of the same another 0.4 mile across the dam by surfacing, 10 feet wide, this short stretch of access road previously constructed and graded under Contract 66; the surfacing, 10 feet wide, of about 0.9 mile of access road to the Middle Branch regulating dam previously constructed and graded under Contract 66; the construction by regrading and surfacing of about 0.35 mile of existing road, 20 feet wide which connects the southerly end of the above access road to the East Branch regulating dam with the easterly end of the Shaft 12 access road constructed under Contract 60; the regrading and surfacing, 10 feet wide, of about 0.1 mile of the existing access road to Shaft 11A constructed under Contract 20;

and the construction by regrading and surfacing of about 0.8 mile of existing Blue Meadow Road, so-called, 16 feet wide extending from the Winsor Dam west access road northerly to the Commission's Belchertown nursery.

Work was started May 20, 1940, with clearing for a borrow pit area on the East Branch regulating dam access road, and excavation for this road was completed June 21. Excavation on the Blue Meadow Road was completed June 14 to 21. At the Middle Branch regulating dam most of the gravel for the two-inch mixed-in-place surface course was placed on the road June 21 to 23, and the seal coat was applied and completed during the week of July 19. Between June 12 and 30, on the East Branch regulating dam access road, the two-inch mixed-in-place gravel surface course was placed, mixed with tar and rolled, the fine grading completed and the loam placed on the slopes and seeded. The seal coat was applied and completed July 30 to August 6, 1940.

The final estimate dated October 22 was for \$27,433.36. The contractor's force averaged 40 men for twelve weeks ending August 10, 1940, the maximum being 73 for the week ending July 20.

The principal items of plant were as follows:

- 5 power shovels
- 1 road grader
- 1 caterpillar tractor bulldozer
- 1 steam and 2 gasoline rollers
- Miscellaneous trucks, etc.

*Contract 107.*—Contract 107, for constructing buildings on Quabbin Hill, involved two buildings, a utility building on the summit of the hill housing radio broadcasting equipment and including a tower for a fire lookout, and a public toilet building located just west of the summit and near the large automobile parking area constructed under Contract 82. Excavation of earth and ledge for the foundations of the utility building was started November 15 and completed December 1, 1940. The foundations were completed December 8, using transit-mixed concrete from Ware. All concrete work and granolithic finish for the tower stair landings was completed January 20, 1941, and all the remaining concrete work January 28. Laying the field stone and brick for the walls of the tower and utility section was started December 9, and completed December 31, 1940, except for window sills in the tower which were completed January 31, 1941. Setting of glazed tile blocks for the interior and partition walls of the utility section of the building was started January 3, and practically completed January 15, 1941. Installation of steel stairways in the tower was started December 14, 1940, and completed January 13, 1941, and for the fire observation platform on January 24. The roof and cornice work was completed January 3, 1941, slate roofing February 10, and copper flashing February 14. All electrical work, plumbing, heating and painting was completed March 29, 1941. For protection of the work during the cold weather the entire tower and the one-story utility section, including the outside staging around the tower, was covered with tarpaulins and a steam boiler set up which provided heat commencing December 7, 1940.

Earth excavation for the foundation of the toilet building was completed November 21, 1940, and the concrete foundation placed. The laying of field stone and brick for the exterior walls was completed December 6, 1940. Tile masonry for the interior walls and the ceramic floor tile was started December 31, 1940, and completed January 7, 1941. Marble partitions were completed February 6. Framing for the roof was started December 6, 1940, and completed December 11, and the slate roof was completed December 24. Plastering, plumbing, ventilating, electric work, etc., and all trim were completed January 22, 1941, and painting March 6.

For the water supply installation, a 3000-gallon underground storage tank was constructed and completely installed with all accessories February 6, 1941. An underground pump chamber was built at the top of the deep well driven under Contract 120. The chamber was completed February 8, housing a tem-

porary pump for the contractor's supply. This was taken out, the pump purchased for permanent installation was installed and the water supply storage tank filled, April 23, 1941.

The construction of the septic tank for the disposal of sewage outside the watershed was completed January 2, 1941, together with the 6-inch sewer lines from the two buildings.

Electric cables for connections to the buildings from the transmission line constructed under Contract 124 were laid in the trench excavated for the water and sewer lines. This underground electrical installation with protective creosoted timbers placed over the cables was completed in the trench backfill April 21, 1941. Gravel and crushed stone were purchased for the construction of paths between the buildings and the service parking area at the top of the hill and placed December 28, 1940. The penetrating and sealing casts of tar were completed December 31.

The final estimate, dated May 26, 1941, was for \$72,477.06. In general, the contractor maintained one 8-hour shift, six days a week, although some operations were on two shifts and some work was done on Sundays. The contractor's force averaged 70 for seven weeks in 1940, and was much reduced after the end of the year, the maximum being 114 in the week ending December 14, 1940.

*Contract 108.*—Contract 108, for the construction of a ramp and utility wharf in the sheltered bay near the entrance to the spillway channel, was started in September, 1940, and excavation, filling and grading of the lower ramp was completed November 25. Similar work on the upper ramp, for providing access from the Quabbin Hill Road, was started October 16, and completed November 26. This included rubble retaining walls which were constructed October 8 to November 15. Paving and riprap protecting the slopes of the lower ramp and the turn-around area between the two ramps was practically completed before November 30, 1940. The grading of the anchorage basin to eliminate navigation hazards was completed September 27 to October 31. Ledge outcroppings were drilled and blasted. The base course of crushed stone in the approach ramp and turn-around area was placed and graded in December, 1940. The top course was completed and penetrating and sealing casts of asphalt applied December 10. Work was then continued on gutters along the approach ramp and on riprap protection of the main ramp. Cable guard rail was completed December 14. The timber float to be moored alongside the ramp and the gang-plank were completed December 10. The construction of permanent fencing along the spillway channel was started with the drilling of holes in the capstones and the ledge December 16, 1940, and completed January 8, 1941. This completed all work for the contract except painting, which, on account of the seasonal conditions, was omitted from the contract and done later by the Commission's labor force.

The final estimate, dated March 18, 1941, was for \$18,528.27. The contractor's force averaged 12 men for 17 weeks, the maximum being 24 for the week ending October 19, 1940.

*Contract 111.*—Work under Contract 111, for constructing Winsor Dam outlet superstructure, was started October 15, 1940, with the excavation of trenches for electric connections to the transmission line constructed under Contract 124. The building is of brick masonry of stone trim and constructed on foundations previously built under Contract 52. Anchor bolts for the steel columns were set November 14. Structural steel was delivered to the job November 18 and its erection completed November 25. The laying of brick and stone masonry commenced November 25. Setting of brick for the walls was completed December 31, 1940. The brick was washed and the joints pointed January 24, 1941. The setting of glazed tile for the interior walls was started December 11, 1940, and completed January 11, 1941. Precast concrete roof slabs were placed January 6 to January 10, and the entire slate roof with copper cornices was completed January 22. Guniting of the structural steel roof support commenced with wrapping of wire mesh January 8, and was completed January 17. Plumb-

ing, electrical work, installation Venturi meter recorders and all miscellaneous trim was completed April 16, and grading and loaming of the grounds and all other work May 19, 1941. For protection of the work during cold weather, a protective covering of tarpauline was used with heat supplied by coke and oil-burning salamanders.

The final estimate dated June 11, 1941, was for \$48,060.36. The contractor's force averaged 8 men for five weeks, in 1940, increasing to a maximum of 47 on December 23, 1940, and being reduced to about 10 by the first of February, 1941.

The following subcontractors did substantial amounts of work under this contract.

Federal Electric Construction Co.	Electrical work
Dunnels and Lanagan	Plumbing
West End Iron Works	Structural steel

*Contract 112.*—Contract 112, for constructing a spillway at the top of Shaft 2 of Quabbin Aqueduct, was started in September, 1940, with the excavation and removal of old timbering used in making the original shaft excavation to sound ledge. The top of this shaft had been left, under Contract 14, in an incomplete state, pending decision as to the construction that would be necessary in case works for diverting the Quinapoxet River into the tunnel at this point should be found feasible. The work consisted of excavating and regrading the tunnel spoil areas near the shaft, encasing the top of the shaft with a concrete collar, and paving a spillway channel for a distance of approximately 200 feet away from the shaft toward the Quinapoxet River. Riprapping the new basin and channel was started September 12, and concrete masonry October 21. All the major items of work were completed November 18, 1940.

The final estimate dated January 21, 1941, was for \$6,737.16. The contractor's force averaged 8 men, the maximum being 13 for the week ending October 19, 1940.

*Contract 116.*—Work under Contract 116, for constructing a utility building in Quabbin Park Cemetery, consisted of dismantling the existing old wooden building which has been used until now to house tools and equipment for maintenance, and erecting on the site a new stone masonry building, housing public toilets in addition to the space for tools and equipment. The building contains a portico which will provide partial protection from the weather for some of the memorials removed from the abandoned towns in the reservoir area.

Work was started promptly, and the existing buildings razed October 29, 1940. The building foundations were completed October 30. The laying of stone masonry with stone collected and delivered at the site by the Commission's labor force, as hereinbefore noted, was completed October 31 to November 22, and damp-proofing was placed on the insides of the walls November 26 to 29. Concrete work, including the portico floor slab with granolithic finish, was completed November 29, using transit-mixed concrete. The cesspools and all plumbing work were completed November 11, and electrical work November 30. The roof framing and boarding were completed November 18 to 22. The setting of glazed tile blocks for the interior partitions was started December 3 and completed, washed and pointed December 30, 1940. The chimney was built, and all other rubble stone masonry completed, December 26, 1940, and pointed later, May 14, 1941. Laying of slate for the roof was started December 13 and completed with all flashing work December 31, 1940. Heating, plumbing, electrical work, and other trim, was completed December 30, 1940, and painting May 15, 1941.

The final estimate dated May 22, 1941, was for \$10,871.36. The contractor's force averaged about 12 men for eight weeks, the maximum being 16 for the two weeks ending November 16, 1940.

*Contract 118.*—Work under Contract 118, for the construction of stone masonry posts and walls and other miscellaneous work at Winsor Dam and Quabbin Dike was started October 23, 1942. Under the provisions of the contract, the Commission was obligated to furnish stones for the masonry, cement, sand, gravel, loam and drain pipe, and to do miscellaneous work in preparation

for the contractor's operations. A labor force averaging 10 men was so employed for about six weeks. The contractor started work on October 28 on the masonry posts.

The final estimate, dated July 29, 1943, was for \$512.07.

*Contract 119.*—Work under Contract 119 consisted of furnishing and setting two granite pylons in the traffic circles at the ends of Winsor Dam. Foundations had previously been prepared by the Commission's labor force using ready-mixed concrete from Springfield. The stones were delivered at the site October 10, 1941, and set in position the following day. The lettering was cut by sandblasting and completed November 18. All work was completed February 21, 1942, when the bronze state seal on the pylon at the west end of the dam was set.

The final estimate dated June 8, 1942, was for \$4,588.00. The greater part of the work was completed with an average force of two men for 16 days.

*Contract 120.*—Work under Contract 120 consisted of drilling a six-inch diameter well near the parking area on Quabbin Hill to determine in advance of the construction of the Quabbin Hill Buildings the possibility of obtaining a suitable water supply therefor. Work was started August 21, and completed September 6, 1940, with equipment consisting of one well-drilling rig. The well was started at about Elev. 999 and drilled to a depth of 165 feet. The casing was sealed to sound ledge. The 24-hour pump test showed a capacity of about 15 gallons per minute, which was satisfactory.

The final estimate, dated September 25, 1940, was for \$677.40. The contractor's force averaged two men for three weeks.

*Contract 124.*—Work under Contract 124, for the construction of a transmission line between the Winsor Dam outlet works and the Quabbin Hill Buildings, started February 10, 1941, with the clearing for the pole line which was completed February 22. During the next two weeks poles were set and back-filled and all cross-arms, insulators, etc., installed. Placing all overhead and underground cables was completed April 5, and the installation of transformers and switch panels, April 15. All work of the contract was completed April 25, 1941.

The final estimate, dated May 2, 1941, was for \$15,142.00. Most of the work was done in seven weeks, with a contractor's force which averaged 19 at the start and was reduced to 10.

*Contract 125.*—Work under Contract 125 consisted of the construction of a marine railway on the ramp in front of the Administration Buildings. The first load of rails was delivered on the job September 4, 1941. By September 11, the laying of the rails was completed except for final adjustments after the installation of the dolly. The fabrication of steel for the main ramp dolly, the caster dolly for moving equipment on the level from the head of the ramp to and from the hangar and boathouse was done in Somerville, Massachusetts. The first delivery of steel for the caster dolly was on October 6. All work was completed December 17, 1941, with the assembling and painting of the ramp dolly, caster dolly and removable bridge.

The final estimate, dated February 20, 1942, was for \$8,800.00.

#### *Opening of Hultman Aqueduct*

Construction was sufficiently completed to permit plans for a celebration on October 23, 1940, of the opening by His Excellency, Governor Leverett Saltonstall, of the new pressure aqueduct into Norumbega Reservoir. Following an inspection of the Quabbin works, the Governor's party motored to the Ware River intake works in Barre where the Chief Engineer explained the automatic features of the operation of the diversion works. At the pressure aqueduct intake arrangements had been made for the Governor and party to inspect the interior of the 12½-foot diameter pipe. The Governor entered the gatehouse and opened the sluice gate, allowing the first water to enter the reservoir from the pressure aqueduct.

Careful plans were made in preparation for this event. The entire line was first inspected and cleaned, then the upper section, including two miles of the 12½-foot diameter pipe and three miles of 14-foot diameter tunnel under Sudbury Reservoir, was allowed to fill and this section was disinfected by heavy chlorination. The control gates at the uptake shaft from the tunnel were then opened and the disinfectant allowed to flow slowly through the entire length of the aqueduct past Norumbega Reservoir to a blowoff into the Charles River. The entire line was then thoroughly washed of the disinfectant by clean water from the upper intake. Throughout this entire process, and on the occasion of the first flow to and into the reservoir on October 23, careful plans had to be made for the safe acceleration of the entire body of water at the proper time but particularly to meet the requirements of the celebration. The water in the aqueduct was in effect a solid battering ram 18 miles long and weighing about 300,000 tons. The entire operation was successfully carried out according to schedule.

### *Storage and Flow Records*

*Quabbin Reservoir Storage and Release.*—Following the plugging of the stream control conduit at Winsor Dam, as previously described, the storage of water in Quabbin Reservoir was commenced on August 7, 1939, the date of final closure of the gates shutting off the unrestricted flow of the river. Quabbin Reservoir has risen at a rate somewhat better than was estimated at the time storage was commenced. The accompanying table shows the annual rise in water level and the amount of storage accumulated. The figures in the table are for the storage above the sill of the lower intake in Quabbin aqueduct. Elevation 528.00. Below this sill and hence not available for draft to Wachusett Reservoir there are about 10,000 million gallons above the reservoir bottom. The quantities diverted from the Ware River to Quabbin Reservoir are given below.

*Ware River Diversion.*—Ware River water was first diverted westerly into Quabbin Reservoir March 21, 1940. Diversion both to Quabbin Reservoir and to Wachusett Reservoir continued intermittently in the amounts shown in the accompanying table.

*Sewage Diversion from Ware River Watershed.* The Rutland-Holden sewer continued in operation. On September 24, 1942, sewage was first received from the Holden Hospital to the completed central portion of the sewerage system of the Town of Holden. The entire system of sanitary sewers for the town, which was constructed as a WPA project, was accepted and put into operation by an agreement with the town dated November 2, 1943. The system of sanitary sewers for the Town of Rutland, which was similarly constructed as a WPA project, was accepted and put into operation by an agreement with the town dated September 17, 1945. The quantities discharged from the various institutions and towns into the sewerage system of the City of Worcester in the City's fiscal years, which coincide with the calendar years, are shown in the accompanying table.

*Delivery from Hultman Aqueduct to Distribution System.* Pending the extension of Hultman Aqueduct to Chestnut Hill via the proposed City Tunnel, this aqueduct has been used to a limited extent commencing July 28, 1943, to supply Spot Pond and to reinforce the Northern High Service through the connection to the Weston Aqueduct supply main extending northerly through Arlington and Belmont. It has also been used occasionally, commencing April 30, 1945, to reinforce the service to Chestnut Hill through the connection to

## STORAGE IN QUABBIN RESERVOIR

(In addition to about 10,000 million gallons below sill of lower intake to Quabbin Aqueduct Elev. 428.00)  
Storage Commenced August 7, 1939, with Water Surface at Elev. 393.9

	1939	1940	1941	1942	1943	1944	1945
Elevation on December 31:							
Behind Middle Branch Regulating Dam . . . . .		530.00	527.10	530.15	530.04	530.10	530.12
Behind East Branch Regulating Dam . . . . .	524.12	530.21	530.08	530.55	530.39	530.62	530.39
Behind East Branch Baffle . . . . .		477.12	475.74				
Main Reservoir . . . . .	422.0	469.03	472.14	488.71	500.50	507.24	520.72
Intermediate Peaks, if any:							
High Point Elev. . . . .		465.91	477.04	485.10	501.45	508.26	520.14
On . . . . .		Aug. 8	July 31	July 31	Aug. 5	July 7	June 27
Low Point Elev. . . . .		465.65	470.85	484.87	498.33	505.35	519.02
On . . . . .		Oct. 29	Oct. 31	Sept. 27	Oct. 14	Sept. 12	Sept. 29
Million Gallons Available Dec. 31							
Above the ground contours . . . . .		71,640	80,620	140,650	203,540	242,180	333,140
Estimated ground storage . . . . .	720	10,300	10,400	10,140	10,630	12,830	14,070
Total . . . . .	800	81,940	91,020	150,790	214,170	255,010	347,210
Elevation of Main Reservoir . . . . .							
and Total Million Gallons . . . . .		467.39	471.40	486.77	500.21	506.47	519.92
At end of Fiscal Year on . . . . .		Nov. 30	Nov. 30	Nov. 30	Nov. 30	Nov. 30	Nov. 30
M. G. Drawn to Wachusett Reservoir . . . . .							
From . . . . .	None	None	20,462	None	17,020	25,425	22,008
To . . . . .			Sept. 17	Aug. 6	June 13	June 27	June 27
			Oct. 28	Sept. 7	Sept. 11	Sept. 22	Sept. 22
						intermittent	intermittent

WARE RIVER DIVERSION

	1939	1940	1941	1942	1943	1944	1945
Million Gallons Diverted:							
To Quabbin Reservoir	20,451.1	4,430.8	12,368.1	17,254.9	13,482.5	18,779.4	
To Wachusett Reservoir	541.6	1,857.7	2.8	554.7	1,359.9		
Total	541.6	22,308.8	4,433.6	12,922.8	17,254.9	14,842.4	18,779.4
Maximum M.G. in one day		1,062.6	201.3	1,026.2	378.8	1,505.5	508.3
Total M.G. in the Fiscal Year from the previous Dec. 1 to		21,154.6	5,144.9	11,875.6	18,394.6	12,573.9	14,120.2
Seasonal Diversion Began	May 31	June 14	June 7	June 15	June 12	May 18	June 11
Stopped	Nov. 1	Nov. 14	Dec. 15	Nov. 4	Oct. 28	Nov. 29	Nov. 20
Emergency Diversion Began						June 24	
Stopped						July 7	
Emergency Diversion Began						Sept. 15	
Stopped						Sept. 19	

GALLONS OF SEWAGE DIVERTED INTO WORCESTER SEWERAGE SYSTEM

	1940	1941	1942	1943	1944	1945
Rutland State Sanatorium	29,793,000	25,643,000	27,210,000	26,156,000	31,942,000	29,348,000
U. S. Veterans Hospital	26,980,000	21,022,000	21,809,000	19,341,000	34,773,000	35,060,000
Town of Holden			1,958,000	7,300,000	7,345,000	19,072,000
Town of Rutland						5,550,000
Total	56,773,000	46,665,000	50,977,000	52,797,000	74,060,000	89,030,000

the Weston Aqueduct supply main extending easterly through Brighton. The total supplied to the distribution system in this manner is shown in the following table:

*Gallons Delivered to Distribution System*

	1943	1944	1945
January . . . . .		812,740,000	970,670,000
February . . . . .		720,970,000	959,530,000
March . . . . .		680,950,000	949,420,000
April . . . . .		594,260,000	917,630,000
May . . . . .		669,710,000	1,774,380,000
June . . . . .		781,420,000	1,645,010,000
July . . . . .	116,860,000	822,880,000	1,407,280,000
August . . . . .	972,110,000	853,750,000	988,970,000
September . . . . .	578,780,000	1,034,990,000	855,810,000
October . . . . .	602,460,000	810,780,000	844,480,000
November . . . . .	634,020,000	702,780,000	1,007,680,000
December . . . . .	704,590,000	682,330,000	1,586,620,000
<b>Total . . . . .</b>	<b>3,608,820,000</b>	<b>9,167,560,000</b>	<b>13,907,480,000</b>

The totals delivered in the fiscal years were as follows:

2,904,230,000 gals. in the year ending Nov. 30, 1943.  
 9,189,820,000 gals. in the year ending Nov. 30, 1944.  
 7,898,970,000 gals. in the seven months ending June 30, 1945.

*Dedication of Winsor Memorial*

The memorial to former Chief Engineer Frank E. Winsor, located alongside Administration Road at Quabbin Reservoir overlooking Winsor Dam, was dedicated June 17, 1941. This memorial was erected by Mr. Winsor's many friends and sponsored by the Boston Society of Civil Engineers and the Northeastern Section of the American Society of Civil Engineers. It was presented on behalf of the engineers by George T. Seabury, a lifelong friend of Mr. Winsor and Secretary of the American Society of Civil Engineers, and unveiled by Edward Winsor, Jr., a grandson. It was accepted for the State by His Excellency, Governor Leverett Saltonstall, and Chairman Eugene C. Hultman of the Commission accepted its custodianship. About 250 officials and guests attended the dedication, following which they were served luncheon in the Commission's seaplane hangar in the Administration Buildings and were conducted on a tour over the work.

LIST OF DRAWINGS AND TABLES APPENDED HERETO

Takings of Real Estate and Water Rights for Quabbin Supply.  
 Status of Contracts completed between November 30, 1939, and June 30, 1945.  
 Status of Contracts in Force on June 30 1945.  
 Canvass of Bids, Contract 94.  
 Canvass of Bids, Contract 110.  
 Canvass of Bids, Contract 111.  
 Monthly Rainfall at Stations on Ware and Swift Watersheds, 1940 to 1945, inclusive.

For data on contracts completed prior to November 30, 1939, see sixth to fourteenth annual reports, inclusive. A General Plan and Profile of the Present and Proposed Metropolitan Water Supply was included in the geological report appended to the 1935 annual report.

For summaries of rainfall for years previous to 1940, see 1935 to 1939 annual reports, inclusive.

Respectfully submitted,

KARL R. KENNISON, *Chief Engineer.*

20 Somerset Street, Boston, Mass.

January 15, 1946.



COMMONWEALTH OF MASSACHUSETTS  
METR. DISTR. WATER SUPPLY COMMISSION  
STATUS OF CONTRACTS IN FORCE ON JUNE 30th, 1945

Contract No.	Description	Contractor	No. Bids	Date of Agreement	Contract Executed	Basis of Award	Agreed Rates	Payments to date
33	Purchase of Power at Shaft 1	New England Power Co.			Aug. 6, 1931			\$11,668.61
42	Use of Worcester Sewerage System and Treatment Works a/c Rutland-Holden Sewer	City of Worcester		Date of Agreement	May 1, 1933	{ Lump Sum \$325,000. Annual Charges *		325,000.00 4,450.82
46	Connection with Rutland-Holden Sewer & Disposal of Sewage from the U. S. Veterans Hospital	U. S. Veterans Admin. (Note: Payments under Cont. 46 are RECEIVED by the MDWSC)		Date of Agreement	Nov. 7, 1934	{ Lump Sum \$87,000. Annual Charges *		37,000.00 4,277.36
48	Connection with Rutland-Holden Sewer & Disposal of Sewage from the Rutland State Sanatorium	Rutland State San. (Note: Payments under Cont. 48 are RECEIVED by the MDWSC)		Date of Agreement	June 5, 1934	{ Lump Sum \$60,000. Annual Charges *		60,000.00 88.37
148	Sale of Power at Winsor Dam	New England Power Co. (Note: Net payments under Cont. 148 are RECEIVED by MDWSC)		Date of Agreement	May 1, 1945	Agreed Rates		None

\* Proportion of Annual Maintenance Cost.

