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NATIONAL DAM SAFETY PROGRAM. ALCOVE DAM (INVENTORY NUMBER NY-93--ETC(U)
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1 OF 3

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AD A069100

LOWER HUDSON RIVER BASIN

ALCOVE DAM

ALBANY COUNTY, NEW YORK
INVENTORY NUMBER NY 93

LEVEL II

PHASE 1 INSPECTION REPORT NATIONAL DAM SAFETY PROGRAM

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Prepared by

L. ROBERT KIMBALL and ASSOCIATES
615 W. Highland Ave. Ebensburg, Pa.

Prepared For

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
NEW YORK, NEW YORK

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Hannacrois Creek
Albany County
Alcove Reservoir Dam

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

This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.

Alcove Reservoir Dam was judged to be safe, although a stability analysis and a hydrologic analysis were recommended.

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FOR

LOWER HUDSON RIVER BASIN

ALCOVE DAM

ALBANY COUNTY, NEW YORK
INVENTORY NUMBER NY 93

PHASE 1 INSPECTION REPORT NATIONAL DAM SAFETY PROGRAM

Prepared by

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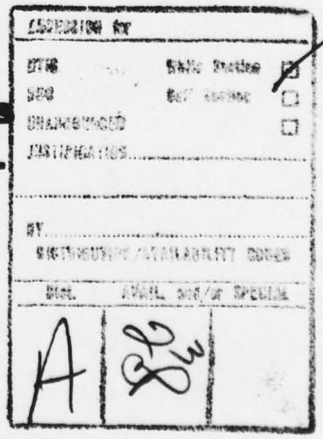
615 W. Highland Ave. Ebensburg, Pa.



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DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
NEW YORK, NEW YORK

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: Alcove Reservoir Dam

State Located: New York

County Located: Albany

Stream: Hannacrois Creek

Date of Inspection: June 15, 1978

ASSESSMENT

The inspection and evaluation of Alcove Dam did not reveal any problems which require immediate emergency action.

Clearing of vegetation from the downstream slope should be performed in the near future.

An evaluation of embankment stability under current criteria should be performed in the near future to substantiate embankment stability. As noted during this inspection and inspections performed in 1976 by Thomsen Associates wet areas on the downstream slope, probably attributable to seepage through the dam, are present. Also, the water levels in the monitors located on top of the berm indicate a fairly high water level which possibly indicates a high seepage level in the embankment.

Future studies should be directed at locating the apparent seepage within the embankment. Drilling, testing, monitor installation, analysis of the core wall, seepage, embankment stability and foundation conditions should be conducted.

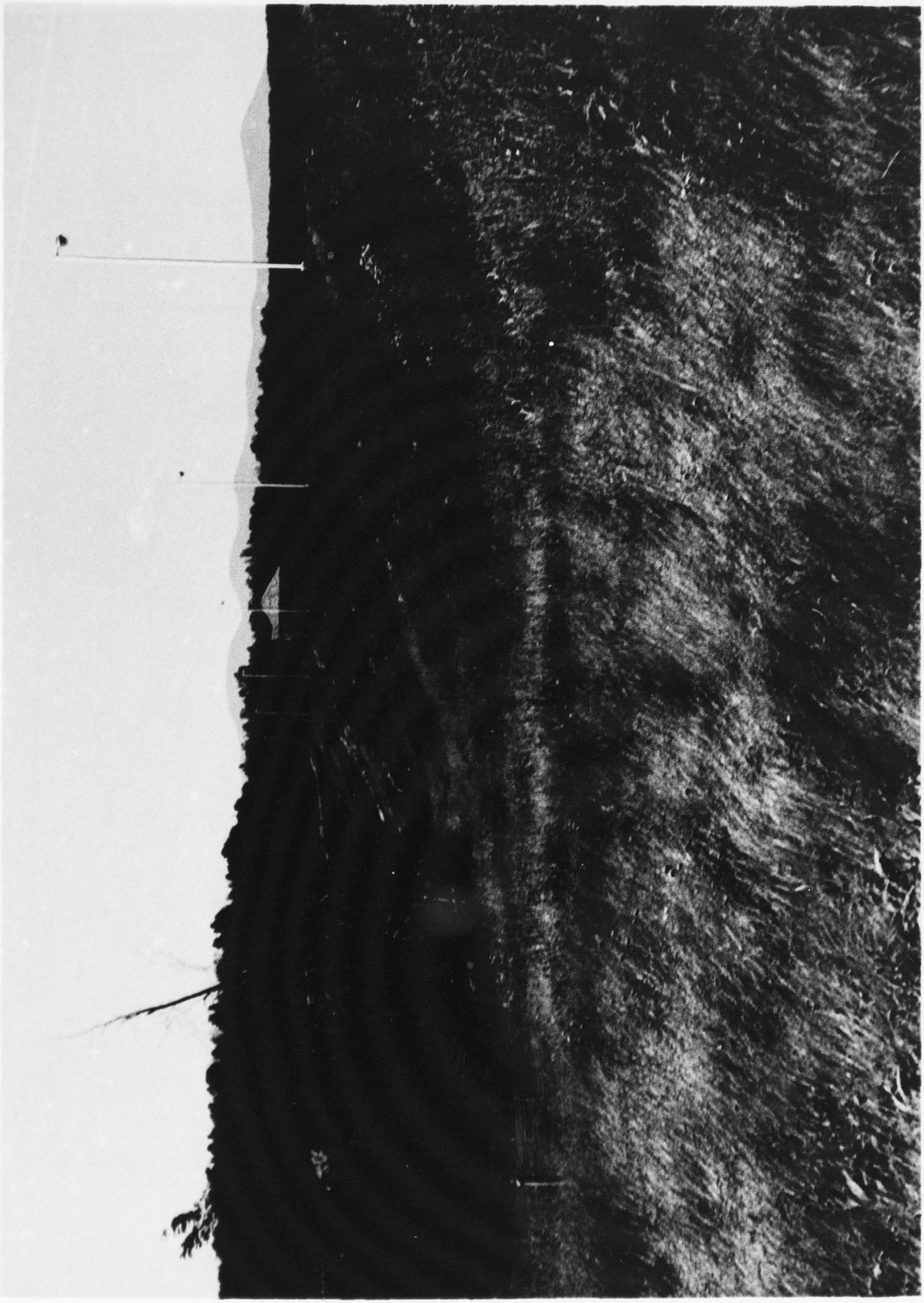
The hydrologic analysis indicated that the spillway and reservoir can control the SPF with 3.15 feet of freeboard remaining. The dam is overtopped by 2,300 cfs (approximately 0.3') during the PMF. The owner should consider modifications to the structure to control the PMF. Approximately 1' of additional freeboard would be required or an additional width added to the spillway at the right abutment in the area where the low embankment section is present.

Submitted by: R. Jeffrey Kimball
R. Jeffrey Kimball, P.E.
L. ROBERT KIMBALL & ASSOCIATES
Registration No. 26275E

Approved by: Clark H. Benn
CLARK H. BENN
Colonel, Corps of Engineers
District Engineer

