



US Army Corps  
of Engineers  
Baltimore District

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25

# **OPERATION & MAINTENANCE MANUAL**

## **LOCAL FLOOD PROTECTION PROJECTS**

**LISLE, WHITNEY POINT VILLAGE  
AND OXFORD, NEW YORK  
(TIOGHNIGA AND CHENANGO RIVERS)  
SUSQUEHANNA RIVER BASIN**

**OCTOBER 1989**

OXFORD, NEW YORK

CONDITION OF IMPROVEMENT, 30 SEPTEMBER 1985

AUTHORIZATION: The project is a unit of the comprehensive flood control plan for the protection of communities in southern New York and eastern Pennsylvania authorized by the Flood Control Act of 22 June 1936, as amended by the Flood Control Act of 28 June 1938, and is described in House Document 702, 77th Congress, second session.

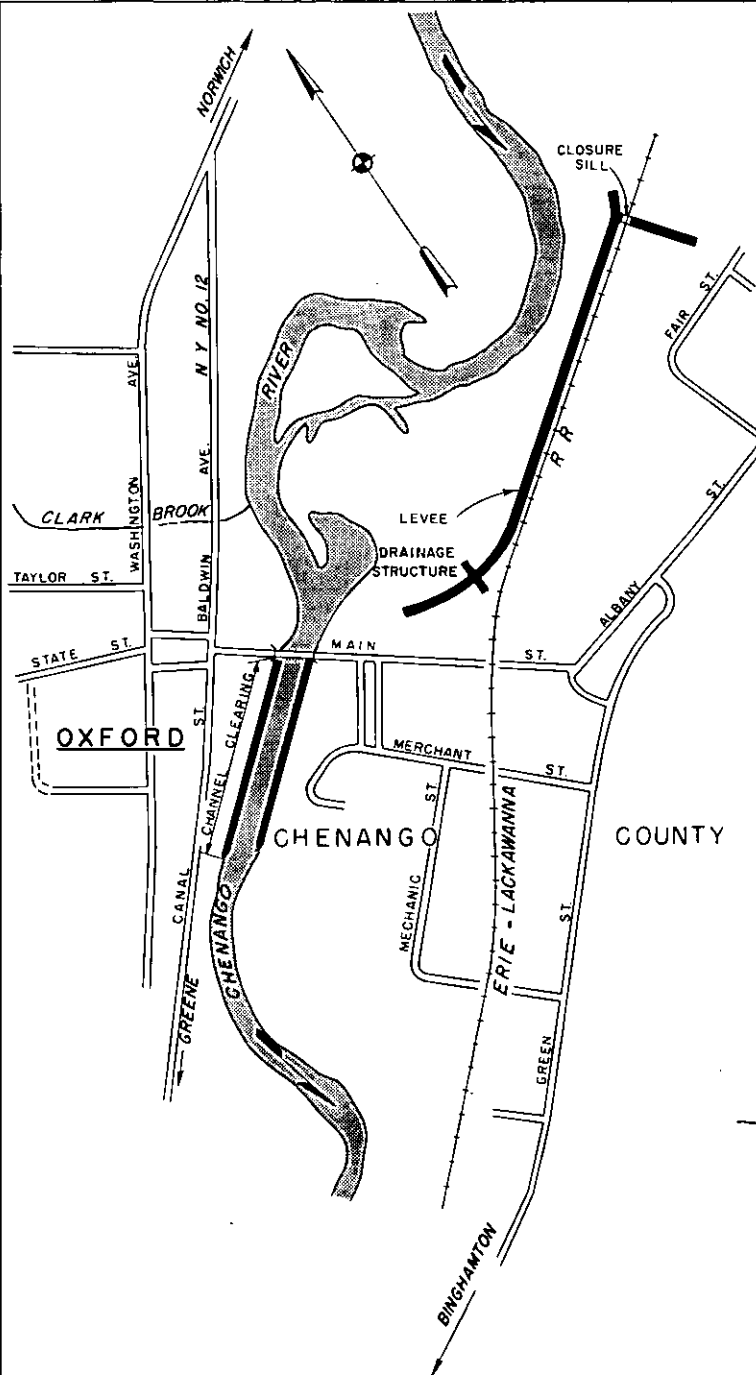
PROJECT: Protective works at Oxford consist of about 2,100 feet of earth levee on the left bank of the Chenango River; removal of an island, channel clearing, appurtenant drainage structures along the Chenango River; and raising of the Erie-Lackawanna Railroad over the levee. The improvements provide substantial protection for the village of Oxford on the left bank against floods larger than the maximum of record which occurred in July 1935. Federal maintenance is provided for the channel improvements on the Chenango River downstream from Main Street Bridge and drainage structures in the levee as shown in red on the project map.

LOCAL COOPERATION: Local cooperation has been provided as prescribed by the Flood Control Act of 22 June 1936, as amended by the Flood Control Act of 28 June 1938. Except for the federally maintained portion, the project is maintained and operated by the New York State Department of Environmental Conservation.

PROGRESS: The project was operationally complete in 1938.

COST: The Federal cost of new work was \$131,000, of which \$96,944 was for construction and \$34,056 was for lands and damages. The reported local cost of lands and damages was \$11,000.

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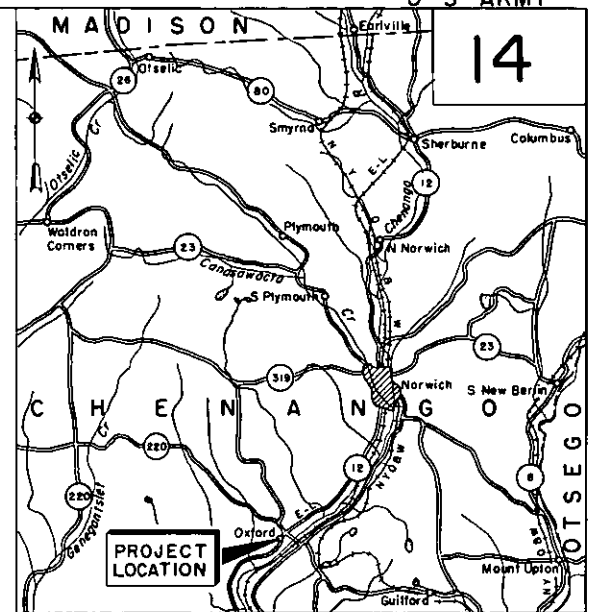
GENERAL PLAN

SCALE OF FEET  
400 0 400 800

STREAM	DRAINAGE AREA	DESIGN DISCHARGE	MINIMUM FREEBOARD
Chenango R.	465 Sq.Mi.	30,000 CFS.	0.3 Ft.

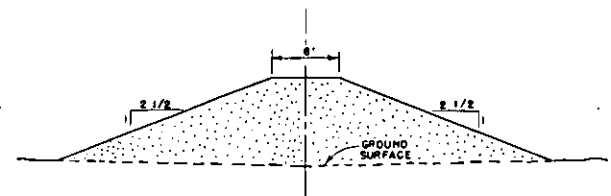
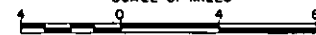
## LEGEND

■ WORK COMPLETED



VICINITY MAP

SCALE OF MILES



SECTION

LEVEE

NOT TO SCALE

SUSQUEHANNA RIVER BASIN  
OXFORD, N.Y.  
GENERAL PLAN AND SECTION

REVISED: SEPTEMBER 1985

CHENANGO RIVER

NEW YORK

SCALE AS SHOWN

BALTIMORE DISTRICT OFFICE

BALTIMORE, MARYLAND

LISLE, NEW YORK

CONDITION OF IMPROVEMENT, 30 SEPTEMBER 1985

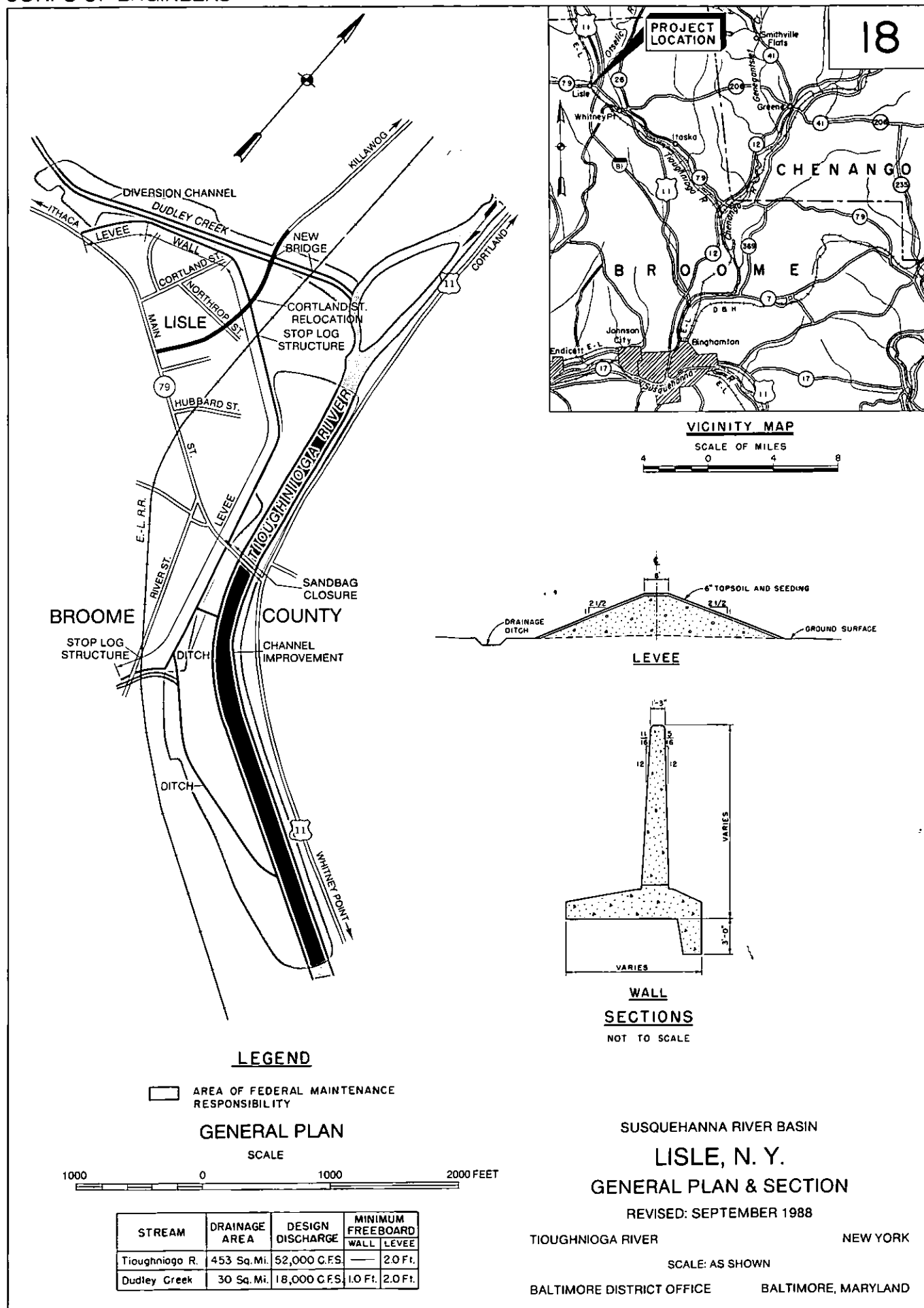
AUTHORIZATION: The project is a unit of the comprehensive flood control plan for the protection of communities in southern New York and eastern Pennsylvania authorized by the Flood Control Act of 22 June 1936, as amended by the Flood Control Act of 28 June 1938, and is described in House Document 702, 77th Congress, second session.

PROJECT: Protective works at Lisle consist of 4,150 feet of earth levee; 970 feet of concrete floodwall; 5,700 feet of channel relocation and realignment along the Tioughnioga River; relocation of about 3,000 feet of the Dudley Creek channel; raising of about 1,860 feet of the Erie-Lackawanna Single track railroad over the levee; relocation of about 1,600 feet of Cortland Street; a new bridge over relocated Dudley Creek; and construction of appurtenant drainage structures. The improvements provide protection for Lisle against flood discharges of the maximum flood of record, which occurred in July 1935. Federal maintenance is provided for the channel improvements along Tioughnioga River and Dudley Creek as shown in red on the project map.

LOCAL COOPERATION: Local cooperation has been provided as prescribed by the Flood Control Act of 22 June 1936, as amended by the Flood Control Act of 28 June 1938. Except for the federally maintained portion, the project is maintained and operated by the New York State Department of Environmental Conservation.

PROGRESS: The project was operationally complete in 1948.

COST: The Federal cost of new work, completed in 1954, was \$661,199, of which \$605,000 was for construction and \$56,199 was for lands and damages. The reported cost to local interests was \$68,000 for lands and damages.



WHITNEY POINT VILLAGE, NEW YORK

CONDITION OF IMPROVEMENT, 30 SEPTEMBER 1985

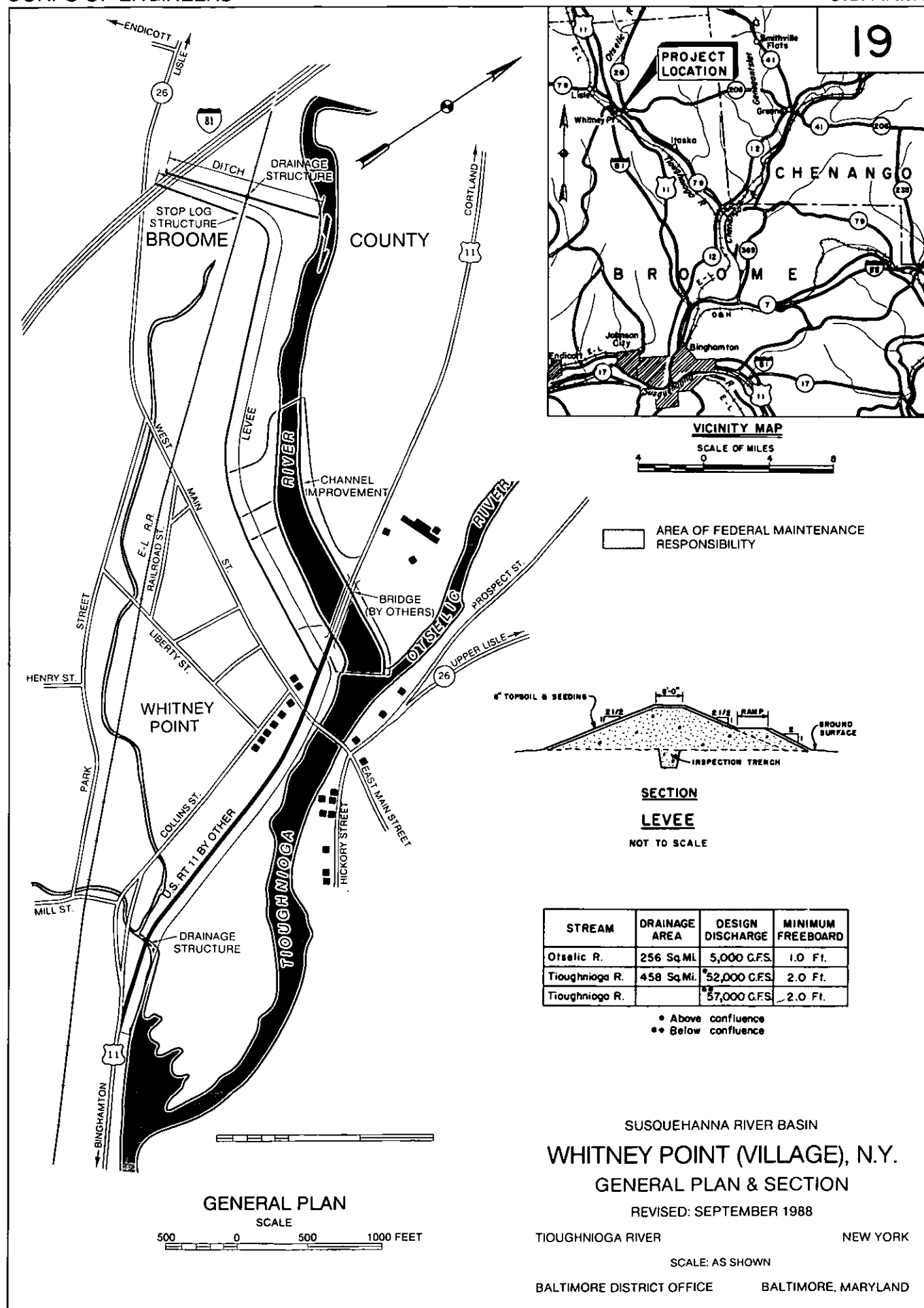
AUTHORIZATION: The project is a unit of the comprehensive flood control plan for the protection of communities in southern New York and eastern Pennsylvania authorized by the Flood Control Act of 22 June 1936, as amended by the Flood Control Act of 28 June 1938, and is described in House Document 702, 77th Congress, second session.

PROJECT: Protective works at Whitney Point Village consist of 7,100 feet of earth levee; 1,800 feet of channel realignment; a twin-barrel reinforced concrete culvert; and other appurtenant drainage structures along the Tioughnioga River. The improvements, supplemented by Whitney Point Dam upstream from the area, provide protection for Whitney Point Village against flood discharges approximately 20 percent greater than the maximum of record, which occurred in July 1935. Federal maintenance is provided for the channel improvement of Tioughnioga River as shown in red on the project map.

LOCAL COOPERATION: Local cooperation has been provided as prescribed by the Flood Control Act of 22 June 1936, as amended by the Flood Control Act of 28 June 1938. Except for the federally maintained portion, the project is maintained and operated by the New York State Department of Environmental Conservation.

PROGRESS: The project was operationally complete in 1948.

COST: The Federal cost of new work, completed in 1952, was \$424,096, of which \$411,653 was for construction and \$12,443 was for lands and damages. The cost to local interests was \$62,500 for lands, rights-of-way, and utility changes.





DEPARTMENT OF THE ARMY  
BALTIMORE DISTRICT, CORPS OF ENGINEERS  
P.O. BOX 1715  
BALTIMORE, MARYLAND 21203-1715

REPLY TO ATTENTION OF:

CENAB-EN-RD (340d)

1 November 1989

MEMORANDUM FOR Commander, North Atlantic Division, ATTN: CENAD-EM

SUBJECT: Lisle, Whitney Point Village and Oxford, New York, Local Flood Protection Projects, Operation and Maintenance Manual

1. Enclosed for your files are three copies of the revised Operation and Maintenance Manual for Lisle, Whitney Point Village and Oxford, New York, Local Flood Protection Projects.
2. No significant revisions have been made to the manual since the last printing in November 1964.

FOR THE COMMANDER:

Encl (trip)

*Stanley N. Block*  
h THAYNE C. COFFIN, P.E.  
Chief, Engineering Division

SUSQUEHANNA RIVER BASIN

LISLE, WHITNEY POINT VILLAGE,

AND

OXFORD, NEW YORK

LOCAL FLOOD-PROTECTION PROJECTS

OPERATION AND MAINTENANCE MANUAL

DEPARTMENT OF THE ARMY  
Baltimore District, Corps of Engineers  
P.O. Box 1715  
Baltimore, Maryland 21203

## PREFACE

This manual, prepared in compliance with section three of the Flood Control Act approved 22 June 1936 (Public Law No. 738, 74th Congress), will familiarize operating personnel with the general features of the project and will provide detailed instructions for its maintenance. The manual will also provide assistance to local interests in carrying out their obligations and responsibilities under the regulations contained in exhibit A of this manual.

The Manual enumerates the responsibilities of the project superintendent during flood periods and periods of low water. It also establishes an inspection and maintenance routine to be followed to detect and correct minor defects before they become major failures.

From time to time there will be changes in the manual as improved maintenance practices are developed. Most of these changes will probably come from the personnel at the project. Each member of the maintenance force is requested to think carefully about ways whereby maintenance can be made more efficient or more economical. New ideas in this field should be prepared in written form and submitted to the District Engineer, U.S. Army Engineer District, Baltimore, P.O. Box 1915, Baltimore, Maryland 21203.

OPERATION AND MAINTENANCE MANUAL  
LISLE, WHITNEY POINT VILLAGE, AND OXFORD, NEW YORK

C O N T E N T S

<u>Paragraph</u>	<u>Title</u>	<u>Page</u>
	Preface . . . . .	a
	<u>CHAPTER 1 - MANUAL</u>	
1.1	Purpose . . . . .	1-1
1.2	Authority . . . . .	1-1
1.3	Scope of manual . . . . .	1-1
	<u>CHAPTER 2 - PROJECT DESCRIPTION</u>	
2.1	Authorization . . . . .	2-1
2.2	Location . . . . .	2-1
2.3	Project descriptions . . . . .	2-1
2.4	Protection provided . . . . .	2-2
2.5	Construction history and contracts . . . . .	2-2
	<u>CHAPTER 3 - LOCAL COOPERATION REQUIREMENTS</u>	
3.1	Flood Control Act . . . . .	3-1
3.2	Local cooperation . . . . .	3-2
	<u>CHAPTER 4 - PERSONNEL AND REPORTS</u>	
4.1	General rules and procedures . . . . .	4-1
4.2	Project-operating personnel . . . . .	4-1
4.3	Duties of the superintendent . . . . .	4-1
4.4	Periodic inspections . . . . .	4-2
4.5	Checksheets . . . . .	4-2
4.6	Operating records . . . . .	4-2
4.7	Semiannual report . . . . .	4-2
4.8	Agreements . . . . .	4-3
	<u>CHAPTER 5 - LEVEES</u>	
5.1	Location . . . . .	5-1
5.2	Description . . . . .	5-1
5.3	Foundation . . . . .	5-2
5.4	Maintenance . . . . .	5-2
5.5	Operation . . . . .	5-3

# CONTENTS (cont'd)

<u>Paragraph</u>	<u>Title</u>	<u>Page</u>
<u>CHAPTER 6 - FLOODWALLS</u>		
6.1	Location . . . . .	6-1
6.2	Description . . . . .	6-1
6.3	Foundation . . . . .	6-1
6.4	Maintenance . . . . .	6-1
6.5	Operation . . . . .	6-1
<u>CHAPTER 7 - DRAINAGE STRUCTURES</u>		
7.1	General description . . . . .	7-1
7.2	Maintenance . . . . .	7-3
7.3	Operation . . . . .	7-3
<u>CHAPTER 8 - CLOSURE STRUCTURES</u>		
8.1	General description . . . . .	8-1
8.2	Maintenance . . . . .	8-1
8.3	Operation . . . . .	8-2
<u>CHAPTER 9 - OPEN CHANNELS</u>		
9.1	General description . . . . .	9-1
9.2	Maintenance . . . . .	9-1
9.3	Operation . . . . .	9-2
<u>CHAPTER 10 - MISCELLANEOUS FACILITIES</u>		
10.1	Maintenance . . . . .	10-1
10.2	Operation . . . . .	10-1
<u>CHAPTER 11 - HIGH WATER MAINTENANCE AND OPERATION</u>		
11.1	Scope . . . . .	11-1
11.2	General . . . . .	11-1
11.3	Earthwork . . . . .	11-1
11.4	Preliminary work . . . . .	11-1
11.5	Operation of drainage structures . . . . .	11-2
11.6	Precautionary measures . . . . .	11-2
11.7	Patrol . . . . .	11-2
11.8	Drainage of slopes . . . . .	11-3
11.9	Sloughs . . . . .	11-3

## C O N T E N T S (cont'd)

<u>Paragraph</u>	<u>Title</u>	<u>Page</u>
<u>CHAPTER 11 - HIGH WATER MAINTENANCE AND OPERATION (cont'd)</u>		
11.10	Scours . . . . .	11-3
11.11	Topping . . . . .	11-4
11.12	Sand boils . . . . .	11-4

### PLATES

<u>Plate</u>	<u>Title</u>
1	General plans
2	Sandbag closure at street or roadway crossings
3	Sandbag closure at railroad tracks without sill
4	Typical closures at railroad tracks with sill
5	Sandbag ring for sand boils
6	Treatment of embankment sloughs
7	Wave-wash protection, cotton bagging
8	Wave-wash protection, timber bulkhead
9	Wave-wash protection, movable timber bulkhead
10	Deflection dike
11	Sack topping
12	3-foot timber and sandbag levee
13	3 to 5-foot mud-box levee

### EXHIBITS

<u>Exhibit</u>	<u>Title</u>
A	Flood control regulations
B	List of drainage structures
C	List of closure structures
D	List of bench marks
E	Checksheet for levees and floodwalls
F	Checksheet for inspection of drainage gates
G	Checksheet for inspection of stoplog structures
H	Checksheet for inspection of sandbags
I	Checksheet for inspection of channels
J	Record of operations for closure structures

DEPARTMENT OF THE ARMY  
Corps of Engineers  
Office of the District Engineer  
Baltimore, Maryland 21203

OPERATION AND MAINTENANCE MANUAL

LISLE, WHITNEY POINT VILLAGE, AND OXFORD, NEW YORK

LOCAL FLOOD-PROTECTION PROJECTS

CHAPTER 1 - MANUAL

1.1 Purpose. This manual has been prepared to familiarize the operating personnel with the above-named protection projects, to organize proper operation and care of the projects, to establish adequate inspection routines as aids in maintaining the equipment and grounds in a satisfactory condition, and to aid in detecting and correcting incipient failures before they develop into major defects.