COMMONWEALTH OF MASSACHUSETTS  
METR. DIST. WATER SUPPLY COMMISSION  
STATUS OF CONTRACTS COMPLETED BETWEEN NOVEMBER 30, 1939 AND JUNE 30, 1945

Contract No.	Description	Contractor	No. of Bids †	Contract Executed	Basis of Award	Final Estimate	Date of Final Estimate
49	Excavating diversion channels at site of Quab. Res.	Cenedella & Co.	12	10/1/35	\$79,050.00	\$87,928.70	1/24/41
52	Construction of Main Dam of Quabbin Reservoir	Benjamin Foster Co.	9	8/24/36	2,317,445.00	2,439,727.82	1/ 8/41
66	Regulating Dams on Middle & East Branches of the Swift River	C. & R. Construction Co.	11	10/25/38	171,650.00	188,965.86	\$ 9/14/40
67	Surfacing Access Road at Shaft #9, Quab. Aqueduct	George E. Duteau	6	8/27/40	1,546.61	1,428.96	\$11/7/40
68	Connections with Rutland-Holden Sewer & Disposal of Sewage from Town of Rutland	Town of Rutland		Oct. 3, 1938	Annual Charges*		None
69	Connections with Rutland-Holden Sewer and Disposal of Sewage from Town of Holden	Town of Holden		Aug. 31, 1938	Annual Charges*		None
72	Clearing portion of Site of Quabbin Reservoir on Upper Middle and East Branches of Swift River	C. & R. Construction Co.	4	10/25/38	469,975.00	476,374.54	\$ 9/14/40
73	Inverted Pipe Siphons on Weston Aqueduct	Leo Butler Company	8	11/17/38	265,832.50	261,467.58	\$ 7/19/40
74	Constructing the Southborough Tunnel, Section 2 of the Pressure Aqueduct	West Construction Co.	8	12/30/38	3,197,015.00	2,933,832.49	\$ 9/27/40
75	Constructing Cut-and-Cover Aqueduct, Section 1 of the Pressure Aqueduct	B. A. Gardetto, Inc.	7	3/10/39	503,871.38	521,806.66	\$ 1/29/41
77	Constructing Cut-and-Cover Aqueduct, Section 3 of the Pressure Aqueduct	B. A. Gardetto, Inc.	6	5/ 3/39	497,382.48	496,597.43	\$ 1/24/41

\* Proportion of Annual Maintenance Cost.  
 † Contract financed with aid of Federal Grant.  
 ‡ The above contracts were all awarded to the lowest bidder.

## STATUS OF CONTRACTS COMPLETED BETWEEN NOVEMBER 30, 1939 AND JUNE 30, 1945—(Continued)

Contract No.	Description	Contractor	No. of Bids †	Contract Executed	Basis of Award	Final Estimate	Date of Final Estimate
78	Constructing Cut-and-Cover Aqueduct, Section 4 of the Pressure Aqueduct	American Concrete & Steel Pipe Co.	15	3/20/39	535,554.60†	551,629.18	\$ 11/7/40
79	Constructing Cut-and-Cover Aqueduct, Section 5 of the Pressure Aqueduct	" "	11	3/20/39	536,950.22†	522,335.25	\$ 9/30/40
80	Constructing Norumbega High Level Reservoir on Pressure Aqueduct	Carlo Bianchi and Co., Inc.	6	6/15/39	478,605.49	574,183.69	\$ 5/13/41
81	Constructing Cut-and-Cover Aqueduct, Section 6 of the Pressure Aqueduct	M. F. Gaddis, Inc.	6	4/26/39	560,432.25	615,154.67	\$ 3/13/41
82	Constructing Quabbin Hill Road	G. Rotondi & Son	10	3/9/39	219,060.92	228,550.64	\$ 8/30/40
83	Constructing Spot Pond By-Pass	S. Rotondi & Sons	12	8/29/39	143,928.28	141,894.22	\$12/16/40
83A	Electric Wiring, Spot Pond By-Pass	J. J. Reddington Electric Service Co.	5	9/20/40	2,335.00	1,095.00	\$ 6/4/41
84	Head House, Shaft 4 for Pressure Aqueduct	John F. Griffin Co.	5	9/18/40	104,986.54	100,673.01	\$10/1/41
85	Furnishing and Delivering Pre-Cast Steel Cylinder Reinf. Concrete Pressure Pipe for Pressure Aqueduct	Lock Joint Pipe Co.	4	12/28/38	4,164,126.50	4,198,409.03	\$10/15/40
86	Furnishing and Delivering Gate Valves for Pressure Aqueduct	The Chapman Valve Manufacturing Company	4	6/15/39	79,330.70	81,086.10	\$ 7/11/40
87A	Valves for Pressure Aqueduct	Gilbert Howe Gleason & Co.	2	7/6/39	7,515.00	7,515.00	\$12/28/39
87B	Furnish and Deliver Needle Valve & Discharge Control Valve for Pressure Aqueduct	" "	1	6/30/39	18,917.00	18,917.00	\$ 7/11/40
87D	Furnish and Deliver-Flap Valve and Gate Valves	Crane Company	8	7/31/39	2,527.47	2,527.47	\$ 4/15/40

87E	Furnish and Deliver Meter Register-Indicator, Recorders & Piezometer Rings	2	Builders Iron Foundry	7/11/39	6,323.00	6,323.00	\$ 7/1/40
87F	Furnish and Deliver Tunnel Unwatering Pump for Pressure Aqueduct	1	Warren Steam Pump Company Inc.	7/6/39	3,354.00	3,339.00	\$ 7/16/40
87G	Furnish and Deliver Sump Pump	5	Lunt Moss Company	7/7/39	746.50	746.50	\$ 5/16/40
87H	Furnish and Deliver Air Blower	1	B. F. Sturtevant Company	7/6/39	465.67	465.67	\$ 5/24/40
89	Constructing Mortar Lining in Existing Sudbury River and Happy Hollow Steel Pipe Siphons of the Western Aqueduct	5	Marinucci Brothers and Company	11/6/39	38,417.75	42,940.85	\$ 6/28/40
90A	Furnish and Deliver Gasoline engine driven, Electric Generating Unit, Complete for Pressure Aqueduct	1	Sandberg Equipment Co.	11/14/39	1,224.00	1,224.00	\$ 7/24/40
90B	Furnish and Deliver Traveling Crane and Chain Hoists for Pressure Aqueduct	1	Robert Abel, Inc.	9/11/39	2,359.25	2,359.25	\$ 6/4/40
90C	Furnish and Deliver Flanged and Spigot Pipes and Elbows	3	Fred A. Houdlette & Son, Inc.	9/15/39	2,110.47	2,110.47	\$ 3/7/40
90D	Furnish and Deliver Special Two-way Bronze Stop Valve	1	Lombard Governor Corp.	9/14/39	459.75	459.75	\$ 5/13/40
90E	Furnish and Deliver Motor driven Sump Pump of Deep Well Turbine Type	1	Lunt Moss Company	9/11/39	257.00	257.00	\$ 7/20/41
92A,	Furnish and Deliver Gate Valves, Check B,C Valve and Regulating Valve	1	The Chapman Valve Manufacturing Company	8/16/39	24,073.00	24,198.00	\$ 6/29/40
92D	Furnish and Deliver Pressure Relief Valves	1	Lombard Governor Corp.	8/21/39	2,774.10	2,774.10	\$ 5/13/40
92E	Furnish and Deliver Flange, Spigot and Special Pipes, Sleeve and Tee	3	Warren Foundry & Pipe Corp.	8/23/39	7,971.44	7,971.44	\$ 5/15/40
93	Completing the East Branch Baffle	9	J. J. Callahan	10/27/39	28,876.75	25,102.08	\$ 2/21/40
94	Proposed Charles River Shaft	13	John MacDonald Construction Co.	2/20/40	215,548.45	190,396.32	\$ 1/21/41
95A,	Charles River Shaft Equip. (Shaice Gate B & Valves)	1	Chapman Valve Co.	2/19/40	38,170.00	38,170.00	\$10/18/40

## STATUS OF CONTRACTS COMPLETED BETWEEN NOVEMBER 30, 1939 AND JUNE 30, 1945—(Continued)

Contract No.	Description	Contractor	No. of Bids †	Contract Executed	Basis of Award	Final Estimate	Date of Final Estimate
95C	Sluice Gates	"	4	2/19/40	3,636.00	3,636.00	\$ 9/22/40
95D	Deep Well Pump	Duro Pump Co.	5	2/4/40	997.50	997.50	\$ 5/27/40
95E	Electrical Equipment	Westinghouse Electric & Mfg. Co.	1	4/16/40	1,335.89	1,241.80	\$ 9/13/40
95F	Hydraulic Operative Valve	Evans Mills Supply Co.	1	2/12/40	583.00	583.00	\$ 5/23/40
95G	Stone bounds	H. E. Fletcher	4	2/13/40	1,249.00	1,249.00	\$ 8/9/40
95H	Padlocks	Chandler & Barber Co.	2	2/21/40	465.00	465.00	\$ 7/22/40
95I	Flanges, Pipes & Fittings	Pittsburgh Piping & Equipment Co.	1	3/4/40	7,535.00	7,794.00	\$10/7/40
96	Constructing Chlorine Storage House, etc.	Chandler Constr. Co. Inc.	20	4/5/40	48,387.00	54,795.38	\$ 5/31/41
97	Diesel-engine driven pumping unit for Spot Pond	Ralph P. Hall, Inc.	5	4/22/40	11,476.00	11,476.00	\$10/2/40
99	Enlarging Fells High Level Distributing Res.	Middlesex Constr. Co.	11	1/9/40	134,380.93	145,115.80	\$12/17/40
100	Placing Mortar Lining in the Wachusett Aqueduct at the Assabet River Crossing	The Nat'l Gunite Contracting Co.	3	10/27/39	\$5,805.80	\$6,011.25	\$ 4/16/40
101	Furnishing, Delivering & Erecting Bronze Tablets	Dimond-Union Bronze Works	3	1/30/40	397.68	397.68	\$ 9/15/40
102-1	Furnishing & Laying Linoleum & installing complete plumbing, Heating & Electric Systems in Sauer Residence	Springfield Floor Covering Center	3	3/8/40	85.50	80.50	11/12/40
102-2	" " " "	R. G. Harrington	4	7/11/40	615.00	615.00	11/22/40
102-3	" " " "	The Mutual Plumbing & Heating Co.	4	7/11/40	578.00	578.00	10/16/40

102-4	" " " " " "	3	8/3/40	251.00	251.00	11/21/40
	Springfield Elec. Com- pany, Inc.					
103	Furnishing, equipping & delivering work boat for use on Quab. Res.	5	10/25/40	12,975.00	13,461.00	\$ 6/19/41
	Quincy Adams Yacht Yard, Inc.					
104A	Furn. & del. valves, sluice gate, elec. hoists & fabricated steel pipe	1	4/26/40	1,444.00	1,444.00	\$ 9/21/40
	Chapman Valve Mfg. Co.					
104B	"	2	5/7/40	1,115.00	1,115.00	\$11/4/40
	Crane Co.					
104C	"	1	4/26/40	2,047.50	2,047.50	\$ 7/29/40
	Robert Abel, Inc.					
104D	"	8	5/7/40	1,822.40	1,822.40	\$ 9/5/40
	The Walworth Co.					
105	Furn. & install. lightning protection systems	4	6/4/41	4,135.00	4,335.00	2/13/42
	Boston Lightning Rod Co.					
106	Improvement of Access Roads to Middle & East Branch Reg. Dams & elsewhere	5	6/5/40	28,298.71	27,433.36	\$10/22/40
	A. R. Montuori & Co.					
107	Constructing Quab. Hill Bldgs.	2	12/2/40	71,165.00	72,477.06	\$ 5/26/41
	H. P. Cummings Constr. Co.					
108	Constructing Ramp & Utility Wharf	4	9/27/40	18,117.75	18,528.27	\$ 3/18/41
	J. J. Callahan					
109	Furn. & Install'g radio system	5	10/30/40	20,341.92	20,988.60	\$11/14/41
	Kenworthy & Taylor, Inc.					
110	Extending Charles River Shaft No. 5	7	9/13/40	261,282.57	205,194.97	\$ 7/10/41
	C. & R. Construction Co.					
111	Constructing Winsor Dam Outlet Super- structure	6	10/18/40	47,788.23	48,060.36	\$ 6/11/41
	Chandler Construction Co., Inc.					
112	Constructing a Spillway at Top of Shaft 2 of Quab. Aque.	12	9/16/40	6,671.05	6,737.16	\$ 1/21/41
	Wachusett Engineering Company, Inc.					
113	Making Core Borings in Counties of Middlesex, Norfolk & Suffolk	6	8/6/40	14,839.30	13,553.46	4/28/41
	Riley Engineering & Drilling Company					
114	Diamond Drill Borings	1	8/24/42	4,200.00	3,707.42	12/3/42
	B. F. Smith & Co., Inc.					
116	Constructing Utility Bldg. in Quab. Park Cemetery	5	10/25/40	10,452.00	10,871.36	\$ 5/22/41
	Chandler Construction Company, Inc.					
118	Constructing stone masonry posts and walls and other misc. work at Winsor Dam and Quab. Dike	2	10/22/42	4,979.30	4,701.79	8/26/43
	A. R. Montuori					

## STATUS OF CONTRACTS COMPLETED BETWEEN NOVEMBER 30, 1939 AND JUNE 30, 1945—(Continued)

Contract No.	Description	Contractor	No. of Bids †	Contract Executed	Basis of Award	Final Estimate	Date of Final Estimate
119	Furnishing & setting granite pylons in traffic circles at the ends of Winsor Dam	W. C. Canniff & Sons, Inc.	4	5/13/41	4,588.00	4,588.00	6/8/42
120	Drilling well for water supply	R. E. Chapman Co.	2	8/15/40	800.00	677.40	11/12/40
121	Furnish and Delivering travelling cranes	The Enckid Crane & Hoist Company	2	9/23/40	9,445.00	9,445.00	\$ 1/10/41
122	Furnishing and Delivering equip. for Venturi Meters	Builders Iron Foundry	1	9/23/40	4,567.00	4,567.00	\$ 2/10/41
123A	Furnishing and Delivering Stop Shutter Lifters	A. L. Smith Iron Co.	3	12/4/40	315.00	315.00	\$ 2/11/41
123B	Furnishing and Delivering Quabbin Hill pump	Food Machinery Corp. Peerless Pump Division	5	12/14/40	381.00	381.00	\$ 6/2/41
124	Constructing a transmission line	George W. Ellis Co., Inc.	3	7/3/41	15,142.00	15,142.00	\$ 5/2/41
125	Constructing Marine Railway at Quabbin Reservoir	Berke-Moore Company	1	8/25/41	8,800.00	8,800.00	2/20/42
127	Furnishing and installing switchboard equipment in District's power plant at Sudbury Dam	A. C. Senecal Co.	3	7/18/41	2,265.00	2,405.00	3/22/42
128	Furnishing & Delivering Padlocks	Chandler & Barber Co.	3	3/6/41	310.00	310.00	\$ 8/4/41
129	Constr. Drainage Pipe Line	John Williams	11	3/6/41	475.00	475.00	\$ 6/30/41
130	Grading, Loaming and Grassing & Improving Access Roads	Lee Crane Service, Inc.	5	5/5/41	6,706.61	9,999.00	\$ 6/17/41

## MONTHLY RAINFALL IN INCHES AT STATIONS OF THE WARE WATERSHED

1940

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Ware River Intake Works*	2.16	3.49	4.30	5.61	5.44	2.17	3.51	1.36	1.80	1.15	6.25	2.67	39.91
West Rutland*	2.31	3.62	4.45	5.83	5.45	2.18	3.45	1.53	1.80	1.24	6.59	2.78	41.23
North Rutland	1.34	3.46	3.25	5.31	5.28	3.43	3.65	1.37	2.00	1.18	7.64	2.15	40.06
Williamsville	2.39	3.62	4.19	6.94	5.86	2.47	4.45	2.13	2.36	1.10	6.65	2.10	44.26
Hubbardston	1.98	2.69	3.89	5.63	5.57	2.15	4.99	1.88	1.96	1.06	7.11	2.86	41.77
1940 Mean	2.04	3.38	4.01	5.86	5.52	2.48	4.01	1.65	1.98	1.15	6.85	2.51	41.44
17-Year Mean	3.42	2.88	3.69	3.70	3.39	4.01	4.04	3.90	5.08	3.24	3.57	3.10	44.02

1941

Ware River Intake Works*	2.55	2.14	1.82	0.49	2.62	3.19	5.38	2.47	0.93	2.00	2.77	3.03	29.39
West Rutland*	2.50	2.22	1.98	0.52	2.94	3.23	5.46	2.98	0.72	2.27	2.88	3.46	31.16
North Rutland	2.46	2.28	1.19	0.50	3.23	3.96	6.38	3.19	0.73	2.68	3.15	2.70	32.45
Williamsville	2.29	1.60	1.82	0.90	3.69	3.65	4.46	2.92	1.29	2.70	3.36	2.71	31.39
Hubbardston	1.78	2.02	1.32	1.01	3.48	3.25	4.31	3.01	0.94	2.60	3.01	2.65	29.38
1941 Mean	2.32	2.05	1.63	0.68	3.19	3.46	5.20	2.91	0.92	2.45	3.03	2.91	30.75
18-Year Mean	3.36	2.83	3.57	3.53	3.38	3.98	4.10	3.85	4.85	3.20	3.54	3.09	43.28

## MONTHLY RAINFALL IN INCHES AT STATIONS OF THE WARE WATERSHED

1942

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Ware River Intake Works* . . .	3.77	2.56	5.72	1.04	4.58	4.78	5.94	2.20	3.26	2.93	5.18	5.00	46.96
West Rutland* . . .	3.45	2.39	5.15	1.01	4.98	4.19	4.39	2.45	3.24	2.98	4.78	4.54	43.55
North Rutland . . .	3.69	2.40	6.01	0.92	4.18	5.27	5.45	1.67	2.98	4.23	3.58	3.33	43.71
Williamsville . . .	3.71	2.06	6.72	0.94	3.25	5.63	6.43	1.95	3.11	3.90	4.67	4.80	47.17
Hubbardston . . .	3.04	1.73	6.64	1.01	3.30	4.52	6.36	1.45	2.75	3.52	4.35	3.30	41.97
1942 Mean . . .	3.53	2.23	6.05	0.98	4.06	4.88	5.71	1.94	3.07	3.51	4.51	4.20	44.67
19-Year Mean . . .	3.37	2.80	3.70	3.40	3.41	4.03	4.19	3.75	4.75	3.21	3.59	3.15	43.35

1943

Ware River Intake Works* . . .	3.13	1.48	3.32	3.95	5.14	1.55	3.80	2.46	0.72	6.00	6.21	0.57	38.33
West Rutland* . . .	2.98	1.24	3.46	3.93	5.17	1.66	4.23	1.44	0.68	5.64	6.03	0.73	37.19
North Rutland . . .	3.29	1.81	2.54	2.55	4.49†	1.88	4.81†	2.68	1.12	5.00	5.08†	0.32	35.57
Williamsville . . .	3.28	1.68	2.89	3.59	5.65	2.24	4.63	3.70	1.12	5.28	6.38	0.61	41.05
Hubbardston . . .	2.59	1.36	2.46	3.54	4.77	1.80	4.62	3.58	1.20	5.01	5.59	0.76	37.28
1943 Mean . . .	3.05	1.51	2.93	3.51	5.04	1.83	4.42	2.77	0.97	5.39	5.86	0.60	37.88
20-Year Mean . . .	3.35	2.74	3.66	3.41	3.50	3.92	4.20	3.70	4.56	3.32	3.70	3.02	43.08

## 1944

Ware River Intake Works*	1.25	2.38	4.48	4.41	1.22	8.01	1.86	1.08	7.82	1.51	3.64	3.09	40.75
West Rutland*	1.58	2.59	4.62	4.55	1.25	8.51	1.65	0.83	7.84	1.65	4.13	3.26	42.46
North Rutland	1.11	2.74	3.78	3.21	1.26	8.31	1.95	1.44	7.56	1.82	3.53	2.82	39.53
Williamsville	1.11	2.30	4.51	4.15	1.45	9.08	2.59	0.79	7.48	1.74	3.43	3.16	41.79
Hubbardston	1.16	1.85	4.03	3.63	1.44	11.82	2.46	1.12	7.43	1.58	2.73	3.01	42.26
1944 Mean	1.24	2.37	4.28	3.99	1.32	9.15	2.10	1.05	7.63	1.66	3.49	3.07	41.35
21-Year Mean	3.25	2.72	3.69	3.43	3.39	4.18	4.10	3.57	4.71	3.24	3.69	3.02	42.99

## 1945

Ware River Intake Works*	3.73	3.98	2.02	5.40	5.58	6.50	4.93	3.25	1.90	2.80	4.08	4.08	48.25
West Rutland*	3.75	4.26	2.11	4.49	5.40	6.52	5.77	3.42	2.00	2.95	4.11	4.48	49.26
North Rutland	2.07	4.48	1.89	4.82	5.26	6.75	4.27	3.78	1.64	1.48	4.97	4.05	45.46
Williamsville	3.26	4.40	1.72	5.38	5.87	6.62	6.79	4.64	1.24	2.51	3.57	4.27	50.27
Hubbardston	2.29	3.93	1.44	4.69	4.86	6.18	6.18	3.76	1.41	2.73	3.43	3.45	44.35
1945 Mean	3.02	4.21	1.84	4.96	5.39	6.51	5.59	3.77	1.64	2.49	4.03	4.07	47.52
22-Year Mean	3.24	2.79	3.61	3.50	3.48	4.27	4.17	3.58	4.57	3.21	3.71	3.07	43.20

\* Station maintained By Metropolitan District Water Supply Commission. Data for stations at North Rutland, Williamsville, Hubbardston, Shutesbury and Wendell furnished by Massachusetts Department of Public Health.

† Interpolated.