Date: 10 August 78

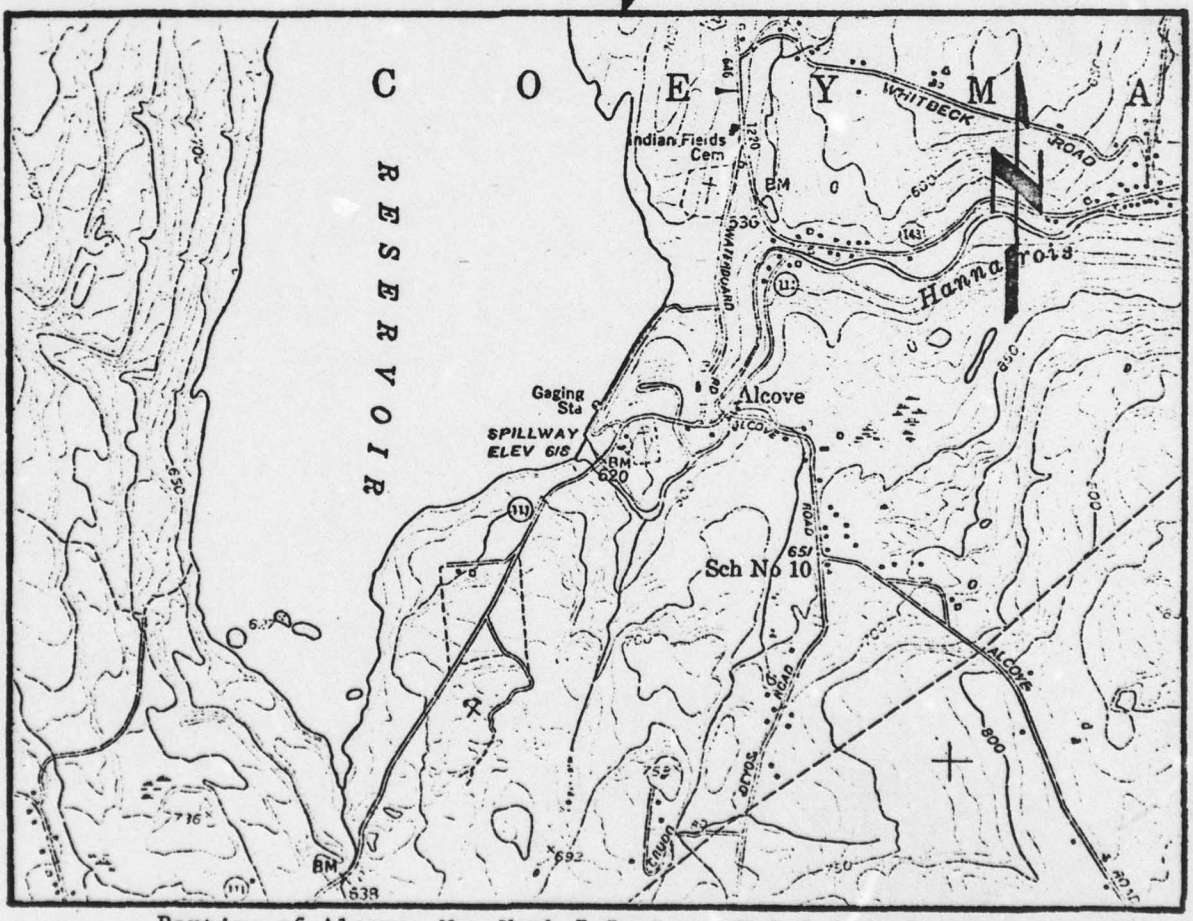
OVERVIEW OF UPSTREAM
SLOPE FROM LEFT ABUTMENT



OVERVIEW OF DOWNSTREAM
SLOPE FROM LEFT ABUTMENT

NEW YORK

ALBANY COUNTY



Portion of Alcove, New York 7.5 minute U.S.G.S. quadrangle

ALCOVE DAM

SITE LOCATION MAP

SCALE : 1"=2000'

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
ALCOVE RESERVOIR DAM ID # 93

SECTION 1: PROJECT INFORMATION

1.1 General:

a. Authority: Authority is provided by the National Dam Inspection Act, Public Law 92-367.
Contract Number: DACW51-78-C-0025

b. Purpose of Project: Evaluation of non-Federal dams to identify dams which are a threat to life and property.

1.2 Description of Project:

a. Description of Dam and Appurtenances: The Alcove Dam is a homogeneous earthfill embankment with a concrete cutoff wall. The embankment is 77 feet high. The upstream slope is 3:1, the downstream slope 3:1 with a terrace.

The emergency spillway is located at the right abutment. The spillway is a concrete ogee weir discharging to an open channel excavated to rock with concrete side walls.

The water supply intake facilities are located near the center of the dam with controls in the gatehouse.

The drain tunnel is located left of the gatehouse. The tunnel is a 4 foot square tunnel. The control gate is located in a manhole at the embankment crest.

Observation wells were placed in the embankment to monitor the phreatic surface. The wells are read twice a week and results reviewed by the city consultant.

b. Location: The dam is located in Albany County near Alcove and Coegmans Hollow on Hannacrois Creek. The location of the dam can be found on the Alcove Quadrangle, both U.S.G.S. and New York State DOT 7.5 minute topographic quadrangles (see site location map).

c. Size Classification: The dam is an intermediate size structure.

d. Hazard Classification: Alcove dam is a high hazard potential structure.

e. Ownership: City of Albany

f. Purpose of Dam: Albany water supply.

g. Design and Construction History: The dam was designed by Whitman, Requardt Smith in 1928 and constructed by Winston and Co. in 1929. Minor repairs have been made including recent replacement of supply control and 1950 guniting of the spillway section.

h. Normal Operating Procedures: The reservoir is used for Albany city water supply. Occasional change of intake controls is made as required by water quality.

Routine inspections and monitor readings are made by the city staff. Periodic maintenance is conducted by the city.

1.3 Pertinent Data:

a. Drainage Area: The drainage area is recorded as 32.5 square miles.

b. Discharge at Damsite:

Maximum known flood at damsite: Believed March 1936, 1.71 feet over spillway (2,400 cfs estimated).

Spillway capacity at maximum design pool elevation: Estimated 20,000 cfs (from design calculations), 12,400 from construction permit.

Principal spillway capacity: Approximately 200 cfs.

c. Elevation: (feet above MSL)

Top of Dam: 625.0

Maximum Pool Design Surcharge: 624.18

Spillway Crest: 618.0

Stream bed at centerline of dam: $546^{\pm}$

Maximum tail water: $550^{\pm}$

Upstream drain pipe invert: 547.8

Downstream drain pipe invert: 546.2

d. Reservoir:

Length of normal pool: 13,500 feet

Length of maximum pool: 14,000 feet

e. Storage: (acre-feet)

Normal Pool: 37,000

Design Surcharge: 46,000

Top of Dam: 47,600

f. Reservoir Surface: (acres)

Top of Dam: 1,646

Normal Pool: 1,434

g. Dam:

Type: Homogeneous earthfill with concrete cutoff wall

Length: 2,177 feet

Height: 77 feet

Top Width: 16 feet

Side Slopes: 3:1 upstream and downstream with downstream terrace

Zoning: None

Impervious Core: Concrete wall

Cutoff: Concrete wall into rock

Grout Curtain: Some grouting apparently done, effectiveness questionable

h. Diversion and Regulating Tunnel:

Type: 4 foot square tunnel

Length: 480'

Closure: Sluice gate in manhole at embankment crest

Access: At embankment crest

Regulating Facilities: Closure gate only

i. Spillway:

Type: Ogee weir-concrete section

Length: 300 feet

Crest Elevation: 618.0 feet

Gates: None

Upstream Channel: None

Downstream Channel: Open channel in rock with concrete side walls

j. Regulating Outlets: Water supply system, two 42" pipes.

SECTION 2: ENGINEERING DATA

2.1 Design: Detailed construction drawings and design data was available for review. Test boring, soils testing, and monitor installations were reviewed.

2.2 Construction: Minor amounts of information were available. The dam appears to conform closely to the construction drawings. Some correspondence is available from inspections during construction.

2.3 Operation: Major maintenance records are available. Continuous pool level records are kept.

2.4 Evaluation: The information available was sufficient to complete the hydrologic study. No information on the stability of the embankment was available for review. Therefore, a complete evaluation of the structure could not be completed.

2.5 Past Studies: Observation wells were installed in early 1976 at the recommendation of the city consultant to monitor the embankment. In April and October of 1976 Thomsen and Associates, Consulting Geotechnical Engineers, were contracted to review monitor readings and review the geotechnical aspects of the structure (see appendix D). Thomsen noted wet areas on the downstream slope and recommended continued evaluation. However, he indicated that apparent seepage may have been attributed to surface runoff. Thomsen recommended additional drilling, sampling and monitor installation to adequately define the source of seepage and high water level in the 1976 monitors.

In October of 1976 Thomsen reviewed monitor level readings at the dam. In his review he concluded that the monitor level in the wells was being maintained by hydraulic head from the reservoir either seeping though the core wall or under the embankment. Again Thomsen recommended more instrumentation and stability analysis.

It should be noted that detailed boring logs were not kept during monitor installation and no soil samples were obtained to provide information on embankment materials.

SECTION 3: VISUAL INSPECTION

3.1 Findings:

a. General: Alcove Dam was inspected by personnel from L. Robert Kimball and Associates, the city water staff and the city consultant.

b. Dam: The dam appears to conform closely to the design drawings. The dam is in need of some minor maintenance, particularly vegetation removal. Several wet areas were noted on the downstream slope near the top of the berm.

c. Appurtenant Structure: The emergency spillway appeared to be in good condition and free from obstruction.

The drain tunnel has not been operated reportedly since construction and is probably not functional.

The water supply intake structure and controls are in good condition and maintained well.

d. Reservoir Area: The reservoir area is heavily wooded with no development.

e. Downstream Channel: The channel downstream of the dam (Hannacrois Creek) is a fairly narrow vegetated valley with considerable development.

3.2 Evaluation: The visual inspection did not reveal any serious signs of instability or problems with the embankment or appurtenances.

The embankment is in need of minor maintenance particularly clearing of vegetation on the lower downstream slope.

The water supply facilities appear to be in good condition and can function as a drawdown pipe in place of the inoperable diversion tunnel.

Several wet areas were noted on the downstream slope. Some of these areas are attributable to surface runoff being ponded on the berm. One area, near the right abutment, appeared to be saturated due to seepage though the dam.

The numerous wet areas noted by Thomson in 1976 were not observed during our inspection. Also the ponding at the toe of the dam has been eliminated.

The unexpectedly high water level in the monitors and the apparent seepage on the berm dictated that additional studies be conducted. Note: Some of the monitors are showing a water level at or near the surface.

SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedure: The City of Albany maintains a sufficient staff to perform most of the required operations and maintanance at the dam.

4.2 Maintenance of Dam: No planned maintenance schedule is utilized. However, the staff is at the dam daily. The monitor wells are read twice a week and thus the embankment is walked as often.