1.2 Authority. This manual was prepared in accordance with the "Flood Control Regulations," chapter II, part 208, published under Title 33, Code of Federal Regulations (see exhibit A).

1.3 Scope of manual. This manual will cover essential operation and maintenance instructions for the three local flood-protection projects given in the title.

## CHAPTER 2 - PROJECT DESCRIPTION

2.1 Authorization. By enactment of the Flood control Act approved 22 June 1936 (Public Law No. 738, 74th Congress), Congress authorized "Construction of detention reservoirs and related flood-control works for protection of Binghamton, Hornell, Corning, and other towns in New York and Pennsylvania in accordance with plans approved by the Chief of Engineers . . . ." The flood-protection works at Lisle, Whitney Point Village, and Oxford, New York, constructed under that authority, as amended by the Flood Control Act approved 28 June 1938 (Public Law No. 761, 75th Congress, 3d session), are a part of the comprehensive plan for flood control in the upper Susquehanna River watershed in southern New York and eastern Pennsylvania. The general scope of this project is described in House Document No. 702, 77th Congress, 2d session.

### 2.2 Location.

a. Lisle. The village of Lisle, Broome County, New York, is located on the right bank of the Tioughnioga River, 11 miles above its confluence with the Chenango River in the upper Susquehanna River Basin.

b. Whitney Point. The village of Whitney Point, Broome County, New York, is located at the confluence of the Tioughnioga and Otselic Rivers, 9 miles above the confluence of the Tioughnioga and Chenango Rivers in the upper Susquehanna River Basin.

c. Oxford. The village of Oxford, Chenango County, New York, is situated on both banks of the Chenango River, 40 miles above its confluence with the Susquehanna River at Binghamton, New York.

### 2.3 Project descriptions.

a. Lisle. The improvement consists of relocation of about 3,000 feet of the Dudley Creek channel, extending from 1,200 feet west of the intersection of Cortland and Main Streets to the confluence with the Tioughnioga River; realignment of 5,700 feet of the Tioughnioga River channel east of the village; construction of about 4,150 feet of earth levee and 970 feet of concrete wall on the right bank of Dudley Creek and the Tioughnioga River extending from Main Street on the west end of the village to the railroad crossing on River Street; stoplog structure for the railroad through the levee; relocation of about 1,600 feet of Cortland Street; construction of railroad and highway bridges over the relocated Dudley Creek; and construction of appurtenant drainage structures.

b. Whitney Point Village. The improvement consists of realignment of about 1,800 feet of the Tioughnioga River channel above the confluence of the Otselic River; construction of about 7,100 feet of earth levee along the right bank of the Tioughnioga River, extending from Interstate 81 above the village to Collins Street just below the village; and construction of appurtenant structures.

c. Oxford. The improvement consists of the construction of about 2,100 feet of earth levee on the left bank of the Chenango River extending from high ground near Main Street and running mostly along the railroad to high ground near Cemetery Drive; removal of the dam and island below Main Street; raising of the railroad over the levee and a sandbag closure across the tracks; and construction of appurtenant structures.

#### 2.4 Protection provided.

a. Lisle. The improvement provides protection for the village of Lisle against flood discharges 20 percent greater on the Tioughnioga River and about 100 percent greater on Dudley Creek than the maximum flood of record, which occurred in July 1935.

b. Whitney Point Village. The improvement, supplemented by the Whitney Point Lake above the area, provides protection for the village of Whitney Point against a flood discharge approximately 20 percent greater than the flood of July 1935.

c. Oxford. The improvement provides protection for the village of Oxford on the left bank of the Chenango River against a flood approximately double the maximum flood of record, which occurred in July 1935.

#### 2.5 Construction history and contracts.

a. Lisle. The protective works include the realignment of the Tioughnioga River channel, east of the village, which was constructed in 1938 by Government hired labor. Coincident with the Tioughnioga River channel improvement in 1938, the State of New York constructed a new highway bridge carrying State Highway Route No. 79 (Main Street) over the relocated Tioughnioga River channel. The main project of earth levees and concrete walls along the right bank of Dudley Creek and the Tioughnioga, relocation of Dudley Creek, and appurtenant drainage structures was constructed during the period from July 1946 to June 1948 by Harrison & Burrowes, Inc., 507 Summit Avenue, Jersey City, New Jersey. The project included construction of two stoplog structures crossing the railroad tracks; also a new railroad bridge and a new highway bridge crossing the relocated Dudley Creek channel.

b. Whitney Point. The protective works include the realignment of the Tioughnioga River above the confluence with the Otselic River, earth levee along the right bank of the Tioughnioga River, and appurtenant drainage structures. A stoplog structure and a 48-inch reinforced concrete pipe culvert were installed across the railroad tracks. The project was constructed during the period from August 1946 to June 1948 by D. W. Winkelmann Company, Inc., 205 Harrison Street, Syracuse, New York. Coincident with the Tioughnioga River channel improvement, the State of New York constructed a new highway bridge carrying U.S. Highway Route No. 11 over the relocated Tioughnioga River channel near the downstream end of the project. The Interstate 81 bridge crossing the river near the upstream end of the project was constructed in 1969.

c. Oxford, New York. The protective works include an earth levee on the left bank of the Chenango River, clearing of Chenango River, removal of dam and

island below Main Street, appurtenant structures, and raising of the railroad tracks where they intersect the levee. The project was constructed during the period from April 1937 to July 1938 by Government hired labor; track raising was performed by the railroad.

### CHAPTER 3 - LOCAL COOPERATION REQUIREMENTS

3.1 Flood Control Act. The Flood Control Act of 1936, under which these three projects were authorized, requires cooperation by local interests as follows:

"Sec. 3. That hereafter no money appropriated under authority of this Act shall be expended on the construction of any project until States, political subdivisions thereof, or other responsible local agencies have given assurances satisfactory to the Secretary of War\* that they will:

(a) Provide without cost to the United States, all lands, easements, and rights-of-way necessary for the construction of the project, except as otherwise provided herein;

(b) Hold and save the United States free from damages due to the construction works;

(c) Maintain and operate all the works after completion in accordance with regulations prescribed by the Secretary of War\* . . . . "

The Flood Control Act approved 28 June 1938 modified Section 3 of the Flood Control Act of 1936 as follows:

"Sec. 2. That Section 3 of the Act of June 22, 1936 (Public, Numbered 738, Seventy-fourth Congress), as heretofore amended and as herein further modified, shall apply to all flood control projects, except as otherwise specifically provided by law.

"That in case of any dam and reservoir project, or channel rectification project for flood control, herein authorized or heretofore authorized by the Act of June 22, 1936 (Public, Numbered 738, Seventy-fourth Congress), as amended, and by the Act of May 15, 1928 (Public, Numbered 391, Seventieth Congress) as amended by the Act of June 15, 1936 (Public, Numbered 678, Seventy-fourth Congress), as amended title to all lands, easements, and rights-of-way for such project shall be acquired by the United States or by States, political subdivisions thereof or other responsible local agencies, and conveyed to the United States, and provisions (a), (b), and (c) of Section 3 of said Act of June 22, 1936, shall not apply thereto . . . . "

In accordance with the above, a decision was rendered by the Office, Chief of Engineers, to the effect that the provisions of Section 2 of the 1938 Flood Control Act apply to the following: Dudley Creek and Tioughnioga River channels at Lisle, New York; Tioughnioga River channel at Whitney Point, New York; and Chenango River channel at Oxford, New York.

3.2 Local cooperation. Chapter 862, New York State Laws of 1936, and amendments thereto, authorize State participation in the Federal program of flood protection. By virtue of this law and its amendments, the State of New York assumed responsibility for local cooperation and authorized and directed the State Superintendent of Public Works\*\* to carry out the State's participation in a Federal program of flood control. Assurances of local cooperation for the Lisle and Oxford projects were executed by the

Superintendent of Public Works on behalf of the State of New York on 9 September 1936 and approved and accepted by the Secretary of War\* on 15 December 1936. Similarly, assurances for the Whitney Point Village project were executed on 5 June 1940, approved and accepted on 20 June 1940.

\*Responsibilities of the Secretary of War are now the responsibilities of the Secretary of the Army.

\*\*This authority was later transferred to the Secretary of the State Department of Environmental Conservation.

## CHAPTER 4 - PERSONNEL AND REPORTS

4.1 General rules and procedures. Excavation within 200 feet of the levee toe may result in boils or blowouts from seepage or underground flow during periods of high river stages, and could result in levee failure. Consequently, such excavation should be controlled even on land not acquired for the project. The danger increases with the height of levee, proximity of the excavation to the levee, and depth of the excavation. The responsible local official should review the plans and the subsurface conditions for the particular area before issuing a permit to build or excavate in these zones so that it may be assured that the proposed excavation will not endanger the levee and that adequate protection from flooding by seepage has been provided. General rules for the maintenance and operation of facilities of a local protection project are stated in items 1 through 10 under paragraph (a) of the regulations (exhibit A). Further details and suggestions for complying with these requirements are given in this chapter.

4.2 Project-operating personnel. The operating and maintaining agency is required by the regulations (paragraph 208.10(a) (2), exhibit A) to appoint a permanent committee consisting of or headed by an official, called the "superintendent," who shall be responsible for the development and maintenance of, and directly in charge of, an organization which can efficiently carry out the operation and maintenance of all structures and facilities during flood periods and the inspection and maintenance of the project works at all other times.

### 4.3 Duties of the superintendent.

a. Labor and materials. It is not contemplated that the maintenance and operation of these flood-protection works will require extensive labor forces except that an adequate standby or reserve should be available for emergency repairs or maintenance in the event that failure of any facility is imminent during period of flood. A reserve supply of materials needed during a flood emergency should also be available at all times. Competent and responsible men for staffing of key positions to handle all contingencies in an expeditious manner is essential. Such key personnel should include an assistant to act in the absence of the superintendent and a sufficient number of supervisors or sector foremen to patrol the entire system of levees and walls continuously during flood periods and to direct the erection of closure structures. These men should be thoroughly acquainted with the physical features of those portions of the protection works under their charge and applicable portions of the Regulations and this manual. They should be fully trained by periodic drills in the necessary steps of operation of these facilities during high water and also in the emergency precautions and methods of repair outlined in chapter 11.

b. Plans for improvements or alterations. The regulations (exhibit A) require that drawings or prints of proposed improvements or alterations to the levee or appurtenant structures be submitted in triplicate to the District Engineer, Corps of Engineers, P.O. Box 1715, Baltimore, Maryland 21203, sufficiently in advance of proposed initiation of construction to permit adequate study and consideration of the work. Drawings, in duplicate, or reproducible prints showing any improvement or alterations as finally

constructed, should be furnished the District Engineer, Corps of Engineers, after completion of the work.

c. Securing weather and river stage reports. It is necessary that the superintendent make permanent arrangements to secure streamflow data and forecasts of river stages and weather conditions in the tributary drainage area. It cannot be too greatly emphasized that he should never depend upon rumor or hearsay for guidance relative to the operation of the levees and appurtenant facilities. The official Federal forecasting agency in New York is the National Weather Service. Both weather and river-stage forecasts are issued by the Binghamton office of the Weather Service by the:

National Weather Service  
Broome County Airport  
Phone: (607) 729-2160

The superintendent should check the address and phone number periodically and make any necessary revisions.

4.4 Periodic inspections. Periodic inspections as required by the Regulations (exhibit A) should be made at the following times:

a. Immediately prior to the beginning of a major flood season (generally considered to include the months of March and April).

b. Immediately following each major high water period.

c. Otherwise at periods not exceeding 90 days.

d. At such other times as may be necessary.

4.5 Checksheets. To facilitate inspection, either routine or emergency, there are suggested forms of checksheets shown in exhibits E through I. These, or similar forms, should be used at each inspection to insure that no feature of the protective system is overlooked. Any item requiring repairs should be noted thereon; satisfactory items should be indicated by a check. Appropriate notations regarding the condition of drainage structures should be made at the time the various drainage gates are inspected.

4.6 Operating records. Records of operations should be kept for the stoplog and sandbag structures each time they are erected during flood periods and also at trial or seasonal closures made by the operating personnel. A suggested form of record for reporting these operations is given in exhibit J.

4.7 Semiannual report. The semiannual report required by paragraph (a) (6) of the Regulations (exhibit A) is to be submitted by the superintendent to the District Engineer, Baltimore District, Corps of Engineers. Such reports should cover inspection, maintenance, and operation of the protective works and should include dated and signed copies of inspection checklists or report sheets made during the period covered by each report. In case repairs have been made, either temporary or permanent, the nature and dates of construction are pertinent and should be included. Prints of any photographs showing the

protective works in operation during floods are desired whenever available. The reports should be completed and transmitted during the latter part of December and June, unless the superintendent desires to arrange for other submission dates, and should include all operation and maintenance performed during the preceding six months.

#### 4.8 Agreements.

a. Successful operation of the Lisle, Whitney Point Village, and Oxford projects during high water will require that the State of New York develop a working agreement with the railroad providing for closure of the levee gaps over its tracks.

b. Similarly, agreements must also be developed and maintained with the villages of Lisle and Whitney Point providing for coordinated operation of their flood protection and sanitary facilities during high water. It will be of particular importance that the superintendent assure himself that the villages' facilities are maintained in serviceable condition and do not jeopardize the entire system of protection.

## CHAPTER 5 - LEVEES

### 5.1 Location.

a. Lisle. The total length of the levee in this project is 4,150 feet, which is divided into two sections. A section approximately 500 feet in length from Main Street just above Collier Street extends in a northeasterly direction until it intersects the floodwall which runs parallel to the right bank of Dudley Creek channel. The remaining section of levee extends from the other end of the floodwall near Cortland Street in a easterly direction until it reaches Hubbard Street where it turns to the south and runs parallel to the right bank of Tioughnioga River. The length of this section is approximately 3,650 feet. There are two stoplog structures in this section at intersections of the levee and the railroad.

b. Whitney Point. The total length of the levee in this project is 7,100 feet, and extends along the right bank of the Tioughnioga River from high ground at Interstate 81 and Main Street, above the village, to Collins Street just below the village. The section of levee below Main Street Bridge, exclusive of a short stretch adjoining drainage structure No. 7, which was completed in September 1941, was constructed of spoil materials from Whitney Point Lake operations, and forms part of the fill for U.S. Highway Route No. 11, which was relocated by the State of New York.

c. Oxford. The total length of levee in this project is approximately 2,100 feet, beginning at high ground about 150 feet east of Main Street and extending 250 feet southeasterly toward the railroad. From there it runs parallel to the railroad for a distance of 1,480 feet and then angles from the railroad embankment and continues 100 feet. Another section of the levee begins on the south side of the railroad embankment opposite the angle point of the levee on the north side of the embankment and extends 270 feet in a southerly direction and perpendicular to the railroad and terminates at an old stone retaining wall. The opening at the railroad tracks must be closed by sand bagging during extreme high river stages.

### 5.2 Description.

a. Lisle. In general, the crown width of the levees is eight feet and side slopes are one vertical to 2.5 horizontal. The average height of both sections of the levee is about 10 feet. Levee freeboard of two feet above the adopted flow line was provided, except at the upper end of the levee, where the possibility of disposition and shifting of the channel makes future channel conditions uncertain. Here freeboard was increased to 4 feet. Rock paving protection is provided on the riverside slope of the levee at each end of the floodwall, extending a short distance along the levee. The remainder of the levee slopes are covered with topsoil and grass. Foundation conditions indicated that there is a possibility that underseepage could cause sand boils to occur along the landside toe of the levee during high river stages. Therefore, it is important that close observations be maintained around the clock when the river reaches stages above elevation 971.0. Paragraph 11.11 describes emergency procedures to be followed in the event any boils should appear.

b. Whitney Point Village. In general, the crown width of the levee is eight feet and side slopes are one vertical on 2.5 horizontal. The average height of levee is approximately 13 feet. A minimum freeboard of two feet above the adopted flow line has been provided. The embankment slopes will be stable under all probable conditions. There will be negligible settlement due to foundation consolidation or embankment shrinkage. The levees are constructed of impervious material and have negligible seepage. Rock paving is provided on the side slope of the new Tioughnioga River channel for distance of about 850 feet to protect the levee toe, and levee slopes are covered with topsoil and grass.

c. Oxford. The levee has a crown width of eight feet and side slopes of one vertical on 2.5 horizontal, except where they merge into railroad embankment. The average height of levee is eight feet. The fill for the levee is impervious material, but in the event that seepage occurs under the levee it will be intercepted by seepage drains. Riprap protection consisting of a six-inch gravel base and one foot of handlaid set-on-edge riprap stone, is provided on the riverside slope of the levee. The landside slopes of the levee are covered with topsoil and are seeded. Riprap is provided below the Main Street Bridge to protect the right abutment from undercutting. Since the developed area along the left bank below Main Street Bridge will be inundated during flows of 30,000 c.f.s., the freeboard of the levee along the railroad was limited to six inches. The cross levee at the upper end was made six inches lower (that is, with zero freeboard) to insure its being overtopped before the main levee and to insure against scouring of the railroad roadbed.

### 5.3 Foundation.

a. Lisle. Foundation material underlying the levees consists of an impervious blanket of sandy silt, two to six feet thick, underlain by pervious sandy gravel to a depth of about 18 feet. Relatively impervious silty sand extends from 18 to 25 feet, the maximum depth explored. Prior to placing the levee embankment, the area under the levee was stripped to a minimum depth of six inches; and, where considered necessary, an inspection trench was excavated to remove unsuitable material and backfilled with impervious fill.

b. Whitney Point. Foundation material underlying the levees consists of a layer of impervious clayey sandy silt, two to five feet thick, overlying pervious sandy gravel. The natural impervious blanket was retained, except where the contractor was directed to strip or excavate inspection trenches to remove unsuitable material. Due to the pervious sandy gravel underlying this area, underseepage will occur. Flooding of cellars and low spots may be expected, and there is some danger of piping. On the landside of the levee, where the natural impervious cover was thin, a seepage trench was constructed.

c. Oxford. The material underlying the levee consists of a blanket of clayey silt and soil to a depth of 12 feet, overlying silty gravel. The material furnishes ample support for the levee and limits underseepage to a minimum.

5.4 Maintenance. The pertinent requirements for maintenance of levees are stated in paragraph (b) (1) of the Regulations (exhibit A), and are generally self-explanatory. Should inspections, either periodic or otherwise, disclose

conditions that are potentially dangerous, immediate corrective measures should be taken. A suggested form of checksheet for reporting conditions found during inspections is presented in exhibit E. Excavation in the vicinity of the levee, as well as dumping rubbish adjacent to the levee, tends to interfere with the effectiveness of the flood control works increases maintenance costs, and should be prohibited. Excavation near the levee toe, in particular, endangers the safety of the levee and may be inducive to formation of sand boils behind the levee. The maintenance of sod is particularly important, and activities detrimental to its growth should be discouraged. These include excessive grazing, burning of brush or other material, burrowing of rodents, unauthorized traffic, and digging for worms by fisherman. As sod is the first line of defense against erosion, all barren spots should be reseeded as soon as practicable. Routine mowing of grass to a minimum height of four inches and cutting of weeds before they go to seed are beneficial to sod growth and will prevent development of serious infestations that can be corrected only by extensive renovation and reseeded. Burrowing animals have been known to cut holes either through or under a levee, these holes being a source of danger during high water periods. Rodent colonies should be exterminated as soon as practicable and their burrows filled with earth tamped in place. Regular maintenance and repair measures should be scheduled and accomplished by the superintendent to insure that the levees will be kept in the best possible condition. Levels should be run periodically. Should settlement be observed, levees must be raised to restore the designed degree of protection. See exhibit D for list of bench marks.

5.5 Operation. Among the requirements for operation of levees given in paragraph (b) (2) of the Regulations (exhibit A), the provision for continuous patrol during periods of flood is of prime importance. Notwithstanding the fact that the periods of high stages are of relatively short duration, and that the levees are designed to be stable under all conditions, unforeseen contingencies may arise. The patrol men should be alert and observant during their rounds to locate possible sand boils or unusual wetness in the landside slope, indications of slides or sloughs developing, wave wash or scouring action, or low reaches of levee which may be overtopped. Appropriate measures should be taken to insure the availability of adequate labor and materials to meet all contingencies, and immediate steps should be taken to repair any damaged section in order to control any conditions which may endanger the levee. Suggested methods for control and handling of emergency repairs on damaged levees are given in chapter 11 of this manual.

## CHAPTER 6 - FLOODWALLS.

6.1 Location. A floodwall is provided for the Lisle project where clearance is restricted for levee construction. The wall parallels the right bank of Dudley Creek channel, extends approximately 1,000 feet between the two sections of levee, and joins them into one complete barrier. Floodwalls were not provided at the Whitney Point Village and Oxford projects.