## MONTHLY RAINFALL IN INCHES AT STATIONS OF THE SWIFT WATERSHED

1940

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
West Ware . . . . .	1.55	2.27	4.33	5.45	4.39	Discontinued		2.06	2.34	1.52	6.98	2.31	40.48
Administration Building* . . . . .	1.91	2.08	4.45	6.23	4.84	1.80	3.96	2.87	2.74	1.31	7.41	2.69	48.26
Shutesbury . . . . .	2.87	3.20	4.75	5.35	7.21	3.08	4.78	2.31	2.72	1.34	6.32	3.88	49.06
Wendell . . . . .	2.84	3.17	5.83	5.89	6.86	3.42	4.48	2.09	2.54	1.07	6.96	3.34	47.10
Petersham (Harvard Forest)** . . . . .	1.90	4.21	5.57	6.86	5.82	2.47	4.09	2.12	2.18	1.07	6.61	3.05	45.39
Petersham (Nichewaung)* . . . . .	2.15	2.66	5.28	7.08	6.31	2.60	4.28	2.28	2.41	1.51	7.64	2.32	45.19
Pelham* . . . . .	2.19	2.25	4.83	6.11	7.09	3.05	3.51	2.29	2.49	1.33	6.99	2.93	45.91
1940 Mean*** . . . . .	2.31	2.93	5.12	6.25	6.35	2.74	4.18	2.29	2.49	1.33	6.99	2.93	45.91
21-Year Mean**** . . . . .	3.54	2.97	3.66	4.22	3.58	4.74	4.13	4.08	4.94	3.18	4.10	3.31	46.45

1941

Administration Building* . . . . .	1.91	1.57	1.30	0.87	2.67	3.40	6.65	4.07	1.21	2.55	3.56	2.90	32.66
Shutesbury . . . . .	2.15	1.81	1.56	0.55	2.05	4.49	3.85	3.18	1.38	3.19	2.64	4.95	31.79
Wendell . . . . .	2.59	1.82	2.19	1.00	2.41	4.48	5.85	3.20	0.95	2.44	3.52	4.47	34.92
Petersham (Harvard Forest)** . . . . .	3.13	2.12	2.48	0.87	2.22	3.61	4.18	3.09	0.89	2.12	3.43	2.94	31.08
Petersham (Nichewaung)* . . . . .	2.41	1.59	1.39	0.66	3.66	3.27	4.51	2.26	1.10	2.44	3.54	3.18	30.01
Pelham* . . . . .	2.09	2.11	1.10	0.90	3.87	5.73	5.88	3.73	1.67	2.79	3.58	3.91	37.36
North New Salem* . . . . .										2.94	3.37	3.06	
Quabbin Aqueduct Intake Works* . . . . .										1.12	3.39	4.06	
New Salem* . . . . .										1.20	3.38	3.72	
1941 Mean**** . . . . .	2.38	1.84	1.67	0.81	2.81	4.16	5.15	3.26	1.20	2.59	3.38	3.72	32.97
22-Year Mean**** . . . . .	3.49	2.92	3.57	4.07	3.54	4.71	4.18	4.05	4.77	3.15	4.06	3.33	45.84

1942

Administration Building*	1.33	5.08	1.29	3.34	4.71	4.98	1.72	4.29	4.37	7.32	5.62	47.55
Shutesbury . . . . .	3.98	7.51	1.06	3.34	4.64	5.14	3.93	4.08	4.13	5.27	6.06	50.94
Wendell . . . . .	3.83	7.47	1.31	2.62	4.45	5.41	2.21	4.02	4.06	5.34	5.95	48.66
Petersham (Harvard Forest)*	3.32	5.94	0.78	2.09	4.37	5.00	1.58	3.02	2.73	5.76	4.42	41.20
Petersham (Nichewaug)*	4.19	6.30	0.94	3.35	5.79	4.81	1.92	3.59	3.84	5.56	3.74	45.97
Pelham* . . . . .	2.99	6.14	0.68	3.80	6.06	5.62	2.17	4.54	4.34	5.92	5.13	48.08
North New Salem* . . . . .	3.64	8.07	1.15	3.23	4.35	5.40	2.20	3.60	3.94	5.93	6.18	49.74
Quabbin Aqueduct Intake Works*	3.99	7.33	1.00	2.54	4.33	4.14	1.96	3.73	3.43	5.57	5.19	45.35
South New Salem† . . . . .	3.93	7.20	0.99	3.55	5.60	4.47	2.47	4.04	4.29	4.58	6.28	49.03
1942 Mean . . . . .	3.71	6.78	1.02	3.04	4.92	5.00	2.24	3.88	3.90	5.69	5.40	47.39
23-Year Mean . . . . .	3.50	3.71	3.93	3.52	4.72	4.22	3.97	4.73	3.18	4.14	3.42	45.91

1943

Administration Building*	1.61	3.34	3.11	6.21	3.12	7.03	3.90	1.44	4.19	6.49	0.76	43.99
Shutesbury . . . . .	3.13	3.32	3.51	5.95	1.88	4.87	4.35	2.24	4.76	5.03	0.59	40.80
Wendell . . . . .	2.79	3.93	3.54	6.67	2.14	4.65	2.39	2.54	4.22	6.25	0.61	41.32
Petersham (Harvard Forest)*	1.91	2.44	3.72	5.21	1.92	4.52	2.99	1.55	5.05	5.75	0.73	37.13
Petersham (Nichewaug)*	3.22	0.20	0.79	3.62	5.53	1.68	4.70	5.82	1.51	6.36	0.74	39.65
Pelham* . . . . .	2.63	1.70	2.48	6.48	1.84	6.54	3.60	1.77	4.47	6.29	0.63	42.72
North New Salem* . . . . .	2.63	0.72	3.25	5.94	2.63	4.84	2.98	1.96	6.04	5.70	0.69	41.15
Quabbin Aqueduct Intake Works*	2.35	1.11	1.66	4.75	1.62	4.58	4.19	1.49	5.29	5.80	0.76	35.62
South New Salem* . . . . .	2.57	1.73	3.08	5.60	1.85	3.59	4.81	1.53	5.32	5.49	0.54	39.99
1943 Mean . . . . .	2.67	1.24	2.73	3.40	5.82	5.04	3.89	1.78	5.04	5.91	0.67	40.27
24-Year Mean . . . . .	3.46	2.80	3.67	3.91	3.62	4.25	3.96	4.61	3.26	4.21	3.31	45.67

\* Station maintained by Metropolitan District Water Supply Commission.

\*\* Station maintained by Metropolitan District Commission (after Dec. 15, 1941 by MDWWSO)

\*\*\* Rainfall at West Ware not included in these figures because station was discontinued in June, 1940

\*\*\*\* Omitting New Salem, No. New Salem and Quabbin Aqueduct Intake which were operating during part of year 1941.

Data for stations at North Rutland, Williamsville, Hubbardston, Shutesbury and Wendell furnished by Massachusetts Department of Public Health.

† Station moved from New Salem to South New Salem on October 19, 1942.

## MONTHLY RAINFALL IN INCHES AT STATIONS OF THE SWIFT WATERSHED

1944

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Administration Building*	1.05	1.88	4.28	4.81	1.40	7.92	1.72	1.58	7.08	2.53	5.12	3.03	42.40
Shutesbury . . . . .	1.54	2.24	4.75	3.58	1.49	7.72	4.80	2.44	6.18	2.40	4.52	2.99	44.65
Wendell . . . . .	1.54	2.63	4.99	3.75	1.51	6.73	5.97	1.38	6.65	2.13	4.21	2.79	44.28
Petersham (Harvard Forest)*	1.13	1.83	4.34	3.59	0.91	9.48	4.28	0.63	6.40	1.49	3.54	2.61	40.23
Petersham (Nichevaug)*	1.34	1.57	4.32	4.61	1.43	3.08	3.62	1.97	7.01	1.96	3.79	2.33	42.03
Pelham*	1.26	1.88	4.04	4.50	1.84	7.72	4.01	2.51	7.44	2.40	4.51	2.81	44.92
North New Salem*	1.10	2.57	4.55	3.64	1.30	8.44	3.81	0.89	5.67	2.18	4.04	2.74	40.93
Quabbin Aqueduct Intake Works*	1.37	1.91	4.09	4.69	1.45	8.25	2.44	1.84	6.43	2.12†	4.19†	2.75	41.53
South New Salem*	1.28	2.29	4.93	4.44	1.00	8.44	4.66	1.93	5.52	1.91	3.76	2.20	42.36
1944 Mean . . . . .	1.29	2.09	4.47	4.18	1.37	8.09	3.92	1.69	6.49	2.12	4.19	2.69	42.59
25-Year Mean . . . . .	3.37	2.78	3.70	3.92	3.53	4.75	4.24	3.87	4.69	3.21	4.21	3.28	45.55

1945

Administration Building*	2.58	3.49	1.88	5.25	6.30	6.81	7.89	3.14	1.74	2.35	4.12	5.16	50.71
Shutesbury . . . . .	3.27	4.24	1.60	6.04	6.58	10.34	8.11	2.83	4.02	2.93	4.62	4.56	59.14
Wendell . . . . .	3.70	4.32	2.12	6.27	7.14	6.64	9.34	2.55	3.78	2.72	4.23	5.60	58.41
Petersham (Harvard Forest)*	1.59	3.95	1.70	4.90	5.29	7.72	6.03	3.20	3.09	2.59	3.68	4.13	47.87
Petersham (Nichevaug)*	2.89	2.92	1.50	5.31	6.70	9.17	8.01	3.09	1.60	2.85	3.96	4.55	52.55
Pelham*	2.49	3.87	1.80	6.55	7.43	10.12	7.70	3.31	3.00	3.11	4.28	4.08	57.74
North New Salem*	3.29	3.70	2.09	5.84	6.90	8.32	8.33	3.16	3.35	3.24	4.83	3.90	56.95
Quabbin Aqueduct Intake Works*	3.33	3.43	1.76	6.40	6.40	8.69	7.02	3.64	1.76	2.78	4.02	4.69	53.92
South New Salem*	2.29	—	1.86	6.32	6.48	10.24	7.01	2.98	2.95	2.83	3.86	4.45	51.27
1945 Mean . . . . .	2.83	3.32	1.81	5.88	6.58	8.67	7.71	3.10	2.81	2.82	4.18	4.57	54.28
26-Year Mean . . . . .	3.36*	2.80	3.63	3.99	3.64	4.90	4.37	3.85	4.61	3.20	4.21	3.33	45.89

\* Station maintained by Metropolitan District Water Supply Commission. Data for stations at North Rutland, Williamsville, Hubbardston, Shutesbury and Wendell furnished by Massachusetts Department of Public Health.  
 † Interpolated.

# FINANCIAL STATEMENT OF THE METROPOLITAN DISTRICT WATER SUPPLY COMMISSION

EXPENDITURES AND DISBURSEMENTS FOR THE PERIOD DECEMBER 1, 1939, TO JUNE 30, 1945, INCLUSIVE  
AND FROM JULY 28, 1926, THE DATE OF THE APPOINTMENT OF THE COMMISSION  
ON ACCOUNT OF METROPOLITAN WATER SUPPLY CONSTRUCTION FUND

## GENERAL OVERHEAD

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
<i>ADMINISTRATION, Commissioners' Office:</i>							
Salaries, Commissioners' . . . . .	\$10,500.00	\$10,500.00	\$10,500.00	\$10,844.10	\$11,325.84	\$6,244.80	\$198,330.30
Salaries, Clerical . . . . .	16,241.04	16,670.73	18,780.12	17,590.35	18,784.00	11,079.00	255,268.98
General Legal Expense . . . . .	1,255.68	382.82	794.00	0.00	0.00	0.00	4,787.38
Furniture and Fixtures . . . . .	283.94	0.00	0.00	0.00	0.00	0.00	6,859.68
Engineering Instruments . . . . .	0.00	0.00	0.00	0.00	0.00	0.00	519.97
Rental of Equipment . . . . .	0.00	0.00	0.00	0.00	0.00	0.00	5.00
Rent and Upkeep . . . . .	2,527.27	4,287.68	2,086.98	1,709.63	1,899.01	1,086.94	43,347.52
Automobile Purchase . . . . .	735.38	267.50	0.00	0.00	0.00	0.00	3,920.81
Automobile Maintenance . . . . .	344.79	940.24	357.67	275.03	143.95	109.05	6,027.27
Miscellaneous Expenses (undistributed) . . . . .	1,359.64	1,662.73	452.82	98.43	98.12	149.96	27,454.17
Printing and Blueprinting . . . . .	758.46	791.18	393.12	184.71	285.47	435.54	14,898.10
Stationery and Office Supplies . . . . .	389.51	349.92	285.52	139.71	187.56	95.28	5,359.49
Advertising . . . . .	659.85	760.72	829.99	0.00	71.70	71.60	15,079.17
Postage . . . . .	333.00	295.00	143.00	184.00	176.00	107.00	3,520.13
Current Distributed Overhead P. W. A. General Overhead . . . . .	7,666.06	2,477.69	0.00	0.00	0.00	0.00	15,721.35
Miscellaneous Expenses . . . . .	34.45	197.74	0.00	0.00	0.00	0.00	232.19
<b>Total Administration, Commissioners' Office</b>	<b>\$43,089.07</b>	<b>\$39,583.95</b>	<b>\$34,628.22</b>	<b>\$31,025.96</b>	<b>\$32,971.65</b>	<b>\$19,379.17</b>	<b>\$601,331.51</b>

## GENERAL OVERHEAD (Continued)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
<i>ENGINEERING, Headquarters Office:</i>							
Salaries, Engineering . . . . .	\$40,373.05	\$38,381.18	\$62,296.76	\$50,957.71	\$55,747.70	\$19,822.66	\$1,257,038.67
Salaries, Clerical . . . . .	16,314.15	20,605.90	24,614.04	19,958.97	18,034.15	8,198.73	241,999.29
Salaries, Engineering, Pension . . . . .	0.00	1,225.00	1,470.00	1,470.00	1,470.00	857.50	6,492.50
General Consultant Expense . . . . .	3,204.02	-533.32	0.00	681.39	2,036.53	0.00	123,366.27
General Legal Expense . . . . .	0.00	0.00	0.00	0.00	0.00	0.00	53,160.29
Furniture and Fixtures . . . . .	484.15	24.31	0.00	0.00	0.00	0.00	16,029.46
Laboratory Equipment . . . . .	0.00	0.00	0.00	0.00	0.00	0.00	1,961.00
Laboratory Supplies . . . . .	0.00	0.00	0.00	0.00	0.00	0.00	2,071.94
Rental of Equipment . . . . .	0.00	0.00	0.00	0.00	0.00	- 0.00	3,370.02
Engineering Instruments . . . . .	0.00	0.00	0.00	0.00	0.00	77.21	1,718.67
Rent and Upkeep of Boston Office . . . . .	\$11,245.58	\$11,805.68	\$7,791.24	\$6,123.21	\$6,202.85	\$3,487.79	\$182,809.19
Rent and Upkeep of Springfield Laboratory . . . . .	0.00	0.00	0.00	0.00	0.00	0.00	3,950.54
Automobile Purchase . . . . .	0.00	267.50	0.00	0.00	0.00	0.00	3,872.12
Automobile Maintenance . . . . .	264.85	759.95	389.59	183.87	197.09	153.39	6,689.88
Special Experiments . . . . .	0.00	0.00	0.00	0.00	0.00	0.00	2,304.63
Miscellaneous Expense (undistributed) . . . . .	757.35	601.82	478.78	369.95	391.46	421.05	27,415.95
Printing and Blueprinting . . . . .	400.52	395.25	195.42	921.02	750.24	385.59	20,234.64
Stationery and Office Supplies . . . . .	489.74	564.32	460.96	234.32	356.99	211.81	9,567.81
Postage . . . . .	711.00	306.60	90.00	108.00	122.50	64.35	4,712.53
Medical and Surgical Services . . . . .	0.00	0.00	0.00	0.00	0.00	0.00	5.00
Current Distributed Overhead							
P.W.A. General Overhead . . . . .	96,255.92	33,469.47	0.00	0.00	0.00	0.00	239,052.88
Miscellaneous Expenses . . . . .	7,438.06	17,175.96	0.00	0.00	0.00	0.00	24,614.02
Transfer to Sewerage . . . . .	0.00	0.00	-2,499.93	0.00	0.00	0.00	-2,499.93
Total Engineering, Headquarters Office . . . . .	\$177,938.39	\$124,749.62	\$95,286.86	\$81,008.44	\$85,318.51	\$33,680.08	\$2,229,937.37
UNDISTRIBUTED . . . . .		102.72	-102.72				
TOTAL GENERAL OVERHEAD . . . . .	\$221,027.46	\$164,436.29	\$129,512.36	\$112,084.40	\$118,290.16	\$53,059.25	\$2,831,268.88

DISTRIBUTION OF GENERAL OVERHEAD

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
ADMINISTRATION, Commissioners' Office:							
Ware Supply, including Wachusett-Coldbrook Tunnel Section of Quabbin Aqueduct (except PWA)	\$3,867.97	\$5,954.30	\$4,054.97	\$6,183.47	\$12,700.68	\$2,223.15	\$124,825.39
Ware Supply, including Wachusett-Coldbrook Tunnel Section (PWA)	126.76	0.00	0.00	0.00	0.00	0.00	129.21
Coldbrook-Swift Tunnel section of Quabbin Aqueduct (except PWA)	106.17	205.77	128.12	421.95	639.65	139.43	31,511.71
Coldbrook-Swift Tunnel section of Quabbin Aqueduct (PWA)	173.20	0.00	0.00	0.00	0.00	0.00	173.20
Quabbin Reservoir (PWA)	815.51	228.08	0.00	0.00	0.00	0.00	1,589.11
Quabbin Reservoir (except PWA)	23,758.94	19,012.55	22,522.18	9,580.82	12,324.80	10,608.39	277,243.54
Winsor Dam (except PWA)	7,477.60	11,541.00	1,291.63	688.78	880.34	1,190.98	76,051.55
Winsor Dam (PWA)	147.34	46.50	0.00	0.00	0.00	0.00	193.84
Quabbin Dike	201.71	254.67	173.16	9.31	837.48	65.84	30,196.44
Southern Sudbury Emergency Supply	0.00	0.00	0.00	0.00	0.00	0.00	4,298.45
Special Investigations	0.00	0.00	0.00	0.00	0.00	0.00	8,690.28
Wachusett Watershed Protection and Elimination of Pollution (except PWA)	\$10.62	\$0.00	\$4,141.54	\$5,801.86	\$2,337.69	\$2,103.09	\$15,699.14
Weston Aqueduct Siphons (PWA)	0.00	0.00	0.00	0.00	0.00	0.00	423.11
Hultman Aqueduct (Supply Section) (PWA)	2,173.03	1,200.15	0.00	0.00	0.00	0.00	6,771.17
Hultman Aqueduct (Supply Section) (except PWA)	0.00	0.93	1,163.11	3,025.03	491.28	11.62	4,681.97
Hultman Aqueduct (Distribution Section) (PWA)	3,915.68	1,138.15	0.00	0.00	0.00	0.00	5,976.56
Hultman Aqueduct (Distribution Section) (except PWA)	0.00	1.85	1,163.51	5,314.74	2,759.73	8,036.67	12,276.50
Spot Pond By-Pass (PWA)	144.50	0.00	0.00	0.00	0.00	0.00	430.30
Enlargement of Fells Reservoir (PWA)	170.04	0.00	0.00	0.00	0.00	0.00	170.04
Total Administration, Commissioner's Office	\$43,089.07	\$39,583.95	\$34,623.22	\$31,025.96	\$32,971.65	\$19,379.17	\$601,331.51

## DISTRIBUTION OF GENERAL OVERHEAD (Continued)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
Ware Supply, including Wachusett-Coldbrook Tunnel Section of Quabbin Aqueduct (except PWA)	\$10,477.37*	\$12,099.74	\$10,455.47	\$16,145.01	\$32,659.19	\$3,866.48	\$431,881.00
Ware Supply, including Wachusett-Coldbrook Tunnel Section (PWA)	689.06	269.55	0.00	0.00	0.00	0.00	1,622.20
Coldbrook-Swift Tunnel Section of Quabbin Aqueduct (except PWA)	222.73	500.03	330.35	1,101.71	1,630.44	242.50	118,151.77
Coldbrook-Swift Tunnel Section of Quabbin Aqueduct (PWA)	289.31	2.72	0.00	0.00	0.00	0.00	292.03
Quabbin Reservoir (PWA)	7,555.46	3,943.13	0.00	0.00	0.00	0.00	16,854.90
Quabbin Reservoir (except PWA)	51,109.96	38,443.01	58,072.19	25,015.42	32,790.01	18,449.95	945,748.24
Winsor Dam (except PWA)	15,737.88	28,738.83	3,330.40	1,798.38	2,329.82	2,071.32	231,323.77
Winsor Dam (PWA)	5,318.44	1,015.14	0.00	0.00	0.00	0.00	6,333.58
Quabbin Dike	984.94	889.35	446.44	24.29	2,178.84	114.51	111,356.15
Special Investigations	0.00	0.00	0.00	0.00	0.00	0.00	19,863.79
Southern Sudbury Emergency Supply	0.00	0.00	0.00	0.00	0.00	0.00	33,407.97
Wachusett Watershed Protection and Elimination of Pollution (except PWA)	2,600.98*	2,163.73	10,678.71	15,148.60	5,880.56	3,657.65	43,282.08
Wachusett Watershed Protection (PWA)	20.91	430.04	0.00	0.00	0.00	0.00	450.95
Weston Aqueduct Siphons (PWA)	656.44	0.00	0.00	0.00	0.00	0.00	5,722.73
Hultman Aqueduct (Supply Section) (PWA)	37,493.00	14,666.11	0.00	0.00	0.00	0.00	114,472.88
Hultman Aqueduct (Supply Section) (except PWA)	0.00	2,753.64	2,973.25	7,898.33	1,052.69	20.21	14,698.12
Hultman Aqueduct (Distribution Section) (PWA)	35,293.00	11,388.57	0.00	0.00	0.00	0.00	72,793.01
Hultman Aqueduct (Distribution Section) (except PWA)	\$548.61	\$5,691.82	\$9,000.05	\$13,876.70	\$6,796.96	\$5,257.46	\$41,171.60
Spot Pond By-Pass (PWA)	5,062.85	1,673.43	0.00	0.00	0.00	0.00	13,611.66
Enlargement of Fells Reservoir (PWA)	3,877.45	80.78	0.00	0.00	0.00	0.00	6,898.94
Total Engineering, Headquarters Office	\$177,938.39	\$124,749.62	\$95,286.86	\$81,008.44	\$85,318.51	\$33,680.08	\$2,229,937.37

\* Town of Rutland Sewer (WPA) (200.39) transferred to Wachusett Watershed Protection.