4.3 Maintenance of Operating Facilities: Maintenance of the operating facilities is performed as needed.

4.4 Description of Any Warning System in Effect: None in effect.

4.5 Evaluation: The maintenance performed on the dam and operating facilities appears to be adequate. It is recommended that a monthly inspection program and a warning and evacuation plan be developed.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Hydrologic Evaluation of Features:

a. Design Data: Brief hydrologic and hydraulic design calculations are available. The design was based on record flows in near by rivers, approximate design inflow 20,000 cfs. Considering storage and outflow the resultant maximum design water level was 624.18.

b. Experience Data: The apparent maximum discharge of record was 2,400 cfs in 1936. Reservoir water level records are kept and a nearby station records rainfall.

c. Visual Observations: At the time of the inspection the reservoir water level was 617.2'. Due to high winds wave action was splashing water over the spillway weir. The weir appeared to be in good condition.

The downstream channel was in good condition. The highway bridge downstream did not appear to be the controlling structure.

d. Overtopping Potential: Overtopping potential was investigated through the development of the probable maximum flood (PMF) for the watershed and the subsequent routing of the PMF through the reservoir system. The PMF is that hypothetical flow induced by the most critical combination of precipitation, minimum infiltration losses, and concentration of run-off at a specific location, that is considered reasonably possible for a particular drainage area.

The drainage area contributing to the Alcove Reservoir is approximately 34 square miles. To develop the basic hydrologic working tool, the unit hydrograph, Snyder Coefficients were used. After discussions with Corps personnel assumed parameters of Cp = 0.60 and Ct = 2.0 were used. A value of Tp was calculated considering watershed size and shape.

Using hydrometeorological Report No. 33, the PMP index rainfall was determined to be 20.0 inches for a 24 hour duration, 200 square mile basin. The percentages of the index rainfall applied to other durations were interpolated from the plot of drainage area versus percent of 24 hour, 200 square mile. The computed PMF peak flow was 30,242 CFS. After routing the PMF through the impounded storage, the peak flow was reduced to 22,332 CFS. A plot of the PMF inflow and outflow hydrographs is included in Appendix B.

The ability of the Alcove Reservoir to discharge the standard project flood (SPF) was also evaluated. The SPF peak flow of 13,321 CFS was routed through the impounded storage and reduced to 8,074 CFS. The SPF outflow is indicative of a pool elevation of 621.85 feet above MSL. Approximately 3.15 feet of freeboard remain.

The PMF outflow is equivalent to 0.3 feet over the dam (7.3 feet above spillway crest).

To allow inflow and outflow hydrographs to be developed and routed several assumptions were made.

1. The reservoir was assumed to be at spillway level at the start of flood routing.

2. No flow was considered through the water supply lines or drain tunnel.

3. Flow over the top of the entire dam length was added to evaluate overtopping.

4. The highway bridge over the spillway exit channel was assumed to have sufficient capacity to pass spillway flows.

SUMMARY OF HYDROLOGIC ANALYSES
ALCOVE DAM

Elevation Top of Dam = 625.0

Elevation Crest of Spillway = 618.0

PMF Routing

PMF Peak - 30,242 CFS

PMF After Routing through Reservoir - 22,322 CFS

Elevation of Routed PMF
Corresponding to 22,322 CFS - 625.3 Feet above MSL

Dam Overtopped - 0.3 Feet

Spillway Surcharge - 7.3 Feet above spillway.

SPF Routing

SPF Peak - 13,321 CFS

SPF After Routing Through Reservoir - 8,074 CFS

Elevation of Routed SPF Corresponding to 8,074 CFS - 621.85 Feet above MSL

Freeboard Remaining - 3.15 Feet

Spillway Surcharge - 3.85 Feet

5.2 Hydraulic Evaluation of Flood Wave

For the dam break analysis the flood wave for both total and partial failures was computed to a distance of 17,700 feet downstream of the dam. Alcove Dam is a earthfill dam with a concrete core wall founded partially on rock making partial failure the most likely of the two cases.

The town of Coeymans Hollow is located on Hannacrois Creek 15,000 feet downstream of the dam. For total failure a water depth of 95 feet was calculated in Coeymans Hollow flooding all structures shown on the U.S.G.S. topographic map. For a partial failure of one-third the dam breast, the water depth at Coeymans Hollow is 45 feet flooding all structures. It should also be noted that for total failure, all structures along Hannacrois Creek for 17,000 feet were inundated.

Calculated water depths for the downstream channel reach are shown in Appendix B.

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability:

a. Visual Observations: Based on our visual inspection the dam appears to be well constructed according to the design plans. No distress was noted in the embankment or overflow section.

However, no information is available on solution activity or caverns in the area. The ability of the limestone foundation to support the structure has not been evaluated. It is impossible to determine the effect of cavernous limestone on the stability of the structure from a visual inspection.

b. Design and Construction Data: No stability calculations were available on the embankment portion of the dam.

A stability analysis of the overflow section was performed. Assuming a water elevation of 623; an ice pressure of 20,000 lbs per lin. foot and an uplift pressure of 33% of full head at heel and zero at the toe the resultant falls well within the middle third.

No construction data is available.

c. Operating Records: Operating records indicate that the dam is not operated in a manner which would affect stability.

d. Post-construction Changes: No past construction changes have been made which would influence the structural stability.

e. Seismic Stability: The dam is located in seismic zone 1. No seismic stability has been performed.

6.2 Summary: The unexplained high monitor readings and wet areas at the downstream slope require further investigation. Drilling, testing, monitor installation, seepage, stability and foundation analysis are necessary to completely assess this structure.

SECTION 7: ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment:

a. Safety: This dam does not appear to present an immediate danger to life or property.

b. Adequacy of Information: The information available is not adequate for complete analysis of the dam. The validity of available information appears to be good.

c. Urgency: No conditions were noted during our inspection which require immediate emergency action.

d. Necessity of Future Analyses: The absence of a stability analysis, the unexplained water level recorded and the location of wet areas on the downstream slope by the observations wells make it necessary for stability analysis, to be conducted, according to current criteria.

7.2 Recommendations:

1. Maintenance of the downstream slope particularly removal of vegetative growth should be completed.

2. Evaluation of embankment stability should be conducted in the near future. The evaluation should be directed at determining the source and location of apparent seepage through the embankment. The study should include drilling, testing, monitor installation, analysis of the core wall, seepage, embankment stability, and foundation conditions particularly the condition of limestone under the structure.

3. Consideration should be given to increasing spillway capacity to control the PMF.

APPENDIX A

GEOLOGY

Alcove Reservoir and Dam

The bedrock underlying the Alcove Dam is predominately shales and siltstones from the lower Hamilton group and are of lower Devonian in age. The Onondaga limestone also underlies Alcove Reservoir at depths of approximately 100 feet. These limestones form caves and caverns to the north and east. But within the reservoir area, no evidence of karst topography exist.

The local topography is controlled by stratigraphic variations of the bedrock. Terracing is the main feature in the vincinity of Alcove. This is indicative of nearly horizontal strata with varying lithologies. Primarily, resistant sandy siltstones form the "cap rock" for the terraces while weaker shales usually forms the gentler slopes.

The local drainage pattern is rectangular-trellis. This is characterized by the main stream channels being long, straight and parallel. Minor tributaries are usually short and are at right angles. This type of drainage is associated with bedrock structure. No major faults or other tectonic features are indicated on the general structure map of this area. This suggests that the drainage patterns are controlled by joints and fractures.

APPENDIX B

HYDROLOGIC COMPUTATIONS

L. ROBERT KIMBALL
Consulting Engineers

SU: _____ BY_____ DATE_____
SHEET NO._____ OF_____
JOB NO._____

ALCOVE RESERVOIR

DRAINAGE AREA

AREA = 34.35 SQ. MI.

PRECIPITATION:

PMP = 20", FROM REPORT #33

DEPTH - AREA RELATIONSHIPS

6 HR — 98%

12 HR — 110%

24 HR — 120%

48 HR — 129%

SPS = 9"(1.13) = 10.2"
FROM DRAFT EM 1110-2-1411

SNYDER COEFFICIENTS

LENGTH OF MAIN CHANNEL:

L = 11.5 MILES.

LENGTH OF MAIN CHANNEL AT RIGHT ANGLE FROM THE DRAINAGE AREA'S CENTER OF GRAVITY:

L_{ca} = 4.3 MILES.