6.2 Description. There are two types of floodwalls in the projects--one an I type, and the other a T type, with respective total lengths of 700 feet and 300 feet. A minimum freeboard of one foot above design flow was provided for both type walls. For exact location of the walls see plate 1-A, General Plan of the Lisle Project.

a. The I type wall is a composite structure of interlocking steel sheet piling and reinforced concrete, designed as a cantilever, and is prevented from sliding or overturning by the penetration of the piling below ground surface. The reinforced concrete wall cap extends 3.5 feet below ground surface and extends above it to a maximum height of 10 feet.

b. The T type wall is reinforced concrete designed as a cantilever with a wide footing to prevent sliding or overturning. The average height of the T type wall above ground is 10 feet.

6.3 Foundation. Foundation material underlying the floodwalls is similar to that described in paragraph 5.3(a) for levees. Unsatisfactory foundation material was removed and replaced with a suitable compacted earth fill.

6.4 Maintenance. The requirements for maintenance of floodwalls are stated in the Regulations (exhibit A) in paragraph (c) (1), and are generally self-explanatory. Inspections of walls at the intervals indicated in the Regulations are necessary to insure that they will be kept in the best possible condition and that no circumstances arise which endanger the stability of the walls. A suggested form of checksheet for reporting conditions found during inspections is presented in exhibit E. With regard to the structural stability of walls, it is important that the inspector be informed on the structural details concerning the various types of walls and have an appreciation of the factors which influence their stability. Immediate steps should be taken to eliminate encroachments, to prevent accumulation of trash and debris, to insure that no fires are being built near the walls, and to effect repairs found necessary by the above inspections. All repairs shall be accomplished by methods acceptable in standard engineering practice and consistent with the design of the constructed project.

6.5 Operations. The requirements of the Regulations on operation are given in paragraph (c) (2), exhibit A. It is important that a continuous patrol of walls be maintained during flood periods to locate possible leakage of construction joints or seepage underneath the walls. The Regulations require that, "Immediate steps shall be taken to correct any condition which endangers the stability of the walls."

## CHAPTER 7 - DRAINAGE STRUCTURES

7.1 General description. During normal periods when the river is below flood stage, interior surface drainage and domestic sewage are discharged by means of gravity outlets. These outlets are provided with automatic gates which will close during flood periods and prevent backflow from the river. In some instances the automatic gates are supplemented with manually operated sluice gates. Consequently, in time of flood-emergency the protective works will form a barrier between the communities and the rivers. It is, therefore, necessary to allow water from interior drainage to pond in low areas during high river stages. However, the whole system of protective works has been arranged so that, in the event of a local flood such as may result from a summer storm of the "cloudburst" type, the flow may pass to the river with no greater damage to property than would have occurred before the protective works were constructed.

a. Lisle. Local runoff and coincidental high river stages at Lisle will result from a single storm or from closely related storms. For any storm producing high stages in the river, there will be an initial period of at least six hours and usually 12 hours or more during which free discharge through the culverts will take place. For storms lasting longer than 12 hours the amount of ponding will depend directly on storm duration and distribution of runoff. Full culvert capacities with non-damaging pond stages will be available for a high Tioughnioga River stage which may occur on an average of once annually. Higher river stages and protracted durations of runoff occurring on an average of once in ten years can be discharged by the culverts against a Tioughnioga River peak stage of the same frequency without serious damage. The entire volume of local runoff of the one-year frequency can be stored under elevation 970.0 with only some flooding of cellars and barns. Drawdown of ponding will be rapid, being affected first, as the river falls, by culvert No. 2 at station 29+85.5, but principally by the twin culvert No. one at station 10+50 (see General Plan 1-A). The effect of seepage is not significant. If the structures had been in operation during the July 1935 and April 1940 floods, no damage would have resulted, while only flooding of a few cellars would have resulted during the March 1936 flood. Damage from ponding will not occur. See General Plan 1-A for location of drainage structures, and for other pertinent data see exhibit B-1.

b. Whitney Point.

(1) Approximately 85 percent of the total drainage area at Whitney Point consists of hilly pasture land and 5 percent is farm wood lot located back of the flood plain. The remaining area consists of relatively flat flood plain with suburban to rural development. A ditch roughly parallel to the railroad on the landside of the levee intercepts the major part of the interior drainage. That portion of the ditch which was outside of the upstream end of the levee has been diverted to the river through drainage structure No. one, which is under the railroad. See General Plan, plate 1-B for location. Drainage structure No. 7 is located where this ditch was relocated and crosses the alignment of U.S. 11 and the levee near the downstream end. Several small drains with catch basins which discharged into the old channel of Tioughnioga River and served the area along West Main Street are now handled by drainage structures No. four and No. 5 and discharge into the relocated channel. Local runoff which formerly drained directly into the river in the vicinity of the creamery at the upstream end of

the protection is now served by drainage structure No. 2. Drainage structure No. 3 is an extension of an existing creamery waste pipe. Drainage structure No. 6 was constructed as an outlet for an interceptor sewer constructed by the State which services a limited number of sanitary outlets from buildings to the north of West Main Street. The drainage structures are indicated on the General Plan, plate 1-b, and other pertinent details of these facilities are shown on exhibit B-2.

(2) The facilities described above have been provided to permit drainage from each location where local runoff would otherwise pond against the project levee. In order to avoid damage which might be attributable to existence of the levee, culverts within the protection have been made of capacity adequate to discharge runoff which may occur on an average of once in 10 years under moderate tailwater conditions, including all flow from existing structures. A study of coincidental rainfall has been made, and it has been determined, on the basis of records from 1930 to 1944 and from flood reproductions, that the chance of damaging ponding with the river up is remote. The village of Whitney Point is located close enough to the upper reaches of the Tioughnioga River basin that coincidental local runoff would be generated by the same rainfall disturbance which would cause high stage on the river. Reconstitution of storms over the basins indicate a lag of over 12 hours between high local runoff and peak stages on the river. Records from 1930 to 1943 indicated that rainfall, coincidental with discharges in the river greater than 14,000 cubic feet per second (highest stage at which maximum culvert discharge is available at non-damaging ponding), was of low intensity and occurred only during the greatest floods of record. At drainage structure No. 7 there is available, with non-damaging ponding, 1.0 inch of storage for 586 acres of drainage area, and a maximum culvert discharge of 720 c.f.s. This outflow is equivalent to 1.23 inches of rainfall per hour. The outlet could easily have accommodated the worst flood of record (1935) without damaging ponding. During the next greatest flood of record (1936), the local runoff, including snowmelt, is far below the discharge capacity of the culvert.

(3) To further illustrate the tendency of intense local rainfall to run off prior to high river stages, floods occurring on an average of once in 100 years were reconstructed for the whole basin, with highest intensity at the beginning and at the end for worst conditions. It was found that the local runoff would have emptied into the river before the tailwater would have affected the culvert discharge. Under the worst conditions only 10 acre feet of ponding would remain during high river stage and this would not reach damaging stage. At drainage structure Nos. 2, 4, and 5, drainage areas are small. For the low runoff which may be expected coincidental with high river stages, ponding will be restricted to the locality near the levee north of West Main Street.

c. Oxford. Drainage of the area behind the levee at Oxford is provided for by a 36-inch corrugated iron pipe which passes under the levee at station 4+00. This culvert is designated drainage structure "A" and is equipped with an automatic floodgate to prevent backflow from the river. A 36-inch corrugated iron pipe has also been provided at the upstream end of the levee. This culvert is designated drainage structure "B", and passes under the levee and the railroad. It is not equipped with a floodgate. An ungated

24-inch corrugated metal pipe, designated drainage structure "C", has been installed under the ramp at the downstream end of the levee. For location of these structures see plate 1-C, and for other pertinent data see exhibit B-3.

**7.2 Maintenance.** Provisions for maintenance of drainage structures are contained in paragraph (d) (1) of the Regulations, exhibit A. The inspections at the intervals indicated in the Regulations are to insure that inlet and outlet channels and pipes or culverts are free of trash and debris; that drainage gates are unobstructed, in proper alinement, and operating freely; that pipes, riprap, and headwalls are in good condition; that no erosion which will endanger the structure is occurring and that no fires are being built in pipes or adjacent to structures. Necessary repairs should receive prompt attention. Prevention of vandalism is important. The Regulations require that "gates and valves on drainage structures shall be examined, oiled, and trial operated at least once every 90 days." Frequently well meaning, but uninformed residents will prop open the flap of an automatic floodgate to facilitate local runoff without considering the serious consequences in event of flood. Likewise gates of relief culverts are sometimes secured in a closed position to prevent leakage during high river stages without consideration of potential damage resulting from precipitation within the leveed area. Though such obstructions are placed with no intent to sabotage the flood-protection works, the result is no less serious; necessary steps should be taken to prevent such acts. Another cause of failure is the collecting of drift, silt, debris, and ice at outlets, which may block automatic gates in an open or closed position. The removal of such deposits and of trash and materials from adjacent areas likely to contribute to such deposits should be a part of regular maintenance. Paragraph (h) (i) of the Regulations requires that ". . . facilities which function as a part of, or affect the efficient functioning of the protective works, shall be periodically inspected by the Superintendent and appropriate maintenance measures taken." A suggested form of checksheet for reporting conditions during inspections is given in exhibit F. Local residents should be cautioned against filling in or developing low-lying areas in the vicinity of relief culverts, since ponding of local runoff from the landside of levees and walls is relied upon to prevent inundation of more valuable adjoining areas. (See chapter 10.)

**7.3 Operation.** Paragraph (d) (2) of the Regulations (exhibit A) states: "Whenever high water conditions impend, all gates will be inspected a short time before water reaches the invert of the pipe and any object which might prevent closure of the gate should be removed. Automatic gates shall be closely observed until it has been ascertained that they are securely closed. . . . All drainage structures in levees shall be inspected frequently during floods to ascertain whether seepage is taking place along the lines of their contact with the embankment. Immediate steps shall be taken to correct any adverse conditions. . . ." Some of the gated outlets are submerged with only moderate rise in river stages. Therefore, it will be necessary, prior to undertaking other duties incidental to the emergency, to inspect the gates and perform any necessary servicing to assure that they will open and close properly. The ponding of water at the intake structure does not necessarily indicate serious leakage since some ponding may be due to local runoff. Leakage of the gate can be established from close observation of the direction of flow at the landside end of the pipe. In regard to manually operated gates the Regulations state: "Manually-operated gates and valves shall be closed as necessary to prevent

inflow of flood water." In drainage structures where discharge takes place through sluice gates and then through automatic gates, the sluice gate need not be closed unless the automatic gates leak significantly.

## CHAPTER 8 - CLOSURE STRUCTURES

8.1 General description. Where railroad tracks cross the levee at a lower elevation than the top of levee, thus creating openings in the protective works, such openings shall be closed during periods of extremely high river stages by the methods outlined below. (See exhibit C for list of closure structures and pertinent data.)

a. Lisle. Two stoplog structures have been provided in the Lisle project, one for closing the opening where the railroad crosses the levee near Northrop Road, and the other at the downstream end of the levee. The respective sizes of the openings are 3.5 feet high by 20 feet wide and 4.5 feet high by 20 feet wide. Each stoplog structure consists of reinforced concrete abutments with slots to receive the stoplogs; a bituminous cap on a concrete sill which is 2.5 feet thick approximately 7 feet in depth and extends throughout the full width of the opening; and a steel sheet pile cutoff wall which extends between the abutments on each side of the concrete sill. The piling was cut off 6 inches below the bottom of sill. A reinforced concrete storage vault, which has been constructed as an integral part of the concrete abutment, is equipped with storage racks for storing the stoplogs and other removable parts of the structure when they are not in use. A sandbag closure will be required at the right abutment of Main Street Bridge to the top of the concrete wingwalls. This opening is 40 feet wide and 30 inches high.

b. Whitney Point. A stoplog structure has been provided in the Whitney Point project where the railroad crosses the upstream end of the levee. The gap height is 6.3 feet, and the width is 33 feet, 5 inches. This stoplog structure consists of reinforced concrete abutments slotted to receive the stoplogs; a steel sheet piling cutoff wall capped with concrete and a bituminous sill; a concrete pier located midway between abutments and provided with two steel framed recesses, one to receive a 10-inch H-section steel post, which is the center support for the stoplogs, and the other to receive a 6-inch H-section steel strut, which supports the center post. Each recess is provided with a removable steel cover plate attached to the recess frame by four brass cap screws. A lead gasket is provided between cover and frame. A reinforced concrete storage vault, equipped with storage racks, is provided at the barrier structure for storing stoplogs, post, strut, and all other removable parts of the structure.

c. Oxford. The only closure which is required to be made in the Oxford project is a sandbag closure at the opening in the levee at the crossing of the railroad at the upstream end of the levee. The gap height is 1 foot and the width of the opening is 20 feet.

8.2 Maintenance. The general requirements for maintenance of closure structures are stated in paragraph (e) (i) of the Regulations (exhibit A). During inspections it is important to ascertain whether structures show signs of settlement; whether concrete abutments are in good condition; that all parts of the structure assembly are on hand and in usable condition; that slots for stoplogs are free from sand, silt, and debris; and that shovels and sandbags are

readily available. Remedial measures found necessary shall be undertaken immediately. The Regulations require the superintendent to make inspections every 90 days to be certain that ". . . Sufficient materials are on hand for the erection of the sandbag closure and that location of such materials will be readily accessible in times of emergency." A sample checksheet for use in making the regular 90-day inspection of stoplog structures is given in exhibit G. The stoplogs should be plainly marked, and the numbering system should be explained to all employees who might be assigned to erect the stoplogs during an emergency. A record of operation (exhibit J) should be kept for each seasonal operation of each stoplog structure, as well as for any emergency erections. It is very important that the records indicate the time and number of men involved since these data will be useful as the basis for establishing an organization for future flood emergencies. The number of man-hours required to make the closure should be compared with the tentative figures given in exhibit C and necessary corrections made. Railroad officials must be given advance notice of intent to effect a closure as stipulated in agreements negotiated by the State of New York and the railroad.

### 8.3 Operation.

a. The Regulations (exhibit A) give the following instructions for the operation of closure structures:

"Erection of each movable closure shall be started in sufficient time to permit completion before floodwaters reach the top of the structure sill . . . Closure structures will be inspected frequently during flood periods to ascertain that no undue leakage is occurring."

In preparation for closing stoplog structures, all recesses should be thoroughly cleaned of sand, silt, and other materials. It is suggested that each structure be completed to its full height before water reaches the sill so that inefficiencies consequent to erection with part of the work area covered with water may be avoided. It will be necessary to have close contact with railroad officials, so that traffic will be stopped or rerouted prior to erection of stoplog structures. After the stoplogs are placed in position, they should be wedged tight to prevent floating. Leakage through the stoplogs can be largely overcome by applying caulking material or by fastening a tarpaulin or roofing paper over the riverside face after the logs have been placed. An adequate supply of such items--wedges, nails, caulking material, canvas, or roofing paper and lath--should be kept on hand at all times, and the practice of borrowing these materials for other purposes should be avoided. As soon as the water reaches the closure structure, an inspector should be assigned to make frequent checks on the amount of leakage. Necessary measures should be promptly applied whenever excessive leakage is found. Normal seepage should be conducted into storm inlets, or other means of runoff provided.

b. After the water has receded, but only after official forecast information relative to the continued recession of the water surface has been obtained from the National Weather Service, all materials used in the closure should be carefully removed, cleaned, and replaced in storage. Any timbers,

wedges, canvas, roofing paper, caulking, or other material that may have been damaged should be replaced immediately for future use since two or more high stages in succession may occur as in the 1936 flood on the Susquehanna River. The post and strut recesses at stoplog structures should be filled with oil-saturated cotton waste, and the lead gaskets put in place prior to fastening the cover plates. After the plates are fastened, a bituminous seal should be poured around the edge of the plates to exclude water which would freeze and greatly delay erection of posts or struts. Erection of the railroad closure structures should be in accordance with a working agreement between the State of New York and the railroad with regard to time for closure and advance notice to the railroad company. Actual decision as to when closures are to be made during an emergency must be made by the superintendent on the basis of prevailing river stage and the latest forecast from the National Weather Service.

## CHAPTER 9 - OPEN CHANNELS

9.1 General description. The channel improvements at Lisle, Whitney Point Village, and Oxford consist of channel realignment and clearing. The capacities of the streams have thus been increased permitting larger flows without the accompanying damages. The Tioughnioga and Chenango Rivers, in general, have relatively steep slopes, and channels will not be difficult to maintain since the tendency is for them to be self clearing.

a. Lisle. Protection against flood flows in Tioughnioga River and Dudley Creek is provided. The channel improvement consists of realining and deepening approximately 5,700 feet of Tioughnioga River channel at the village thereby increasing its capacity from about 8,000 to 12,000 cubic feet per second. Materials excavated from the channel were placed along the right bank of the river to provide a base for the Tioughnioga River levee. Along Dudley Creek 8,000 feet of channel was relocated along the bottom of the hillside at the northern limits of the village, extending from 1,200 feet west of the intersection of Cortland and Main Streets to the confluence with the Tioughnioga River.

b. Whitney Point Village. The Tioughnioga and Otselic Rivers meet at the village of Whitney Point. Completion of Whitney Point Dam on the Otselic River about one mile upstream from the village has eliminated that stream as a potential source of damage. Above the confluence of the two streams, 1,800 feet of the Tioughnioga River channel was realined, the relocated portion having a final bottom width of 230 feet. All of the suitable material removed in the channel excavation was used as levee embankment.

c. Oxford. The Chenango River is the major stream passing through the village of Oxford. Improvement of the river channel provided for the removal of a mill dam and island and clearing and grading the channel commencing just downstream from the Main Street Bridge and extending downstream about 870 feet. The excavated materials derived from channel excavation and dam demolition were used to fill the scoured section of the channel below the dam. The right bank of the channel was rippedraped for 100 feet below the Main Street Bridge. The improvement increases the channel capacity through the village from about 6,000 to 10,000 cubic feet per second. The levee will protect the portion of the village along the left bank from direct flows up to 30,000 c.f.s., but it will not prevent inundation by backwater from below the levee, which begins at discharges in excess of 20,000 c.f.s. for the area above Main Street. No protection is provided from floods on Clark Brook, a small stream which empties into the Chenango River from the right, just upstream from the Main Street Bridge.

9.2 Maintenance. Paragraph (g) of the Regulations (exhibit A) provides for periodic inspections of improved channels to assure that the channel is clear of debris, wild growth, shoals, or encroachments. A checklist (exhibit I) should be used for recording the inspections. Whenever it becomes necessary to clear the river banks and channels of regrowth of trees and brush that were removed as part of the local protection project, such subsequent clearing is part of

maintenance required by the Regulations. In addition to the examination of portions of the channel and drainage ditches improved by the Corps of Engineers the inspections should be extended to other portions of the river, creeks, and drainage ditches, as serious flooding could result from obstructions elsewhere in these channels. Paragraph (g) (ii) of the Regulations (exhibit A) provides for inspections to assure that the channel is not being restricted by the deposition of waste materials, building of unauthorized structures, or other encroachments. No deposits should be made or structures built channelward of walls or levees, or otherwise placed in the channel, without prior authority of the Corps of Engineers, and in no event will any deposition or building be authorized that may restrict the channel.

9.3 Operation. Paragraph (g) (2) of the Regulations (exhibit A) provides for patrolling the channels during periods of high water. Particular attention should be given to the collection of drift material at bridges and culverts.

## CHAPTER 10 - MISCELLANEOUS FACILITIES

10.1 Maintenance. Miscellaneous structures and facilities constructed as a part of the protective works and other structures and facilities which function as a part of, or affect the efficient functioning of the protective works, regardless of whether provided by the Federal flood protection project or otherwise, shall be periodically inspected by the superintendent and appropriate measures taken. Paragraph (h) (1) of the Regulations provides that damaged or unserviceable parts shall be repaired or replaced without delay. It also provides that areas used for ponding in connection with temporary storage of interior runoff during flood periods shall not be allowed to become filled with silt, debris, or dumped material, or otherwise obstructed or occupied in a manner that would reduce their capacity and effectiveness. Ponding areas are, in part, outside the project right-of-way. These areas and their functions are indicated in chapter 7. The potential damages consequent to a reduction of ponding capacity should be brought to the attention of all concerned, and adequate measures should be taken to preserve their full effectiveness. The superintendent shall take proper steps to prevent restriction of bridge openings to maintain channel capacities during high river flows.

10.2 Operation. Miscellaneous facilities shall be operated to prevent or reduce flooding during periods of high water. Those facilities constructed as part of the protective works shall not be used for purposes other than flood protection without approval of the District Engineer, Corps of Engineers, Baltimore District.

## CHAPTER 11 - HIGH WATER MAINTENANCE AND OPERATION

11.1 Scope. This section of the manual is supplementary in nature and intended as an outline of standard practices that have been developed during years of experience with the various problems that arise during periods of flood stages. The remarks are primarily concerned with the levee portions of the flood-protection system. Reference is made to the applicable sections of the manual for details concerning high-water operations of other features of the protection.

11.2 General. While the streams of this region are characterized by a comparatively quick rise and a peak flow of short duration, which mitigates the dangers from seepage and sand boils, a rapid rise leaves little time to make emergency repairs. Effective flood fighting under these circumstances can be carried on only if there is a well organized and trained crew together with an ample supply of suitable materials immediately available. Confidence of the protected persons and firms is a valuable asset that should not be carelessly lost through inefficient operation of the protection system in time of emergency. It is possible that dangerous conditions may arise which are not covered by these instructions. It is not the intent to restrict the superintendent, or others concerned, to a rigid set of rules. Difficult conditions can be met by the methods suggested here, together with independent initiative and action using sound engineering principles. In cases where the superintendent is in doubt as to the procedure to be taken, he will be expected to consult the District Engineer, Baltimore District, Corps of Engineers, P.O. Box 1715, Baltimore, Maryland 21203 (Telephone: 301-962-4545). In connection with flood fighting, attention is invited to the manual titled: "Baltimore District Natural Disaster Assistance, Supplements A and B," which is prepared by the Baltimore District, Corps of Engineers. This manual outlines the function to be performed by the Corps of Engineers during floods. The functions of organizations other than the Corps of Engineers, such as the National Weather Service, Coast Guard, Red Cross, military organizations and local agencies concerned with activities during floods, are also described and channels of liaison between the Corps and these agencies defined.

11.3 Earthwork. Well constructed levees of proper cross section should, if properly maintained and not overtopped, hold throughout any major flood. A break may result in serious damage if not actual loss of life. Unfavorable foundation conditions may result in sand boils or settlement of a levee. Wave wash, inherent to a wide stretch of open water, is not expected to be a major problem in this area; however, it may be serious if it should occur, particularly if permitted to continue over an extended period. For methods of combating wave wash refer to plates 7, 8, and 9. High velocity in a stream may cause erosion of embankments tending to promote slides or cave-in of banks. Such threatened failures can be successfully met with prompt action and proper methods of treatment, such as are suggested in the following paragraphs.

11.4 Preliminary work. Upon receipt of information that high water is imminent, the superintendent should immediately mobilize the skeleton force of key personnel which has previously been formed as outlined in paragraph 4.3.