WARE SUPPLY, INCLUDING WACHUSETT-COLDBROOK TUNNEL SECTION OF QUABBIN AQUEDUCT  
(EXCEPT PWA)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
<b>GENERAL OVERHEAD:</b>							
Administration, Commissioners' Office	\$3,867.97	\$5,954.29	\$4,054.97	\$6,183.47	\$12,700.68	\$2,223.15	\$124,825.39
Engineering, Headquarters Office	10,477.37	12,099.74	10,455.47	16,145.01	32,659.19	3,866.48	431,881.00
Total General Overhead	\$14,345.34	\$18,054.03	\$14,510.44	\$22,328.48	\$45,359.87	\$6,089.63	\$556,706.39
<b>ENGINEERING:</b>							
Total Except the Following Listed Items	\$243.13	\$164.69	\$804.13	\$185.11	\$9.06	\$0.00	\$41,344.64
Salaries, Engineering and Clerical	8,138.32	10,006.63	3,997.45	2,012.76	2,222.49	330.95	433,040.30
Consultant Expense	3.00	625.00	300.00	243.44	231.55	206.04	10,944.28
Labor	658.29	2,273.07	362.12	111.21	1,029.55	29.12	9,301.36
Miscellaneous Expense (undistributed)	358.06	125.52	137.21	22.61	389.19	2.86	11,661.98
Printing and Blueprinting	18.14	20.77	12.43	16.45	0.39	20.31	1,332.65
Stationery and Office Supplies	61.91	52.49	32.93	10.67	19.37	1.30	3,331.69
Postage	12.11	12.60	10.10	7.94	3.70	4.00	525.61
Automobile Maintenance	600.97	1,277.55	1,010.44	178.48	270.36	200.43	19,793.31
Rent and Upkeep	1,764.42	582.16	494.59	233.06	25.30	5.70	24,001.34
Tools and Equipment	535.02	40.20	67.52	0.00	0.00	3.80	667.92
Total Engineering	\$12,393.37	\$15,180.68	\$6,788.92	\$2,971.73	\$4,200.96	\$804.51	\$556,545.08
<b>REAL ESTATE—General Construction:</b>							
Total Except the following listed Items	847.85	399.00	7.30	\$0.00	\$1.74	\$0.00	\$145,819.04
Police Protection—labor	3,556.33	644.38	4,433.90	155.25	70.68	0.00	9,665.29
Special Agents, Salaries	0.00	0.00	1,158.39	515.55	1,537.65	821.40	16,981.99
Total Real Estate	\$4,404.18	\$1,043.38	\$5,609.59	\$670.80	\$1,610.07	\$821.40	\$172,466.32

## WARE SUPPLY, INCLUDING WACHUSETT-COLDBROOK TUNNEL SECTION OF QUABBIN AQUEDUCT (EXCEPT PWA)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
<b>WARE WATERSHED:</b>							
Total Except the Following Listed Items . . . . .	\$13,942.01	\$6,461.01	\$7,226.94	\$22,826.93	\$499.22	\$0.00	\$336,860.08
Salaries, Engineering and Clerical . . . . .	10,966.89	10,312.95	13,550.78	5,871.17	2,308.35	631.88	197,207.53
Legal and Expent Expense . . . . .	2,861.66	1,272.82	1,521.32	1,765.74	2,986.16	1,692.80	41,869.71
Consultant Expense . . . . .	.00	.00	.00	.00	199.91	28.30	991.91
Labor . . . . .	10,591.80	2,693.58	4,622.35	1,218.09	6,312.07	2,197.15	48,056.89
Automobile Maintenance . . . . .	2,285.34	2,158.17	2,181.97	249.80	471.05	511.07	15,168.70
Miscellaneous Expense (undistributed) . . . . .	597.10	601.46	900.88	33.03	205.89	196.97	8,759.55
Printing and Blueprinting . . . . .	69.79	53.97	34.46	34.46	18.61	2.09	1,155.43
Stationery and Office Supplies . . . . .	119.63	118.62	82.83	43.81	21.40	1.00	964.99
Postage . . . . .	27.92	35.47	25.88	13.75	7.28	3.00	204.82
Tools and Equipment . . . . .	217.61	147.63	63.56	6.85	0.00	3.80	519.90
Engineering Instruments . . . . .	5.15	5.43	0.00	0.00	0.00	3.54	452.17
Purchases and Settlements (including Certif- cate of Judgment) . . . . .	38,817.97	69,897.27	8,293.45	15,846.19	93,151.37	45,775.00	1,689,080.19
Taxes . . . . .	22,141.34	13,454.11	14,102.33	11,687.79	14,463.11	2,320.33	134,505.53
Maintenance of Real Estate . . . . .	390.13	365.76	544.61	8.61	93.85	5.88	12,909.44
Fire Stops and Fire Access Roads . . . . .							
Labor . . . . .	7,105.59	4,468.38	1,805.43	187.53	209.61	272.00	38,056.10
Total Ware Watershed . . . . .	\$110,139.93	\$112,046.33	\$54,996.20	\$59,593.75	\$120,947.97	\$53,644.81	\$2,526,757.94
<b>WARE DIVERSION DAMAGES:</b>							
PERMANENT CONSTRUCTION-CONSTRUCTION CON- TRACTS:	3,780.30	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$1,429,557.92
PERMANENT CONSTRUCTION-EXCEPT CONSTRU- CTION CONTRACTS:	\$0.00	\$0.00	\$1,257.16	\$0.00	\$0.00	\$0.00	\$9,643,641.87
Total Except the Following Listed Items . . . . .	\$373.30	\$190.35	\$44.23	\$0.00	\$0.00	\$0.00	\$20,502.99
Labor . . . . .	1,536.09	93.83	322.21	163.59	117.83	0.00	10,161.79
Maintenance of Partially Completed Structures . . . . .	5,203.49	6,863.72	5,462.47	996.29	0.00	0.00	42,476.41
Maintenance of Grounds . . . . .	1,212.18	1,943.86	2,227.62	62.58	0.00	0.00	11,102.98
Instal Equipment . . . . .	95.00	1,306.98	581.73	.00	0.00	0.00	113,784.44
Total Total Except Construction Contracts . . . . .	\$8,420.06	\$10,398.74	\$8,638.26	\$1,222.46	\$117.83	\$690.00	\$198,028.61
Total Permanent Construction . . . . .	\$8,420.06	\$10,398.74	\$9,895.45	\$1,222.46	\$117.83	\$690.00	\$9,841,670.48
Total Ware Supply, including Wachuset- t-Coldbrook Tunnel Section of Quabbin Aqueduct (except PWA) . . . . .	\$153,483.18	\$156,723.16	\$91,800.57	\$86,787.22	\$172,236.70	\$62,050.35	\$15,083,704.13

WACHUSETT-COLDBROOK TUNNEL SECTION OF QUABBIN AQUEDUCT (PWA ONLY)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
GENERAL OVERHEAD . . . . .	\$815.82	\$269.55	\$0.00	\$0.00	\$0.00	\$0.00	\$1,751.41
ENGINEERING . . . . .	1,811.76	917.71	569.31	0.00	0.00	0.00	10,144.23
CONSTRUCTION CONTRACT 64 . . . . .	8,251.15	0.00	0.00	0.00	0.00	0.00	82,511.51
CONSTRUCTION CONTRACT 101 . . . . .	78.73	0.00	0.00	0.00	0.00	0.00	78.73
CONSTRUCTION CONTRACT 109 . . . . .	0.00	6,034.22	0.00	0.00	0.00	0.00	6,034.22
CONSTRUCTION CONTRACT 112 . . . . .	2,979.15	3,758.91	0.00	0.00	0.00	0.00	6,737.16
OTHER PERMANENT CONSTRUCTION . . . . .	38.93	15.97	149.89	0.00	0.00	0.00	274.65
Total Wachusett-Coldbrook Tunnel Section of Quabbin Aqueduct (PWA only) . . . . .	\$13,975.54	\$10,995.16	\$719.20	\$0.00	\$0.00	\$0.00	\$107,531.91

TOTAL WARE SUPPLY, INCLUDING WACHUSETT-COLDBROOK TUNNEL SECTION OF QUABBIN AQUEDUCT . . . . .	\$167,458.72	\$167,718.32	\$92,519.77	\$86,787.22	\$172,236.70	\$62,050.35	\$15,191,236.04
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COLDBROOK-SWIFT TUNNEL SECTION OF QUABBIN AQUEDUCT (EXCEPT PWA)

GENERAL OVERHEAD:							
Administration, Commissioners' Office . . . . .	\$106.17	\$205.78	\$128.12	421.95	\$639.65	\$139.43	\$31,511.71
Engineering, Headquarters Office . . . . .	222.73	500.03	330.35	1,101.71	1,630.44	242.50	118,151.77
Total General Overhead . . . . .	\$328.90	\$705.81	\$458.47	\$1,523.66	\$2,270.09	\$381.93	\$149,663.48

ENGINEERING:							
Total Except the Following Listed Items . . . . .	\$279.70	\$1,007.83	\$352.36	\$54.15	\$21.41	\$0.00	\$44,378.19
Salaries, Engineering and Clerical . . . . .	821.00	1,180.79	1,147.21	3,859.48	5,213.45	290.30	281,799.28
Installed Equipment . . . . .	0.00	0.00	0.00	0.00	0.00	315.41	315.41
Miscellaneous Expense (undistributed) . . . . .	28.06	73.81	35.19	4.98	9.80	0.50	8,482.39
Automobile Maintenance . . . . .	179.00	265.82	179.98	90.47	178.18	13.85	19,286.20
Labor . . . . .	719.70	292.32	51.29	155.62	955.73	16.10	5,133.20
Total Engineering . . . . .	\$2,027.46	\$2,820.67	\$1,904.03	\$4,164.70	\$6,378.57	\$636.16	\$359,394.67

REAL ESTATE—GENERAL CONSTRUCTION . . . . .	32.50	\$6.42	\$5.35	\$0.00	\$0.00	\$0.00	\$27,876.13
COLDBROOK-SWIFT DAMAGES: . . . . .	\$0.00	\$298.75	\$0.00	\$0.00	\$0.00	\$0.00	\$8,668.18
PERMANENT CONSTRUCTION: . . . . .	\$498.26	\$412.06	\$505.15	\$67.83	\$0.00	\$0.00	\$4,874,523.66
Total Coldbrook-Swift Tunnel Section (Except PWA) . . . . .	\$2,827.12	\$4,243.71	\$2,873.00	\$5,756.19	\$8,648.66	\$1,018.09	\$5,420,126.12

COLDBROOK-SWIFT TUNNEL SECTION OF QUABBIN AQUEDUCT (PWA ONLY)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
Total Expenditure . . . . .	\$2,302.72	\$2.72	\$0.00	\$0.00	\$0.00	\$0.00	\$2,305.44
TOTAL COLDBROOK-SWIFT TUNNEL SECTION OF QUABBIN AQUEDUCT . . . . .	\$5,129.84	\$4,246.43	\$2,873.00	\$5,756.19	\$8,648.66	\$1,018.09	\$5,422,431.56

QUABBIN RESERVOIR (PWA ONLY)

GENERAL OVERHEAD: . . . . .	\$8,370.97	\$4,171.21	\$0.00	\$0.00	\$0.00	\$0.00	\$18,444.01
ENGINEERING: Total except the Following Listed Items . . . . .	\$2,973.13	\$3,408.01	\$3,273.59	\$0.00	\$0.00	\$0.00	\$19,811.44
Salaries, Engineering and Clerical . . . . .	21,165.26	9,902.51	252.94	0.00	0.00	0.00	100,992.82
Labor . . . . .	6,252.12	1,813.79	48.00	0.00	0.00	0.00	15,255.86
Total Engineering . . . . .	\$30,390.51	\$11,124.31	\$3,574.53	\$0.00	\$0.00	\$0.00	\$136,060.12

PERMANENT CONSTRUCTION:

Contracts 61, 62, 63, 72 . . . . .	\$96,945.52	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$1,312,873.74
Contract 66 . . . . .	40,956.14	0.00	0.00	0.00	0.00	0.00	188,965.86
Contract 82 . . . . .	62,292.45	0.00	0.00	0.00	0.00	0.00	228,550.84
Contract 93 . . . . .	20,194.61	0.00	0.00	0.00	0.00	0.00	25,102.08
Contract 101 . . . . .	93.06	0.00	0.00	0.00	0.00	0.00	93.06
Contract 103 . . . . .	2,911.95	10,549.05	0.00	0.00	0.00	0.00	13,461.00
Contract 106 . . . . .	27,433.36	0.00	0.00	0.00	0.00	0.00	27,433.36
Contract 107 . . . . .	0.00	72,477.06	0.00	0.00	0.00	0.00	72,477.06
Contract 108 . . . . .	7,672.50	10,855.77	0.00	0.00	0.00	0.00	18,528.27
Contract 109 . . . . .	0.00	9,969.60	0.00	0.00	0.00	0.00	9,969.60
Contract 116 . . . . .	0.00	10,871.36	0.00	0.00	0.00	0.00	10,871.36
Contract 122 . . . . .	0.00	4,567.00	0.00	0.00	0.00	0.00	4,567.00
Contract 123B . . . . .	0.00	381.00	0.00	0.00	0.00	0.00	381.00
Contract 124 . . . . .	0.00	15,142.00	0.00	0.00	0.00	0.00	15,142.00
Other Permanent Construction . . . . .	0.00	0.00	1,163.36	0.00	0.00	0.00	3,131.23
Total Permanent Construction . . . . .	258,499.59	134,812.84	1,163.36	0.00	0.00	0.00	1,931,547.26
Total Quabbin Reservoir (PWA only) . . . . .	297,261.07	150,108.36	4,737.89	0.00	0.00	0.00	2,086,051.39

QUABBIN RESERVOIR NOT INCLUDING WINSOR DAM AND QUABBIN DIKE (EXCEPT PWA)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
<b>GENERAL OVERHEAD:</b>							
Administration, Commissioner's Office	\$23,756.94	\$19,012.55	\$22,522.18	\$9,580.82	\$12,324.80	\$10,608.39	\$277,243.54
Engineering, Headquarters Office	51,109.96	38,443.01	58,072.19	25,015.42	32,790.01	18,449.95	945,748.24
Total General Overhead	\$74,866.90	\$57,455.56	\$80,594.37	\$34,596.24	\$45,114.81	\$29,058.34	\$1,222,991.78
<b>ENGINEERING:</b>							
Salaries, Engineering and Clerical	\$46,364.70	\$47,480.32	\$33,383.69	\$6,230.06	\$13,269.35	\$7,766.73	\$769,613.12
Consultant Expenses	302.88	1,889.14	989.57	730.31	701.52	702.99	12,010.14
Labor	21,129.75	14,701.36	12,076.70	2,242.64	10,332.00	3,251.19	123,210.49
Tools and Equipment	1,461.26	987.04	171.50	80.83	79.60	42.70	3,478.43
Rent and Upkeep	6,960.95	5,921.29	5,786.67	3,093.70	48.41	31.99	45,666.01
Medical and Surgical Service	103.81	106.99	31.97	46.53	17.00	59.00	354.00
Automobile Maintenance	7,219.39	6,739.88	4,848.31	10.86	1,427.84	851.87	61,428.74
Miscellaneous Expense (undistributed)	2,980.16	1,886.65	947.39	349.32	818.34	617.53	22,167.63
Printing and Blueprinting	188.78	90.99	64.51	8.70	40.66	4.52	4,080.12
Stationery and Office Supplies	726.98	613.46	203.55	57.51	39.96	15.46	10,531.28
Postage	226.62	184.00	85.50	101.00	45.00	20.00	2,917.34
Labor on Automobiles and Mechanical Equipment	869.99	900.00	606.43	204.47	777.70	273.12	3,776.71
Maintenance of Mechanical Equipment	1,421.83	775.11	505.42	169.45	550.36	26.98	3,877.40
All Other Items	12,574.71	9,412.52	3,938.18	190.23	197.80	0.00	100,535.54
Total Engineering	\$102,531.81	\$91,688.75	\$63,589.39	\$13,515.61	\$28,345.63	\$13,664.08	\$1,163,646.95
<b>REAL ESTATE—EXCEPT AWARDS BY COURT DECREE:</b>							
Legal and Expert Expense	\$2,608.92	\$1,229.95	\$633.28	\$514.20	\$800.66	\$325.90	\$193,179.35
Labor	3,087.76	444.62	266.63	98.04	1,315.38	76.34	31,906.70
Printing and Blueprinting	76.80	27.22	23.66	2.83	15.13	18.62	1,831.95
Taxes	29,484.81	17,531.36	18,113.02	16,999.38	16,068.16	79.56	575,205.00
Fire Protection							
Labor	38,622.02	4,469.90	1,510.86	49.07	41.40	34.75	78,904.24
Renting Agents							
Salaries	1,192.04	2,787.99	347.02	18.83	62.10	20.70	36,122.08
All Other Items	63,462.60	22,233.44	22,172.19	2,468.75	12,140.35	0.00	8,173,067.99
Sub Total Real Estate—Except Awards by Court Decree	\$138,534.95	\$48,724.48	\$43,066.66	\$20,151.10	\$30,443.18	\$555.87	\$9,909,217.31

QUABBIN RESERVOIR NOT INCLUDING WINSOR DAM AND QUABBIN DIKE (EXCEPT PWA)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
<b>REAL ESTATE—AWARDS BY COURT DECREE—</b>							
<b>BOARD OF REFEREES:</b>							
Total Except the following listed items . . .	\$304.53	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$73,336.97
Legal Expense . . .	3,571.15	150.00	0.00	0.00	0.00	0.00	4,431.88
Payments Under Certificates of Judgment . . .	36,721.90	0.00	0.00	0.00	0.00	510.00	240,106.57
Sub Total Real Estate—Board of Referees . . .	\$40,597.58	\$150.00	\$0.00	\$0.00	\$0.00	\$510.00	\$317,875.42
<b>REAL ESTATE—AWARDS BY COURT DECREE—</b>							
<b>JURY VERDICTS:</b>							
Total Except the following listed items . . .	\$378.44	\$387.05	\$2.60	\$14.00	\$0.00	\$0.00	\$4,959.13
Consultant Expense . . .	1,138.84	100.00	0.00	0.00	0.00	0.00	2,339.93
Payments under Certificates of Judgment . . .	42,453.00	16,990.44	0.00	12,108.74	0.00	0.00	92,430.83
Settlements made by Attorney General on Petitions brought in Superior Court prior to judgment . . .	16,956.84	39,484.85	24,730.30	600.00	0.00	0.00	81,771.89
Sub Total Real Estate—Jury Verdicts . . .	\$60,927.12	\$56,962.34	\$24,732.60	\$12,722.74	\$0.00	0.00	\$181,501.58
Total Real Estate . . .	240,059.65	\$105,836.82	67,799.26	32,873.84	30,443.18	1,065.87	9,589,594.31
<b>QUABBIN RESERVOIR DAMAGES—EXCEPT AWARDS BY COURT DECREE:</b>							
Total Except Purchases and Settlements . . .	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$3,195.65
Purchases and Settlements . . .	9,862.33	328.00	0.00	0.00	0.00	0.00	68,136.33
Sub Total Quabbin Reservoir Damages—Except Awards by Court Decree . . .	\$9,862.33	\$328.00	\$0.00	\$0.00	\$0.00	\$0.00	\$71,331.98
<b>QUABBIN RESERVOIR DAMAGES—AWARDS BY COURT DECREE—BOARD OF REFEREES:</b>							
Legal Expense . . .	\$3,444.16	\$152.01	\$0.00	\$0.00	\$0.00	\$0.00	\$6,136.71
Expert and Other Witness Expense . . .	0.00	20.00	0.00	0.00	0.00	0.00	960.00
Payments Under Certificates of Judgment . . .	2,500.00	0.00	0.00	0.00	0.00	0.00	4,155.44
Sub Total Quabbin Reservoir Damages—Awards by Court Decree—Board of Referees . . .	\$5,944.16	\$172.01	\$0.00	\$0.00	\$0.00	\$0.00	\$11,252.15
<b>QUABBIN RESERVOIR DAMAGES—AWARDS BY COURT DECREE—JURY VERDICTS:</b>							
Total Quabbin Reservoir Damages: . . .	\$0.00	\$195.65	\$0.00	\$0.00	\$0.00	\$0.00	\$195.65
TOTAL QUABBIN RESERVOIR DAMAGES: . . .	\$18,806.49	\$695.66	\$0.00	\$0.00	\$0.00	\$0.00	\$82,779.78

SWIFT DIVERSION DAMAGES (INCLUDING BEAVER BROOK) EXCEPT AWARDS BY COURT DECREE AND PAYMENTS TO COUNTIES:									
Total Except the Following Listed Items:	\$1,089.82	\$1,150.94	\$226.79	\$67.97	\$0.00	\$1,358,535.69			
Salaries, Engineering and Clerical Labor	5,339.85	2,884.31	933.58	2,032.42	937.33	138,075.04			
	1,136.25	1,344.73	692.64	504.71	394.32	18,792.77			
Sub Total Swift Diversion Damages—Except Awards by Court Decree	\$7,565.92	\$5,379.98	\$1,853.01	\$2,605.10	\$1,331.65	\$1,515,403.50			
SWIFT DIVERSION DAMAGES (INCLUDING BEAVER BROOK) AWARDS BY COURT DECREE—JURY VERDICTS:									
Total Except the Following Listed Items	\$0.00	\$175,000.00	\$701.34	\$0.00	\$0.00	\$185,738.70			
Legal Expense	6,901.07	6,013.75	4,250.00	945.25	2,754.37	34,191.35			
Consulting and Engineering Expert Expense	60,985.37	2,413.51	0.00	3,661.41	12,632.31	86,255.63			
Expert and Other Witness Expense	27,839.78	0.00	0.00	0.00	14,512.33	48,702.71			
Miscellaneous Expense (undistributed)	2,151.45	79.48	0.00	127.09	390.14	3,076.64			
Printing and Blue printing	177.11	20.74	0.00	1,061.27	32.53	1,370.44			
Automobile Maintenance	13.92	0.00	0.00	0.00	0.97	123.58			
Sub Total Swift Diversion Damages Awards by Court Decree—Jury Verdicts	\$95,312.42	\$184,081.13	\$4,951.34	\$5,796.02	\$30,323.25	\$359,459.05			
SWIFT DIVERSION DAMAGES—PAYMENTS TO COUNTIES FOR REIMBURSEMENTS AND EXPENSES OF LITIGATION IN COUNTY COURTS:									
Total Swift Diversion Damages (Including Beaver Brook)	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$4,307.05			
QUABBIN RESERVOIR—LIQUIDATION OF TOWNS TOWN OBLIGATION:	\$134,713.72	\$189,461.11	\$6,804.35	\$8,401.12	\$31,654.90	\$1,879,169.60			
Town of Enfield	\$5,219.12	\$3,911.59	\$3,351.95	\$3,775.97	\$908.30	\$32,864.99			
Town of Greenwich	2,016.45	450.66	993.44	99.20	1,246.00	13,354.33			
Town of Prescott	1,152.71	1,837.39	861.92	11.02	6.00	5,862.09			
Town of Dana	3,800.99	2,529.19	5,909.28	649.18	2,556.91	34,659.36			
Sub Total Town Obligations	\$12,189.27	\$7,186.44	\$11,116.59	\$4,533.37	\$4,717.21	\$80,740.77			
QUABBIN RESERVOIR—LIQUIDATION OF TOWNS LIQUIDATING EXPENSES:									
Total Except the Following Listed Items	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$1,372.48			
Salaries Engineering	2,649.03	2,641.71	2,545.24	1,813.40	1,054.30	14,292.74			
Legal and Expert Expense	1,068.57	0.00	0.00	0.00	0.00	3,244.43			
Sub Total Liquidating Expenses	\$3,717.60	\$2,641.71	\$2,545.24	\$1,813.40	\$1,054.30	\$18,909.65			
Total, Quabbin Reservoir—Liquidation of Towns	\$15,906.87	\$9,828.15	\$13,661.83	\$6,346.77	\$5,771.51	\$105,650.42			

## QUABBIN RESERVOIR NOT INCLUDING WINSOR DAM AND QUABBIN DIKE (EXCEPT PWA)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
<b>QUABBIN RESERVOIR — CEMETERIES — QUABBIN PARK CEMETERY CONSTRUCTION: (except PWA)</b>							
Total Except the Following Listed Items . . .	\$2,248.63	\$284.54	\$321.49	\$206.27	\$0.00	\$0.00	\$38,798.45
Salaries, Engineering and Clerical . . .	299.75	757.17	1,229.67	967.54	0.00	0.00	17,475.91
Labor . . .	4,590.27	1,525.13	531.09	2,208.08	0.00	0.00	53,556.90
Maintenance of Grounds . . .	4,698.10	5,357.00	6,782.03	3,890.84	0.00	0.00	42,546.89
Sub Total Quabbin Park Cemetery Con- struction . . .	\$11,836.75	\$7,923.84	\$8,858.28	\$7,272.73	\$0.00	\$0.00	\$152,378.15
<b>REMOVALS FROM CEMETERIES WITHIN RESERVOIR AREA TO QUABBIN PARK CEMETERY:</b>							
Total Except the Following Listed Items . . .	\$493.08	\$210.50	\$87.08	\$124.93	\$0.00	\$0.00	\$24,779.11
Salaries, Engineering and Clerical . . .	2,465.78	469.09	531.83	496.54	0.00	0.00	24,121.34
Removal and Reinterment of Bodies . . .	1,261.79	434.31	263.09	600.26	0.00	0.00	33,351.02
Sub Total Removals to Quabbin Park Cemetery . . .	\$4,220.65	\$1,113.90	\$882.00	\$1,221.73	\$0.00	\$0.00	\$82,251.47
<b>REMOVALS FROM CEMETERIES WITHIN RESERVOIR AREA TO CEMETERIES OTHER THAN QUAB- BIN PARK:</b>							
Total Quabbin Reservoir—Cemeteries (ex- cept PWA) . . .	\$309.45	\$9.27	\$13.00	\$154.93	\$0.00	\$0.00	\$31,132.70
Sub Total Removals to Quabbin Park Cemetery . . .	\$16,366.85	\$9,047.01	\$9,753.28	\$8,649.39	\$0.00	\$0.00	\$265,762.32
<b>PERMANENT CONSTRUCTION — CONSTRUCTION CONTRACTS:</b>							
Completed Contracts . . .	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$679,733.70
Contract 49 . . .	0.00	3,139.01	0.00	0.00	0.00	0.00	87,928.70
Contract 102 . . .	1,524.50	0.00	0.00	0.00	0.00	0.00	1,524.50
Contract 105 . . .	0.00	1,907.40	0.00	0.00	0.00	0.00	1,907.40
Contract 118 . . .	0.00	0.00	4,701.79	4,701.79	0.00	0.00	4,701.79
Contract 120 . . .	677.40	0.00	0.00	0.00	0.00	0.00	677.40
Contract 125 . . .	0.00	1,980.00	6,820.00	0.00	0.00	0.00	8,800.00
Sub Total Construction Contracts . . .	\$2,201.90	\$5,119.01	\$8,727.40	\$4,701.79	\$0.00	\$0.00	\$785,263.49