ALCOVE RESERVOIR

LAG TIME:

$$t_{pR} = C_t (1.955)(L \times L_{CA})^{.3} + .25 t_R$$

$$= 2.0 (.955)(11.5 \times 4.3)^{.3} + .25(2)$$

$$= 6.66 \text{ HR.}$$

UNIT HYDROGRAPH PEAK DISCHARGE:

$$Q_{pR} = \frac{640 C_p A}{t_{pR}}$$

$$= \frac{640(0.6)(34.35)}{6.66}$$

$$= 1980 \text{ CFS}$$

L. ROBERT KIMBALL
Consulting Engineers

SUBJECT _____ BY JPT DATE 7/10/28

SHEET NO _____ OF _____

JOB NO. _____

ALCOVE RESERVOIR

ELEVATION - DISCHARGE RELATIONSHIP

	SPILLWAY		OVERTOP		TOTAL DISCHARGE
ELEV	H	Q	H	Q	Q
FT	FT	CFS	FT	CFS	CFS
618	0	0	—	—	0
619	1.0	1080	—	—	1080
620	2.0	3055	—	—	3055
621	3.0	5612	—	—	5612
622	4.0	8640	—	—	8640
623	5.0	12,075	—	—	12,075
624	6.0	15,870	—	—	15,870
625	7.0	20,000	0	0	20,000
626	8.0	24,440	1.0	6096	30,536
627	9.0	29,160	2.0	17,241	46,401
628	10.0	34,152	3.0	31,674	65,826
629	11.0	39,400	4.0	48,765	88,165
630	12.0	44,890	5.0	68,151	113,041

SPILLWAY: $Q = CLH^{\frac{3}{2}}$ $C = 3.6$

$L = 300'$

TOP OF DAM: ELEV 625.0'

L. ROBERT KIMBALL
Consulting Engineers

SUBJECT _____ BY JPT DATE 7/10/58

SHEET NO _____ OF _____

JOB NO. _____

ALCOVE RESERVOIR

ELEVATION - STORAGE RELATIONSHIP

ELEV. FT	SURFACE AREA ACRES	Δ ELEV. FT	STORAGE AC-FT	DISCHARGE CFS
618	1434		0	0
		1.0		
619	1460		1447	1080
		1.0		
620	1487		2920	3055
		1.0		
621	1514		4421	5612
		1.0		
622	1540		5948	8640
		1.2		
623	1566		7501	12,075
		1.0		
624	1593		9080	15,870
		1.0		
625	1620		10,687	20,000
		1.0		
626	1646		12,320	30,536
		1.0		
627	1672		13,979	46,401
		1.0		
628	1699		15,664	65,826
		1.0		
629	1726		17,377	88,165
		1.0		
630	1752		19,116	113,041

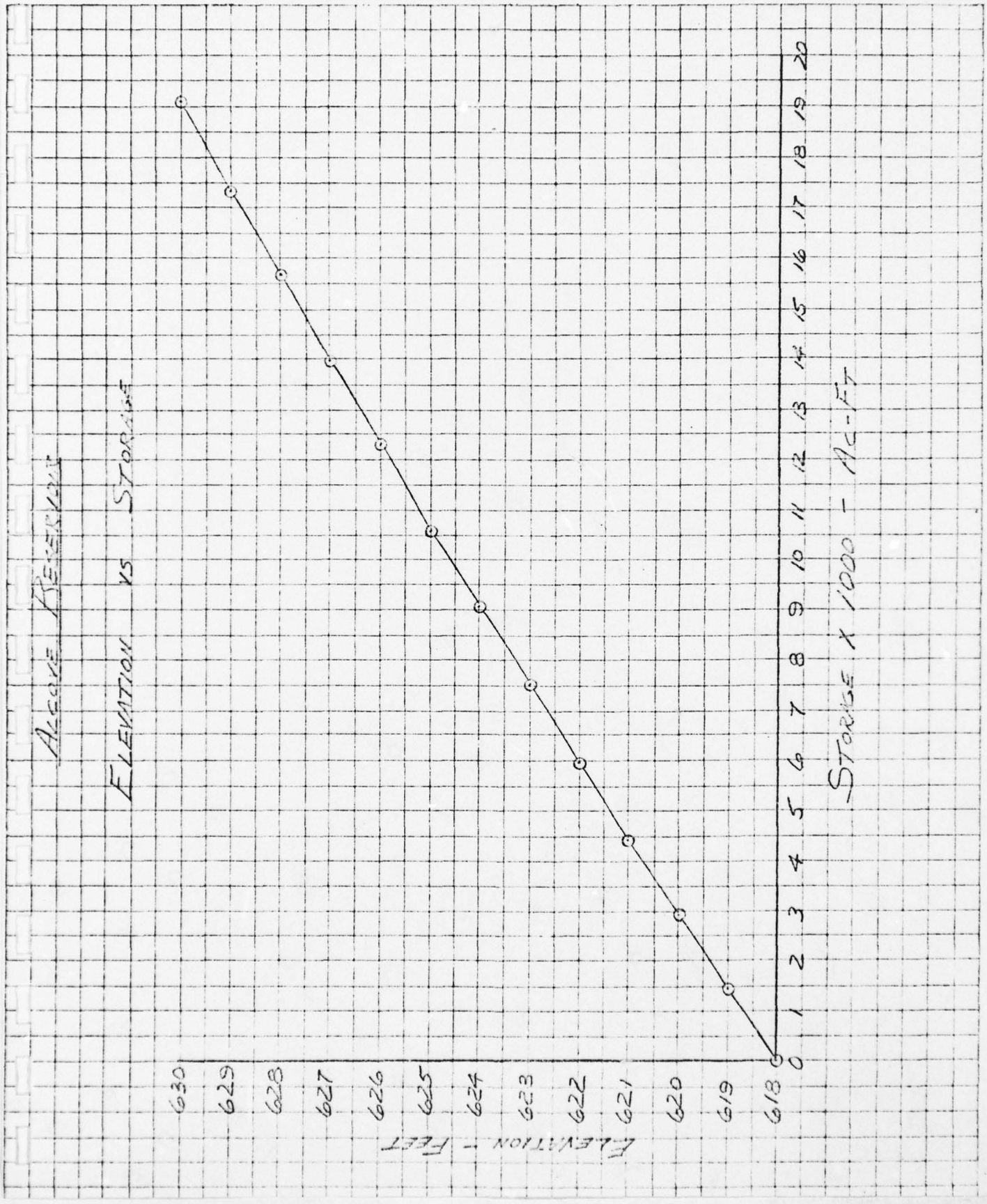
TOP OF DAM: ELEV. 625.0'

L. ROBERT KIMBALL
Consulting Engineers

SUBJECT _____ BY _____ DATE _____

SHEET NO _____ OF _____

JOB NO. _____



L. ROBERT KIMBALL
Consulting Engineers

JOB NAME Alcove
JOB NUMBER
BY CW DATE 7/2/73
SHEET NO. 1 OF 5

ALCOVE DAM

HYDRAULIC EVALUATION OF FLOOD WAVE

STORAGE CAPACITY, $V_b = 47{,}600$ A.F.
@ TOP OF DAM

$$Q_{MAX} = .29\sqrt{g}\, K^{.28} W_b D_b^{1.5}$$

$$K = \frac{W_d}{W_b} \cdot \frac{Y_o}{D_b} \qquad T_s = L t_s \qquad t_s = \frac{\Delta S}{\Delta Q}$$

$$S_i = \frac{12 V_b}{Q_{MAX}}$$

$$\frac{\text{Att. } Q_{MAX}}{Q_{MAX}} = \frac{0.91 S_i}{S_i + T_s}$$

A) FULL BREACH

$W_b = W_d = 2177'$

$D_b = Y_o = 80'$

$Q_{MAX} = 2{,}619{,}000$ c.f.s.

DIST. FROM DAM

REACH 1 L = 2500' @ ALCOVE RD. 2500'

D_{DS} = 80' W = 2040'

WATER SURFACE EL. 625'

Q_{MAX} = 2,454,000 c.f.s.

REACH 2 L = 1400' 3900'

D_{DS} = 115' W = 1130' D_{AVE} = 103'

WATER SURFACE EL. 625'

Q_{MAX} = 2,343,000 c.f.s.

REACH 3 L = 2200' 6100'

D_{DS} = 115' W = 1090' D_{AVE} = 115'

WATER SURFACE EL. 600'

Q_{MAX} = 2,239,000 c.f.s.

DIST. FROM DAM

REACH 4 L = 3700' 9800'
@ STANTON & MUD HILL RDS.

D_{DS} = 90' W = 1490' D_{AVG} = 98'

WATER SURFACE EL. 530'

Q_{MAX} = 2,139,000 c.f.s.

REACH 5 L = 5300' 15,100'
@ GREENBUSH AVE.

D_{DS} = 95' W = 1260' D_{AVE} = 97'

WATER SURFACE EL. 485'

Q_{MAX} = 1,961,000 c.f.s.

REACH 6 L = 2600' 17,700
@ GEDNEY HILL ROAD

D_{DS} = 80' W = 1350' D_{AVE} = 88'

WATER SURFACE EL. 450'

Q_{MAX} = 1,623,815 c.f.s.

B) PARTIAL BREACH

W_b = 700' $D_b = Y_o$ = 80'

Q_{MAX} = 842,000 cfs

REACH 1 L = 2500' @ ALCOVE RD. DIST. FROM DAM 2500'

D_{DS} = 45' W = 1460' D_{AVE} = 57'

WATER SURFACE EL. 590'

Q_{MAX} = 741,000 c.f.s.

REACH 2 L = 1400' 3900'

D_{DS} = 80' W = 570' D_{AVE} = 68'

WATER SURFACE EL. 590'

Q_{MAX} = 686,000 cfs

REACH 3 L = 2200' DIST. FROM DAM 6100'

D_{DS} = 65' W = 700' D_{AVE} = 70'

WATER SURFACE EL. 550'

$Q_{MAX.}$ = 617,000 cfs

REACH 4 L = 3700' 9800'

@ STANTON & MUD HILL RDS.

D_{DS} = 45' W = 1045' D_{AVE} = 52'

WATER SURFACE EL. 485'

Q_{MAX} = 530,000 cfs

REACH 5 L = 5300' 15,100'

@ GREENBUSH AVE.