Following this, reserve labor forces should be alerted for call on emergency work. As his initial activity, each sector foreman should make an immediate inspection of his assigned section to ascertain the following:

- a. Condition of all drainage gates.
- b. Condition of levees and floodwalls including recent repairs.
- c. Location of any encroachment on right-of-way interfering with access and efficient operation.
- d. Transportation facilities, including trucks available, and possible detours.
- e. Material supply: Items necessary for closure and emergency repairs; quantity, locations, and conditions.
- f. Communications: Convenient telephones available at any hour; also police and radio systems.
- g. Location of relief organizations.

11.5 Operation of drainage structures. After the initial inspection, or in connection therewith, each sector foreman should be assigned sufficient laborers to repair and see that all gates are properly seated before they are covered with flood waters. The importance of this step cannot be overemphasized. Once the gates are submerged, proper servicing becomes difficult, if not impossible. Sector foremen should be furnished copies of checksheets, so that no gates are overlooked.

11.6 Precautionary measures. After determination that all gates are either securely closed or known to be operating in a satisfactory manner, or concurrently with making such determination, attention should be given to the following additional items wherever applicable and the necessary work performed without delay:

- a. Fill with compacted material any holes or washes found in the levee.
- b. Repair gaps where road crossings have worn down the levee crown or where the levee is below grade for any other reason. The use of sandbags is preferable to loose material during an emergency.
- c. Obtain necessary tools and materials (sand, sandbags, brush, lumber, lights, etc.) and distribute and store the same at points where active maintenance is anticipated.
- d. Investigate all drainage ditches and storm sewer inlets on the landside of the levee and open these drains when obstructions exist.

11.7 Patrol. After preliminary work is completed, continuous patrol should be

established, if not previously done, and maintained during the flood period to locate:

- a. Possible sand boils or unusual wetness of the landward slope of levees.
- b. Indications of embankment slides or sloughs.
- c. Possible wave wash or scouring.
- d. Low reaches of levees that may be overtopped and that were not detected and repaired as described in paragraph 11.6 above.
- e. Leakage through or at drainage gates or along culvert and sewer pipes.
- f. Any condition or encroachment that might endanger levees, walls, or drainage structures.

11.8 Drainage of slopes. Should seepage through the levee embankment occur, its effects can be minimized by cutting seep drains at locations where the seepage appears. The drains should be V-shaped, as shallow as possible, and never more than 6 inches deep. Care must be taken not to cut the sod unnecessarily. Drains should be cut straight down, and not lengthwise along the levee slope. Seepage should be diverted from landside toe of the levee by ditching to the main drainage ditch or nearest storm drainage facility. Locations where it has been necessary to cut these drains should be kept under observation for this seepage may be indicative of an incipient slide or slough. If the seepage increases and is carrying particles of earth with it, and if longitudinal cracks form in the slopes a settlement or slide may be imminent. When such conditions appear, the treatment in paragraph 11.9 should be applied.

11.9 Sloughs. Should any slough develop in the levees, all soft areas should be thoroughly drained as described in paragraph 11.8 after which a single layer of willow brush, or any small trees or limbs, should be laid on the slope with the butts up and tops down, and weighted with sacks. In lieu of brush, a layer of picket snow fence topped with a mat of sandbags may be used. Care should be taken not to obstruct the small drainage ditches. This type of treatment is indicated on plate 6. If the slope begins to slough down, a buttress of sacks should be built on the toe extending part way up the slope. No sacks or weight other than that necessary to hold the brush in place should be placed higher than two-thirds of the way from the toe of the slope to the place where the sloughing has occurred.

11.10 Scours. A careful observation should be made of the riverside of the levee at all localities where a current of more than two feet per second is observed. Trouble may be expected at road-crossing ramps and places where pipes, sewers, and other structures penetrate the levee. If any sign of scour is observed, soundings should be taken to observe the extent and progress of the scour. The approved method of checking scour is to construct deflection dikes, using brush, treetops, or lumber, driving stakes and wiring together, and filling in between with brush and filled sacks of stone. Plate 10 shows the

method of constructing deflection dikes.

11.11 Topping. Consideration should be given to the possibilities of water overtopping the levee, especially at any point where the levee might have a tendency to settle due to a poor foundation conditions. The emergency topping may be done (a) by sacked earth, (b) with lumber and sacked earth, (c) with mud boxes, or (d) by cutting back of crown and raising front crown.

a. Sack topping. If lumber is not available, a sack topping, (plate 11) may be used to raise the crown of the levee as much as three feet. The sacks should be laid lengthwise along the levee for the first layer, crosswise for the second layer, and so on. Sacks should be lapped at least 1/3 of their length and well mauled or tamped in place. When properly sacked and tamped one sack will give about three to four inches of topping. If gravel is available, it should be used for the front facing so as to avoid washing out.

b. Lumber and sacked earth topping. This is the most commonly used method of raising low reaches in emergencies. Stakes 2 x 4 inches or 2 x 6 inches should be driven on the streamside and the crown 6 feet apart, and 1-inch boards should then be nailed to the landside of the streamside stakes. This wall, backed with a single tier of sacks will hold out at least 1 foot of water. If a second foot is necessary, the layers of sacks will have to be increased in number and reinforced. See plate 12 for details of this method of construction. In some instances, it may be practicable to backup the sheathing with tamped earth obtained in lieu of the sacks shown on the drawing.

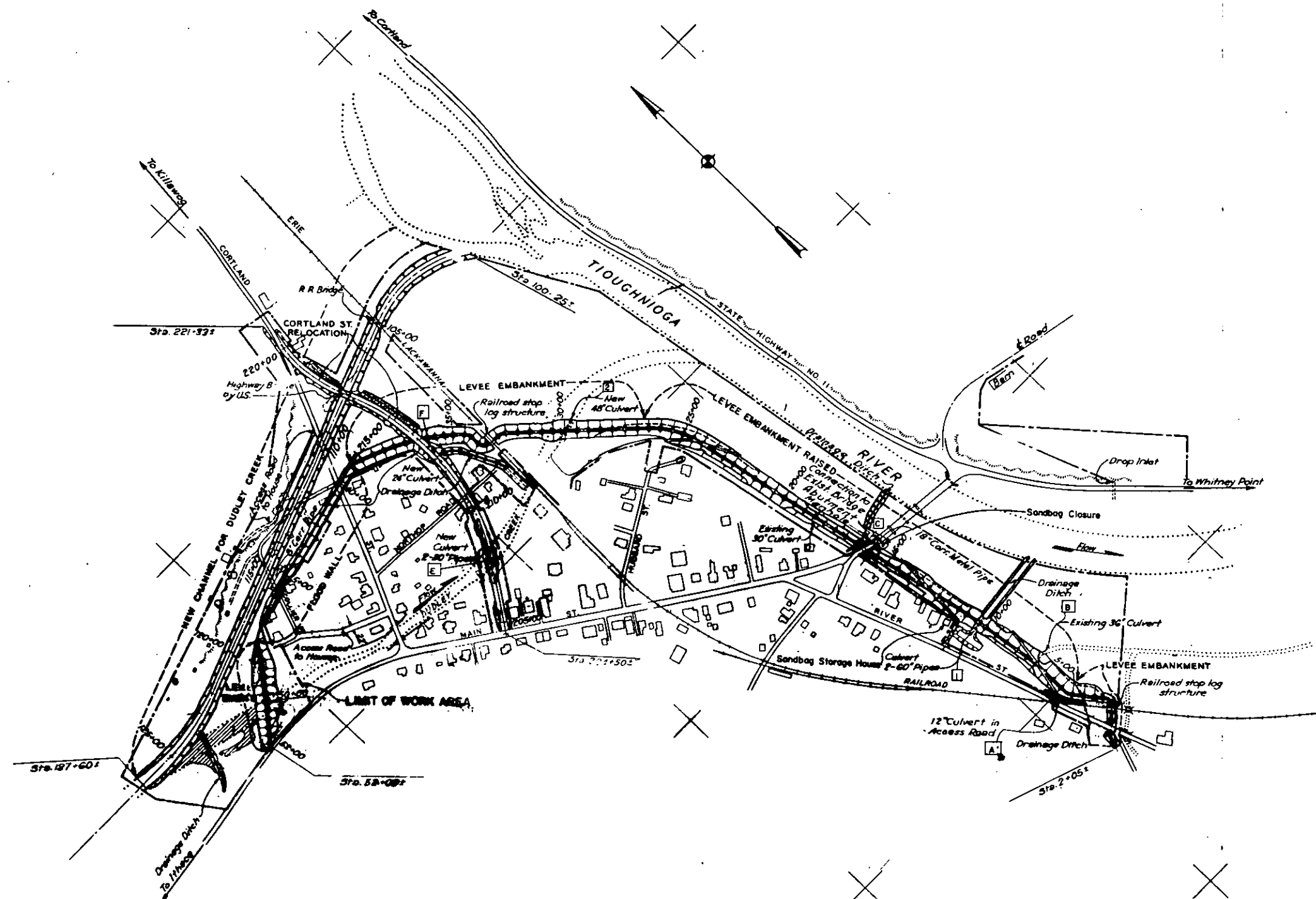
c. Mud box. A standard double bulkhead mud box is shown on plate 13. The size of box is controlled by the conditions under which the box will function, available materials, method of placing the dirt, and time element.

d. Cut crown topping. This form of work should never be resorted to except as a final alternative when filled sacks and lumber cannot be secured.

11.12 Sand boils. Even with proper levee construction, it is possible for water to seep through a pervious stratum under the levee and break through the ground surface back of the levee. These "blowouts" or sand boils are danger spots when discharging solids. An effective way to localize the danger from a sand boil is to build a watertight sandbag ring around it, making the ring sufficiently large to avoid the defective area immediately surrounding the boil. The ring should be of such height that counteracting head is produced which reduces the pressure and velocity of flow below the critical point so that erosion of material ceases. No attempt should be made to completely stop the flow of water as other boils might then occur outside the sandbag ring. If several sand boils occur in an immediate vicinity, a sandbag sublevee should be built around the entire nest of boils, rising to such a height that none of the boils will discharge with enough force to displace sand or silt. It is advisable to carry off the water from the ringed boil through a small spillway by means of a V-shaped trough constructed of two boards or a piece of sheet metal. Discharge should be diverted to the nearest drainage ditch or other facility when practicable. If the water from the boil is clear, there is no

danger of the levee failing by undermining, and such boils do not need to be ringed. Plate 5 shows suggested treatment of sand boils.

PLATES



SOUTHERN NEW YORK FLOOD CONTROL PROJECT  
LISLE, NEW YORK  
TIOUGHNIOGA RIVER - DUDLEY CREEK  
GENERAL PLAN

SHEET 2 OF 2 SHEETS  
SCALE: 1 IN. = 500 FT.

U.S. ENGINEER OFFICE, SYRACUSE DISTRICT SYRACUSE, N.Y. - 4 DEC. 1943

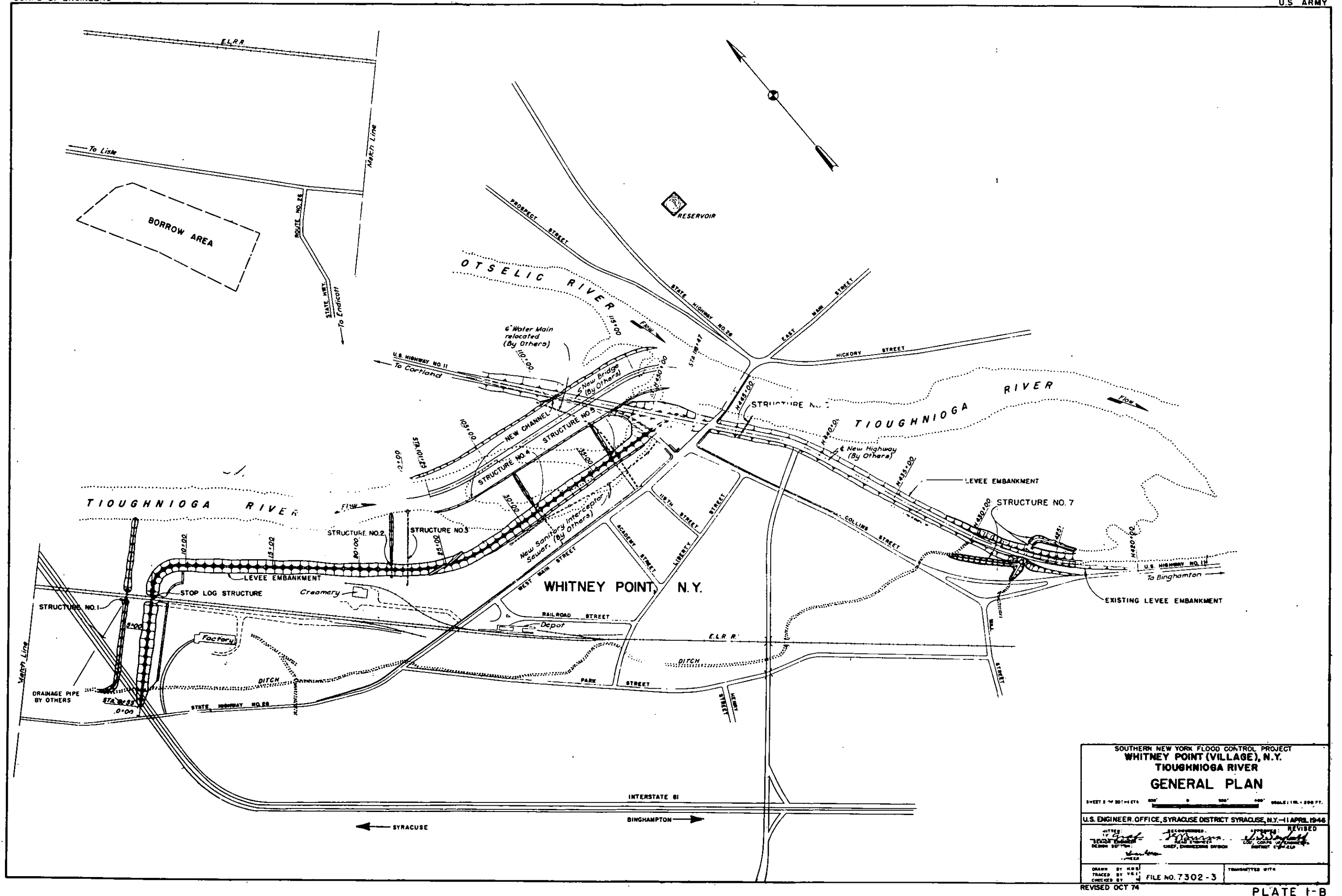
SUBMITTED: *M. D. [Signature]* RECOMMENDED: *[Signature]* APPROVED: *[Signature]*

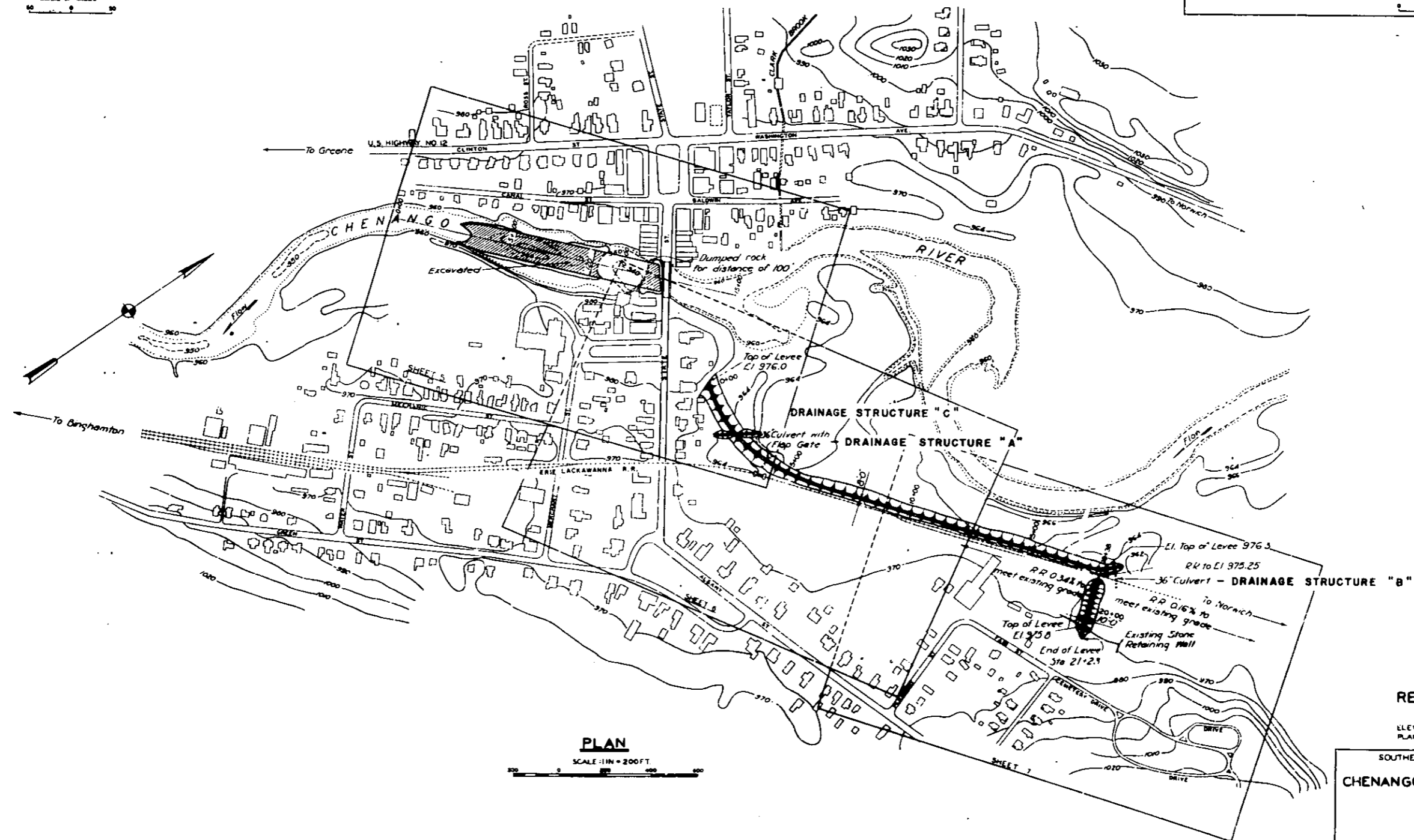
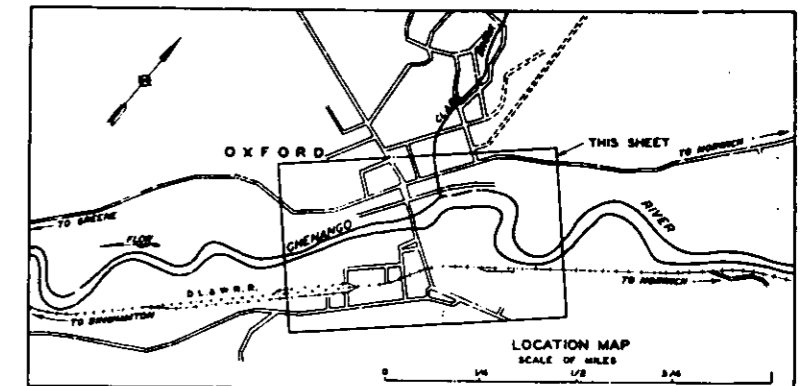
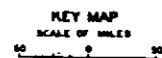
DESIGN SECTION: *[Signature]* CHECKED BY: *[Signature]* DISTRICT ENGINEER: *[Signature]*

REVISIONS: *[Signature]* CHECKED BY: *[Signature]*

FILE NO. 6202-11  
PLATE 1-A

REVISED OCT 74





RECORD DRAWING

ELEVATIONS ARE IN FEET AND REFER TO THE  
PLANE OF MEAN SEA LEVEL AT SANDY HOOK, N.J.

SOUTHERN NEW YORK FLOOD CONTROL PROJECT

CHENANGO RIVER CHANNEL IMPROVEMENT  
OXFORD, NEW YORK

## GENERAL PLAN

SWEET : OF 2 SWEETS

SCALES AS SHOWN

U S ENGINEER OFFICE, BINGHAMTON DISTRICT, BINGHAMTON, N Y. JULY 30, 1938

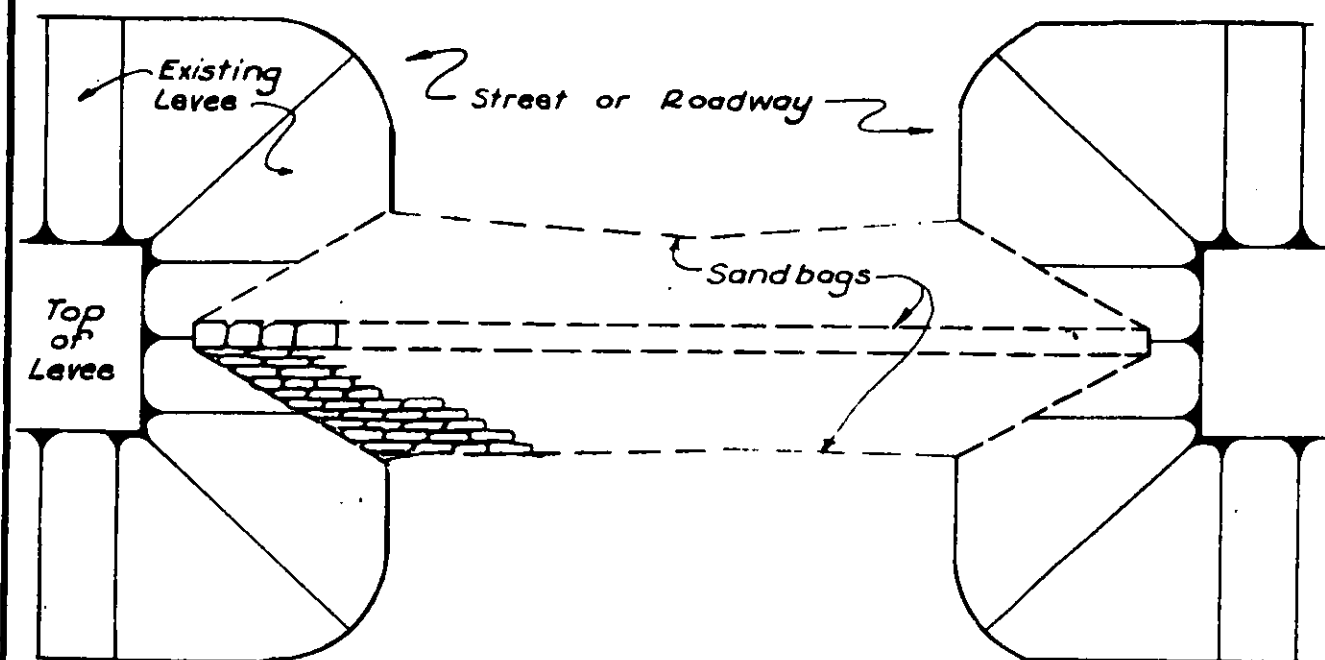
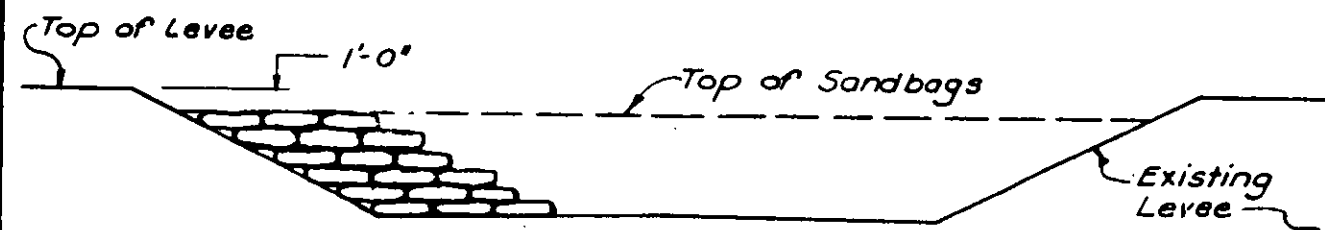
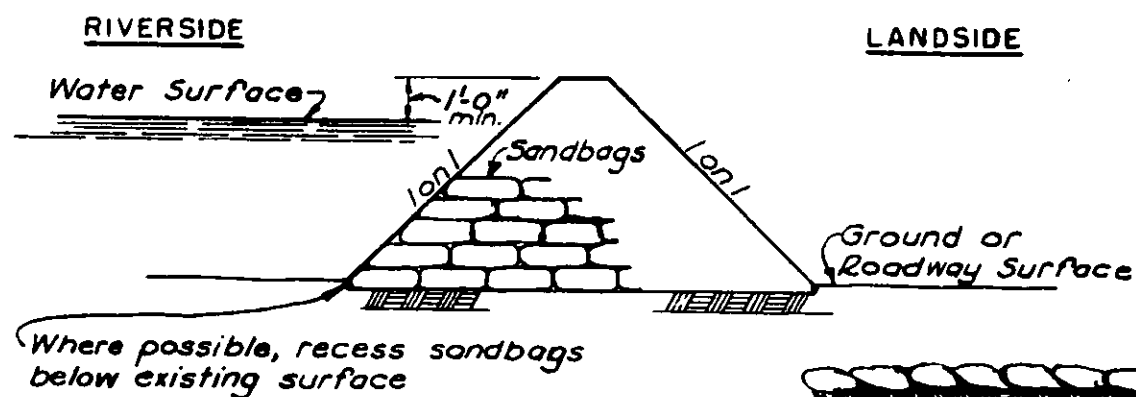
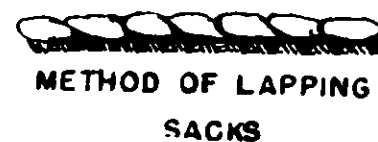
U.S. ENGINEER OFFICE, BRUSHINGTON DISTRICT, BRUSHINGTON, N.Y. JULY 30, 1936

SUBMITTED BY <i>L. T. Bailey</i> SENIOR ENGINEER	RECOMMENDED <i>Wm. C. P. Jones</i> PRINCIPAL ENGINEER	APPROVED <i>W. C. P. Jones</i> CHIEF OF DISTRICT DISTRICT ENGINEER
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DRAWN BY A.E.  
TRACED BY R.E.C.