OTHER PERMANENT CONSTRUCTION—EXCEPT CLEARING:									
Total except Labor	\$34.49	\$2,005.20	\$309.60	333.24	\$109.72	\$0.00	\$9,976.53		
Labor	357.50	1,305.28	362.29	64.54	0.00	0.00	6,482.30		
Sub Total Other Permanent Construction—Except Clearing	\$391.99	\$3,310.48	\$671.89	\$397.78	\$109.72	\$0.00	\$16,458.83		
PERMANENT CONSTRUCTION—AWARDS BY COURT DECREE—ACTIONS FOR BREACH OF CONTRACT:	\$0.00	\$0.00	\$5.94	\$0.00	\$0.00	\$0.00	\$22,316.54		
OTHER PERMANENT CONSTRUCTION—1936 CLEARING PROJECT:									
Compensation Payments to Employees Injured on Work	\$1,051.44	\$832.00	\$112.00	\$1,156.00	\$636.00	\$360.00	\$46,529.11		
All Other Items	126.43	—265.00	5.00	125.00	0.00	0.00	1,794,652.10		
Sub Total 1936 Clearing Project	\$1,177.87	\$567.00	\$117.00	\$1,281.00	\$636.00	\$360.00	\$1,841,181.21		
OTHER PERMANENT CONSTRUCTION—WPA CLEARING PROJECT:	\$0.00	\$3,387.76	\$0.00	0.00	\$0.00	\$0.00	\$3,387.76		
OTHER PERMANENT CONSTRUCTION—RESERVOIR CLEARING NOT INCLUDING 1936 CLEARING PROJECT OR WPA CLEARING PROJECT:									
Total Except the Following Listed Items:	\$192.62	\$48.51	\$178.10	\$73.29	\$303.29	\$26.86	\$3,870.46		
Salaries, Engineering	483.15	871.07	1,056.02	1,375.35	2,114.02	1,135.03	7,708.27		
Labor	31,567.85	24,986.19	17,776.03	22,387.53	35,223.71	15,546.94	218,965.17		
Sub Total Reservoir Clearing, Not Including 1936 Clearing Project, or WPA	\$32,243.62	\$25,905.77	\$19,010.15	\$23,736.17	\$37,641.02	\$16,708.83	\$230,543.90		
Total Quabbin Reservoir Permanent Construction	\$36,015.38	\$38,290.02	\$28,532.38	\$30,116.74	\$38,886.74	\$17,068.83	\$2,899,151.73		
HIGHWAY AND PUBLIC UTILITY RELOCATION:									
Total Except Labor	\$31.36	\$109.02	\$504.89	\$129.45	\$0.00	\$0.00	\$1,357,191.50		
Labor	3,468.46	3,164.15	7,660.90	7.94	0.00	0.00	32,615.97		
Total Highway and Public Utility Relocation	\$3,499.82	\$3,273.17	\$8,165.79	\$137.39	\$0.00	\$0.00	\$1,389,807.47		
QUABBIN RESERVOIR WATERSHED—REFORESTATION NURSERIES:									
Total Except the Following Listed Items	\$2,363.71	\$1,423.49	\$147.39	\$5.50	\$12.94	\$0.00	\$16,296.20		
Salaries, Engineering and Clerical	1,312.17	1,247.33	759.00	557.95	394.50	386.21	8,964.88		
Labor	18,218.64	14,212.43	19,404.04	5,225.18	3,029.40	2,095.82	110,332.45		
Sub Total Reforestation—Nurseries	\$21,894.52	\$16,883.15	\$20,310.43	\$5,788.63	\$3,436.84	\$2,482.03	\$135,593.53		

QUABBIN RESERVOIR NOT INCLUDING WINSOR DAM AND QUABBIN DIKE (EXCEPT PWA)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
<b>QUABBIN RESERVOIR WATERSHED—REFORESTATION WATERSHED PLANTING:</b>							
Total Except the following Listed Items . . . . .	\$581.05	\$237.88	\$83.00	\$0.00	\$0.00	\$14.29	\$4,808.62
Salaries, Engineering and Clerical . . . . .	1,422.50	1,040.85	1,030.76	175.60	779.50	974.40	7,061.14
Labor . . . . .	25,360.79	19,865.44	16,927.16	3,022.02	6,088.09	6,175.62	101,487.76
Sub Total Reforestation—Watershed Planting . . . . .	\$27,364.34	\$21,134.17	\$18,040.92	\$3,197.62	\$6,867.59	\$7,164.31	\$113,357.52
<b>QUABBIN RESERVOIR WATERSHED—REFORESTATION FIRE STOPS AND FIRE ACCESS ROADS:</b>							
Total Except Labor . . . . .	\$3,766.87	\$148.63	\$622.24	\$149.15	\$36.75	\$0.00	\$20,125.32
Labor . . . . .	16,469.94	651.25	5,642.59	-55.92	335.17	0.00	61,739.85
Sub Total Reforestation—Fire Stops and Fire Access Roads . . . . .	\$20,236.81	\$779.88	\$6,264.83	\$93.23	\$371.92	\$0.00	\$81,865.17
<b>QUABBIN RESERVOIR WATERSHED—FENCING OF WATERSHED PROPERTY:</b>							
QUABBIN RESERVOIR WATERSHED—OTHER FORESTRY AND HURRICANE CLEARING:	\$557.90	\$283.78	\$182.11	\$13.71	\$444.83	\$4.33	\$6,505.63
Total Except the Following Listed Items . . . . .	\$55.55	\$10.80	\$0.00	\$57.00	\$13.00	\$0.00	\$6,552.75
Salaries, Engineering . . . . .	928.63	507.24	288.46	118.25	7.50	0.00	2,769.03
Labor . . . . .	2,978.87	0.00	0.00	1,689.74	20.76	0.00	41,963.28
Sub Total Other Forestry and Hurricane Clearing . . . . .	\$3,963.05	\$518.04	\$288.46	\$1,864.99	\$41.26	\$0.00	\$51,285.06
<b>QUABBIN RESERVOIR WATERSHED—PATROL EQUIPMENT:</b>							
Total Quabbin Reservoir Watershed . . . . .	\$3,722.82	\$1,073.87	\$1,812.94	\$164.36	\$0.00	\$0.00	\$6,773.99
Total Quabbin Reservoir, not Including Winsor Dam and Quabbin Dike (except PWA) . . . . .	\$77,739.44	\$40,672.89	\$46,899.69	\$11,122.54	\$11,162.44	\$9,650.67	\$395,380.90
TOTAL QUABBIN RESERVOIR, NOT INCLUDING WINSOR DAM AND QUABBIN DIKE	\$717,508.93	\$383,880.60	\$504,623.42	\$151,477.93	\$168,200.69	\$107,934.20	\$18,993,935.26
ING WINSOR DAM AND QUABBIN DIKE	\$1,014,770.00	\$533,986.96	\$509,361.31	\$151,477.93	\$168,200.69	\$107,934.20	\$21,079,986.65

WINSOR DAM (EXCEPT PWA)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
<b>GENERAL OVERHEAD:</b>							
Administration, Commissioners' Office . . . . .	\$7,477.60	\$11,541.00	\$1,291.63	\$688.78	\$880.34	\$1,190.98	\$76,051.55
Engineering, Headquarters Office . . . . .	15,737.38	28,738.83	3,330.40	1,798.38	2,329.82	2,071.32	291,323.77
Total General Overhead . . . . .	\$23,215.48	\$40,279.83	\$4,622.03	\$2,487.16	\$3,210.16	\$3,262.30	\$307,375.32
<b>ENGINEERING:</b>							
Total Except the Following Listed Items . . . . .	\$3,239.98	\$452.32	\$46.44	\$29.83	\$31.59	\$179.33	\$110,199.45
Salaries, Engineering and Clerical . . . . .	37,332.78	4,479.58	1,536.68	609.05	558.60	275.00	337,764.94
Labor . . . . .	9,280.10	2,209.57	7.25	113.54	0.00	0.00	68,463.03
Total Engineering . . . . .	\$49,852.86	\$7,141.47	\$1,590.37	\$752.42	\$590.19	\$454.33	\$566,427.42
<b>PERMANENT CONSTRUCTION — CONSTRUCTION CONTRACTS:</b>							
Completed Contracts . . . . .	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$2,411,543.40
Contract 52 . . . . .	242,107.96	200,000.00	4,588.00	0.00	0.00	0.00	2,436,926.18
Contract 119 . . . . .				0.00	0.00	0.00	4,588.00
Sub Total Construction Contracts . . . . .	\$242,107.96	\$200,000.00	\$4,588.00	\$0.00	\$0.00	\$0.00	\$4,843,057.58
<b>PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:</b>							
Total Except the Following Listed Items . . . . .	\$463.24	\$141.53	\$173.78	\$3.76	\$14.29	\$0.00	\$19,438.26
Labor . . . . .	0.00	0.00	2,991.84	94.58	0.00	0.00	9,268.58
Installed Equipment . . . . .	2,064.49	51.59	0.00	0.00	16.84	0.00	46,004.21
Sub Total Except Construction Contracts . . . . .	\$2,527.73	\$193.12	\$3,165.62	\$98.34	\$31.13	\$0.00	\$74,711.05
<b>PERMANENT CONSTRUCTION—AWARDS BY COURT DECREE—ACTION FOR BREACH OF CONTRACT:</b>							
Total Except the Following Listed Items . . . . .	\$131.36	\$18,184.78	\$12,107.17	\$1,351.18	\$271.26	\$0.00	\$32,045.75
Legal Expense . . . . .	0.00	5,084.20	1,436.49	5,870.49	7,906.94	5,000.00	25,297.22
Miscellaneous Expense (Undistributed) . . . . .	0.00	941.44	180.96	1.95	0.30	1.38	1,126.03
Sub Total Permanent Construction Awards . . . . .	\$131.36	\$24,210.42	\$13,724.62	\$7,223.62	\$8,177.60	\$5,001.38	\$58,469.00
Total Permanent Construction . . . . .	244,767.05	234,403.54	21,478.24	7,321.96	8,208.73	5,001.38	4,976,237.63
Total Winsor Dam (Except PWA) . . . . .	317,835.39	271,824.84	27,690.64	10,561.54	12,009.08	8,718.01	5,850,040.37

## WINSOR DAM (PWA ONLY)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
GENERAL OVERHEAD:	\$5,465.78	\$1,061.64	\$0.00	\$0.00	\$0.00	\$0.00	\$6,527.42
ENGINEERING:							
Total Except the Following Listed Items	\$241.98	\$104.81	\$0.00	\$0.00	\$0.00	\$0.00	\$346.79
Salaries, Engineering and Clerical	719.73	1,668.14	0.00	0.00	0.00	0.00	2,387.87
Legal Expense		1,474.40		0.00	0.00	0.00	1,474.40
Total Engineering	\$961.71	\$1,772.95	\$1,474.40	\$0.00	\$0.00	\$0.00	\$4,209.06
CONSTRUCTION CONTRACTS:							
Contract 111	\$1,774.80	\$48,060.36	\$0.00	\$0.00	\$0.00	\$0.00	\$48,060.36
Contract 121		690.20	0.00	0.00	0.00	0.00	2,465.00
Total Construction Contracts	\$11,774.80	\$48,750.56	\$0.00	\$0.00	\$0.00	\$0.00	\$50,525.36
Total Winsor Dam (PWA only)	\$8,202.99	\$51,585.15	\$1,474.40	\$0.00	\$0.00	\$0.00	\$61,261.84
TOTAL WINSOR DAM	\$326,037.68	\$323,409.99	\$29,165.04	\$10,561.54	\$12,009.08	\$8,718.01	\$5,911,302.21
QUABBIN DIKE							
GENERAL OVERHEAD:							
Administration, Commissioners' Office	\$201.71	\$254.67	\$173.16	\$9.31	\$837.48	\$65.84	\$30,196.44
Engineering, Headquarters Office	984.94	889.35	446.44	24.29	2,178.84	114.51	111,356.15
Total General Overhead	\$1,186.65	\$1,144.02	\$619.60	\$33.60	\$3,016.32	\$180.35	\$141,552.59
ENGINEERING:							
Total Except the Following Listed Items	\$700.93	\$217.64	\$45.04	\$12.87	\$6.81	\$0.00	\$45,135.26
Salaries, Engineering and Clerical	552.24	96.62	50.09	0.00	56.76	0.00	176,214.80
Labor	2,893.31	1,079.74	.99	0.00	0.00	0.00	42,424.64
Total Engineering	\$4,149.48	\$1,394.00	\$96.12	\$12.87	\$63.57	\$0.00	\$263,774.70
PERMANENT CONSTRUCTION -- CONSTRUCTION CONTRACTS:	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$2,455,889.88
PERMANENT CONSTRUCTION--EXCEPT CONSTRUCTION CONTRACTS:							
Total Except the Following Listed Items	\$0.00	\$12.72	\$0.00	\$0.00	\$11.09	\$0.00	\$4,204.75
Labor	0.00	2,608.98	94.35	8.69	514.36	0.00	18,379.67
Maintenance of Grounds	86.15	401.30	549.04	8.69	0.00	0.00	1,278.79
Sub Total Except Construction Contracts	\$86.15	\$418.52	\$3,158.02	\$103.04	\$525.45	\$0.00	\$23,863.21

QUABBIN DIKE

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
PREMANT CONSTRUCTION—DEFENSE AGAINST AWARDS BY COURT DECREE—ACTIONS FOR BREACH OF CONTRACT:							
Total Except the Following Listed Items . . .	\$263.21	\$1,117.71	\$3.96	\$0.00	\$499.98	\$3.50	\$2,415.51
Salaries, Engineering and Clerical . . .	\$2,376.36	127.57	0.00	144.00	16.00	0.00	3,431.67
Consultant Expense . . .	797.50	2,565.18	10.00	0.00	0.00	0.00	3,600.06
Legal Expense . . .	347.50	363.60	0.00	0.00	7,250.00	300.00	9,464.70
Sub Total Defense Against Awards by Court Decree . . .	\$3,784.57	\$4,174.06	\$13.96	\$144.00	\$7,765.98	\$303.50	\$18,911.94
Total Permanent Construction . . .	3,820.72	4,592.58	3,171.98	247.04	8,291.43	303.50	2,498,665.03
TOTAL QUABBIN DIKE . . .	9,156.85	7,130.60	3,887.70	293.51	11,371.32	483.85	2,903,992.32

SPECIAL INVESTIGATIONS

Total Expenditure . . .	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$149,609.63
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SOUTHERN SUBURBY EMERGENCY SUPPLY

Total Expenditure . . .	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$688,533.83
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WACHUSETT WATERSHED PROTECTION AND ELIMINATION OF POLLUTION (EXCEPT PWA)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
GENERAL OVERHEAD:							
Administration, Commissioners' Office . . .	\$10.62	\$0.00	\$4,141.54	\$5,801.86	\$2,837.69	\$2,103.09	\$15,699.14
Engineering, Headquarters Office . . .	2,600.98	2,163.73	10,678.71	15,148.60	5,880.56	3,657.65	43,282.08
Total General Overhead . . .	\$ 2,611.60	\$2,163.73	\$14,820.25	\$20,950.46	\$8,218.25	\$5,760.74	\$58,981.22
ENGINEERING—EXCEPT WPA PROJECTS:							
REAL ESTATE:	\$627.91	\$619.23	\$477.36	\$65.98	\$0.00	\$0.00	\$36,037.30
Legal Expense . . .			\$310.60	\$0.00	\$0.00	\$0.00	\$310.60
Taxes . . .			\$785.06	0.00	0.00	0.00	785.06
Payments Under Certificates of Judgment . . .			18,234.91	0.00	0.00	0.00	18,234.91
Total Real Estate . . .			\$19,330.57	\$0.00	\$0.00	\$0.00	\$19,330.57

WACHUSETTS WATERSHED PROTECTION AND ELIMINATION OF POLLUTION (EXCEPT PWA)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
<b>TOWN OF HOLDEN SEWER (WPA PROJECT) :</b>							
Total Except the Following Listed Items . . . . .	\$14,261.32	\$7,035.85	\$8,388.85	\$819.05	\$237.66	\$200.01	\$37,657.35
Salaries, Engineering and Clerical . . . . .	13,883.29	17,498.56	18,131.06	8,761.70	1,503.95	0.00	62,158.05
Labor . . . . .	5,955.19	6,822.55	12,876.12	3,831.16	0.00	0.00	29,452.47
Materials of Construction . . . . .	1,728.36	3,925.67	3,007.34	0.00	0.00	0.00	8,751.37
Tools and Equipment . . . . .	3,624.31	724.60	277.62	0.00	0.00	0.00	8,955.10
Rental of Equipment . . . . .	0.00	1,788.95	4,654.65	324.00	0.00	0.00	6,767.60
<b>Total Town of Holden Sewer (WPA Project) . . . . .</b>	<b>\$38,552.47</b>	<b>\$37,796.18</b>	<b>\$47,475.64</b>	<b>\$13,785.91</b>	<b>\$1,741.61</b>	<b>\$200.01</b>	<b>\$153,741.94</b>

<b>TOWN OF RUTLAND SEWER (WPA PROJECT) :</b>							
Total Except the Following Listed Items . . . . .	14,956.37	\$6,444.51	\$7,488.11	\$12,461.41	\$2,598.63	\$133.58	\$34,659.93
Salaries, Engineering and Clerical . . . . .	7,941.01	6,533.23	8,821.48	6,950.07	9,128.78	530.18	39,942.52
Labor . . . . .	2,191.01	2,133.21	7,002.35	3,831.16	7,822.37	6.04	32,564.77
Materials of Construction . . . . .	964.69	8,132.85	2,817.21	300.00	0.00	0.00	12,214.25
Tools and Equipment . . . . .	4,777.95	710.73	310.96	3.11	3.00	0.00	6,400.22
Rental of Equipment . . . . .	0.00	70.88	4,180.00	3,995.72	1,584.90	0.00	9,831.50
<b>Total Town of Rutland Sewer (WPA Project) . . . . .</b>	<b>\$30,831.03</b>	<b>\$24,024.91</b>	<b>\$30,600.11</b>	<b>\$27,541.47</b>	<b>\$21,137.68</b>	<b>\$669.80</b>	<b>\$135,613.19</b>

<b>WEST BOYLSTON SEWER:</b>							
Total Except Salaries Salaries, Engineering and Clerical . . . . .	\$6.80	\$264.09	\$336.80	\$0.00	\$90.83	\$644.07	\$1,342.59
	2,057.67	3,554.99	39.55	0.00	383.95	8,109.64	14,145.80
<b>Total West Boylston Sewer</b>	<b>2,064.47</b>	<b>\$3,819.08</b>	<b>\$376.35</b>	<b>\$0.00</b>	<b>\$474.78</b>	<b>\$8,753.71</b>	<b>\$15,488.39</b>
<b>Total Wachusett Watershed Protection and Elimination of Pollution (Except PWA)</b>	<b>\$74,687.48</b>	<b>\$68,423.13</b>	<b>\$113,080.28</b>	<b>\$62,293.82</b>	<b>\$31,572.32</b>	<b>\$15,384.26</b>	<b>\$419,192.61</b>

WACHUSETT WATERSHED PROTECTION (PWA ONLY)

Total Expenditure	\$20.91	\$430.04	\$0.00	\$0.00	\$0.00	\$0.00	\$450.95
<b>TOTAL WACHUSETT WATERSHED PROTECTION</b>	<b>\$74,708.39</b>	<b>\$68,853.17</b>	<b>\$113,080.28</b>	<b>\$62,293.82</b>	<b>\$31,572.32</b>	<b>\$15,384.26</b>	<b>\$419,643.56</b>

WESTON AQUEDUCT SIPHONS (PWA)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
GENERAL OVERHEAD:	\$656.44	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$6,145.84
ENGINEERING:							
Total Except Salaries	\$255.10	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$1,857.36
Salaries, Engineering and Clerical	\$4,599.61	0.00	0.00	0.00	0.00	0.00	19,358.11
Total Engineering	\$4,854.71	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$21,215.47
REAL ESTATE:							
CONSTRUCTION CONTRACT 78	\$150.00	\$418.56	\$0.00	\$0.00	\$0.00	\$0.00	\$689.00
CONSTRUCTION CONTRACT 91A	\$30,929.86	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$261,467.58
CONSTRUCTION CONTRACT 91B	149.20	0.00	0.00	0.00	0.00	0.00	1,492.00
CONSTRUCTION CONTRACT 89	159.04	0.00	0.00	0.00	0.00	0.00	1,590.40
OTHER PERMANENT CONSTRUCTION:	42,940.85	0.00	0.00	0.00	0.00	0.00	42,940.85
	7.78	21.59	0.00	0.00	0.00	0.00	628.66
TOTAL WESTON AQUEDUCT SIPHONS (PWA)	\$79,847.88	\$440.15	\$0.00	\$0.00	\$0.00	\$0.00	\$336,169.80

HULTMAN AQUEDUCT, SUPPLY SECTION (PWA)

GENERAL OVERHEAD:							
Administration, Commissioners' Office	\$2,173.03	\$1,200.15	\$0.00	\$0.00	\$0.00	\$0.00	\$6,771.17
Engineering, Headquarters Office	37,493.00	14,666.11	0.00	0.00	0.00	0.00	114,472.88
Total General Overhead	\$39,666.03	\$15,866.26	\$0.00	\$0.00	\$0.00	\$0.00	\$121,244.05
ENGINEERING:							
Total Except the Following Listed Items	\$12,772.19	\$3,553.39	\$467.41	\$0.00	\$131.00	\$0.00	\$88,866.00
Salaries, Engineering and Clerical	269,087.76	57,440.97	0.00	0.00	0.00	0.00	543,333.93
Labor	3,656.40	2,694.45	187.68	0.00	0.00	0.00	13,756.90
Automobile Maintenance	5,522.06	2,593.90	681.08	0.00	0.00	0.00	13,792.77
Rent and Upkeep	4,836.01	1,652.23	298.33	0.00	0.00	0.00	11,817.16
Legal Expense	35.00	0.00	3,111.11	0.00	0.00	0.00	3,146.11
Total Engineering	\$295,909.42	\$67,934.94	\$4,745.61	\$0.00	\$131.00	\$0.00	\$669,712.87