D_{DS} = 45' W = 940' D_{AVE} = 45'

WATER SURFACE EL. 435'

Q_{MAX} = 477,000 cfs

REACH 6 L = 2600' 17,700'

@ GEDNEY HILL ROAD

D_{DS} = 45' W = 830' D_{AVE} = 45'

WATER SURFACE EL. 415'

Q_{MAX} = 421,000 cfs

****
HEC-1 VERSION DATED JAN 1973
UPDATED AUG 74
CHANGE NO. 01
****

ALCOVE RESERVOIR
RESERVOIR AT TOP OF FLOOD POOL
TEST PMP

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	ISTAQ
55	2	0	0	0	0	0	2	1	0

JOPER	NWT
3	0

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	0	0	0	0	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	34.35	0.0	34.35	0.0	0.0	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.0	20.00	98.00	110.00	120.00	126.00	0.0	0.0

TRSPC COMPUTED BY THE PROGRAM IS 0.809

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.0	0.0	1.00	0.0	0.0	1.00	1.50	0.10	0.0	0.0

UNIT HYDROGRAPH DATA
TP 6.86 CP 0.60 NTA 0

RECESSION DATA
STRTQ 34.35 QRCSN -0.35 RTIOR 2.00

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC 3.98 AND R 3.26 INTERVALS

UNIT HYDROGRAPH 20 END-OF-PERIOD ORDINATES, LAG 6.68 HOURS, CP 0.60 VOL 1.00

273.	970.	1688.	1941.	1650.	1211.	869.	653.	479.	352.
258.	190.	139.	102.	75.	55.	40.	30.	22.	16.

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q

1	0.01	0.00	31.
2	0.01	0.00	29.
3	0.01	0.00	25.
4	0.04	0.00	22.
5	0.04	0.00	20.
6	0.04	0.00	18.
7	0.29	0.00	16.
8	0.58	0.00	14.
9	0.23	0.00	13.
10	0.02	0.00	11.
11	0.02	0.00	10.
12	0.02	0.00	9.
13	0.22	0.01	10.
14	0.22	0.02	21.
15	0.22	0.02	48.
16	0.67	0.47	211.
17	0.67	0.47	689.
18	0.67	0.47	1480.
19	4.28	4.08	3356.
20	0.72	0.52	8824.
21	3.45	3.25	18340.
22	0.34	0.14	27284.
23	0.34	0.14	30242.
24	0.34	0.14	26076.
25	0.0	0.0	20648.
26	0.0	0.0	15418.
27	0.0	0.0	11446.
28	0.0	0.0	8434.
29	0.0	0.0	7081.
30	0.0	0.0	6344.
31	0.0	0.0	5684.
32	0.0	0.0	5093.
33	0.0	0.0	4563.
34	0.0	0.0	4088.
35	0.0	0.0	3663.
36	0.0	0.0	3282.
37	0.0	0.0	2940.
38	0.0	0.0	2634.
39	0.0	0.0	2360.
40	0.0	0.0	2115.
41	0.0	0.0	1895.
42	0.0	0.0	1698.
43	0.0	0.0	1521.
44	0.0	0.0	1363.
45	0.0	0.0	1221.
46	0.0	0.0	1094.
47	0.0	0.0	980.
48	0.0	0.0	878.
49	0.0	0.0	787.
50	0.0	0.0	705.

51	0.0	0.0	632.
52	0.0	0.0	560.
53	0.0	0.0	507.
54	0.0	0.0	454.
55	0.0	0.0	407.
SUM	21.45	17.75	237901.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	30242.	28067.	15535.	6556.	237898.
INCHES		7.60	16.83	21.31	21.48
AC-FT		13925.	30829.	39032.	39342.

OVF

STATION 1

INFLOW I • OUTFLOW O AND OBSERVED FLOW *

0. 4000. 8000. 12000. 16000. 20000. 24000. 28000. 32000. 0. 0. 0.

* XXXXXO.

PRECIP L AND EXC

ESS X

0. 0. 0. 0. 0. 0. 0. 0. 0. 12. 8. 4.

ESS X XO.