FILE NO. 8304-1

FILE NO **6304-1**

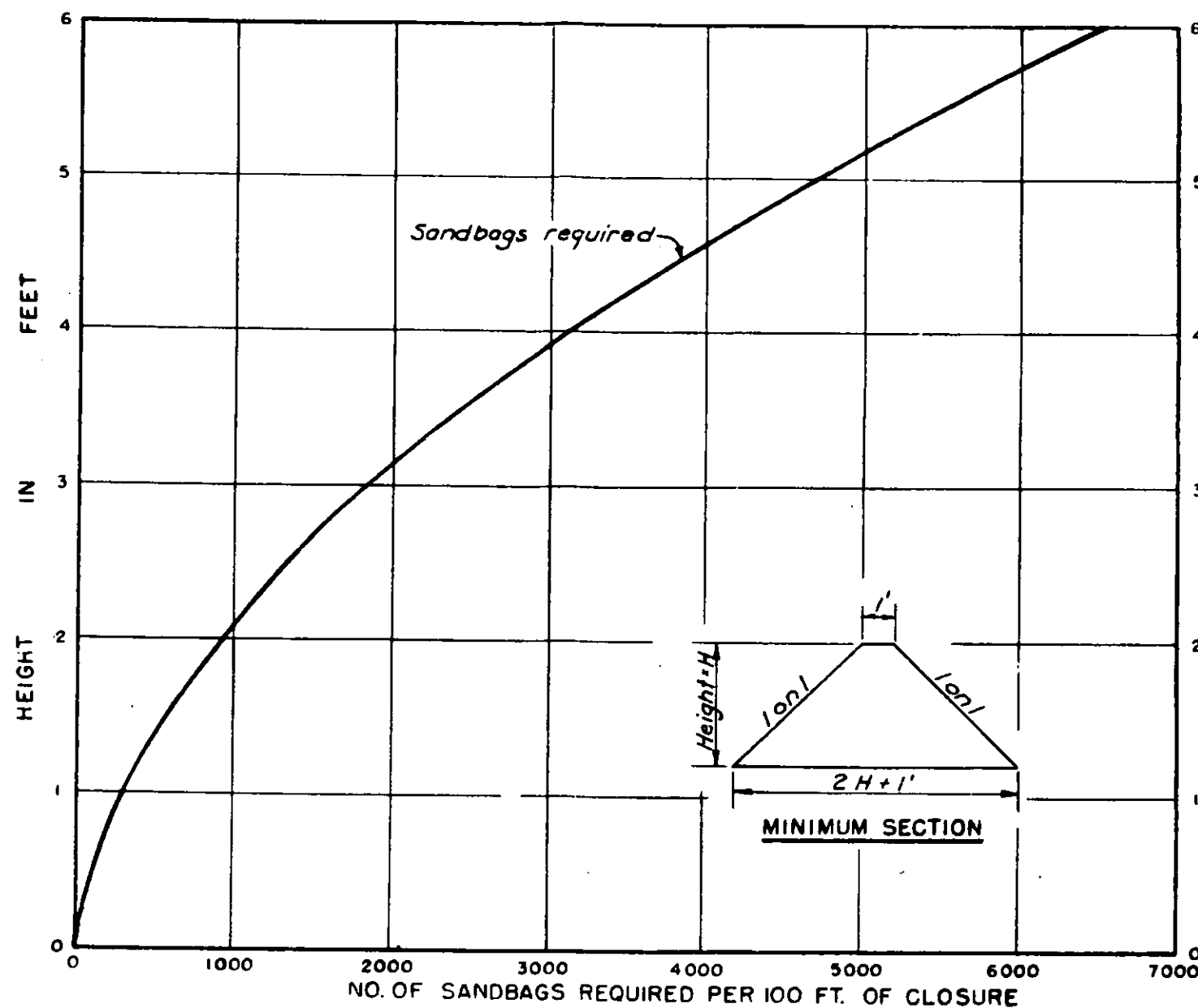
PLANPROFILESECTION

Note:

Bags shall be approximately  $\frac{2}{3}$  full of sand, securely tied and well matted or booted into place. Soil may be substituted for sand if the bags are closely woven.

All courses shall be interlocked and joints staggered. Alternate courses shall be laid transverse to the alignment of the closure.

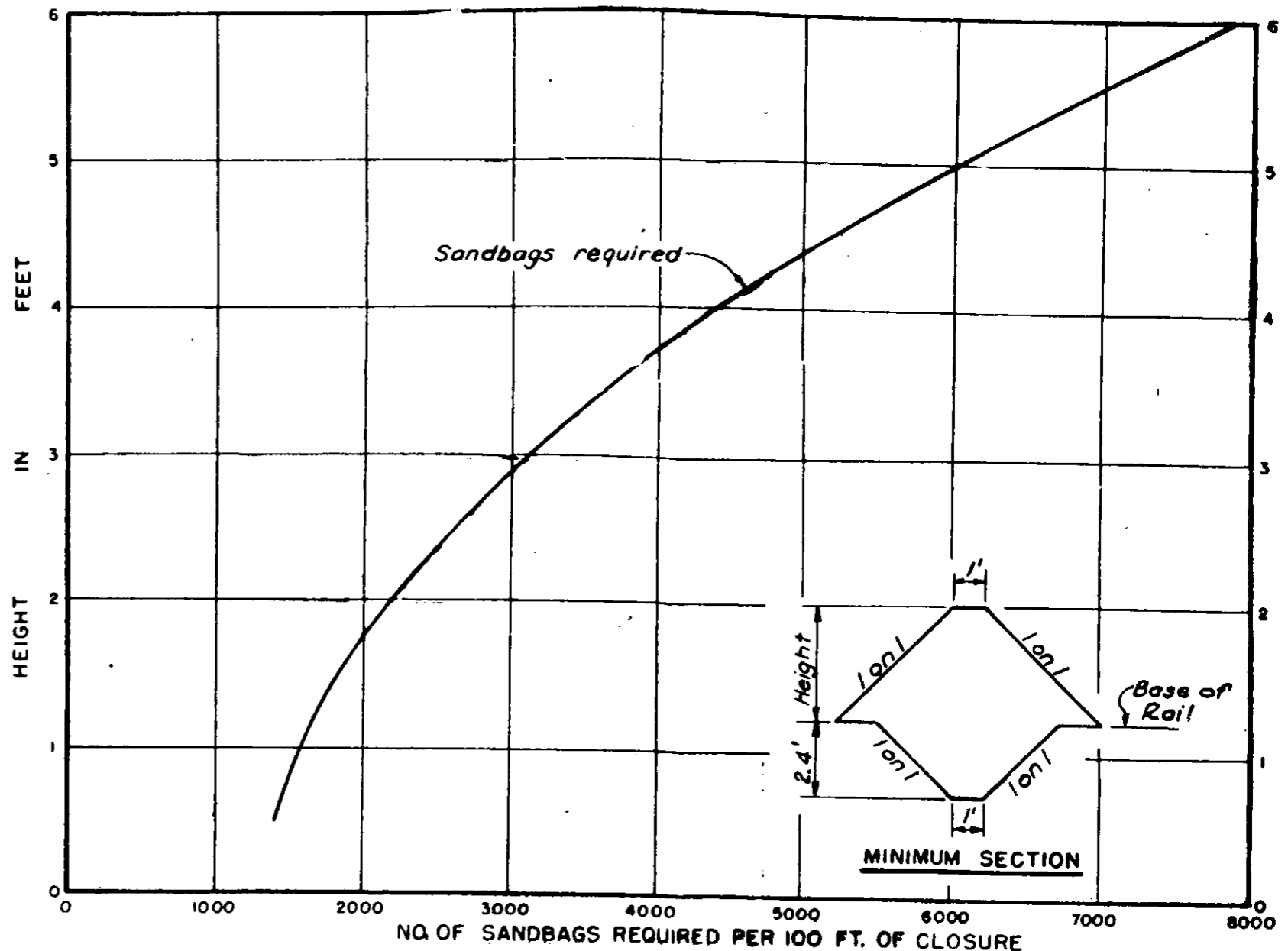
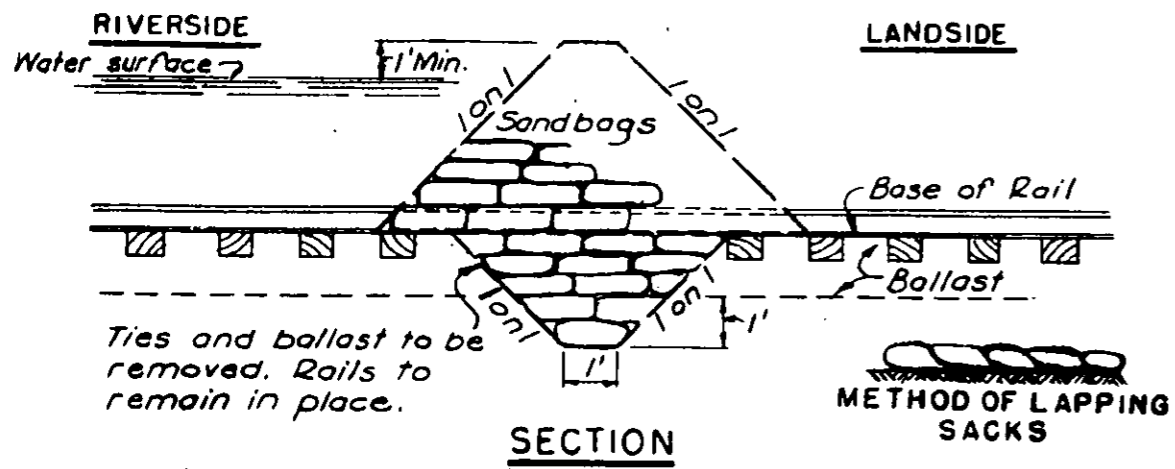
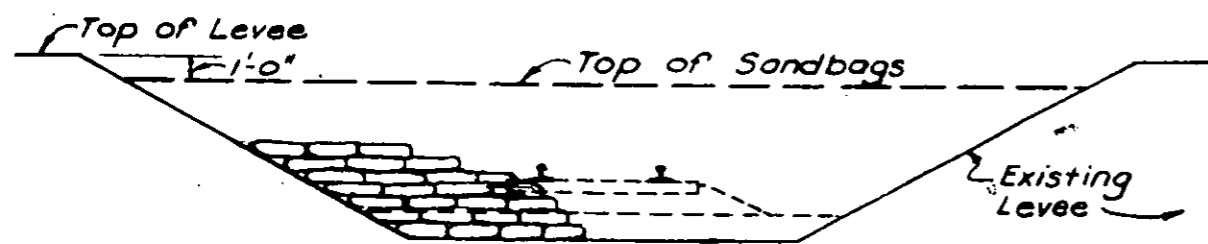
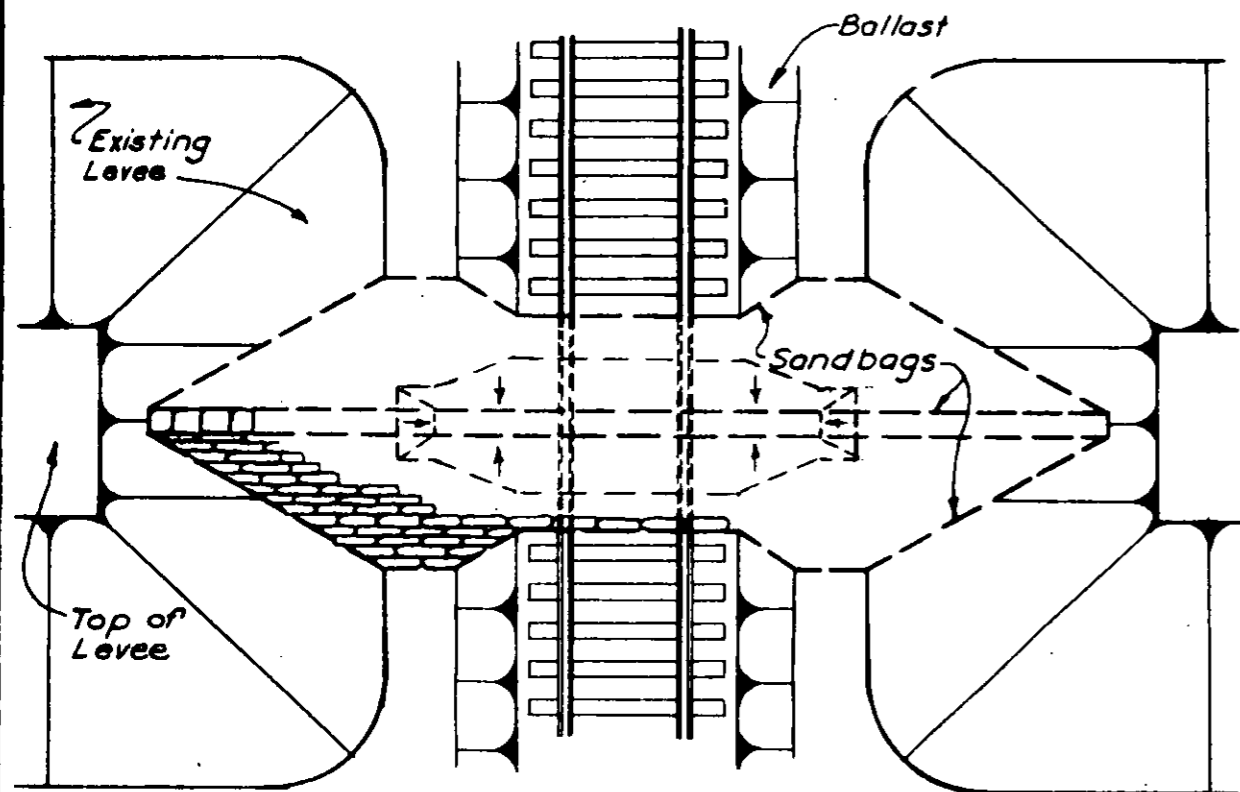
In lieu of tying, bags may be  $\frac{1}{2}$  full and unfilled portion lapped under next sack as shown in "Method of Lapping Sacks".



TYPICAL SANDBAG CLOSURE AT  
STREET OR ROADWAY CROSSINGS

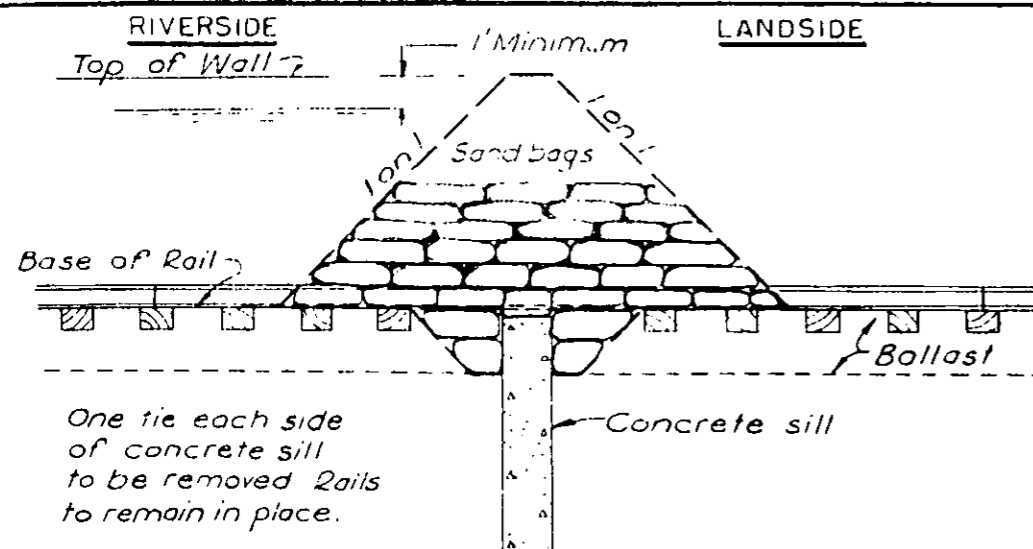
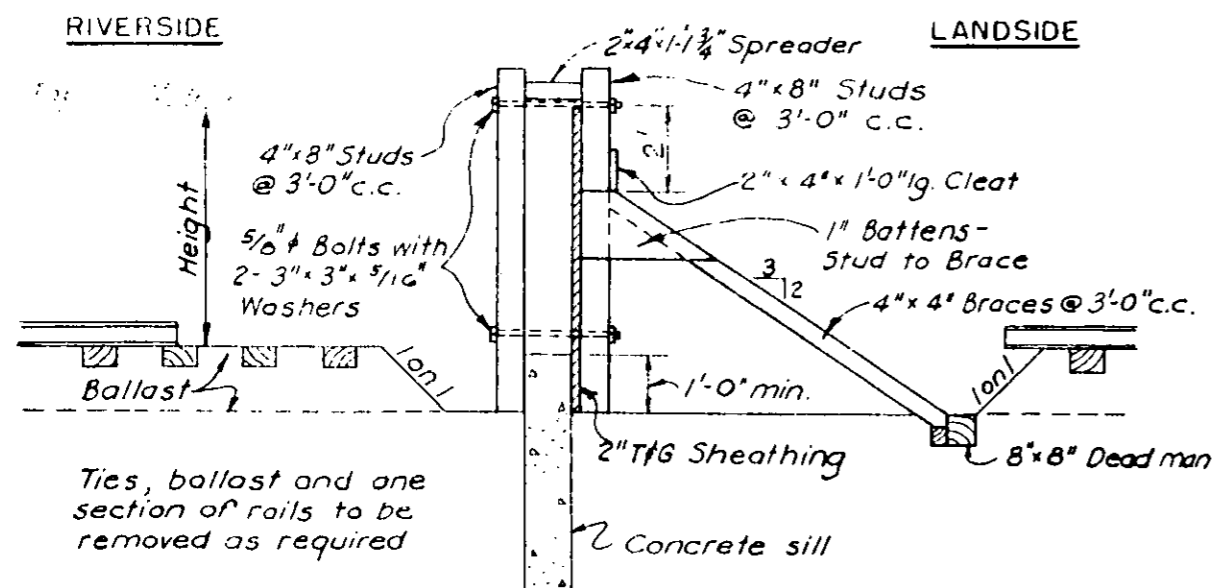
CORPS OF ENGINEERS  
BALTIMORE, MD.