## HULTMAN AQUEDUCT, SUPPLY SECTION (PWA)

	Year Ending		Year Ending		Year Ending		Year Ending		Year Ending		Total To June 30, 1945
	Nov. 30, 1940	Nov. 30, 1941	Nov. 30, 1942	Nov. 30, 1943	Nov. 30, 1944	Nov. 30, 1945	Nov. 30, 1945	Nov. 30, 1945	Nov. 30, 1945		
<b>REAL ESTATE:</b>											
Total Except the Following Listed Items . . . . .	\$945.54	\$719.61	\$212.43	\$2.45	\$-131.00	\$0.00	\$3,484.86				
Salaries, Engineering and Clerical . . . . .	7,283.39	0.00	0.00	0.00	0.00	0.00	9,692.51				
Legal Expense . . . . .	16,802.47	6,565.91	585.58	346.46	131.28	0.00	41,106.96				
Purchases and Settlements . . . . .	46,616.21	43,734.15	2,500.00	1,218.59	1,815.00	0.00	165,534.12				
Taxes . . . . .	2,845.58	2,868.35	2,456.46	2,163.78	2,114.79	0.00	12,268.96				
Special Agents—Salaries . . . . .	2,255.42	1,679.32	0.00	0.00	0.00	0.00	4,654.74				
<b>Total Real Estate . . . . .</b>	<b>76,548.61</b>	<b>55,567.34</b>	<b>5,754.47</b>	<b>\$3,751.28</b>	<b>\$3,930.07</b>	<b>\$0.00</b>	<b>\$236,741.25</b>				
<b>PERMANENT CONSTRUCTION — CONSTRUCTION CONTRACTS:</b>											
Contract 74 . . . . .	\$1,484,476.99	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$2,933,832.49				
Contract 75 . . . . .	195,882.11	60,230.71	0.00	0.00	0.00	0.00	521,806.66				
Contract 77 . . . . .	195,559.00	88,593.45	0.00	0.00	0.00	0.00	496,597.43				
Contract 78 . . . . .	207,755.77	97,102.68	0.00	0.00	0.00	0.00	551,629.18				
Contract 79 . . . . .	247,594.53	0.00	0.00	0.00	0.00	0.00	522,335.25				
Contract 81 . . . . .	23,049.11	40,481.06	0.00	0.00	0.00	0.00	188,029.86				
Contract 84 . . . . .	8,955.72	85,717.29	6,000.00	0.00	0.00	0.00	100,673.01				
Contract 85 . . . . .	528,448.78	193,459.99	0.00	0.00	0.00	0.00	3,488,194.31				
Contract 86 . . . . .	54,325.21	0.00	0.00	0.00	0.00	0.00	57,936.73				
Contract 87 A, H . . . . .	31,924.80	0.00	0.00	0.00	0.00	0.00	38,613.40				
Contract 90 B and D . . . . .	1,367.75	0.00	0.00	0.00	0.00	0.00	1,367.75				
Contract 92 D and E . . . . .	8,446.90	0.00	0.00	0.00	0.00	0.00	8,446.90				
Contract 95 A, F, G, H and I . . . . .	6,363.00	0.00	0.00	0.00	0.00	0.00	6,363.00				
Contract 100 . . . . .	6,011.25	0.00	0.00	0.00	0.00	0.00	6,011.25				
Contract 101 . . . . .	93.06	0.00	0.00	0.00	0.00	0.00	93.06				
Contract 109 . . . . .	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
Contract 121 (Portion) . . . . .	1,861.20	4,984.78	0.00	0.00	0.00	0.00	4,984.78				
Contract 123 A . . . . .	0.00	5,118.80	0.00	0.00	0.00	0.00	6,980.00				
Contract 128 . . . . .	0.00	160.00	0.00	0.00	0.00	0.00	160.00				
Contract 130 . . . . .	0.00	155.00	0.00	0.00	0.00	0.00	155.00				
Contract 130 . . . . .	0.00	4,084.85	0.00	0.00	0.00	0.00	4,084.85				
<b>Sub Total Construction Contracts . . . . .</b>	<b>\$3,002,115.18</b>	<b>\$580,088.61</b>	<b>\$6,000.00</b>	<b>350.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$8,938,296.91</b>				

PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:									
Total Except the Following Listed Items . . . . .	\$4,778.57	\$249.55	\$464.72	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$20,438.67
Labor . . . . .	0.00	2,600.80	204.84	0.00	0.00	0.00	0.00	0.00	2,805.64
Maintenance of Partially Completed Structures . . . . .	0.00	2,387.03	10,953.66	0.00	0.00	0.00	0.00	0.00	13,340.69
Sub Total Except Constructing Contracts . . . . .	\$4,778.57	\$5,237.38	\$11,623.22	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$36,585.00
Total Permanent Construction . . . . .	3,006,893.75	5,853,259.99	17,623.22	350.00	0.00	0.00	0.00	0.00	8,974,881.91
SUPPLY SECTION DAMAGES—EXCEPT AWARDS BY COURT DECREE:									
Purchases and Settlements . . . . .	\$8,550.15	\$0.00	\$0.00	\$500.00	\$0.00	\$0.00	\$0.00	\$0.00	\$9,050.15
Payments Under Certificates of Judgment . . . . .	0.00	0.00	0.00	1,525.30	0.00	0.00	0.00	0.00	1,525.30
Sub Total Damages Except Awards by Court Decree . . . . .	\$8,550.15	\$0.00	\$0.00	\$2,025.30	\$0.00	\$0.00	\$0.00	\$0.00	\$10,575.45
SUPPLY SECTION DAMAGES—AWARDS BY COURT DECREE—JURY VERDICTS:									
Total Except the Following Listed Items . . . . .	\$480.00	\$548.00	\$105.55	\$200.00	\$56.00	\$0.00	\$0.00	\$0.00	\$1,389.55
Payments Under Certificates of Judgment . . . . .	9,393.79	7,095.74	0.00	3,540.65	0.00	0.00	0.00	0.00	20,030.18
Settlements Made by Attorney General in Petitions Brought in Superior Court prior to Judgments . . . . .	0.00	22,815.17	13,100.00	5,100.00	0.00	0.00	0.00	0.00	41,015.17
Sub Total Jury Verdicts . . . . .	\$9,873.79	\$30,458.91	\$13,205.55	\$8,840.65	\$56.00	\$0.00	\$0.00	\$0.00	\$62,434.90
SUPPLY SECTION DAMAGES—OTHER COURT AWARDS:									
Payments Under Certificates of Judgment . . . . .	\$0.00	\$0.00	\$20,200.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$20,200.00
Total Supply Section—Damages . . . . .	\$18,423.94	\$30,458.91	\$33,405.55	\$10,865.95	\$56.00	\$0.00	\$0.00	\$0.00	\$93,210.35
Total Hultman Aqueduct—Supply Section (PWA) . . . . .	\$3,437,441.75	\$755,133.44	\$61,528.85	\$14,967.23	\$4,117.07	\$0.00	\$0.00	\$0.00	\$10,095,790.43
HULTMAN AQUEDUCT, SUPPLY SECTION (EXCEPT PWA)									
GENERAL OVERHEAD:									
Administration, Commissioners' Office . . . . .	\$0.00	\$0.93	\$1,153.11	\$3,025.03	\$491.28	\$11.62	\$0.00	\$11.62	\$4,681.97
Engineering, Headquarters Office . . . . .	0.00	2,753.64	2,973.35	7,898.33	1,052.69	20.21	20.21	20.21	14,698.12
Total General Overhead . . . . .	\$0.00	\$2,754.57	\$4,126.36	\$10,923.36	\$1,543.97	\$31.83	\$31.83	\$31.83	\$19,380.09
ENGINEERING:									
Total Except the Following Listed Items . . . . .	\$0.00	\$5.08	\$0.00	\$1,168.03	\$0.00	\$0.00	\$0.00	\$0.00	\$1,173.87
Salaries, Engineering and Clerical . . . . .	0.00	10,846.80	21,974.80	8,400.65	746.60	26.50	26.50	26.50	41,995.35
Automobile Maintenance . . . . .	0.00	0.00	105.51	0.00	6.76	7.36	7.36	7.36	144.29
Legal Expense . . . . .	0.00	0.00	0.00	110.70	31.42	18.77	18.77	18.77	129.47
Total Engineering . . . . .	\$0.00	\$10,851.88	\$21,974.80	\$9,784.89	\$784.78	\$52.63	\$52.63	\$52.63	\$43,448.98

HULTMAN AQUEDUCT, SUPPLY SECTION (EXCEPT PWA)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
CONSTRUCTION CONTRACT 105 . . . . .	\$0.00	\$0.00	\$216.76	\$0.00	\$0.00	\$0.00	\$216.76
CONSTRUCTION CONTRACT 127 . . . . .	0.00	0.00	2,405.00	0.00	0.00	0.00	2,405.00
OTHER PERMANENT CONSTRUCTION . . . . .	0.00	0.00	0.00	486.85	0.00	0.00	486.85
Total Hultman Aqueduct Supply Section (Except PWA) . . . . .	\$0.00	\$13,606.45	\$28,722.92	\$21,195.10	\$2,325.75	\$84.46	\$65,937.68
TOTAL HULTMAN AQUEDUCT, SUP- PLY SECTION . . . . .	\$3,437,441.75	\$768,759.89	\$90,251.77	\$36,162.33	\$6,445.82	\$84.46	\$10,161,728.11

HULTMAN AQUEDUCT, DISTRIBUTION SECTION (PWA)

GENERAL OVERHEAD:							
Administration, Commissioners' Office . . . . .	\$3,915.68	\$1,138.15	\$0.00	0.00	\$0.00	\$0.00	\$5,976.56
Engineering, Headquarters Office . . . . .	35,293.00	11,388.57	0.00	0.00	0.00	0.00	72,793.01
Total General Overhead . . . . .	\$39,208.68	\$12,526.72	\$0.00	\$0.00	\$0.00	\$0.00	\$78,769.57
ENGINEERING:							
Total Except the Following Listed Items . . . . .	\$8,737.61	\$6,309.05	\$271.87	\$0.00	\$0.00	\$0.00	\$29,874.12
Salaries, Engineering and Clerical . . . . .	105,583.50	38,943.30	0.00	0.00	0.00	0.00	189,050.19
Labor . . . . .	3,516.85	6,605.03	112.84	0.00	0.00	0.00	13,077.90
Automobile Maintenance . . . . .	2,168.86	2,514.52	464.13	0.00	0.00	0.00	6,214.66
Rent and Upkeep . . . . .	1,897.89	2,774.72	380.69	0.00	0.00	0.00	6,357.40
Legal Expense . . . . .	0.00	0.00	7,689.92	0.00	0.00	0.00	7,689.92
Total Engineering . . . . .	\$121,904.71	\$57,146.62	\$8,919.45	\$0.00	\$0.00	\$0.00	\$252,264.19
REAL ESTATE:							
Total Except the Following Listed Items . . . . .	\$1,200.78	\$1,125.90	\$183.40	\$0.75	\$0.53	\$0.00	\$3,102.38
Salaries, Engineering and Clerical . . . . .	1,742.13	0.00	0.00	0.00	0.00	0.00	2,368.99
Legal Expense . . . . .	3,032.08	1,324.51	393.22	330.02	210.78	0.00	15,172.17
Purchases and Settlements . . . . .	13,022.50	27,646.00	150.00	0.00	0.00	0.00	41,802.00
Taxes . . . . .	1,309.86	889.81	1,179.02	1,171.02	1,169.42	0.00	5,719.13
Total Real Estate . . . . .	\$20,307.35	\$30,986.22	\$1,905.64	\$1,501.79	\$1,380.73	\$0.00	\$68,164.67

PERMANENT CONSTRUCTION — CONSTRUCTION CONTRACTS:

Contract 80 . . . . .	\$367,935.49	\$59,686.36	\$0.00	\$0.00	\$0.00	\$574,183.69
Contract 81 . . . . .	167,372.59	142,137.99	0.00	650.00	0.00	405,791.12
Contract 85 . . . . .	286,976.32	26,380.91	0.00	0.00	0.00	730,720.32
Contract 86 . . . . .	22,547.45	0.00	0.00	0.00	0.00	23,149.37
Contract 87 A, B, C . . . . .	340.74	0.00	0.00	0.00	0.00	1,218.24
Contract 90 A, B, C . . . . .	3,987.72	0.00	0.00	0.00	0.00	3,387.72
Contract 94 . . . . .	138,196.25	52,200.07	0.00	0.00	0.00	190,396.32
Contract 95 A, B, C, D, E and I . . . . .	42,924.30	0.00	0.00	0.00	0.00	42,924.30
Contract 96 . . . . .	48,314.26	6,481.12	0.00	0.00	0.00	54,795.38
Contract 101 . . . . .	132.83	0.00	0.00	0.00	0.00	132.83
Contract 104 A, B and C . . . . .	2,978.00	0.00	0.00	0.00	0.00	2,978.00
Contract 110 . . . . .	13,561.04	191,633.93	0.00	0.00	0.00	205,194.97
Contract 123 A . . . . .	\$0.00	\$155.00	\$0.00	\$0.00	\$0.00	\$155.00
Contract 128 . . . . .	0.00	155.00	0.00	0.00	0.00	155.00
Contract 129 . . . . .	0.00	475.00	0.00	0.00	0.00	475.00
Contract 130 . . . . .	0.00	5,914.15	0.00	0.00	0.00	5,914.15
Sub Total Construction Contracts . . . . .	\$1,094,666.99	\$485,219.53	\$0.00	\$650.00	\$0.00	\$2,241,571.41

PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:

Total Except the Following Listed Items . . . . .	\$1,686.72	\$650.09	\$499.18	\$0.00	\$0.00	\$4,848.03
Labor . . . . .	0.00	5,474.15	169.92	0.00	0.00	5,644.07
Maintenance of Partially Completed Structures . . . . .	0.00	3,703.30	14,137.65	0.00	0.00	17,840.95
Sub Total Except Construction Contracts . . . . .	\$1,686.72	\$9,827.54	\$14,806.75	\$0.00	\$0.00	\$28,333.05
Total Permanent Construction . . . . .	\$1,096,353.71	\$495,047.07	\$14,806.75	\$650.00	\$0.00	\$2,269,904.46

DISTRIBUTION SECTION—DAMAGES—AWARDS BY COURT DECREE—JURY VERDICTS:

Total Except the Following Listed Items . . . . .	\$100.00	\$0.00	\$0.00	\$0.00	\$0.00	\$100.00
Legal Expense . . . . .	\$2,091.95	1,119.50	511.50	732.15	0.00	4,455.10
Payments Under Certificates of Judgment . . . . .	48,062.77	0.00	57,547.85	10,004.98	1,601.90	117,217.50
Settlement Made by Attorney General in Petition Brought in Superior Court Prior to Judgment . . . . .	0.00	11,450.00	18,600.00	15,000.00	650.00	45,700.00
Total Jury Verdicts . . . . .	50,254.72	\$12,569.50	\$76,659.35	\$25,737.13	\$2,251.90	\$167,472.60
Total Hultman Aqueduct, Distribution Section (PWA) . . . . .	1,328,029.17	\$608,276.13	\$102,291.19	\$27,888.92	\$3,632.63	\$2,836,575.49

HULTMAN AQUEDUCT, DISTRIBUTION SECTION (EXCEPT PWA)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
<b>GENERAL OVERHEAD:</b>							
Administration, Commissioners' Office	0.00	\$1.85	\$1,163.51	\$5,314.74	\$2,759.73	\$3,036.67	\$12,276.50
Engineering, Headquarters Office	548.61	5,691.82	9,000.05	13,876.70	6,796.96	5,237.46	41,171.60
Total General Overhead	\$548.61	\$5,693.67	\$10,163.56	\$19,191.44	\$9,556.69	\$8,294.13	\$53,448.10
<b>ENGINEERING:</b>							
Total Except the Following Listed Items	\$9,168.75	\$3,635.24	\$7,359.97	\$2,216.60	\$1,350.40	\$0.00	\$24,730.96
Salaries, Engineering and Clerical	0.00	32,638.35	65,986.04	8,689.77	20,065.86	10,943.93	138,023.95
Legal Expense	0.00	75.00	627.52	145.83	0.00	1,831.04	2,679.39
Labor	0.00	0.00	157.76	27.26	334.88	582.37	1,102.27
Miscellaneous Expense (undistributed)	\$0.00	\$116.16	\$915.15	\$92.19	\$205.94	\$35.14	\$964.58
Printing and Blueprinting	0.00	39.27	157.85	30.40	95.64	56.03	379.19
Stationery and Office Supplies	0.00	74.80	254.26	63.69	17.98	32.30	443.03
Postage	0.00	46.00	60.94	0.00	5.00	7.50	119.44
Rent and Upkeep	0.00	155.07	643.71	—38.73	134.97	43.48	938.50
Automobile Maintenance	0.00	292.75	683.30	290.10	488.32	283.62	2,018.09
Furniture and Fixtures	0.00	0.00	6.61	0.00	57.50	31.28	95.39
Total Engineering	\$9,168.75	\$38,072.64	\$76,133.11	\$11,517.11	\$22,756.49	\$13,846.69	\$171,494.79
CONSTRUCTION CONTRACT 105	0.00	0.00	606.90	0.00	0.00	0.00	606.90
OTHER PERMANENT CONSTRUCTION:	0.00	0.00	0.00	2,094.09	1,200.74	0.00	3,294.83
Total Hultman Aqueduct, Distribution Section (Except PWA)	\$9,177.36	\$43,766.31	\$86,903.57	\$32,802.64	\$33,513.92	\$22,140.82	\$228,844.62
TOTAL HULTMAN AQUEDUCT, DISTRIBUTION SECTION	\$1,337,746.53	\$652,042.44	\$189,194.76	\$60,691.56	\$37,146.55	\$22,140.82	\$3,065,420.11
<b>SPOT POND BY-PASS AND IMPROVEMENTS TO PUMPING STATION (PWA)</b>							
	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
<b>GENERAL OVERHEAD:</b>							
Engineering	\$5,207.35	\$1,673.43	\$0.00	\$0.00	\$0.00	\$0.00	\$14,041.96
Total Except Salaries	\$554.83	\$187.50	\$0.00	\$0.00	\$0.00	\$0.00	\$1,328.51
Salaries, Engineering and Clerical	6,776.93	872.22	0.00	0.00	0.00	0.00	12,078.50
Total Engineering	\$7,331.76	\$1,059.72	\$0.00	\$0.00	\$0.00	\$0.00	\$13,407.01
CONSTRUCTION CONTRACT 83	\$99,746.39	\$16,649.16	\$0.00	\$0.00	\$0.00	\$0.00	\$141,894.22
CONSTRUCTION CONTRACT 83 A.	627.01	467.99	0.00	0.00	0.00	0.00	1,095.00



## EXPENDITURES

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
SOUTHERN SUBURBY EMERGENCY SUPPLY . . .	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	638,533.83
WARE AND SWIFT SUPPLY (INCLUDING PORTION UNDER PWA)							
Ware Supply, including Wachusett-Goldbrook Tunnel Section of Quabbin Aqueduct . . .	\$167,458.72	\$167,718.32	\$92,519.77	\$86,787.22	\$172,236.70	\$62,050.35	\$15,191,236.04
Coldbrook-Swift Tunnel Section of Quabbin Aqueduct . . . . .	5,129.84	4,246.43	2,873.00	5,756.19	8,648.66	1,018.09	5,422,431.56
Quabbin Reservoir . . . . .	1,014,770.00	533,988.96	509,361.31	151,477.93	168,200.69	107,934.20	21,079,986.65
Winsor Dam . . . . .	326,037.68	323,409.99	29,165.04	10,561.54	12,009.08	8,718.01	5,911,302.21
Quabbin Dike . . . . .	9,156.85	7,130.60	3,887.70	293.51	11,371.32	483.85	2,303,932.32
SPECIAL INVESTIGATIONS . . . . .	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$149,609.63
WACHUSETT WATERSHED PROTECTION AND ELI- MINATION OF POLLUTION (INCLUDING BOTH PWA AND WPA PROJECTS) . . . . .	74,708.39	68,853.17	113,080.28	62,293.82	31,572.32	15,384.26	419,643.56
HULTMAN AQUEDUCT AND OTHER WORKS, IN- CLUDING PORTION UNDER PWA							
Weston Aqueduct Siphons . . . . .	\$79,847.88	\$440.15	\$0.00	\$0.00	\$0.00	\$0.00	\$336,169.80
Hultman Aqueduct, Supply Section . . . . .	3,437,411.75	768,759.89	90,251.77	36,162.33	6,445.82	84.46	10,161,728.11
Hultman Aqueduct, Distribution Section . . . . .	1,337,746.53	652,042.44	189,194.76	60,691.56	37,146.55	22,140.82	3,065,420.11
Spot Pond By-Pass and Improvements to Pumping Station . . . . .	160,880.26	19,850.30	0.00	0.00	0.00	0.00	218,798.74
Enlarging Fells High Level Distributing Reser- voir . . . . .	164,561.15	6,023.98	0.00	0.00	0.00	0.00	175,444.61
Undistributed General Overhead . . . . .	0.00	102.72	—102.72	0.00	0.00	0.00	0.00
Total Expenditures . . . . .	\$6,777,739.05	\$2,552,566.95	\$1,030,230.91 *	\$414,024.10 *	\$447,631.14	\$217,814.04	\$65,674,297.17

## RECEIPTS

Receipts from Sales \$ . . . . .	\$7,712.84	\$4,116.30	\$2,871.42	\$4,182.93	\$4,719.97	\$2,289.20	\$451,500.23
Receipts from Rents \$ . . . . .	3,158.03	2,860.00	2,186.67	2,993.00	1,540.50	814.00	413,001.87
All other Receipts \$ . . . . .	7,311.20	5,159.66	967.98	1,285.99	4,729.94	0.00	240,205.69
Total Receipts, Construction Account . . . . .	\$18,182.07	\$12,135.96	\$6,026.07	\$7,861.92	\$10,990.41	\$3,103.20	\$1,104,707.79

DISTRIBUTION OF RECEIPTS

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
Credited to Annual Water Assessments as Follows:							
To 1928 Assessment, Rents and Sales . . . . .	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$3,033.03
To 1939 Assessment, Rents and Sales . . . . .	0.00	0.00	0.00	0.00	0.00	0.00	24,343.77
To Assessments 1927 to Date, Interest . . . . .	0.00	0.00	0.00	0.00	0.00	0.00	282.11
Credited to Construction Fund . . . . .	18,182.07	12,135.96	6,026.07	7,861.92	10,990.41	3,103.20	1,077,048.88
<b>Total Receipts, Construction Account . . . . .</b>	<b>\$18,182.07</b>	<b>\$12,135.96</b>	<b>\$6,026.07</b>	<b>\$7,861.92</b>	<b>\$10,990.41</b>	<b>\$3,103.20</b>	<b>\$1,104,707.79</b>

\* To make proper adjustment for belated transfers from this water supply account to the Nut Island Sewage Account, \$5,121.05 originally reported as spent in 1942 has been included in 1943.

§ Differences from previously published reports are only in the distribution between sales, rents and miscellaneous.