1 I • • • • • • • • • • • •

ESS X XO.L

2 I • • • • • • • • • • • •

ESS X XO.L

3 I • • • • • • • • • • • •

ESS X XO.L

4 I • • • • • • • • • • • •

ESS X XO.L

5 I • • • • • • • • • • • •

ESS X XO.L

6 I • • • • • • • • • • • •

ESS X XO.L

7 I • • • • • • • • • • • •

ESS X XOLX

8 I • • • • • • • • • • • •

ESS X XOLX

9 I • • • • • • • • • • • •

ESS X XOLX

10 I • • • • • • • • • • • •

ESS X XOLL

11 I • • • • • • • • • • • •

ESS X XOLL

12 I • • • • • • • • • • • •

ESS X XOLL

13 I • • • • • • • • • • • •

ESS X XOLX

14 I • • • • • • • • • • • •

ESS X XOLX

15 I • • • • • • • • • • • •

ESS X XOLX

16 .I • • • • • • • • • • • •

ESS X XLXX

17 . I • • • • • • • • • • • •

ESS X XLXX

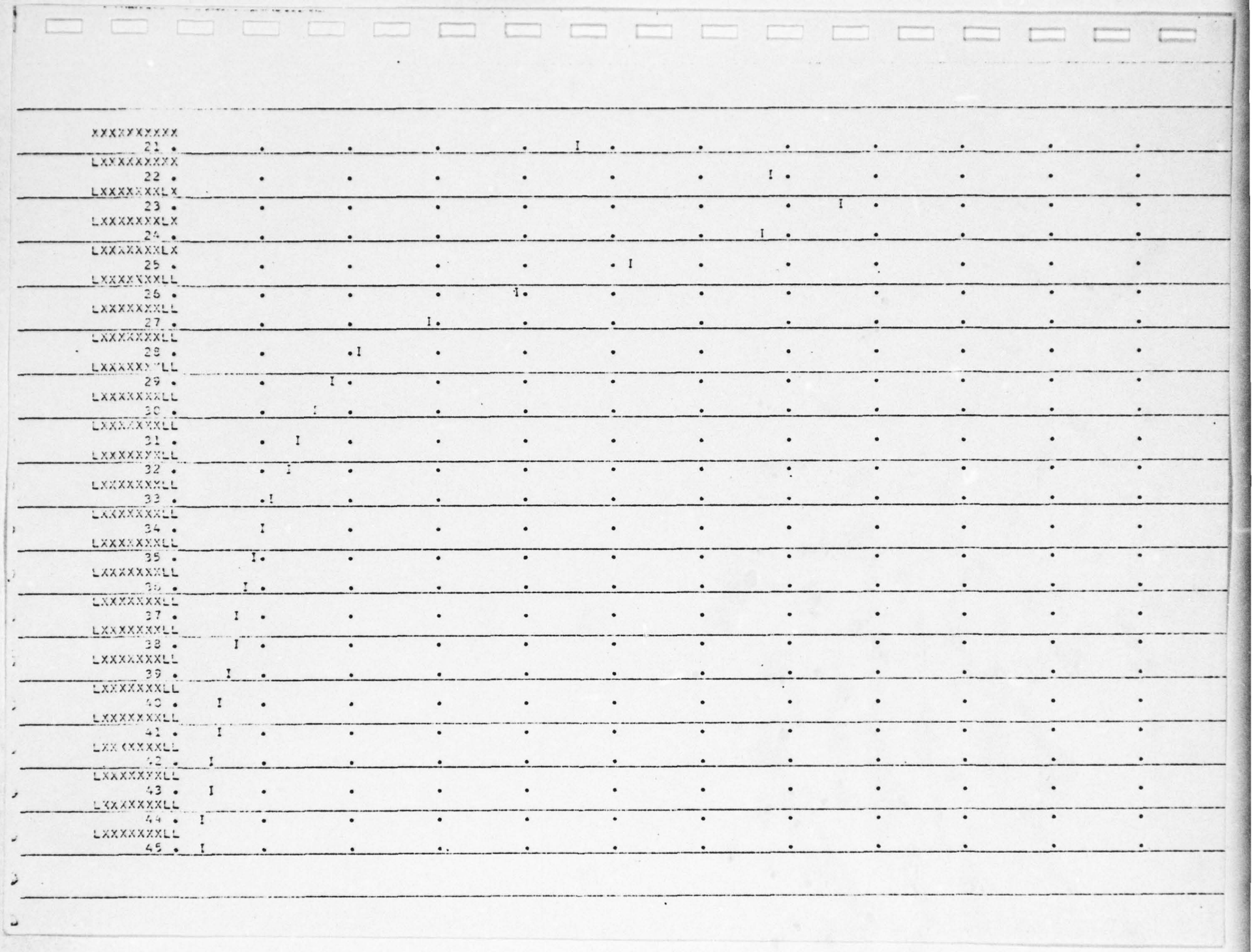
18 . I • • • • • • • • • • • •

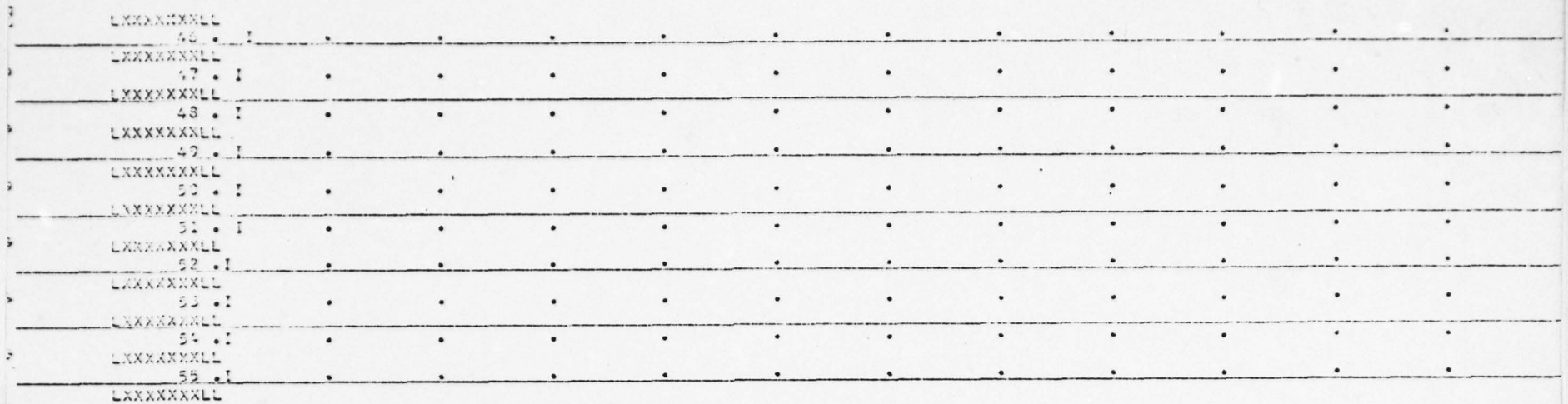
ESS X XLXX

19 . I . • • • • • • • • • • LX

XXXXXXXXX

20 . • . I . • • • • • • • LXXXXXXXXXXX




LXXXXXXXXLL
46 . I . . . . . .
LXXXXXXXXLL
47 . I . . . . . .
LXXXXXXXXLL
48 . I . . . . . .
LXXXXXXXXLL
49 . I . . . . . .
LXXXXXXXXLL
50 . I . . . . . .
LXXXXXXXXLL
51 . I . . . . . .
LXXXXXXXXLL
52 . I . . . . . .
LXXXXXXXXLL
53 . I . . . . . .
LXXXXXXXXLL
54 . I . . . . . .
LXXXXXXXXLL
55 . I . . . . . .
LXXXXXXXXLL

CVN

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
2	1	0	0	0	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME
0.0	0.0	0.0	1	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA
1	0	0	0.0	0.0	0.0	-1.

STORAGE	0.	1447.	2920.	4421.	5948.	7501.	9080.	10687.	12320.	13979.
OUTFLOW	0.	1080.	3059.	5612.	8640.	12075.	15870.	20038.	30538.	40401.

TIME	EOP STOR	AVG IN	EOP OUT
1	41.	21.	31.
2	41.	29.	31.
3	40.	26.	30.
4	39.	23.	29.
5	38.	21.	28.
6	36.	19.	27.
7	35.	17.	26.
8	33.	15.	25.
9	31.	14.	23.
10	30.	12.	22.
11	28.	11.	21.
12	26.	10.	20.
13	25.	10.	18.
14	24.	9.	18.
15	27.	34.	20.
16	44.	138.	33.
17	109.	459.	81.
18	265.	1035.	194.
19	611.	2419.	456.
20	1480.	6091.	1133.
21	3326.	13582.	3750.
22	6055.	22812.	6877.
23	8810.	28703.	15230.
24	10622.	28459.	19833.
25	11048.	23684.	22332.
26	10558.	18033.	19689.
27	9708.	13452.	17483.
28	8675.	9940.	14096.
29	7690.	7757.	12530.
30	6880.	6712.	10701.

31	6229.	6014.	9252.
32	5661.	5388.	8116.
33	5214.	4828.	7459.
34	4803.	4325.	6553.
35	4453.	3879.	5679.
36	4134.	3472.	5129.
37	3845.	3111.	4627.
38	3576.	2787.	4173.
39	3333.	2497.	3759.
40	3113.	2237.	3383.
41	2913.	2005.	3045.
42	2727.	1796.	2736.
43	2550.	1609.	2559.
44	2384.	1442.	2358.
45	2229.	1292.	2128.
46	2084.	1157.	1934.
47	1951.	1037.	1755.
48	1828.	929.	1590.
49	1715.	832.	1439.
50	1612.	746.	1301.
51	1518.	668.	1175.
52	1431.	599.	1068.
53	1348.	536.	1006.
54	1267.	481.	949.
55	1186.	431.	889.
SUM			231209.

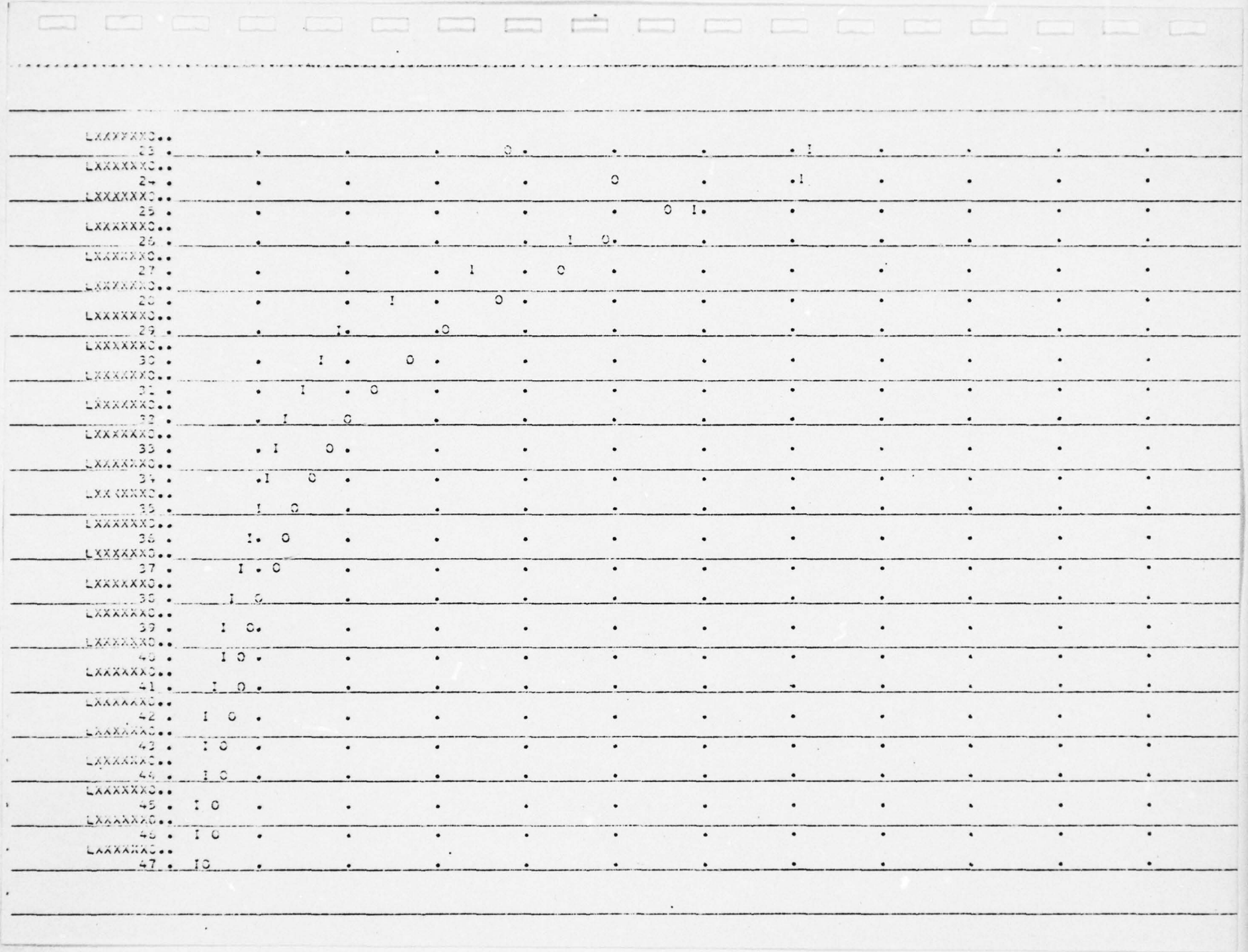
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	22332.	20611.	13842.	6391.	231209.
INCHES		5.56	14.99	20.77	20.87
AC-FT		10226.	27469.	38048.	38236.