FILE NO. 00-85-1

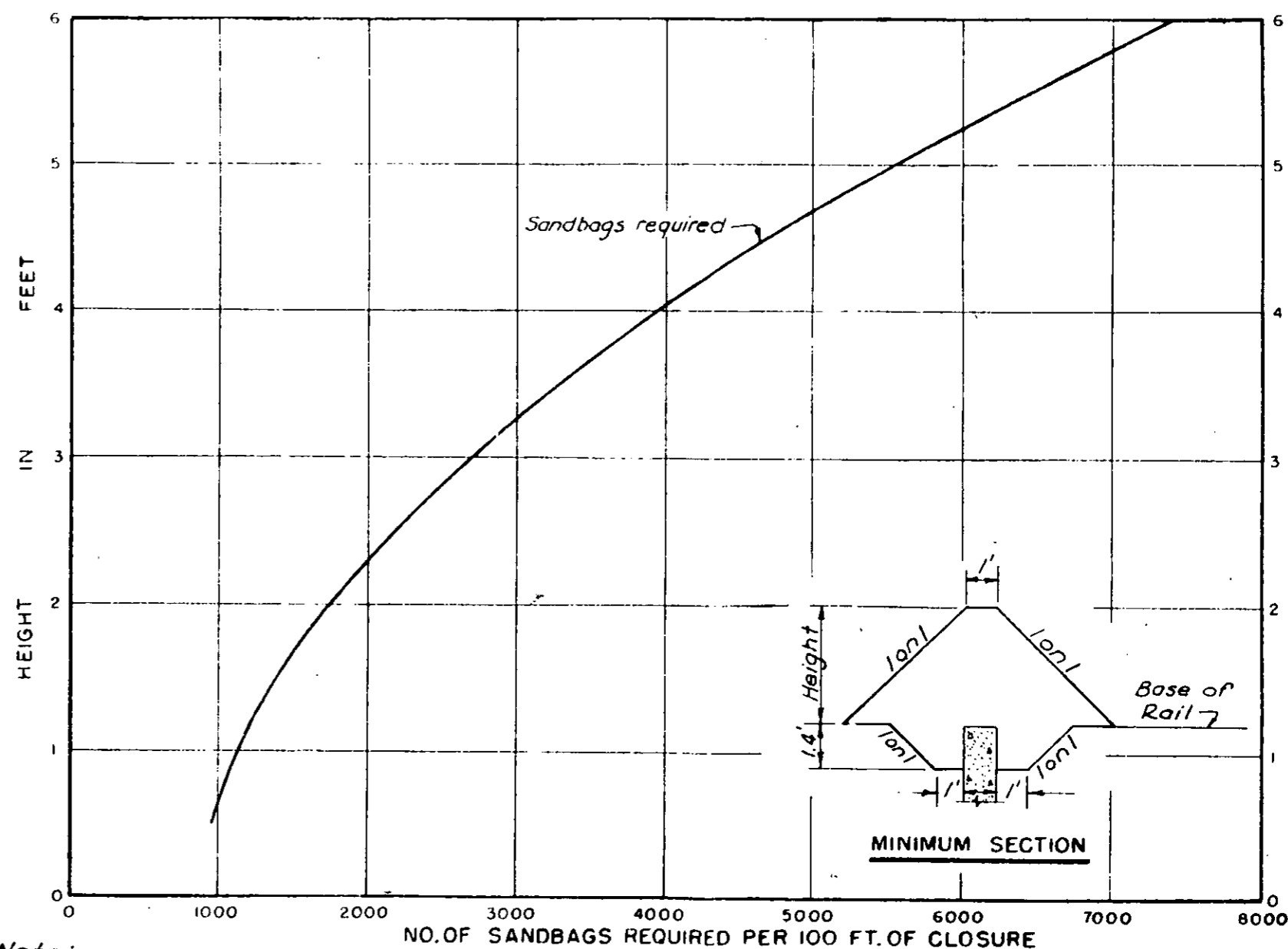


**Note:**  
 Bags shall be approximately  $\frac{2}{3}$  full of sand, securely tied and well matted or booted into place. Soil may be substituted for sand if the bags are closely woven.  
 All courses shall be interlocked and joints staggered. Alternate courses shall be laid transverse to the alignment of the closure.  
 In lieu of tying, bags may be  $\frac{1}{2}$  full and unfilled portion lapped under next sack as shown in "Method of Lapping Sacks"

TYPICAL SANDBAG CLOSURE AT RAILROAD TRACKS WITHOUT SILL  
 CORPS OF ENGINEERS  
 BALTIMORE, MD.  
 FILE NO. 00-85-2

**SANDBAG CLOSURE****TIMBER BULKHEAD CLOSURE**

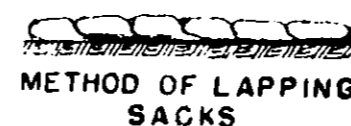
MATERIAL REQUIRED FOR TIMBER BULKHEAD PER 100 FT. OF CLOSURE							
ITEM	UNIT	HEIGHT IN FEET					
		1	2	3	4	5	6
4" x 8" Studs	L.F.	200	270	340	410	480	540
2" Sheathing	S.F.	220	320	420	520	620	720
2" x 4" Spreaders	L.F.	40	40	40	40	40	40
8" x 8" Deadmen	L.F.	—	100	100	100	100	100
4" x 4" Braces	L.F.	—	170	240	270	290	290
2" x 4" Cleats	L.F.	—	—	35	35	35	35
1" x 12" Battens	L.F.	—	—	100	100	100	100
5/8" Bolts, 32" lg.	Each	34	34	68	68	68	68
20d Nails	Lbs.	8	18	22	26	30	34
16d Nails	Lbs.	8	10	14	14	14	14



Note:

Bags shall be approximately  $\frac{2}{3}$  full of sand, securely tied and well matted or booted into place. Soil may be substituted for sand if the bags are closely woven.

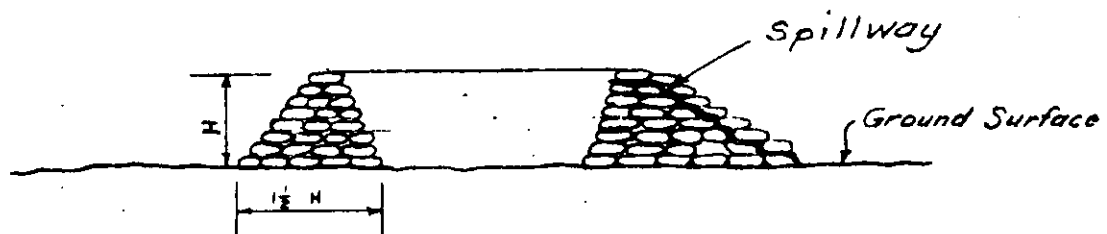
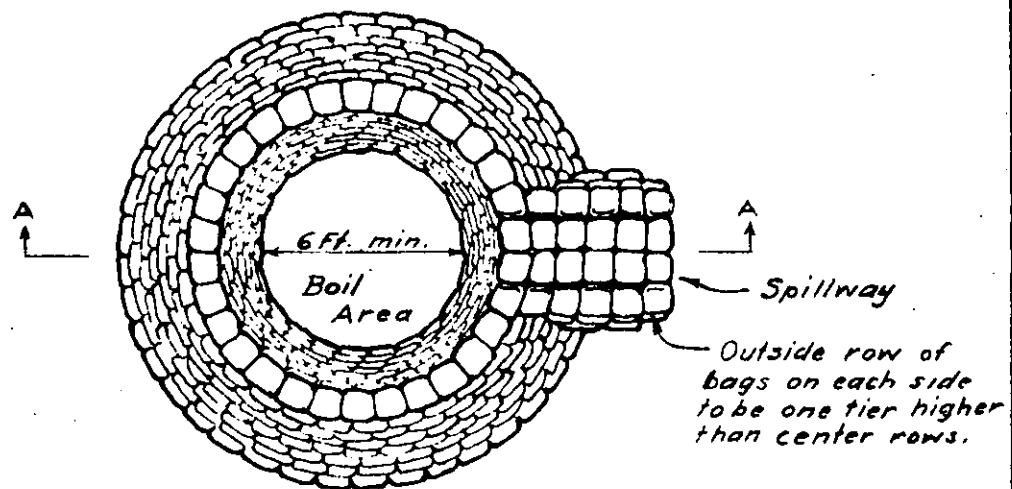
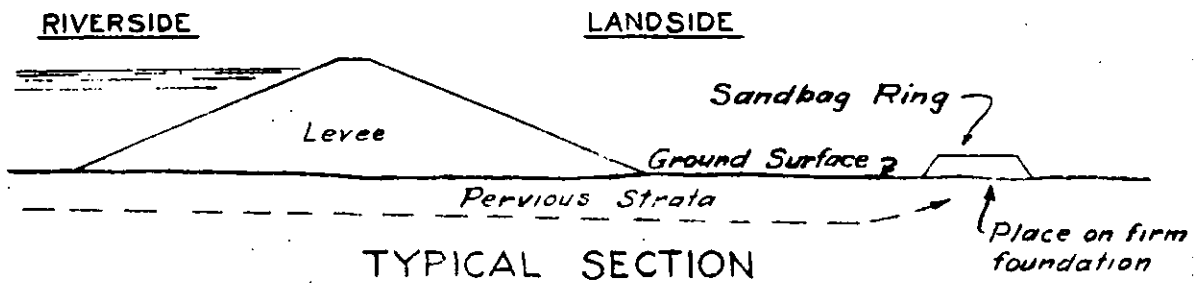
All courses shall be interlocked and joints staggered. Alternate courses shall be laid transverse to the alignment of the closure. In lieu of tying, bags may be  $\frac{1}{2}$  full and unfilled portion lapped under next sack as shown in "Method of Lapping Sacks."

**METHOD OF LAPPING SACKS**

TYPICAL CLOSURES AT  
RAILROAD TRACKS WITH SILL

CORPS OF ENGINEERS  
BALTIMORE, MD.

FILE NO. 00-85-3

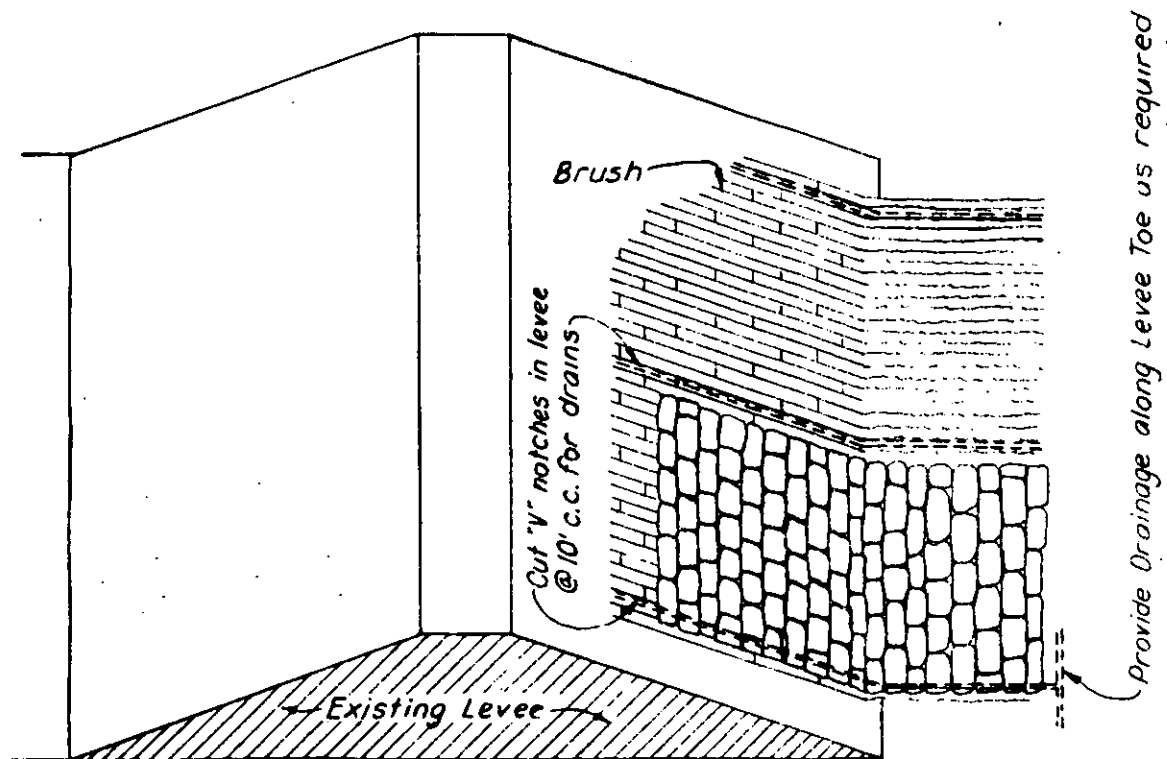
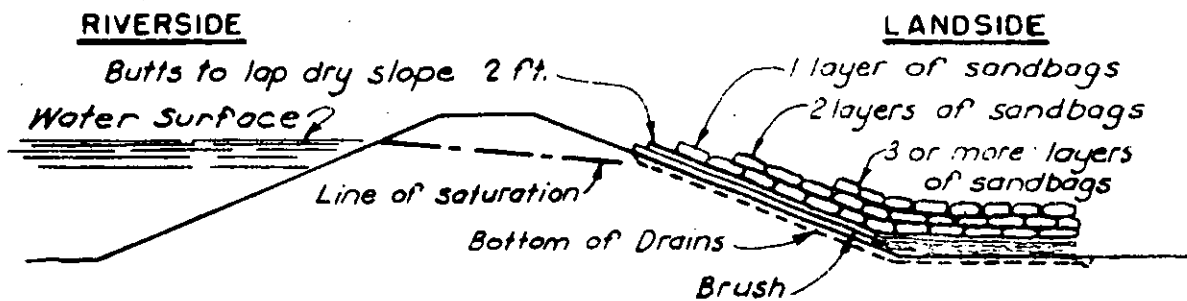
**Note:**

Do not sack boil which does not discharge solids.  
 Height of bag ring to be only sufficient to stop discharge of solids.  
 Do not attempt to completely stop water flow through boil.  
 Preferably use closely woven bags filled with clay or loam.  
 If available, a metal ring such as a culvert pipe or bottomless tank, 6 to 8 ft. in diameter may be used instead of a sandbag ring.

SANDBAG RING  
 FOR SAND BOILS

CORPS OF ENGINEERS  
 BALTIMORE, MD.

FILE NO. 00-84-1

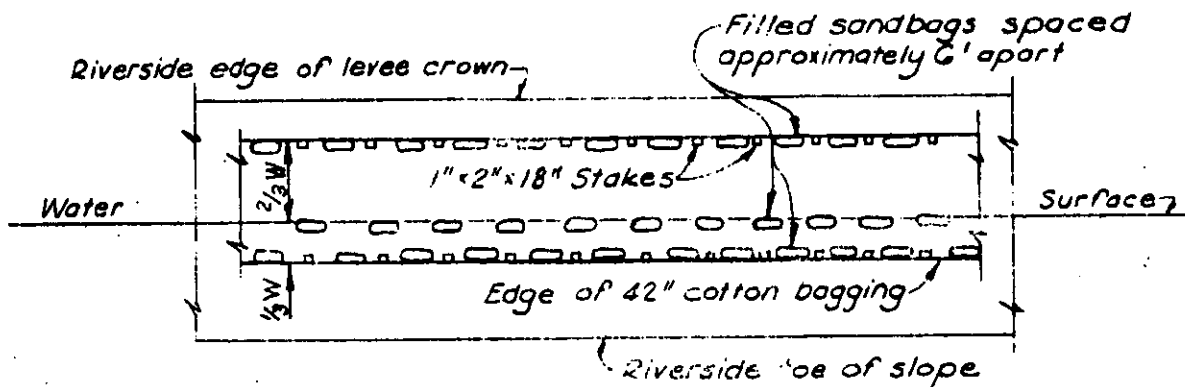
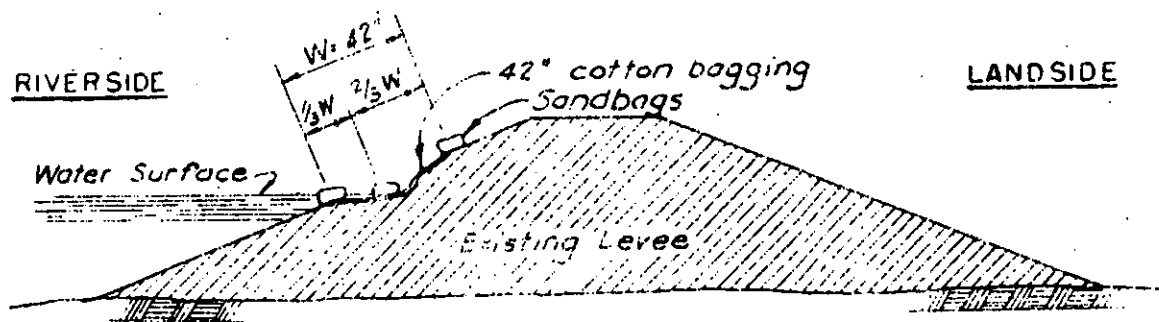
PLANSECTION

Note:  
Picket snow fence can be substituted  
for brush.

TYPICAL TREATMENT OF  
EMBANKMENT SLOUGHS

CORPS OF ENGINEERS  
BALTIMORE, MD.

FILE NO. 00-84-7

PLANSECTIONBILL OF MATERIAL TO CONSTRUCT 100 FT.

One roll regular (jute) cotton bagging 42" x 100'

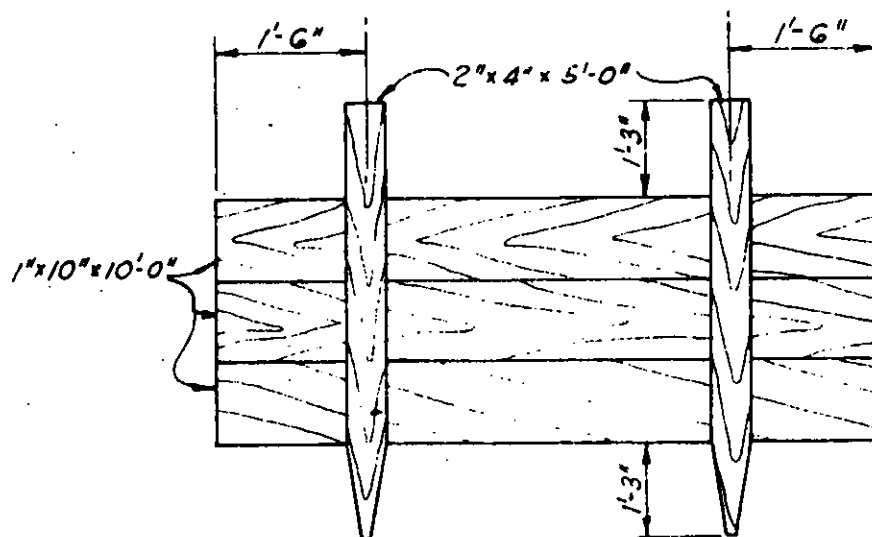
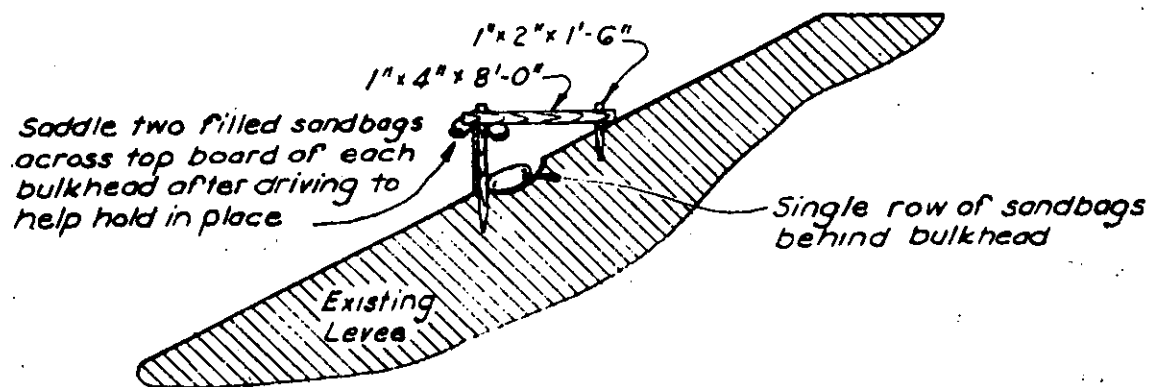
50 - Filled sandbags

35 - Stakes 1" x 2" x 18"

Note: Lay 42" wide cotton bagging longitudinally along riverside slope of levee with approximately  $\frac{2}{3}$  width of bagging laying above water surface. Weight edges and top of bagging along water surface with filled sandbags spaced approximately six feet apart. Drive stakes alternately between filled sandbags located along each edge of bagging. If regular 42" width cotton bagging is not sufficient in width to provide desired protection, two or more widths of bagging may be laced together and layed as desired

WAVE WASH PROTECTION  
COTTON BAGGING

CORPS OF ENGINEERS  
BALTIMORE, MD.

PORTABLE BULKHEADSECTIONBILL OF MATERIAL TO CONSTRUCT 100 FT.Lumber

30 pieces - 1" x 10" x 10'-0"

20 pieces - 2" x 4" x 5'-0"

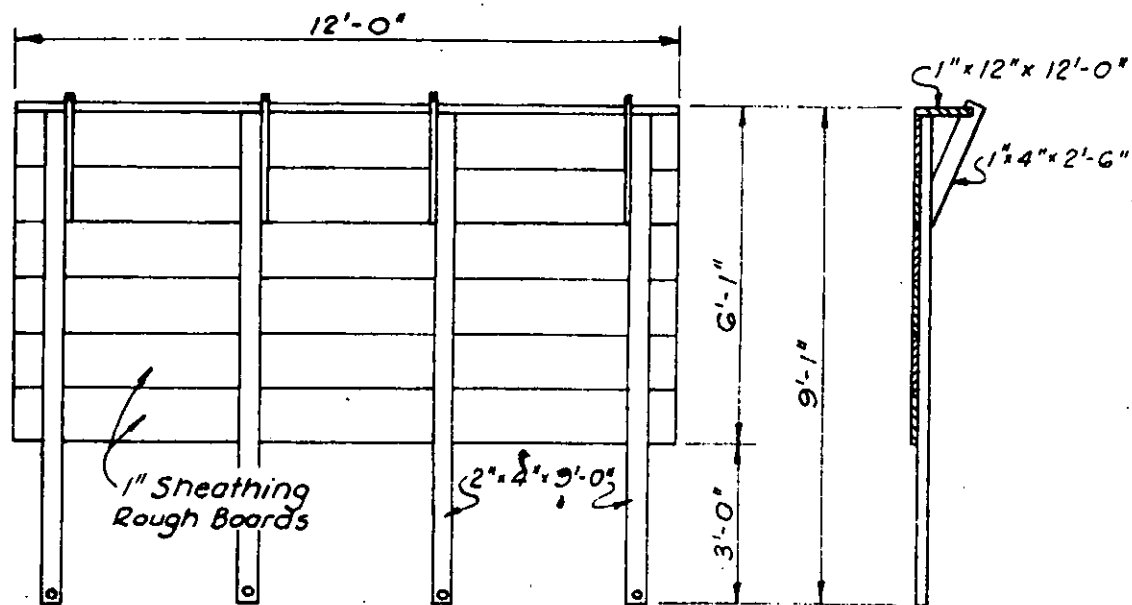
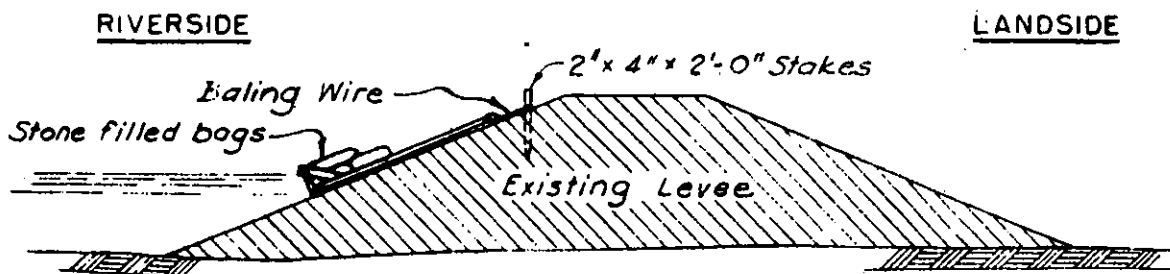
20 pieces - 1" x 4" x 8'-0"

20 pieces - 1" x 2" x 1'-6"

5 lbs. - 10d Nails

120 - Filled Sandbags

WAVE WASH PROTECTION  
TIMBER BULKHEAD  
CORPS OF ENGINEERS  
BALTIMORE, MD.