# Yearly Expenditures and Disbursements by the Metropolitan District Water Supply Commission From Maintenance Funds for the Fiscal Years 1943, 1944 and 1945 (7 months)

## WARE SUPPLY AND QUABBIN AQUEDUCT

	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 months Ending June 30, 1945
<b>MAINTENANCE AND OPERATION OF WATER SUPPLY WORKS:</b>			
Salaries, Engineering and Clerical . . . . .	\$4,213.96	\$4,932.65	\$3,932.02
Labor . . . . .	6,350.78	6,965.35	8,651.85
Supplies . . . . .	416.37	599.33	450.60
Automobile Maintenance . . . . .	587.33	1,116.46	446.20
Installed Equipment . . . . .	686.32	440.71	102.62
Tools and Other Mechanical Equipment . . . . .	62.98	135.06	140.95
Rent and Upkeep . . . . .	2,161.96	1,689.16	1,045.52
Miscellaneous Expense (undistributed) . . . . .	24.77	56.42	9.59
Stationery and Office Supplies . . . . .	42.76	18.36	18.39
Printing and Blueprinting . . . . .	0.60	2.50	0.00
Postage . . . . .	5.55	12.15	9.80
Medical Services . . . . .	0.00	27.00	7.00
Sub Total Maintenance and Operation of Water Supply Works . . . . .	\$14,553.38	\$15,996.35	\$14,814.54
<b>MAINTENANCE OF WATERED:</b>			
Salaries, Engineering . . . . .	\$749.15	\$928.02	\$990.66
Labor . . . . .	87.12	600.31	4,186.90
Supplies . . . . .	10.23	10.38	38.12
Automobile Maintenance . . . . .	530.24	423.49	216.41
Tools and Other Mechanical Equipment . . . . .	44.68	65.96	23.86
Medical and Surgical Services . . . . .	1.11	9.30	0.00
Rent and Upkeep . . . . .	124.32	236.00	276.15
Miscellaneous Expense (undistributed) . . . . .	1.50	1.47	3.00
Stationery and Office Supplies . . . . .	26.89	13.79	15.91
Printing and Blueprinting . . . . .	0.61	2.50	0.00
Postage . . . . .	5.07	6.39	6.10
Sub Total Maintenance of Watered . . . . .	\$1,580.92	\$2,296.61	\$5,757.11

WARE SUPPLY AND QUABBIN AQUEDUCT

GUARDING AND FIRE PROTECTION:

Police Protection									
Salaries, Engineering and Clerical									\$66.60
Labor									10,196.83
Supplies									4.00
Fire Protection									
Salaries, Engineering and Clerical									174.42
Labor									934.23
Supplies									158.76
Automobile Maintenance									63.70
Miscellaneous Expense									58.90
Sub Total Guarding and Fire Protection									\$11,657.44

MAINTENANCE AND OPERATION OF RUTLAND-HOLDEN SEWER:

Salaries, Engineering										\$210.80
Labor										383.96
Miscellaneous Expense										0.00
Use of City of Worcester Sewerage System										0.00
Sub Total Maintenance Rutland-Holden Sewer										\$594.76
Total Ware Supply and Quabbin Aqueduct										28,386.50

QUABBIN RESERVOIR

MAINTENANCE AND OPERATION OF WATER SUPPLY WORKS:

Salaries, Engineering and Clerical											\$10,186.15
Labor											15,864.16
Supplies											495.30
Automobile Maintenance											436.26
Installed Equipment											61.76
Tools and Other Mechanical Equipment											229.07
Rent and Upkeep											6,195.06
Miscellaneous Expense (undistributed)											308.12
Stationery and Office Supplies											29.00
Printing and Blueprinting											0.00
Postage											7.50
Medical and Surgical Services											26.00
Sub Total Maintenance and Operation of Water Supply Works											\$33,812.38

	\$157.45
	9,609.47
	0.00
	249.90
	711.44
	812.61
	134.70
	0.00
	0.00
	45.06
	\$11,588.19

	\$268.00
	1,175.10
	17.68
	459.33
	\$1,920.11
	31,801.26

	\$9,493.71
	10,540.06
	1,054.57
	848.76
	37.45
	220.31
	2,370.69
	453.67
	43.98
	0.00
	25.54
	7.00
	\$24,995.74

## QUABBIN RESERVOIR

	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 months Ending June 30, 1945
<b>MAINTENANCE OF RESERVOIR AND WATERSHED:</b>			
Salaries, Engineering and Clerical . . . . .	\$3,022.46	\$2,799.90	\$1,880.68
Labor . . . . .	7,653.14	6,842.72	5,645.63
Supplies . . . . .	153.15	522.56	1,092.15
Automobile Maintenance . . . . .	351.54	920.37	792.11
Boats and Other Floating Equipment . . . . .	220.68	255.80	106.96
Radio Equipment . . . . .	432.47	18.04	53.90
Tools and Other Mechanical Equipment . . . . .	213.87	611.41	97.63
Rent and Upkeep . . . . .	5.57	27.50	164.79
Miscellaneous Expense (undistributed) . . . . .	0.00	48.22	42.17
Stationery and Office Supplies . . . . .	6.00	14.93	14.61
Printing and Blueprinting . . . . .	2.42	3.93	0.00
Postage . . . . .	2.50	10.00	14.68
Medical and Surgical Services . . . . .	0.00	36.00	2.45
Sub Total Maintenance of Reservoir and Watershed . . . . .	\$12,063.80	\$12,111.38	\$9,907.76
<b>GUARDING AND FIRE PROTECTION:</b>			
Police Protection		\$233.50	\$0.00
Salaries, Engineering and Clerical . . . . .	\$481.18	14,309.76	91.17
Labor . . . . .	15,235.58		237.40
Automobile Maintenance . . . . .	—144.74	—481.75	
Fire Protection			
Salaries, Engineering and Clerical . . . . .	451.44	469.50	233.08
Labor . . . . .	555.80	2,315.30	4,038.53
Automobile Maintenance . . . . .	19.32	6.48	0.00
Fire Equipment . . . . .	98.38	341.21	727.10
Supplies . . . . .	0.00	29.65	0.00
Rent and Upkeep . . . . .	41.50	44.03	23.39
Miscellaneous Expense . . . . .	8.10	41.70	40.00
Sub Total Guarding and Fire Protection . . . . .	\$16,746.11	\$17,909.33	\$5,385.62

MAINTENANCE AND OPERATION OF QUABBIN PARK CEMETERY:

Salaries, Engineering and Clerical . . . . .	\$476.00	\$1,566.92
Labor . . . . .	2,146.44	7,371.03
Supplies . . . . .	287.50	271.95
Automobile Maintenance . . . . .	14.40	22.89
Tools and Other Mechanical Equipment . . . . .	2.05	79.91
Medical and Surgical Services . . . . .	0.00	9.00
Rent and Upkeep . . . . .	11.00	37.00
Printing and Blueprinting . . . . .	0.00	7.10
<b>Sub Total Maintenance of Quabbin Park Cemetery . . . . .</b>	<b>\$2,937.39</b>	<b>\$8,772.70</b>
Total Maintenance of Quabbin Reservoir . . . . .	\$65,559.68	\$79,820.08

HULTMAN AQUEDUCT--SUPPLY SECTION

Salaries, Engineering and Clerical . . . . .	\$10,116.53	\$8,010.38
Labor . . . . .	4,011.98	2,779.92
Supplies . . . . .	34.72	2.00
Automobile Maintenance . . . . .	327.51	228.84
Installed Equipment . . . . .	35.35	35.16
Tools and Other Mechanical Equipment . . . . .	63.94	19.67
Rent and Upkeep . . . . .	249.55	347.80
Miscellaneous Expense (undistributed) . . . . .	4.12	0.57
Printing and Blueprinting . . . . .	0.60	2.00
Stationery and Office Supplies . . . . .	3.54	2.21
<b>Total Maintenance of Hultman Aqueduct, Supply Section . . . . .</b>	<b>\$14,847.94</b>	<b>\$7,357.07</b>

HULTMAN AQUEDUCT--DISTRIBUTION SECTION

Salaries, Engineering and Clerical . . . . .	\$20,300.89	\$16,590.75
Labor . . . . .	7,729.00	9,077.41
Compensation to Labor for Injuries . . . . .	0.00	0.00
Supplies . . . . .	116.29	231.34
Automobile Maintenance . . . . .	429.02	523.65
Installed Equipment . . . . .	446.31	252.22
Laboratory Equipment . . . . .	0.00	0.00
Tools and Other Mechanical Equipment . . . . .	214.62	377.83
Rent and Upkeep . . . . .	1,628.35	2,582.11
Medical and Surgical Services . . . . .	3.00	42.00
Medical and Surgical Supplies . . . . .	7.29	0.00
<b>Total Maintenance of Hultman Aqueduct, Distribution Section . . . . .</b>	<b>\$29,855.08</b>	<b>\$25,857.91</b>

## HULTMAN AQUEDUCT—DISTRIBUTION SECTION

	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 months Ending June 30, 1945
Miscellaneous Expense (undistributed) . . . . .		\$46.61	\$178.33
Printing and Blueprinting . . . . .	\$81.87	2.00	16.73
Stationery and Office Supplies . . . . .	8.36	17.50	8.83
Postage . . . . .	79.80	33.32	13.00
Total Maintenance of Hultman Aqueduct, Distribution Section . . . . .	\$31,078.56	\$29,776.74	\$19,236.07

## SUMMARY

## WATER SUPPLY MAINTENANCE FUNDS

## EXPENDITURES

WARE SUPPLY AND QUABBIN AQUEDUCT . . . . .	\$28,386.50	\$31,801.26	\$22,242.65
QUABBIN RESERVOIR . . . . .	65,559.68	79,820.08	47,057.14
HULTMAN AQUEDUCT, SUPPLY SECTION . . . . .	14,847.94	11,426.74	7,357.07
HULTMAN AQUEDUCT, DISTRIBUTION SECTION . . . . .	31,078.56	29,776.74	19,236.07
Total Expenditures . . . . .	\$139,872.68	\$152,824.82	\$95,892.93

## RECEIPTS

Receipts from Rents . . . . .	\$435.00	\$1,115.00	\$675.00
Quabbin Park Cemetery . . . . .	0.00	0.00	0.00
Receipts from Sales of Lots . . . . .	0.00	192.50	17.50
Interment Fees . . . . .	51.00	422.00	318.50
Foundation Fees . . . . .	0.00	128.03	0.00
Receipts from U. S. Veterans' Administration for Maintenance of Rutland-Holden Sewer . . . . .	0.00	355.67	0.00
Total Cash Receipts . . . . .	\$486.00	\$2,213.20	\$1,011.00

The special fund for Perpetual Care of Lots in Quabbin Park Cemetery held by the State Treasurer, under Chapter 33 of the Resolves of 1936, totalled \$14,915.53 on June 30, 1945.

# Financial Statement of the Metropolitan District Water Supply Commission As Enlarged by Chapter 720 of the Acts of 1941

## Expenditures and Disbursements for the Fiscal Years, 1943, 1944, and 1945 (7 Months) and Total to Date on Account of Metropolitan Sewage Disposal

### SEWAGE DISPOSAL FUND

Authorized under Chapter 512, Acts of 1939, 4% of \$15,000,000 . . . . .	. . . . .	\$600,000.00
Treasury Notes Issued . . . . .	. . . . .	\$204,000.00
Balance of Authorization Available for Issue . . . . .	. . . . .	396,000.00
		\$600,000.00

### EXPENDITURES BY METROPOLITAN DISTRICT COMMISSION 1940-1941

Contract for Borings . . . . .	\$96,291.61	
Preliminary Report of Consulting Engineers . . . . .	147,303.81	
Miscellaneous . . . . .	143.85	\$183,739.27
New Sewage Disposal Fund Available . . . . .	. . . . .	\$416,260.73

### EXPENDITURES NUT ISLAND SEWAGE TREATMENT PLANT

	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 mos. Ending June 30, 1945	Total To June 30, 1945
GENERAL OVERHEAD:					
Administration, Commissioners' Office . . . . .	\$0.00	\$8.75	\$55.60	\$8.05	\$72.40
Engineering, Headquarters Office . . . . .	5,198.90	19,506.81	43,543.63	35,249.16	103,498.50
Total General Overhead . . . . .	\$5,198.90	\$19,515.56	\$43,599.23	\$35,257.21	\$103,570.90

NUT ISLAND SEWAGE TREATMENT PLANT

	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 mos. Ending June 30, 1945	Total To June 30, 1945
ENGINEERING (Field):					
Salaries, Engineering and Clerical . . . . .	\$137.50	\$9,699.26	\$14,448.35	\$16,060.84	\$40,345.95
Consultant Expense . . . . .	0.00	0.00	179.44	0.00	179.44
Legal Expense . . . . .	0.00	452.56	60.00	42.84	555.40
Labor . . . . .	0.00	354.42	1,092.70	1,208.72	2,655.84
Engineering Instruments . . . . .	0.00	0.00	12.24	0.00	12.24
Tools and Equipment . . . . .	0.00	0.00	78.96	34.65	113.61
Laboratory Equipment . . . . .	0.00	0.00	413.00	0.00	413.00
Laboratory Supplies . . . . .	0.00	1.50	127.60	82.78	211.88
Rent and Upkeep . . . . .	0.00	0.00	81.92	83.88	165.80
Automobile Maintenance . . . . .	0.00	169.01	472.09	289.16	930.26
Maintenance of Mechanical Equipment . . . . .	0.00	4.50	58.68	7.65	70.83
Miscellaneous Expense (undistributed) . . . . .	0.00	2.20	287.32	90.88	380.40
Printing and Blueprinting . . . . .	0.00	6.66	71.21	81.11	158.98
Stationery and Office Supplies . . . . .	0.00	5.38	12.89	14.00	32.27
Postage . . . . .	0.00	0.00	11.10	0.00	11.10
Medical and Surgical Services . . . . .	0.00	5.00	121.17	74.15	200.32
Compensation to Labor for Injuries . . . . .	0.00	0.00	51.42	0.00	51.42
Total Engineering . . . . .	\$137.50	\$10,700.49	\$17,580.09	\$18,070.66	\$46,488.74
TOTAL NUT ISLAND SEWAGE TREATMENT PLANT . . . . .	\$5,336.40	\$30,216.05	\$61,179.32	\$53,327.87	\$150,059.64

CHARLES RIVER BASIN, OVERFLOW SOUTH SIDE

	Year Ending Nov. 30, 1944	7 mos. Ending June 30, 1945	Total To June 30, 1945
GENERAL OVERHEAD:			
Engineering, Headquarters Office . . . . .	\$2,326.75	\$545.83	\$2,872.58
ENGINEERING (Field):			
Salaries, Engineering and Clerical . . . . .	\$0.00	\$875.71	\$875.71
TOTAL CHARLES RIVER BASIN, OVERFLOW SOUTH SIDE . . . . .	\$2,326.75	\$1,421.54	\$3,748.29

CHARLES RIVER BASIN, OVERFLOW NORTH SIDE

GENERAL OVERHEAD:			
Engineering, Headquarters Office . . . . .	\$157.19	\$1,610.54	\$1,767.73
ENGINEERING (Field):			
Salaries, Engineering and Clerical . . . . .	\$0.00	\$592.30	\$592.30
TOTAL CHARLES RIVER BASIN, OVERFLOW NORTH SIDE . . . . .	\$157.19	\$2,202.84	\$2,360.03

SUMMARY

	Year Ending	7 mos. Ending	Total To
	Nov. 30, 1944	June 30, 1945	June 30, 1945
NUT ISLAND SEWAGE TREATMENT PLANT . . . . .	\$61,179.32	\$53,327.87	\$150,059.64
CHARLES RIVER BASIN, OVERFLOW SOUTH SIDE . . . . .	\$2,926.75	\$1,421.54	\$3,748.29
CHARLES RIVER BASIN, OVERFLOW NORTH SIDE . . . . .	\$157.19	\$2,202.84	\$2,360.03
Total Expenditures . . . . .	\$63,663.26	\$56,952.25	\$156,167.96

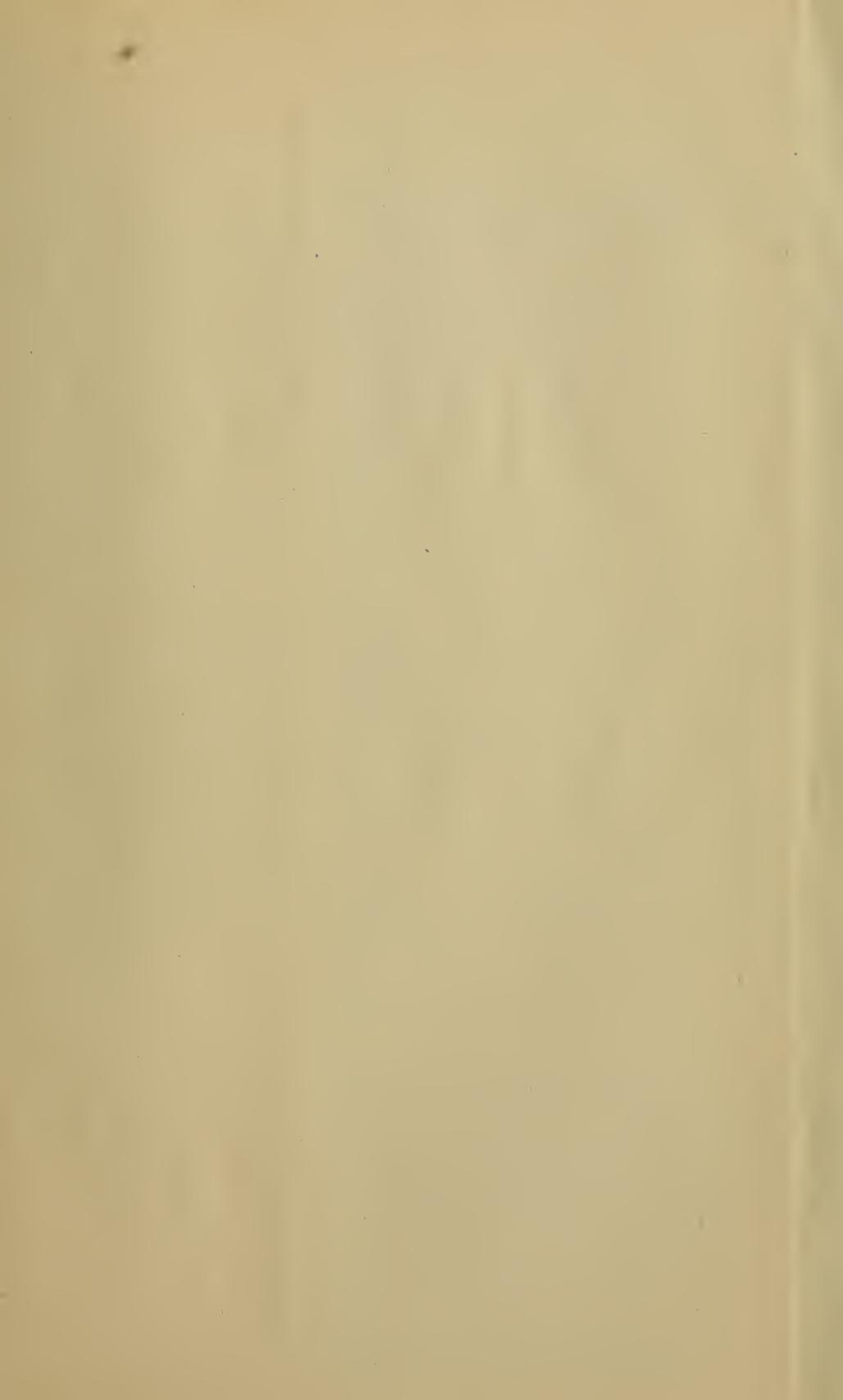
The principal financial items of this report are in agreement with the Comptroller's books.

Nov. 14, 1946  
 Checked by WILLIAM COHEN  
 FRED A. MONCEVICZ, Comptroller.

A tabulation of the acts and resolves under the authority of which expenditures are made by the Metropolitan District Water Supply Commission was published in the 1937, 1938 and 1939 Annual Reports.

A subsequent acts and resolves are as follows:

<i>Chapter</i>	<i>Brief Description</i>
45, Resolves of 1941	Investigation for use of Quabbin Reservoir by Additional municipalities.
91, Resolves of 1941	Further investigation of use of Quabbin Reservoir by additional municipalities.
384, Acts of 1941	Increased reimbursement of Hamden County Trail costs.
461, Acts of 1941	Metropolitan Police to patrol Quabbin Reservoir.
536, Acts of 1941	Welfare Relief Reimbursement to Towns of Dana, Enfield, Greenwich and Prescott.
720, Acts of 1941	Enlargement of the Metropolitan District Water Supply Commission, for purpose of constructing additional works for North and South Metropolitan Sewerage Districts.
16, Resolves of 1943	Investigation of possibility of Release from Quabbin Reservoir to Ware River.
370, Acts of 1943	Maintenance expenditures by Metropolitan District Water Supply Commission authorized for 1943 and 1944 (Item 8902-35).
42, Resolves of 1945	Authorizing payment to Guy Marvel of Petersham.
59, Resolves of 1945	Investigation of conditions in the Neponset River by Joint Board.
83, Resolves of 1945	Investigation of water supply for municipalities in Connecticut, Chicopee, Swift, Ware, Quaboag and Millers River Valleys, by special commission.
279 and 637, Acts of 1945	Changing fiscal year to end June 30.
490, Acts of 1945	Maintenance expenditures by Metropolitan District Water Supply Commission authorized for 1945 (Item 8902-25).
603, Acts of 1945	Increased reimbursement of Hamden County Trail costs.
682, Acts of 1945	Maintenance expenditures by Metropolitan District Water Supply Commission authorized for 1946 (Item 8902-35).
705, Acts of 1945	Further providing for enlargement of the Metropolitan District Water Supply Commission for purpose of constructing additional sewerage works.