OVF

STATION 2

INFLOW I , OUTFLOW O AND OBSERVED FLOW *

```
      0.     4000.     8000.    12000.    16000.    20000.    24000.    28000.    32000.      0.      0.      0.
LXXXXXXO.
    1 I
LXXXXXXO..
    2 I
LXXXXXXO..
    3 I
LXXXXXXO..
    4 I
LXXXXXXO..
    5 I
LXXXXXXO..
    6 I
LXXXXXXO..
    7 I
LXXXXXXO..
    8 I
LXXXXXXO..
    9 I
LXXXXXXO..
   10 I
LXXXXXXO..
   11 I
LXXXXXXO..
   12 I
LXXXXXXO..
   13 I
LXXXXXXO..
   14 I
LXXXXXXO..
   15 I
LXXXXXXO..
   16 I
LXXXXXXO..
   17 OI
LXXXXXXO..
   18 O  I
LXXXXXXO..
   19 .O    I
LXXXXXXO..
   20 .  O      .   I    .
LXXXXXXO..
   21 .        O.        .      .  I     .
LXXXXXXO..
   22 .        .        . O      .        .        .  I     .
```



```
LXXXXXXO..
      48 . I O    .    .    .    .    .    .    .    .    .    .    .
LXXXXXXO..
      49 . I O    .    .    .    .    .    .    .    .    .    .    .
LXXXXXXO..
      50 . IO     .    .    .    .    .    .    .    .    .    .    .
LXXXXXXO..
      51 . IO     .    .    .    .    .    .    .    .    .    .    .
LXXXXXXO..
      52 .I O     .    .    .    .    .    .    .    .    .    .    .
LXXXXXXO..
      53 .I O     .    .    .    .    .    .    .    .    .    .    .
LXXXXXXO..
      54 .IO      .    .    .    .    .    .    .    .    .    .    .
LXXXXXXO..
      55 .IO      .    .    .    .    .    .    .    .    .    .    .
LXXXXXXO..
```

RUNOFF SUMMARY, AVERAGE FLOW

		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	1	30242.	26067.	18539.	6556.	34.35
ROUTED TO	2	22332.	20611.	13842.	6391.	34.35

HEC-1 VERSION, DATED JAN 1973
UPDATED AUG 74
CHANGE NO. 31

ALCOVE RESERVOIR
RESERVOIR AT TOP OF FLOOD POOL
TEST SPF

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	MIN	METRC	IPLT	IPRT	JSTAN
55	2	0	0	0	0	0	2	1	0

JOPER	NRT
3	0

SUB-AREA RUNOFF COMPUTATION

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	0	0	0	0	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	34.35	0.0	34.35	0.0	0.0	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
10.20	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TRSPC COMPUTED BY THE PROGRAM IS 0.839

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.0	0.0	1.00	0.0	0.0	1.00	1.50	0.10	0.0	0.0

UNIT HYDROGRAPH DATA
TP 6.66 CP 0.60 NTA 0

RECESSION DATA
STRTQ 34.35 QRCSN -0.25 RTIOR 3.00
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC 8.88 AND R 8.26 INTERVALS

UNIT HYDROGRAPH 20 END-OF-PERIOD ORDINATES, LAG 6.68 HOURS, CP 0.60 VOL 1.00

273.	970.	1688.	1941.	1650.	1211.	889.	653.	479.	352.
258.	190.	139.	102.	75.	55.	40.	30.	22.	16.

END-OF-PERIOD FLOW
TIME 0 RAIN 0 EXCS 0 COMP Q

1	0.00	0.00	21.
2	0.00	0.00	28.
3	0.00	0.00	25.
4	0.01	0.00	22.
5	0.01	0.00	20.
6	0.01	0.00	18.
7	0.06	0.00	16.
8	0.12	0.00	14.
9	0.05	0.00	13.
10	0.01	0.00	11.
11	0.01	0.00	10.
12	0.01	0.00	9.
13	0.02	0.00	8.
14	0.02	0.00	7.
15	0.02	0.00	7.
16	0.05	0.00	6.
17	0.04	0.00	5.
18	0.05	0.00	5.
19	0.27	0.00	4.
20	0.55	0.00	4.
21	0.22	0.00	4.
22	0.03	0.00	6.
23	0.03	0.00	8.
24	0.03	0.00	9.
25	0.11	0.00	7.
26	0.11	0.00	6.
27	0.11	0.00	6.
28	0.37	0.17	51.
29	0.37	0.17	217.
30	0.37	0.17	508.
31	1.99	1.79	1283.
32	4.06	3.86	3701.
33	1.61	1.41	7936.
34	0.22	0.02	12000.
35	0.22	0.02	13021.
36	0.22	0.02	11670.
37	0.01	0.00	8935.
38	0.01	0.00	6507.
39	0.01	0.00	4802.
40	0.02	0.00	3574.
41	0.02	0.00	3073.
42	0.02	0.00	2783.
43	0.10	0.00	2467.
44	0.21	0.01	2210.
45	0.08	0.00	1980.
46	0.01	0.00	1774.
47	0.01	0.00	1589.
48	0.01	0.00	1424.
49	0.0	0.0	1276.
50	0.0	0.0	1143.

51	0.0	0.0	1024.
52	0.0	0.0	918.
53	0.0	0.0	822.
54	0.0	0.0	737.
55	0.0	0.0	660.
SUM	11.90	7.64	98871.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	13321.	12335.	6746.	2739.	98871.
INCHES		3.34	7.31	8.00	8.00
AC-FT		6120.	13386.	16309.	16361.

OUTP

STATION 1

INFLOW I , OUTFLOW O AND OBSERVED FLOW *

0. 2000. 4000. 6000. 8000. 10000. 12000. 14000. 0. 0. 0. 0.

* 0.

PRECIP L AND EXC

EOS X 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 6. 4. 2.

EOS X 0. 1 I . . . . . .

EOS X 0.L 2 I . . . . . .

EOS X 0.L 3 I . . . . . .

EOS X 0.L 4 I . . . . . .

EOS X 0.L 5 I . . . . . .

EOS X 0.L 6 I . . . . . .

EOS X 0.L 7 I . . . . . .

EOS X 0.L 8 I . . . . . .

EOS X 0LX 9 I . . . . . .

EOS X 0LL 10 I . . . . . .

EOS X 0LL 11 I . . . . . .

EOS X 0LL 12 I . . . . . .

EOS X 0LL 13 I . . . . . .

EOS X 0LL 14 I . . . . . .

EOS X 0LL 15 I . . . . . .

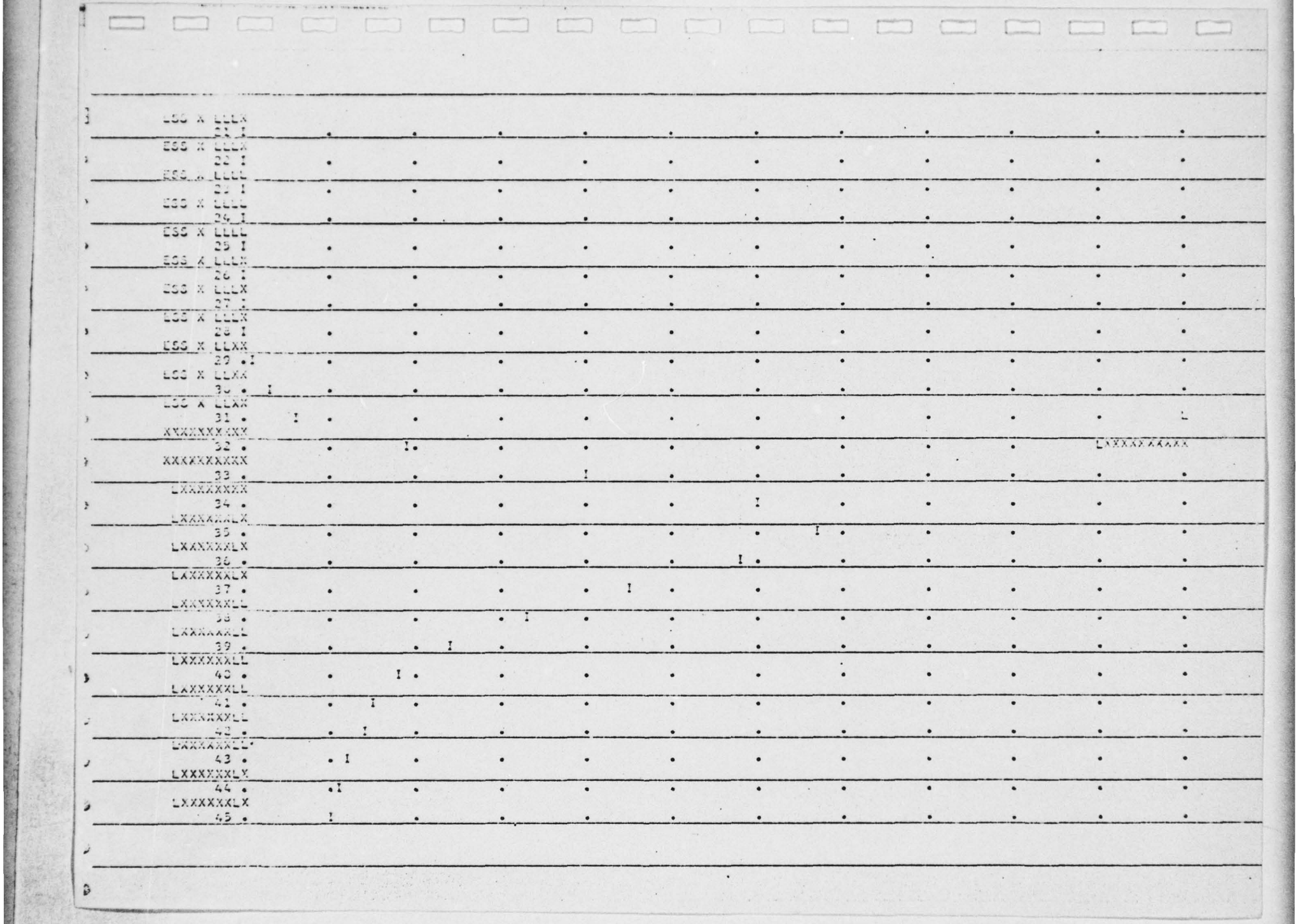
EOS X 0LL 16 I . . . . . .