PLANSECTIONTYPICAL SECTIONBILL OF MATERIAL TO CONSTRUCT 100 FT.Lumber

56 pieces - 1" x 12" x 12'-0"

32 pieces - 2" x 4" x 9'-0"

32 pieces - 1" x 4" x 2'-6"

32 pieces - 2" x 4" x 2'-0"

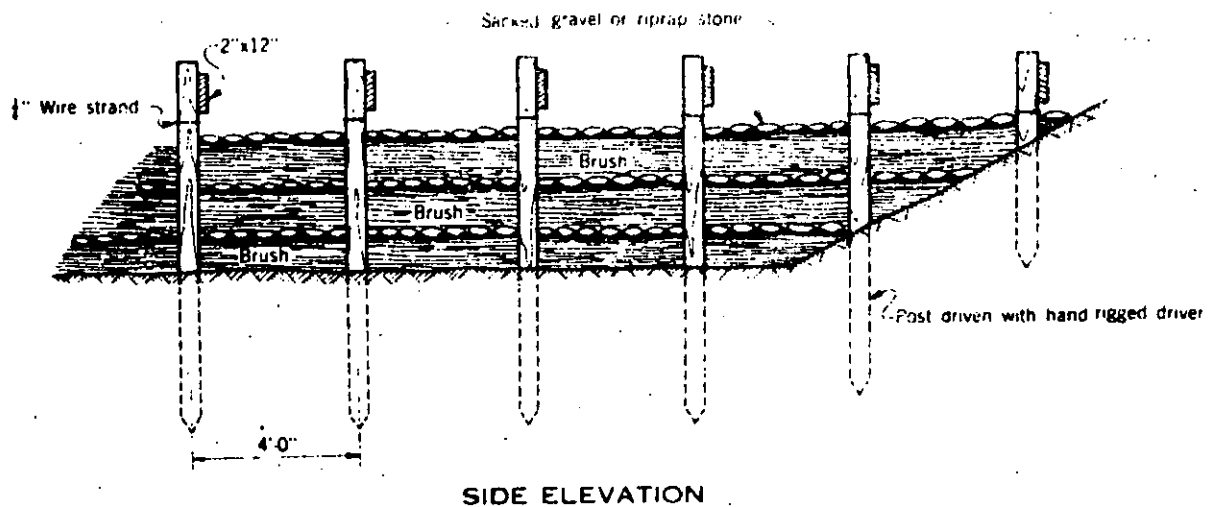
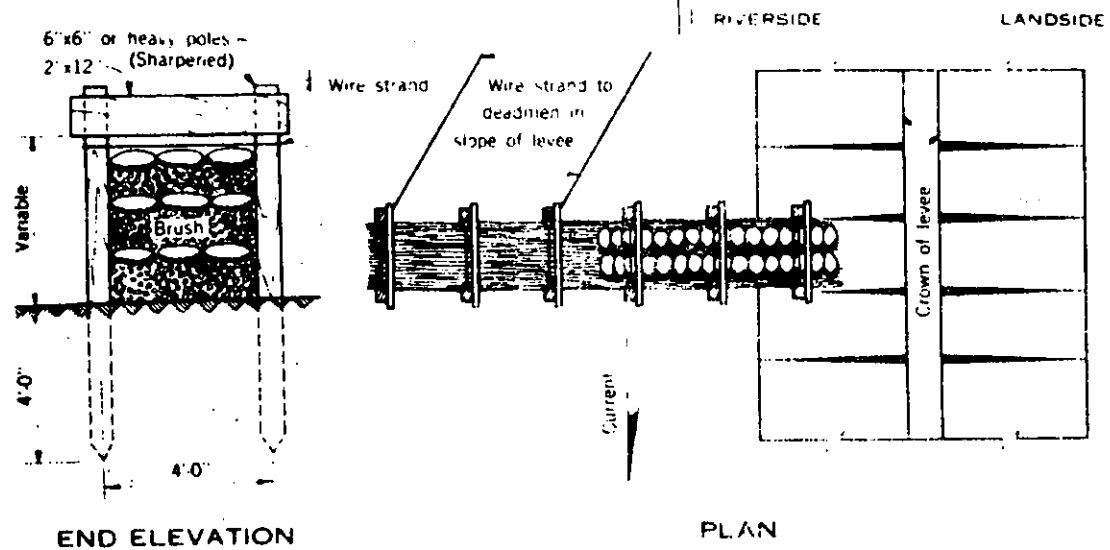
6 lbs. - 8d Nails

5 lbs. - 10d Nails

72 Stone filled bags

WAVE WASH PROTECTION  
MOVABLE TIMBER BULKHEAD

CORPS OF ENGINEERS  
BALTIMORE, MD.



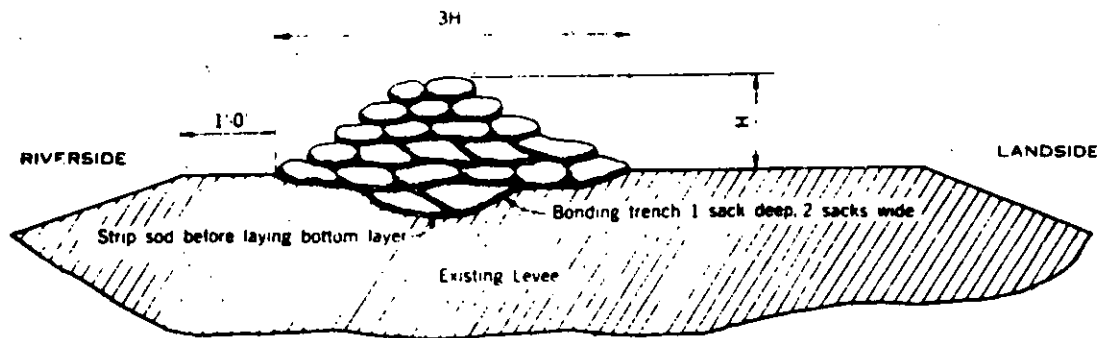
HIGH WATER MAINTENANCE

DEFLECTION DIKE

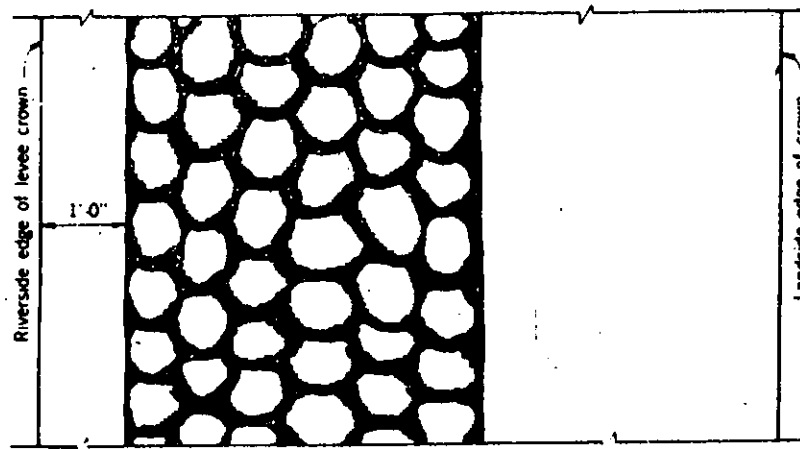
CORPS OF ENGINEERS

BALTIMORE, MARYLAND

FILE NO. 00-84-B



SECTION



PLAN OF BOTTOM LAYER

**Note:**

Alternate direction of sacks with bottom layer lengthwise of levee, next layer crosswise, etc.

Lap unfilled portion under next sack.

Tying or sewing sacks not necessary.

Tamp thoroughly in place.

Bags should be approximately 1/2 full of clay, silt or sand.



METHOD OF LAPPING SACKS

BAGS REQUIRED FOR 100 LINEAR FEET OF LEVEE	
HEIGHT ABOVE LEVEE	BAGS REQUIRED
1 FT.	800
2 FT.	2,000
3 FT.	3,400

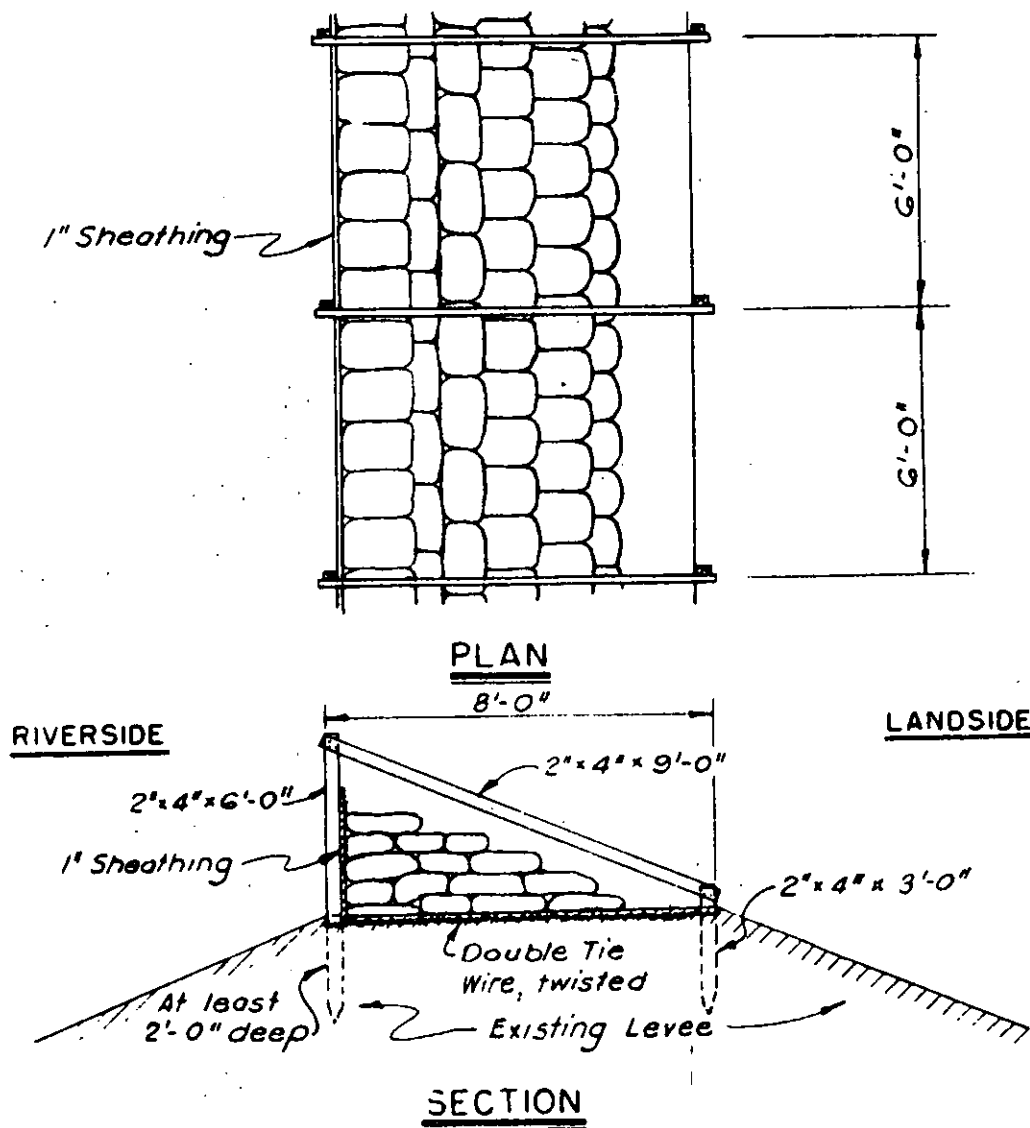
HIGH WATER MAINTENANCE

SACK TOPPING

CORPS OF ENGINEERS

BALTIMORE, MARYLAND

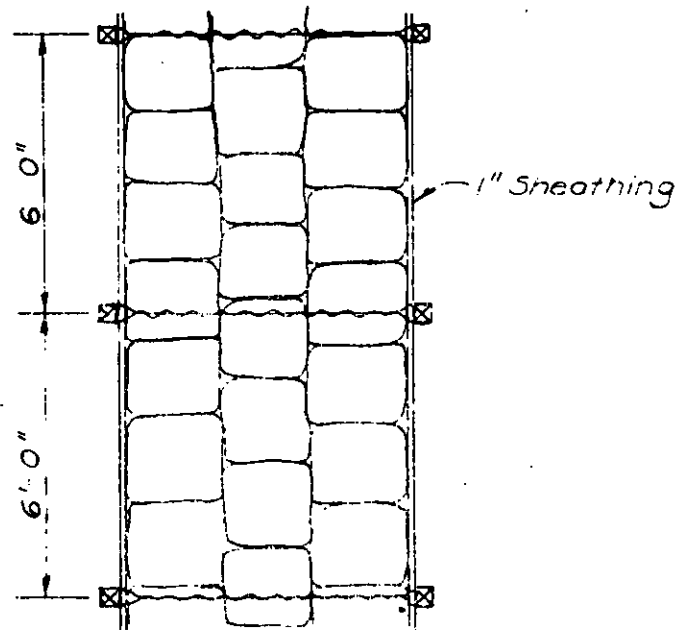
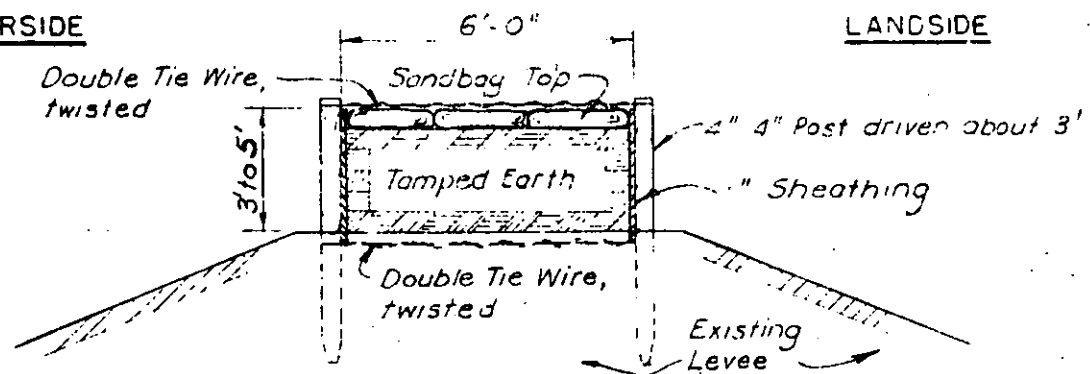
FILE NO. 00-84-9

**BILL OF MATERIAL TO CONSTRUCT 100 FT.****Lumber**

- 300 Sq. Ft. - 1" Sheathing
- 17 Pieces - 2" x 4" x 9'-0"
- 17 Pieces - 2" x 4" x 6'-0"
- 17 Pieces - 2" x 4" x 3'-0"

- 15 lbs. # 12 Gage Wire
- 4 lbs. 10 d Nails
- 4 lbs. 16 d Nails
- 1300 Sandbags

3 FT TIMBER AND  
SANDBAG LEVEE  
CORPS OF ENGINEERS  
BALTIMORE, MD.

PLANRIVERSIDELANDSIDESECTION

BILL OF MATERIAL TO CONSTRUCT 100 FT.					
ITEM	UNIT	HEIGHT			FEET
		3	4	5	
4" x 4" x 6' to 8' Posts	Each	34	34	34	
1" Sheathing	S.F.	600	800	1000	
#12 Gage Wire	Lb.	25	25	25	
10d Nails	Lb.	6	8	10	
Sandbags	Each	400	400	400	
Earth	C.Y.	70	90	110	

Note:

Width may be varied but should not be less than the anticipated height.

3 TO 5-FT. MUD-BOX LEVEE

CORPS OF ENGINEERS  
BALTIMORE, MD.

FILE NO. 00-R4-6

PLATE 13

EXHIBITS

**TITLE 33—NAVIGATION AND  
NAVIGABLE WATERS**

Chap. II—Corps of Engineers,  
Department of the Army

**PART 208—FLOOD CONTROL  
REGULATIONS**

**§ 208.10 Local flood protection works;  
maintenance and operation of struc-  
tures and facilities.**

- (a) (a) *General.* (1) The structures and facilities constructed by the United States for local flood protection shall be continuously maintained in such a manner and operated at such times and for such periods as may be necessary to obtain the maximum benefits.
- (2) The State, political subdivision thereof, or other responsible local agency, which furnished assurance that it will maintain and operate flood control works in accordance with regulations prescribed by the Secretary of the Army, as required by law, shall appoint a permanent committee consisting of or headed by an official hereinafter called the "Superintendent," who shall be responsible for the development and maintenance of, and directly in charge of, an organization responsible for the efficient operation and maintenance of all of the structures and facilities during flood periods and for continuous inspection and maintenance of the project works during periods of low water, all without cost to the United States.
- (3) A reserve supply of materials needed during a flood emergency shall be kept on hand at all times.
- (4) No encroachment or trespass which will adversely affect the efficient operation or maintenance of the project works shall be permitted upon the right-of-way for the protective facilities.
- (5) No improvement shall be passed over, under, or through the walls, levees, improved channels or floodways, nor shall any excavation or construction be permitted within the limits of the project right-of-way, nor shall any change be made in any feature of the works without prior determination by the District Engineer of the Department of the Army or his authorized representative that such improvement, excavation, construction, or alteration will not adversely affect the functioning of the protective facilities. Such improvements or alterations as may be found to be desirable and permissible under the above determination shall be constructed in accordance with standard engineering practice. Advice regarding the effect of proposed improvements or alterations on the functioning of the project and information concerning methods of construction acceptable under standard engineering practice shall be obtained from the District Engineer or, if otherwise obtained, shall be submitted for his approval. Drawings or prints showing such improvements or alterations as finally constructed shall be furnished the District Engineer after completion of the work.
- (6) It shall be the duty of the superintendent to submit a semiannual report to the District Engineer covering inspection, maintenance, and operation of the protective works.
- (7) The District Engineer or his authorized representatives shall have access at all times to all portions of the protective works.

(8) Maintenance measures or repairs which the District Engineer deems necessary shall be promptly taken or made.

(9) Appropriate measures shall be taken by local authorities to insure that the activities of all local organizations operating public or private facilities connected with the protective works are coordinated with those of the Superintendent's organization during flood periods.

(10) The Department of the Army will furnish local interests with an Operation and Maintenance Manual for each completed project, or separate useful part thereof, to assist them in carrying out their obligations under this part.

- (b) (b) *Levees.*—(1) *Maintenance.* The Superintendent shall provide at all times such maintenance as may be required to insure serviceability of the structures in time of flood. Measures shall be taken to promote the growth of sod, exterminate burrowing animals, and to provide for routine mowing of the grass and weeds, removal of wild growth and drift deposits, and repair of damage caused by erosion or other forces. Where practicable, measures shall be taken to retard bank erosion by planting of willows or other suitable growth on areas riverward of the levees. Periodic inspections shall be made by the Superintendent to insure that the above maintenance measures are being effectively carried out and, further, to be certain that:

(i) No unusual settlement, sloughing, or material loss of grade or levee cross section has taken place;

(ii) No caving has occurred on either the land side or the river side of the levee which might affect the stability of the levee section;

(iii) No seepage, saturated areas, or sand boils are occurring;

(iv) Toe drainage systems and pressure relief wells are in good working condition, and that such facilities are not becoming clogged;

(v) Drains through the levees and gates on said drains are in good working condition;

(vi) No revetment work or riprap has been displaced, washed out, or removed;

(vii) No action is being taken, such as burning grass and weeds during inappropriate seasons, which will retard or destroy the growth of sod;

(viii) Access roads to and on the levee are being properly maintained;

(ix) Cattle guards and gates are in good condition;

(x) Crown of levee is shaped so as to drain readily, and roadway thereon, if any, is well shaped and maintained;

(xi) There is no unauthorized grazing or vehicular traffic on the levees;

(xii) Encroachments are not being made on the levee right-of-way which might endanger the structure or hinder its proper and efficient functioning during times of emergency.

Such inspections shall be made immediately prior to the beginning of the flood season; immediately following each major high water period, and otherwise at intervals not exceeding 90 days, and such intermediate times as may be necessary to insure the best possible care of the levee. Immediate steps will be taken to correct dangerous conditions disclosed by such inspections. Regular maintenance repair measures shall be accomplished during the appropriate season as scheduled by the Superintendent.

(2) *Operation.* During flood periods

the levee shall be patrolled continuously to locate possible sand boils or unusual wetness of the landward slope and to be certain that:

(i) There are no indications of slides or sloughs developing;

(ii) Wave wash or scouring action is not occurring;

(iii) No low reaches of levee exist which may be overtopped;

(iv) No other conditions exist which might endanger the structure.

Appropriate advance measures will be taken to insure the availability of adequate labor and materials to meet all contingencies. Immediate steps will be taken to control any condition which endangers the levee and to repair the damaged section.

- (c) (c) *Flood walls.*—(1) *Maintenance.* Periodic inspections shall be made by the Superintendent to be certain that:

(i) No seepage, saturated areas, or sand boils are occurring;

(ii) No undue settlement has occurred which affects the stability of the wall or its water tightness;

(iii) No trees exist, the roots of which might extend under the wall and offer accelerated seepage paths;

(iv) The concrete has not undergone cracking, chipping, or breaking to an extent which might affect the stability of the wall or its water tightness;

(v) There are no encroachments upon the right-of-way which might endanger the structure or hinder its functioning in time of flood;

(vi) Care is being exercised to prevent accumulation of trash and debris adjacent to walls, and to insure that no fires are being built near them;

(vii) No bank caving conditions exist riverward of the wall which might endanger its stability;

(viii) Toe drainage systems and pressure relief wells are in good working condition, and that such facilities are not becoming clogged.

Such inspections shall be made immediately prior to the beginning of the flood season, immediately following each major high water period, and otherwise at intervals not exceeding 90 days. Measures to eliminate encroachments and effect repairs found necessary by such inspections shall be undertaken immediately. All repairs shall be accomplished by methods acceptable in standard engineering practice.

(2) *Operation.* Continuous patrol of the wall shall be maintained during flood periods to locate possible leakage at monolith joints or seepage underneath the wall. Floating plant or boats will not be allowed to lie against or tie up to the wall. Should it become necessary during a flood emergency to pass anchor cables over the wall, adequate measures shall be taken to protect the concrete and construction joints. Immediate steps shall be taken to correct any condition which endangers the stability of the wall.

- (d) (d) *Drainage structures.*—(1) *Maintenance.* Adequate measures shall be taken to insure that inlet and outlet channels are kept open and that trash, drift, or debris is not allowed to accumulate near drainage structures. Flap gates and manually operated gates and valves on drainage structures shall be examined, oiled, and trial operated at least once every 90 days. Where drainage structures are provided with stop log or other

EXHIBIT A-1

Revised  
1 Jan 62

emergency closures, the condition of the equipment and its housing shall be inspected regularly and a trial installation of the emergency closure shall be made at least once each year. Periodic inspections shall be made by the Superintendent to be certain that:

(i) Pipes, gates, operating mechanism, riprap, and headwalls are in good condition;

(ii) Inlet and outlet channels are open;

(iii) Care is being exercised to prevent accumulation of trash and debris near the structures and that no fires are being built near bituminous coated pipes;

(iv) Erosion is not occurring adjacent to the structure which might endanger its water tightness or stability.

Immediate steps will be taken to repair damage, replace missing or broken parts, or remedy adverse conditions disclosed by such inspections.