CANVASS OF BIDS FOR CONTRACT 94 — OPENED FEB. 5, 1940

COMMONWEALTH OF MASSACHUSETTS METR. DIST. WATER SUPPLY COMMISSION CONTRACT 94 FOR SINKING THE CHARLES RIVER SHAFT IN THE TOWN OF WESTON, MASSACHUSETTS. PWA DOCKET NO MASS 1551-F MASS STATE PROJECT NO D-208				★ (1) John MacDonald Construction Co., 215 California St., Newton, Mass	(2) The Foundation Company, 120 Liberty St., New York, N.Y.	(3) New England Foundation Co., Inc., 30 Chauncy St., Boston, Mass	(4) B. Perini & Sons, Inc., Frammingham, Mass	(5) A. Baruffaldi Co., 52 Powder House Blvd., Somerville, Mass	(6) Coleman Bros Corp 245 State St., Boston, Mass.	(7) Senior & Palmer Incorporated, 50 Church St., New York City, N.Y.	(8) Silas Mason Company, Inc., 500 Fifth Ave., New York City, N.Y.	(9) The Peter F. Connolly Co., Perth Amboy, New Jersey	(10) J. F. Fitzgerald Construction Co., 214 Essex St., Boston, Mass	(11) C & R Construction Co., 75 Braeden St., Roslindale, Mass	(12) Dravo Corporation Neville Island Branch, Pittsburgh, Pa	(13) Spencer White & Prentiss, Inc., 10 E. 40th St., New York, N.Y.															
Item	DESCRIPTION	UNIT	QUANTITY	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount								
1	Stripping and storing topsoil	Cu Yd	1000	.50	500.00	.35	350.00	.40	400	.50	500	.50	500	1.00	1000	1.50	1500	1.00	1000	1.00	1000	1.50	1500	1.20	1200						
2	Construction of shaft down to E1-50	L.S.	—	—	85873.	—	115500.	—	108000.	—	114668.	—	147900.	—	150000.	—	162500.	—	148000.	—	179250.	—	190897.	—	235500.	—	196000.	—	218150.		
3	Excavation other than for shaft	Cu Yd	12000	.50	6000.	.30	3600.	.40	4800.	.15	1800.	.70	8400.	.25	3000.	1	12000.	1.40	16800.	.70	8400.	.20	2400.	1.	12000.	.60	7200.				
4	Shaft excavation below E1 50	Cu Yd	1500	19.00	28500	12.	18000.	22.	23685.	15.79	23685.	12.	18000.	20.	30000.	12.	18000.	15.	22500.	20.	30000.	20.	30000.	25.	37500.	25.	37500.				
5	Compacted refill and embankment	Cu Yd	1000	.50	500.	1.	1000.	.60	600.	1.	1000.	.50	500.	.60	600.	1.	1000.	1.50	1500.	.80	800.	1.	1000.	1.	1000.	1.25	1250.				
6	Miscellaneous embankment	Cu Yd	6000	.50	3000.	.30	1800.	20	1200.	.50	3000	.40	2400	.30	1800.	.50	3000.	.30	1800.	.60	3600.	.50	3000	.80	4800.	.75	4500.				
7	Drilling holes in rock and masonry	Lin Ft	2000	.75	1500.	.50	1000.	.60	1200.	.80	1200.	.50	1000.	1.	2000.	.50	1000.	.60	1200.	.50	1000.	1.25	2500.	1.	2000.	1.20	2400.	1.50	3000		
8	Furnishing and placing grout	Cu Yd	500	8.00	4000.	8.	4000.	8.	4000.	8.	4000.	8.	4000.	8.	4000.	8.	4000.	8.	4000.	8.	4000.	8.	4000.	8.	4000.	8.	4000.	8.	4000.		
9	Sand for grout placed under Item 8	Ton	150	2.00	300.	2.50	375.	2.	300.	3	450	1.50	225.	3.	450.	2.	300.	2.50	375.	1.	150.	2.	300.	2.	300.	8.	1200.	2.	300.		
10	Concrete below E1-50	Cu Yd	500	16.00	8000.	10.	5000.	9	4500.	10.	5000.	12.	6000.	13.	6500.	12.	6000.	15.	7500.	7.	3500.	15.	7500.	14.	7000.	20.	10000.	20	10000.		
11	Concrete, outside limits of shaft	Cu Yd	1000	14.00	14000.	10.	10000.	11.	11000.	12.81	12810.	8.	8000.	13.	13000.	8.	8000.	12.50	12500.	8	8000.	7.	7000.	10.	10000.	20.	20000.	15.	15000.		
12	Portland cement, other than for shaft above E1-50	Barrel	7000	2.60	18200.	2.60	18200.	2.60	18200.	2.60	18200.	2.60	18200.	2.60	18200.	2.60	18200.	2.60	18200.	2.60	18200.	2.60	18200.	2.60	18200.	2.60	18200.	2.60	18200.	2.60	18200.
13	Reinforcing steel, other than for shaft above E1-50	Pound	110000	.05	5500.	.06	6600.	.05	5500.	.05	5500.	.06	6600.	.05	5500.	.06	6600.	.05	5500.	.06	6600.	.05	5500.	.06	6600.	.05	5500.	.06	6600.	.07	7700.
14	Cast-iron pipe and specials, other than for shaft above E1-50	Pound	60000	.07	4200.	.07	4200.	.07	4200.	.07	4200.	.06	3600.	.06	3600.	.08	4800.	.08	4800.	.05	3000.	.09	5400.	.05	3000.	.06	3600.	.10	6000.	.12	7200.
15	Misc. lumber, outside limits of shaft	MFBM	25	80.00	2000.	125	3125.	90.	2250.	200.	5000.	100.	2500.	100.	2500.	120.	3000.	100.	2500.	100.	2500.	80.	2000.	150.	3750.	100.	2500.				
16	Steel plate lining, below E1-50	Pound	50000	.09	4500.	.09	4500.	.10	5000.	.10	5000.	.10	5000.	.06	3000.	.10	5000.	.08	4000.	.10	5000.	.10	5000.	.08	4000.	.15	7500.	.15	7500.		
17	Steel plate pipe, outside limits of shaft	Pound	100000	.11	11000.	.15	15000.	.12	12000.	.15	15000.	.15	15000.	.10	10000.	.12	12000.	.14	14000.	.12	12000.	.11	11000.	.13	13000.	.15	15000.	.15	15000.		
18	Mortar lining of steel pipe outside limits of shaft	Sq Ft	4000	.75	3000.	.70	2800.	.90	3600.	.45	1800.	.60	2400.	.40	1600.	.50	2000.	.70	2800.	.60	2400.	.50	2000.	.50	2000.	.75	3000.	.60	2400.		
19	Crushed stone and screened gravel outside limits of shaft	Cu Yd	200	2.00	400.	3	600.	3.	600.	3	600.	2.	400.	2.	400.	3.50	700.	3.	600.	3.	600.	2.50	500.	3.	600.	3.	600.	3.	600.		
20	Misc steel and iron outside limits of shaft	Pound	2000	.12	240.	.12	240.	.15	300.	.25	500.	.10	200.	.10	200.	.20	400.	.15	300.	.15	300.	.20	400.	.30	600.	.20	400.				
21	Non-ferrous metals, other than for shaft above E1-50	Pound	1000	1.00	1000.	.40	400.	.80	800.	.60	600.	1.	1000.	1.	1000.	.80	800.	.60	600.	.90	900.	1.	1000.	1.	1000.	1.	1000.	1.	1000.		
22	Coring for and setting valves furnished by the Comm	Pound	150000	.04	6000.	.02	3000.	.03	4500.	.03	5250.	.04	6000.	.02	3000.	.02	3000.	.02	3000.	.02	3000.	.02	3000.	.02	3000.	.02	3000.	.02	3000.	.07	10500.
23	Coring for and setting misc. metal work furn. by the Comm	Pound	60000	.04	2400.	.04	2400.	.04	2400.	.05	3000.	.04	2400.	.02	1200.	.02	1200.	.05	3000.	.02	1200.	.03	1800.	.03	1800.	.02	1200.	.07	4200.		
24	Galvanizing	Pound	2000	.10	200.	.02	40.	.05	120.	.05	100	.10	200.	.20	400.	.07	140.	.05	100.	.05	100.	.04	80.	.05	100.	.10	200.	.10	200.		
25	Cleaning up	L.S.	—	—	1000.	—	500.	—	1000.	—	5000.	—	5000.	—	1000.	—	1000.	—	2000.	—	1000.	—	1000.	—	500.	—	950.	—	5000.		
27	Timber for shaft support below E1-50, if any, fixed price \$100 per	MFBM	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
28	Protect coat cement mortar below E1-50, if any, fixed price \$35 per	Cu Yd	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	Sub Total (Items 1 to 25 inclusive)				212,363		222,230		229,470		237,863		259,275		264,550		265,340		281,475		296,900		314,377		357,800		358,000		384,500.		
26	Furnishing performance bond. Rate per \$1,000		15		3,185.45	15	3,333.45	15	3,442.05	15	3,567.94	15	3,689.13	15	3,968.25	15	3,980.10	15	4,222.12	10	2,969	15	4,715.65	15	5,277.	15	5,370.	15	5,767.50		
	Totals				215,548.45		225,563.45		232,912.05		241,430.94		263,164.13		268,518.25		269,320.10		285,697.12		299,869.		319,092.65		357,077.		363,370.		390,267.50		
	Bid security				BB 20,000		BB 13,750		BB 12,000		BB 25,000		BB 25,000		BB 20,000		CC 15,000		BB 25,000		BB 25,000		BB 25,000		BB 25,000.		CC 22,500.		BB 35,000		

★ Contract awarded Feb 7, 1940  
Contract executed Feb 20, 1940

I certify the foregoing to be a true and accurate summary  
of all bids on the above Contract 94 received this day by  
the Metr. Distr. Water Supply Commission.

BB indicates Bid Bond  
CC indicates Certified Check

Tabulated by cno  
Checked by ELP

R Nelson Mott, Secretary

FILE CONT 94-333X ACC 26,718

No.	Name	Age	Sex
1	John Smith	25	M
2	Mary Smith	22	F
3	James Smith	20	M
4	Elizabeth Smith	18	F
5	William Smith	15	M
6	Ann Smith	12	F
7	Robert Smith	10	M
8	John Smith	8	M
9	Mary Smith	6	F
10	James Smith	4	M
11	Elizabeth Smith	3	F
12	William Smith	2	M
13	Ann Smith	1	F
14	Robert Smith	0	M
15	John Smith	0	M
16	Mary Smith	0	F
17	James Smith	0	M
18	Elizabeth Smith	0	F
19	William Smith	0	M
20	Ann Smith	0	F
21	Robert Smith	0	M
22	John Smith	0	M
23	Mary Smith	0	F
24	James Smith	0	M
25	Elizabeth Smith	0	F
26	William Smith	0	M
27	Ann Smith	0	F
28	Robert Smith	0	M
29	John Smith	0	M
30	Mary Smith	0	F
31	James Smith	0	M
32	Elizabeth Smith	0	F
33	William Smith	0	M
34	Ann Smith	0	F
35	Robert Smith	0	M
36	John Smith	0	M
37	Mary Smith	0	F
38	James Smith	0	M
39	Elizabeth Smith	0	F
40	William Smith	0	M
41	Ann Smith	0	F
42	Robert Smith	0	M
43	John Smith	0	M
44	Mary Smith	0	F
45	James Smith	0	M
46	Elizabeth Smith	0	F
47	William Smith	0	M
48	Ann Smith	0	F
49	Robert Smith	0	M
50	John Smith	0	M

**CANVASS OF BIDS FOR CONTRACT 110 — OPENED AUG. 29, 1940**

COMMONWEALTH OF MASSACHUSETTS  
METR. DISTR. WATER SUPPLY COMMISSION

**CONTRACT 110**  
FOR THE COMPLETION OF CHARLES RIVER SHAFT  
IN THE TOWN OF WESTON, MASSACHUSETTS.

P.W.A DOCKET NO. MASS. 1551-F MASS. STATE PROJECT NO. D-208

ITEM	DESCRIPTION	UNIT	QUANTITY	①		②		③		④		⑤		⑥		⑦		⑧			
				PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT
1	Excavation for shaft and tunnel	Cu. Yd.	7,000	12.00	84,000.00	16	112,000.00	16	112,000.00	21.00	147,000.00	20.00	140,000.00	24.00	168,000.00	21.	147,000.				
2	Enlargement of shaft and tunnel	Cu Yd	200	12.	2,400.	5.	1,000.	10.	2,000.	21.	4,200.	20	4,000.	15	3,000.	21.	4,200.				
3	Pumping	M.Ft.Gal	6,000	.50	3,000.	.50	3,000.	.60	3,600.	1.	6,000.	.10	600.	.50	3,000.	2.	12,000.				
4	Concrete masonry	Cu.Yd.	5,000	12.	60,000.	10.	50,000.	10.25	51,250.	10.	50,000.	12.	60,000.	15.	75,000.	20.	100,000.				
5	Excess concrete masonry	Cu Yd.	100	5.	500.	5.	500.	5.	500.	5.	500.	5.	500.	5.	500.	5.	500.				
6	Structural - Steel support	Pound	100,000	.075	7,500.	.04	4,000.	.07	7,000.	.08	8,000.	.07	7,000.	.07	7,000.	.10	10,000.				
7	Timbering	M.Ft.B.M.	80	120.	9,600.	60.	4,800.	120.	9,600.	100.	8,000.	70.	5,600.	120	9,600.	150.	12,000.				
8	Dry packing	Cu Yd.	100	8.	800.	4.	400.	6.	600.	7.	700.	5.	500.	5.	500.	8.	800.				
9	Drilling holes in rock or masonry	Lin.Ft.	3,000	.50	1,500.	.30	900.	.55	1,650.	1.25	3,750.	.70	2,100.	1.	3,000.	1.	3,000.				
10	Steel pipe for grouting, etc.	Lin.Ft.	1,500	.50	750.	.25	375.	.75	1,125.	.60	900.	.50	750.	.80	1,200.	1.	1,500.				
11	Connections for grouting	Connection	100	10.	1,000.	5.	500.	6.	600.	5.	500.	2.50	250.	3.	300.	3.	300.				
12	Sand for grout and for protective coating of cement mortar	Cu Yd	100	1.50	150.	2.	200.	6.	600.	5.	500.	3.	300.	2.	200.	3.	300.				
13	Mixing and placing grout	Cu.Yd.	500	20.	10,000.	8.	4,000.	25.	12,500.	15.	7,500.	10.	5,000.	20.	10,000.	15.	7,500.				
14	Protective coating of cement mortar	Cu.Yd	50	50	2,500.	15.	750.	30.	1,500.	10.	500.	40.	2,000.	25.	1,250.	60.	3,000.				
15	Portland cement	Barrel	12,000	2.50	30,000.	2.40	28,800.	2.30	27,600.	2.50	30,000.	2.45	29,760.	2.55	30,600.	2.80	33,600.				
16	Steel for Reinforcing Concrete	Pound	50,000	.05	2,500.	.03	1,500.	.06	3,000.	.05	2,500.	.05	2,500.	.05	2,500.	.08	4,000.				
17	Steel plate lining	Pound	250,000	.12	30,000.	.10	25,000.	.07	18,750.	.085	21,250.	.09	22,500.	.09	22,500.	.18	45,000.				
18	Steel pipe bituminous lined - 16"	Lin.Ft	275	3.60	990.	5.	1,375.	6.40	1,760.	7.	1,925.	10.	2,750.	5.	1,375.	6.	1,650.				
19	Steel pipe bituminous lined - 20"	Lin.Ft	550	4.25	2,337.50	7.	3,850.	7.	3,850.	8.	4,400.	10.50	5,775.	6.	3,300.	8.	4,400.				
20	Steel pipe bituminous lined - 24"	Lin.Ft	275	5.25	1,443.75	8.	2,200.	8.25	2,268.75	10.	2,750.	12.	3,300.	7.	1,925.	12.	3,300.				
21	Miscellaneous earth excavation	Cu Yd.	2,000	.60	1,200.	.30	600.	1.	2,000.	.50	1,000.	.75	1,500.	.50	1,000.	1.	2,000.				
22	Miscellaneous refill and embanking	Cu.Yd.	2,000	.50	1,000.	.30	600.	1.	2,000.	.50	1,000.	.75	1,500.	.30	600.	1.	2,000.				
23	Galvanizing	Pound	3,000	.05	150.	.05	150.	.05	150.	.05	150.	.10	300.	.10	300.	.10	300.				
24	Non-ferrous metals	Pound	100	1.	100.	.60	60.	1.50	150.	1.	100.	1.50	150.	1.	100.	1.	100.				
25	Locker house	Lump S.	1	1000.	1,000.	10,000.	10,000.	2,600.	2,600.	2,000.	2,000.	5,000.00	5,000.	3,000.	3,000.	3,000.	3,000.				
26	Miscellaneous lumber not included in Item 7	M.Ft.B.M	5	100.	500.	60.	300.	165.	825.	50.	250.	80.	400.	100.	500.	150.	750.				
27	Miscellaneous cast iron and steel	Pound	10,000	.15	1,500.	.08	800.	.12	1,200.	.15	1,500.	.07	900.	.15	1,500.	.20	2,000.				
28	Cleaning up	Lump S		1000.	1,000.	1,500.	1,500.	5,500.	5,500.	2,000.	2,000.	6,000.	6,000.	1,500.	1,500.	2,000.	2,000.				
Sub - Totals					257,421.25		259,160.00		276,178.75		300,875.00		310,935.00		347,500.00		406,200.00				
29	Furnishing performance bond. Rate per \$1,000			15.	3,861.32	15.	3,867.40	15.	4,142.68	15.	4,633.13	15.	4,604.02	15.	5,212.50	15.	6,093.00				
<b>Totals</b>					<b>261,282.57</b>		<b>263,027.40</b>		<b>280,321.43</b>		<b>313,508.13</b>		<b>315,599.02</b>		<b>352,712.50</b>		<b>412,293.00</b>				
<b>Bid Security</b>				<b>B.B. INDICATES</b>	<b>BID BOND</b>	<b>C.C. INDICATES</b>	<b>CERTIFIED CHECK</b>	<b>C.C.</b>	<b>15,000.</b>	<b>C.C.</b>	<b>15,000.</b>	<b>B.B.</b>	<b>17,500.</b>	<b>C.C.</b>	<b>17,500.</b>	<b>C.C.</b>	<b>16,000.</b>	<b>C.C.</b>	<b>20,000.</b>	<b>B.B.</b>	<b>25,000.</b>

Cost Plus 10%

Tabulated by: A.J.G. \* Contract Awarded Sept 6, 1940  
Checked by: E.G.M. Contract Executed Sept 13, 1940

I certify the foregoing to be a true and accurate summary of all bids on the above Contract No. 110 received this day by the Metr. Distr. Water Supply Commission.

W. Nelson Mott, (Secretary) FILE CONT 110-333X Acc. 27, 140



**CANVASS OF BIDS FOR CONTRACT III — OPENED OCTOBER 3, 1940**

COMMONWEALTH OF MASSACHUSETTS METR. DISTR. WATER SUPPLY COMMISSION <b>CONTRACT III</b> CONSTRUCTING THE OUTLET WORKS SUPERSTRUCTURE AND APPURTENANCES AT WINSOR DAM IN THE TOWN OF BELCHERTOWN, MASSACHUSETTS P.W.A. DOCKET NO. MASS 1551-F MASS STATE PROJECT NO. D-208																	
ITEM	DESCRIPTION	UNIT	QUANTITY	①		②		③		④		⑤		⑥			
				PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT		
1	Earth excavation	Cu Yd	300	1	300	150	450	120	360	161 1/2	484	1	300	2.12	636		
2	Rock excavation	Cu Yd	40	5	200	5	200	5	200	5	200	5	200	5	200		
3	Refill and embankment	Cu Yd	300	35	105	1	300	90	270	167 1/2	502	2	600	94	282		
4	Soil dressing	Cu Yd	100	35	35	2.50	250	3	300	3.24	324	2	200	2.22	222		
5	Cobble gutters and paving	Lp Sum		71	71	50	50	75	75	100	100	100	100	100	100		
6	Miscellaneous concrete masonry	Cu Yd	50	10	500	20	1,000	0	400	12.96	648	20	1,000	20	1,000		
7	Concrete masonry and granolithic finish	Lp Sum		668	568	1,200	1,200	944	944	980	980	2,000	2,000	1,000	1,000		
8	Portland cement	Barrel	175	2.44	427	3	525	2.85	498.75	2.69	470.50	3	525	2.60	455		
9	Reinforcing steel	Pound	2,000	.06	120	.08	160	.04	120	.05	100	.07	140	.05	110		
10	Miscellaneous iron and steel	Lp Sum		589	589	839	839	689	689	756	756	850	850	640	640		
11	Galvanizing	Lp Sum		85	85	100	100	85	85	54	54	100	100	85	85		
12	Miscellaneous non-ferrous metals	Pound	500	1	500	60	300	.05	425	.06	375	1	500	.00	400		
13	Stone masonry	Lp Sum		5,767	5,767	5,650	5,650	6,449	6,449	5,130	5,130	5,000	5,000	6,800	6,800		
14	Glazed tile masonry	Lp Sum		4,130	4,130	4,600	4,600	6,494	6,494	2,008	2,008	4,000	4,000	6,400	6,400		
15	Brick masonry	Lp Sum		4,756	4,756	5,500	5,500	6,234	6,234	5,304	5,304	8,000	8,000	8,700	8,700		
16	Carpentry	Lp Sum		885	885	720	720	399	399	1,060	1,060	2,000	2,000	800	800		
17	Erig for and installing traveling crane turn by the Comm	Lp Sum		550	550	420	420	250	250	324	324	300	300	350	350		
18	Erig for and installing vacuum pump turn by the Comm	Lp Sum		52	52	215	215	75	75	54	54	360	360	125	125		
19	Erig for and installing vertical meter register indicator recorder turn by Comm	Lp Sum		116	116	725	725	100	100	108	108	300	300	150	150		
20	Structural steel	Lp Sum		4,950	4,950	5,770	5,770	5,777	5,777	6,241	6,241	5,777	5,777	6,377	6,377		
21	Marlar covering for structural steel	Lp Sum		2,050	2,050	2,050	2,050	2,050	2,050	2,214	2,214	2,050	2,050	2,250	2,250		
22	Precast concrete roof slabs	Lp Sum		1,733	1,733	1,733	1,733	1,733	1,733	1,877	1,877	1,733	1,733	2,033	2,033		
23	Roofing and sheet copper work	Lp Sum		2,342	2,342	2,342	2,342	2,342	2,342	2,534	2,534	2,342	2,342	2,642	2,642		
24	Bronze work	Lp Sum		4,228	4,228	4,228	4,228	4,228	4,228	4,545	4,545	4,228	4,228	4,528	4,528		
25	Painting	Lp Sum		200	200	400	400	800	800	972	972	1,200	1,200	600	600		
26	Plumbing	Lp Sum		635	635	635	635	635	635	706	706	635	635	735	735		
27	Electrical work	Lp Sum		10,800	10,800	10,800	10,800	10,800	10,800	14,270	14,270	10,800	10,800	11,680	11,680		
Sub-total (Items 1 to 27 inclusive)					47,002.00		51,248.00		53,012.75		53,199.50		55,260.00		61,300.00		
28	Furnishing performance bond rate per \$1,000		15		706.25	15		768.72	15		795.19	15		828.90	15		919.50
<b>Totals</b>					<b>47,708.25</b>		<b>52,016.72</b>		<b>53,807.94</b>		<b>53,997.49</b>		<b>56,080.90</b>		<b>62,219.50</b>		
Bid Security (BB-Bid Bond)				BB	2500.00	BB	15,000.00	BB	3500.00	BB	3500.00	BB	3000.00	BB	5000.00		

SUBDIVISION OF PROPOSED CONTRACT SUM													
ITEM	DESCRIPTION	①		②		③		④		⑤		⑥	
		AMOUNT	SUB BIDDER										
Group A (All work other than Group B)		20,770.23		23,965.72		25,362.94		23,089.49		27,243.90		31,974.40	
Group B (The work of all subcontractors)		AMOUNT	SUB BIDDER										
20	Structural steel	4,950	A	5,777	B	5,777	D	5,777	D	5,777	D	5,777	D
21	Marlar covering for structural steel	2,050	C										
22	Precast concrete roof slabs	1,733	D										
23	Roofing and sheet copper work	2,342	E										
24	Bronze work	4,228	K										
25	Painting	200	*	400	*	800	*	900	*	1,800	L	600	Estimate
26	Plumbing	635	M	635	M	635	M	635	N	635	N	635	M
27	Electrical work	10,800	P	10,800	P	10,800	P	10,800	Q	10,800	D	10,800	D
Sub total (Group B Items 20 to 27 incl)		27,018.00		28,051.00		28,445.00		30,908.00		28,845.00		28,925.00	
<b>Total amount for entire Contract</b>		<b>47,788.23</b>		<b>52,016.72</b>		<b>53,807.94</b>		<b>53,997.49</b>		<b>56,080.90</b>		<b>62,199.50</b>	

SUB-BIDDERS				
No	Name	Address	Item	Description
A	Chandler Construction Co, Inc	45 Newbury Street, Boston	20	Structural steel
O	West End Iron Works	267 Columbia Street, Cambridge	21	Marlar covering for structural steel
C	National Granite Contracting Co	82 West Deshams Street, Boston	22	Precast concrete roof slabs
D	Federal American Cement Tile Co	14500 Statler Building, Boston	23	Roofing and sheet copper work
E	Atlantic Roofing & Skylight Works	19 Howard St, Roxbury		
F	Highland Street Metal Works	173 Webster Ave, Cambridge		
G	Burgess & Bleeker Co	18 Eustis St, Roxbury		
H	Columbia Corning Co	268 Elm St, Cambridge		
J	Esque Corning & Skylight Works	197 Sidney St, Cambridge		
K	General Bronze Corporation	Langland City, N. & 90 Bedford St, Boston	24	Bronze work
L	Frank T. Westcott	95 High St., North Attleboro	25	Painting
M	Dunnells & Lanagan Co	334 Washington St, Brookline	26	Plumbing
N	J.G. Lamotte & Son Inc	90 Granite Street, Boston		
O	Frank T. Westcott	95 High St., North Attleboro		
P	Federal Electric Construction Co	95 Harvey St, No Cambridge	27	Electrical work
Q	A.C. Senecal Co	Westboro		
R	Anderson-Coffey Co	22 Shawmut Street, Boston		

\* Selected as General Contractor, Item 20  
Contract awarded Oct 7, 1940  
Contract executed Oct 18, 1940  
Notes:  
\* \* \* \* \*  
\* \* \* \* \*

Note: In the award of the Contract to the Chandler Construction Co, Inc, the bid of the West End Iron Works in the amount of \$27,770.00 was substituted for Item 20 changing figures as follows: Item 20 A \$27,770.00; Sub total (Items 1 to 27 incl) to \$47,909.00; Item 20 to \$710.64; and total to \$48,619.64

I certify the foregoing to be a true and accurate summary of all bids on the above Contract III received this day by the Metr. Distr. Water Supply Commission

*Phelan*  
Secretary