(2) Operation. Whenever high water conditions impend, all gates will be inspected a short time before water reaches the invert of the pipe and any object which might prevent closure of the gate shall be removed. Automatic gates shall be closely observed until it has been ascertained that they are securely closed. Manually operated gates and valves shall be closed as necessary to prevent inflow of flood water. All drainage structures in levees shall be inspected frequently during floods to ascertain whether seepage is taking place along the lines of their contact with the embankment. Immediate steps shall be taken to correct any adverse condition.

(c) (1) Closure structures—(1) Maintenance. Closure structures for traffic openings shall be inspected by the superintendent every 90 days to be certain that:

(i) No parts are missing;

(ii) Metal parts are adequately covered with paint;

(iii) All movable parts are in satisfactory working order;

(iv) Proper closure can be made promptly when necessary;

(v) Sufficient materials are on hand for the erection of sand bag closures and that the location of such materials will be readily accessible in times of emergency.

Tools and parts shall not be removed for other use. Trial erections of one or more closure structures shall be made once each year, alternating the structures chosen so that each gate will be erected at least once in each 3-year period. Trial erection of all closure structures shall be made whenever a change is made in key operating personnel. Where railroad operation makes trial erection of a closure structure infeasible, rigorous inspection and drill of operating personnel may be substituted therefor. Trial erection of sand bag closures is not required. Closure materials will be carefully checked prior to and following flood periods, and damaged or missing parts shall be repaired or replaced immediately.

(2) Operation. Erection of each movable closure shall be started in sufficient time to permit completion before flood waters reach the top of the structure sill. Information regarding the proper method of erecting each individual closure structure, together with an estimate of the time required by an experienced crew to complete its erection will be given in the Operation and Maintenance Manual which will be furnished local interests

upon completion of the project. Closure structures will be inspected frequently during flood periods to ascertain that no undue leakage is occurring and that drains provided to care for ordinary leakage are functioning properly. Boats or floating plant shall not be allowed to tie up to closure structures or to discharge passengers or cargo over them.

(f) (1) Pumping plants—(1) Maintenance. Pumping plants shall be inspected by the Superintendent at intervals not to exceed 30 days during flood seasons and 90 days during off-flood seasons to insure that all equipment is in order for instant use. At regular intervals, proper measures shall be taken to provide for cleaning plant, buildings, and equipment, repainting as necessary, and lubricating all machinery. Adequate supplies of lubricants for all types of machines, fuel for gasoline or diesel powered equipment, and flash lights or lanterns for emergency lighting shall be kept on hand at all times. Telephone service shall be maintained at pumping plants. All equipment, including switch gear, transformers, motors, pumps, valves, and gates shall be trial operated and checked at least once every 90 days. Megger tests of all insulation shall be made whenever wiring has been subjected to undue dampness and otherwise at intervals not to exceed one year. A record shall be kept showing the results of such tests. Wiring disclosed to be in an unsatisfactory condition by such tests shall be brought to a satisfactory condition or shall be promptly replaced. Diesel and gasoline engines shall be started at such intervals and allowed to run for such length of time as may be necessary to insure their serviceability in times of emergency. Only skilled electricians and mechanics shall be employed on tests and repairs. Operating personnel for the plant shall be present during tests. Any equipment removed from the station for repair or replacement shall be returned or replaced as soon as practicable and shall be trial operated after reinstallation. Repairs requiring removal of equipment from the plant shall be made during off-flood seasons insofar as practicable.

(2) Operation. Competent operators shall be on duty at pumping plants whenever it appears that necessity for pump operation is imminent. The operator shall thoroughly inspect, trial operate, and place in readiness all plant equipment. The operator shall be familiar with the equipment manufacturers' instructions and drawings and with the "Operating Instructions" for each station. The equipment shall be operated in accordance with the above-mentioned "Operating Instructions" and care shall be exercised that proper lubrication is being supplied all equipment, and that no overheating, undue vibration or noise is occurring. Immediately upon final recession of flood waters, the pumping station shall be thoroughly cleaned, pump house sumps flushed, and equipment thoroughly inspected, oiled and greased. A record or log of pumping plant operation shall be kept for each station, a copy of which shall be furnished the District Engineer following each flood.

(g) (1) Channels and floodways—(1) Maintenance. Periodic inspections of improved channels and floodways shall be made by the Superintendent to be certain that:

(i) The channel or floodway is clear of debris, weeds, and wild growth;

(ii) The channel or floodway is not being restricted by the depositing of waste materials, building of unauthorized structures or other encroachments;

(iii) The capacity of the channel or floodway is not being reduced by the formation of shoals;

(iv) Banks are not being damaged by rain or wave wash, and that no sloughing of banks has occurred;

(v) Riprap sections and deflection dikes and walls are in good condition;

(vi) Approach and egress channels adjacent to the improved channel or floodway are sufficiently clear of obstructions and debris to permit proper functioning of the project works.

Such inspections shall be made prior to the beginning of the flood season and otherwise at intervals not to exceed 90 days. Immediate steps will be taken to remedy any adverse conditions disclosed by such inspections. Measures will be taken by the Superintendent to promote the growth of grass on bank slopes and earth deflection dikes. The Superintendent shall provide for periodic repair and cleaning of debris basins, check dams, and related structures as may be necessary.

(2) Operation. Both banks of the channel shall be patrolled during periods of high water, and measures shall be taken to protect those reaches being attacked by the current or by wave wash. Appropriate measures shall be taken to prevent the formation of jams of ice or debris. Large objects which become lodged against the bank shall be removed. The improved channel or floodway shall be thoroughly inspected immediately following each major high water period. As soon as practicable thereafter, all snags and other debris shall be removed and all damage to banks, riprap, deflection dikes and walls, drainage outlets, or other flood control structures repaired.

(h) (1) Miscellaneous facilities—(1) Maintenance. Miscellaneous structures and facilities constructed as a part of the protective works and other structures and facilities which function as a part of, or affect the efficient functioning of the protective works, shall be periodically inspected by the Superintendent and appropriate maintenance measures taken. Damaged or unserviceable parts shall be repaired or replaced without delay. Areas used for ponding in connection with pumping plants or for temporary storage of interior run-off during flood periods shall not be allowed to become filled with silt, debris, or dumped material. The Superintendent shall take proper steps to prevent restriction of bridge openings and, where practicable, shall provide for temporary raising during floods of bridges which restrict channel capacities during high flows.

(2) Operation. Miscellaneous facilities shall be operated to prevent or reduce flooding during periods of high water. Those facilities constructed as a part of the protective works shall not be used for purposes other than flood protection without approval of the District Engineer unless designed therefor.

(Sec. 3, 49 Stat. 1571, as amended; 33 U.S.C. 701a) [S. P.R. 9989, Aug. 17, 1944; S. P.R. 10203, Aug. 22, 1944]

EXHIBIT A-2

Revised  
1 Jan 62

LISLE, N. Y.  
DRAINAGE STRUCTURES

DRAIN STRUCT. NO.	STA. (LEVEE)	GENERAL DESCRIPTION		GENERAL TREATMENT	INLET STRUCT.			OUTLET STRUCT.			DRAIN GATES			DITCH	REMARKS
		TYPE	LENGTH		TYPE	INV. EL.		TYPE	INV. EL.		NO.	SIZE	TYPE		
1	10+50	Twin 60" Corr. Iron Pipe	48'	New Pipe, Inlet & Outlet Struct.	In R. C. Headwall	958.5		In R. C. Headwall	958.0		2	60"	Auto	Outlet	Outlet ditch 22' wide 250' long.
2	29+85.5	48" Corr. Iron Pipe	65'	New Pipe, Inlet & Outlet Struct.	In R. C. Headwall	964.0		In R. C. Headwall	963.0		1	48"	Auto	Outlet	Ditch shaped to follow Old Dudley Creek Channel
A	6+20	12" Corr. Iron Pipe	18'	New Pipe, Inlet & Outlet Struct.	In R. C. Headwall	966.45		In R. C. Headwall	966.35		None			Inlet Outlet	Inlet ditch 2' wide 150' long. Outlet ditch 2' wide 50' long.
B	7+60	36" Corr. Iron Pipe	95'	Old Structure No Change	In R. C. Headwall	957.8		In R. C. Headwall	956.8		1	36"	Auto	None	
C	16+35	18" Corr. Iron Pipe	67'	Replace existing V.C.P. and manhole with new pipe and manhole.	Ext. of Old Drain at $\frac{1}{2}$ of Levee	961.2		In Manhole	961.0		1	18"	Auto	Outlet	Outlet ditch 3' wide 180' long.
D	18+50	30" Corr. Iron Pipe	65'	Old Structure No Change	In R. C. Headwall	963.1		In R. C. Headwall	962.4		1	30"	Auto	Inlet	Old Inlet ditch 5' wide 400' long
E	(Highway) 207+85	Twin 30" Corr. Iron Pipe	36'	New Pipe, Inlet & Outlet Struct.	In R. C. Headwall	968.0		In R. C. Headwall	967.7		None				Structure located in Old Dudley Creek Channel Bed.
F	(Highway) 212+43	24" Corr. Iron Pipe	52'	New Pipe, Inlet & Outlet Struct.	In R. C. Headwall	969.0		In R. C. Headwall	968.5		None			Inlet Outlet	Inlet ditch 2' wide 850' long. Outlet ditch 2' wide 370' long.

WHITNEY POINT VILLAGE, N. Y.

DRAINAGE STRUCTURES

DRAIN. STRUCT NO.	STA. LEVEL	GENERAL DESCRIPTION		GENERAL TREATMENT	MISCELLANEOUS DATA							DITCH	REMARKS
					INLET STRUCT.		OUTLET STRUCT.		DRAIN GATES				
		TYPE	LENGTH		TYPE	INV. EL.	TYPE	INV. EL.	NO.	SIZE	TYPE		
1	Opp. 7+50	48" Reinf. Conc. Pipe, Extra Strength	58'	New Pipe, Inlet & Outlet Structure	In R. C. Headwall	948.0	In R. C. Headwall	947.7	1	48"	Auto	Inlet & Outlet	Inlet ditch 3' wide 525' long. Outlet ditch 3' wide 400' long.
2	21+30	30" Corr. Iron Pipe	65'	New Pipe, Inlet, & Outlet & Control Manhole Structure	In R. C. Headwall	948.7	In R. C. Headwall	947.0	1 1	30" 30"	Auto Sluice (in M.H.)	Outlet	Outlet ditch 288' long 3' wide.
3	22+80	12" Conc. Pipe, Std. Strength	73' (Under Levee)	New Pipe, Outlet Structure & Manhole	Connects to Existing Manhole	949.1	In Rock Paved Outlet	946.0	1	12"	Auto (in M.H.)	None	Rock Paving & Dumped Riprap Toe at Outlet
4	31+11	12" V. C. Pipe	356'										
		30" Corr. Iron Pipe	76'	New Pipe, Inlet, Outlet & Control Manhole Structures	In R. C. Wall of New Inlet Structure	946.4	In R. C. Headwall	945.0	1 1	30" 30"	Auto Sluice (in M.H.)	Outlet	Outlet ditch 3' wide 220' long.
		15" Conc. Sewer Pipe	190'										
5	36+34	24" Corr. Iron Pipe	78'	New Inlet, Outlet & Control Manhole Structures	In R. C. Wall of New Inlet Structure	945.95	In R. C. Headwall	944.5	1 1	24" 24"	Auto Sluice (in M.H.)	Outlet	Outlet ditch 3' wide 196' long.
6	H444+60	18" Cast Iron Pipe Under Levee	74'	New Pipe, Outlet Structure & Manhole	In Wall of Existing Brick Manhole	941.0±	In Rock Paved Outlet	939.6±	1	18"	Auto (in M.H.)	None	Rock Paving & Dumped Riprap Toe at Outlet
		18" V.C. Pipe Extra Strength	117'										
7	H426+65	Twin 6'x6' Reinf. Conc. Culvert	72'	New Culvert, Inlet, Outlet & Control Manhole Structures	In R. C. Headwall	940.7	In R. C. Headwall	940.5	2 2	72"x72" 72"x72"	Sluice (in M.H.) Auto	Inlet  Outlet	Inlet ditch 6' wide 350' long. Outlet ditch 10' wide 200' long.

OXFORD, NEW YORK

DRAINAGE STRUCTURES

DRAIN. STRUCT NO.	STA. LEVEE	GENERAL DESCRIPTION		GENERAL TREATMENT	MISCELLANEOUS DATA							DITCH	REMARKS
					INLET STRUCT.		OUTLET STRUCT.		DRAIN. GATES				
		TYPE	LENGTH		TYPE	INV. EL.	TYPE	INV. EL.	NO.	SIZE	TYPE		
A	4+00	36" Corr. Iron Pipe	52±	New Pipe, Inlet & Outlet Wall Struct.	In Headwall	963.0	In Headwall	962.33	1	36"	Auto	-	Graded to drain at Outlet
B	19+00	36" Corr. Iron Pipe	105±	New Pipe, Inlet & Outlet Struct.	Riprap	961.2	Riprap	963.2	None			-	Inlet & Outlet Riprapped
C	2+50	24" Corr. Iron Pipe	20±	New Pipe	-	960.0	-	960	None			-	Under Riverside Access Road

# LIST OF CLOSURE STRUCTURES AND PERTINENT DATA

No.	Facility and location	(man-hours)	(feet)	(feet)	sandbags	of logs	base of rail	Stage at which water will reach sill (feet)
zero of staff gage - 956.212 LISLE, NEW YORK								
1	Stoplog closure E-L Railroad Sta. 3+67.86	4	20	4.7	9	8"x8"x20'-9"	970.3	14.8
2	Stoplog closure E-L Railroad Sta. 33+08.2	3	20	3.6	6	8"x8"x20'-9"	978.3	18.6
	Sandbag closure Main St. Bridge abutment Sta. 16+10	150	40	at design flow - 2.5	800	-	973.9	17.7
zero of staff gage - 934.49 WHITNEY POINT VILLAGE, NEW YORK								
1	Stoplog closure E-L Railroad Sta. 7+00	6	34	6.3	22	8"x8"x16'- 11"	959.2	14.8
zero of staff gage - 956.80 OXFORD, NEW YORK								
1	Sandbag closure E-L Railroad Sta. 18+40	60	20	1.0	316	-	975.25	13.3

# LIST OF BENCH MARKS

Note: Elevations of bench marks are in reference to mean sea level.

## Lisle, New York

<u>Identification</u>	<u>Description</u>	<u>Elevation</u>
U.S.C. & G.S. tablet stamped M109-1935	77 yards north of the north edge of the Erie-Lackawanna Railroad Station in park 61.5 feet northeast of centerline track; 33.6 feet west of west rail of main line track; 30 feet southeast of centerline of Hubbard Street; 21 feet north of a signal tower post. Tablet set in top of concrete post 1" below surface of ground.	972.170

## Whitney Point Village, New York

U.S.C. & G.S. tablet stamped L109-1935	Tablet set in top of concrete post two inches high; located 75.5 feet north of the northeast corner of the Erie-Lackawanna Railroad Station at Whitney Point, New York. Seventy-two feet northeast of northeast main line track; 65 feet south of centerline of Main Street at point of crossing of track; and 818 feet northeast of southwest edge of park.	954.805
U.S.E.D. W 1	Chiseled square, painted white, east abutment on south side of the Main Street Bridge over the Tioughnioga River at Whitney Point, New York.	967.060

## Oxford, New York

U.S.C. & G.S. ZZ305-1942	About 0.8 mile east along State Highway 220 from the National Bank at Oxford, Chenango County at Riverview Cemetery, in the stone masonry retaining wall, 28 feet north of the centerline of the highway, 10.8 feet west of the east end of the wall, and about 2.1 feet higher than the sidewalk. A standard disc set vertically.	1,048.810
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EXHIBIT D

Form No. \_\_\_\_\_

NEW YORK STATE  
DEPARTMENT OF ENVIRONMENTAL CONSERVATION  
REGION NO. 7

CHECK SHEET FOR LEVEES AND FLOOD WALLS

Flood-Protection Project at \_\_\_\_\_, New York

( ) Routine Inspection of \_\_\_\_\_ River ( ) Levee ( ) right bank,  
( ) Emergency ( ) Wall ( ) left

From \_\_\_\_\_ to \_\_\_\_\_  
Station or Street Station or Street

Inspected by \_\_\_\_\_ Date \_\_\_\_\_ 19\_\_

ITEM	LOCATION	CONDITION	RECOMMENDATIONS
1. Settlement, loss of grade			
2. Sloughing or caving (either side of wall or levee)			
3. Seepage or sand boils			
4. Possible seepage from tree roots or animal burrows			
5. Riprap and slope protection			
6. Sod			
7. Weeds or undesirable vegetation			
8. Evidence of fires			
9. Access roads and ramps			
10. Drainage of levee crown			
11. Concrete (cracking, breaking, or spalling)			

CHECK SHEET FOR LEVEES AND FLOOD WALLS  
(Continued)

ITEM	LOCATION	CONDITION	RECOMMENDATIONS
12.	Unauthorized encroachments on right-of-way		
13.	Unauthorized excavation or removal of sod		
14.	Unauthorized grazing or vehicular traffic		
15.	Accumulation of drift, trash, and debris		
16.	Ponding Areas		

REMARKS:

NEW YORK STATE  
DEPARTMENT OF ENVIRONMENTAL CONSERVATION  
REGION NO. 7

LISLE, WHITNEY POINT VILLAGE AND OXFORD FLOOD-PROTECTION WORKS  
CHECK SHEET FOR INSPECTION OF DRAINAGE GATES

Inspection by \_\_\_\_\_ Date \_\_\_\_\_ 19\_\_

No.	Station	Gate Size	Description	Lubri cated	Condition & Recommendations
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LISLE, NEW YORK - TIOUGHNIOGA RIVER - RIGHT BANK

	(Levee)	Twin			
1	10+50	60"	Surface Drain		
2	29+85.5	48"	Surface Drain		
	(Opp.)				
A	6+20	12"	Surface Drain		
B	16+25	18"	Surface Drain (Manhole)		
	(Hwy.)	Twin			
C	207+85	30"	Surface Drain		
D	212+43	18"	Surface Drain		

WHITNEY POINT, NEW YORK - TIOUGHNIOGA RIVER - RIGHT BANK

	(Levee)				
1	7+50	48"	Surface Drain		
2	21+80	30"	Surface Drain (Manhole)		
3	22+80	12"	Surface Drain (Manhole)		
4	31+11	30"	Surface Drain (Manhole)		
5	36+34	24"	Surface Drain (Manhole)		
	(Hwy.)				
6	H444+60	18"	Combined Sewer (Manhole)		
		Twin			
7	H426+65	6'x6'	Surface Drain (Manhole)		

OXFORD, NEW YORK - CHENANGO RIVER - RIGHT BANK

A	4+00	36"	Surface Drain		
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Form No.

NEW YORK STATE  
DEPARTMENT OF ENVIRONMENTAL CONSERVATION  
REGION NO. 7

CHECKSHEET FOR INSPECTION OF STOPLOG STRUCTURES

Flood-Protection Project at \_\_\_\_\_ New York

( ) Routine

( ) right

( ) Emergency Inspection of stoplog structure No. \_\_\_\_\_ on

bank

( ) left

Of \_\_\_\_\_ at \_\_\_\_\_  
River or Creek Street or Railroad

Date last trial closure was made \_\_\_\_\_

Was trial closure made during this inspection? \_\_\_\_\_

Time required to complete closure \_\_\_\_\_

Man-hours required to make closure \_\_\_\_\_

Inspected by \_\_\_\_\_ Date \_\_\_\_\_ 19\_\_\_\_.

1. Number of stoplogs available  
for this structure

2. Condition of stoplogs

3. Were wedges and roofing paper or  
canvas available

4. Does structure show signs of  
settlement

5. Condition of concrete

6. Are metal channels properly pro-  
tected with paint.

Remarks:

EXHIBIT G

NEW YORK STATE  
DEPARTMENT OF ENVIRONMENTAL CONSERVATION  
REGION NO. 7

CHECK SHEET FOR INSPECTION ON SANDBAGS

Flood-Protection Project at \_\_\_\_\_ New York

- ( ) Routine  
                    Inspection of Sandbags  
( ) Emergency

Total number of sandbags required for all closures forming a part of  
this project \_\_\_\_\_.

Inspected by \_\_\_\_\_ Date \_\_\_\_\_ 19\_\_\_\_.

Principal source of bags:

Building or establishment \_\_\_\_\_  
Street Address \_\_\_\_\_  
City \_\_\_\_\_  
No. of bags on hand \_\_\_\_\_  
Condition \_\_\_\_\_

Alternate source of bags:

Building or establishment \_\_\_\_\_  
Street Address \_\_\_\_\_  
City \_\_\_\_\_  
No. of bags on hand \_\_\_\_\_  
Condition \_\_\_\_\_

Principal locations where material is available for filling bags:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Location of twine or wire:

\_\_\_\_\_  
\_\_\_\_\_

REMARKS:

EXHIBIT H

NEW YORK STATE  
DEPARTMENT OF ENVIRONMENTAL CONSERVATION  
REGION NO. 7

CHECK LIST FOR INSPECTION OF CHANNELS

Flood-Protection Project at \_\_\_\_\_ New York

Name of Channel \_\_\_\_\_

From \_\_\_\_\_ To \_\_\_\_\_

Inspected by \_\_\_\_\_ Date \_\_\_\_\_

Item	Station or Location	Conditions	Recommendations
1. Weeds & wild growth in channel	_____	_____	_____
2. Trash, ashes, etc. dumped in channel	_____	_____	_____
3. Structures or other un- authorized encroachment within channel right-of- way	_____	_____	_____
4. Shoals forming in channel	_____	_____	_____
5. Erosion of banks	_____	_____	_____
6. Riprap	_____	_____	_____

REMARKS:

FORM NO.

NEW YORK STATE  
DEPARTMENT OF ENVIRONMENTAL CONSERVATION  
REGION NO. 7

RECORD OF OPERATIONS FOR CLOSURE STRUCTURES

Flood-Protection Project at \_\_\_\_\_, New York

( ) Routine Operation of ( ) Stop-log Structure No. \_\_\_\_\_ on ( ) right  
( ) Emergency ( ) Sandbag Closure ( ) left bank

of \_\_\_\_\_ at \_\_\_\_\_  
(River or Creek) (Street or Railroad)

1. Railroad notified of intent to close \_\_\_\_\_
  - a. Time of notification \_\_\_\_\_
  - b. Means of notification i.e. telephone, telegraph etc. \_\_\_\_\_
  - c. Name of R.R. official notified \_\_\_\_\_
2. Date and hour closure initiated \_\_\_\_\_
3. Water elevation when closure began \_\_\_\_\_
4. Date and hour closure completed \_\_\_\_\_
5. No. of logs or sandbags placed in position \_\_\_\_\_
6. Number of men employed to make closure \_\_\_\_\_
7. Number of man-hours to make closure \_\_\_\_\_
8. Maximum elevation of water, date and hour \_\_\_\_\_
9. Date and hour removal of closure initiated \_\_\_\_\_
10. Date and hour removal completed \_\_\_\_\_
11. Man-hours required for removal \_\_\_\_\_

Remarks and Recommendations: \_\_\_\_\_

Signed \_\_\_\_\_ Date \_\_\_\_\_ 19 \_\_\_\_\_

EXHIBIT J