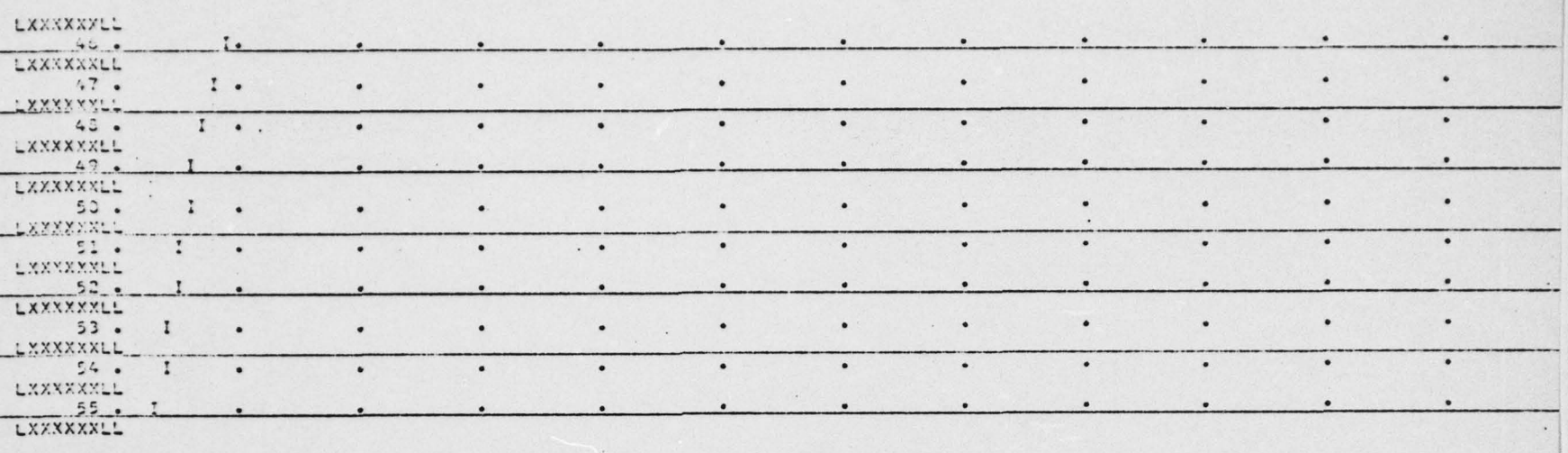
EOS X 0LL 17 I . . . . . .

EOS X 0LL 18 I . . . . . .

EOS X 0LL 19 I . . . . . .

EOS X 0LX 20 I . . . . . .




LXXXXXXLL
46
LXXXXXXLL
47
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49
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LXXXXXXLL

COMMAND

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
2	1	0	0	0	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME
0.0	0.0	0.0	1	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA
1	0	0	0.0	0.0	0.0	-1.

STORAGE	0.	1447.	2920.	4421.	5948.	7501.	9080.	10687.	12320.	13979.
OUTFLOW	0.	1080.	3055.	5612.	8640.	12075.	15870.	20000.	30536.	48401.

TIME	EOP STOR	AVG IN	EOP OUT
1	41.	31.	31.
2	41.	29.	31.
3	40.	26.	30.
4	39.	23.	29.
5	38.	21.	28.
6	36.	19.	27.
7	35.	17.	26.
8	33.	15.	25.
9	31.	14.	23.
10	30.	12.	22.
11	28.	11.	21.
12	26.	10.	20.
13	24.	9.	18.
14	23.	8.	17.
15	21.	7.	16.
16	20.	6.	15.
17	18.	6.	14.
18	17.	5.	13.
19	16.	5.	12.
20	15.	4.	11.
21	13.	4.	10.
22	13.	5.	9.
23	12.	7.	9.
24	12.	8.	9.
25	12.	8.	9.
26	12.	7.	8.
27	11.	6.	8.
28	14.	28.	11.
29	34.	134.	25.
30	86.	362.	64.

31	215.	805.	161.
32	573.	2492.	422.
33	1420.	5841.	1060.
34	2751.	8994.	2628.
35	4161.	12665.	5203.
36	5222.	12498.	7199.
37	5663.	10305.	8074.
38	5610.	7756.	7987.
39	5299.	5730.	7352.
40	4853.	4218.	6469.
41	4406.	3223.	5587.
42	4019.	2915.	4907.
43	3680.	2610.	4305.
44	3391.	2330.	3867.
45	3136.	2095.	3422.
46	2911.	1877.	3044.
47	2709.	1682.	2772.
48	2521.	1507.	2519.
49	2347.	1350.	2286.
50	2186.	1210.	2071.
51	2039.	1084.	1874.
52	1905.	971.	1694.
53	1782.	870.	1530.
54	1671.	779.	1380.
55	1569.	698.	1244.
SUM			89919.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	9074.	7304.	5623.	2486.	89919.
INCHES		2.11	6.39	8.08	8.12
AC-FT		3872.	11156.	14901.	14870.

OVF

STATION 2

INFLOW I , OUTFLOW O AND OBSERVED FLOW *

0. 2000. 4000. 6000. 8000. 10000. 12000. 14000. 0. 0. 0. 0.

LXXXXXO.
1 I
LXXXXXO..
2 I
LXXXXXO..
3 I
LXXXXXO..
4 I
LXXXXXO..
5 I
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6 I
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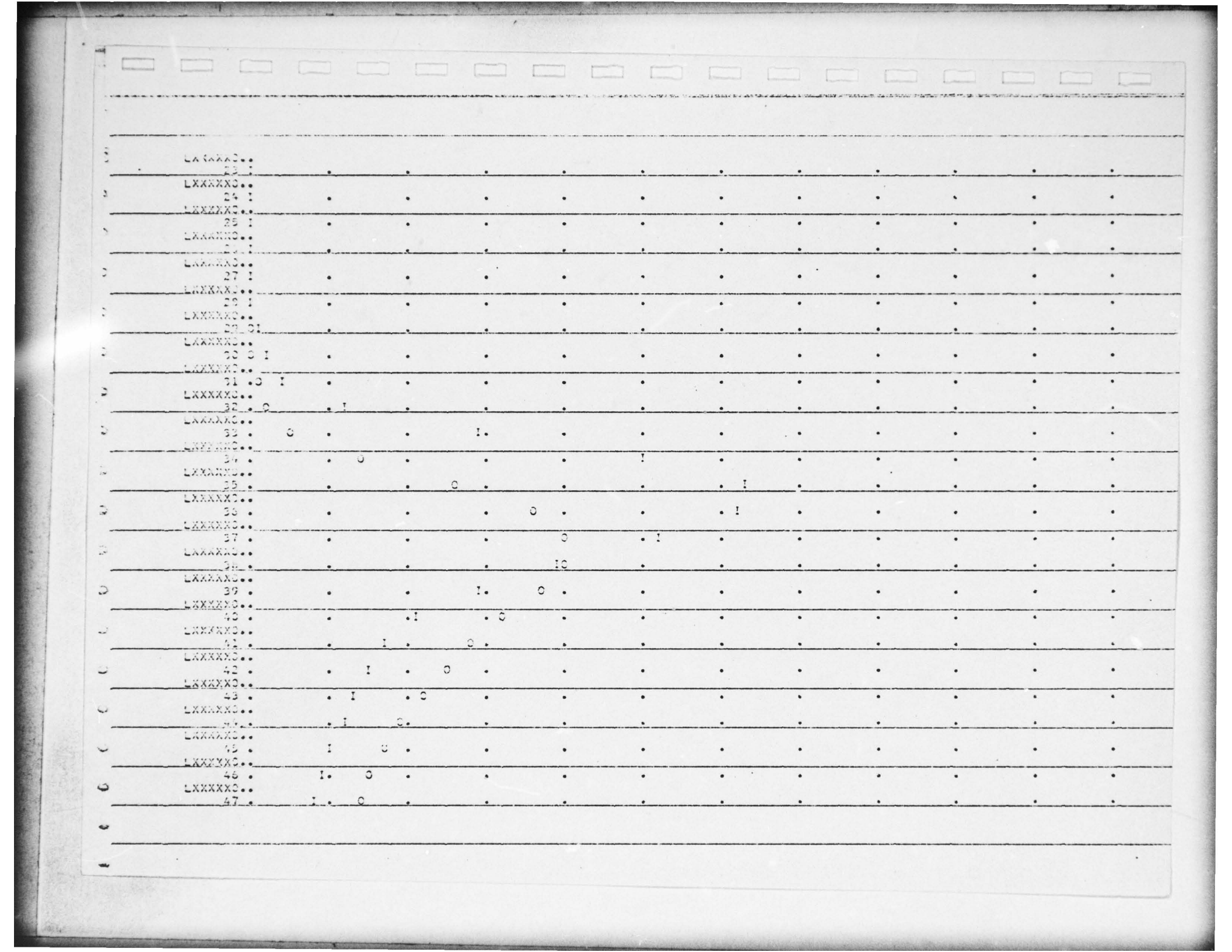
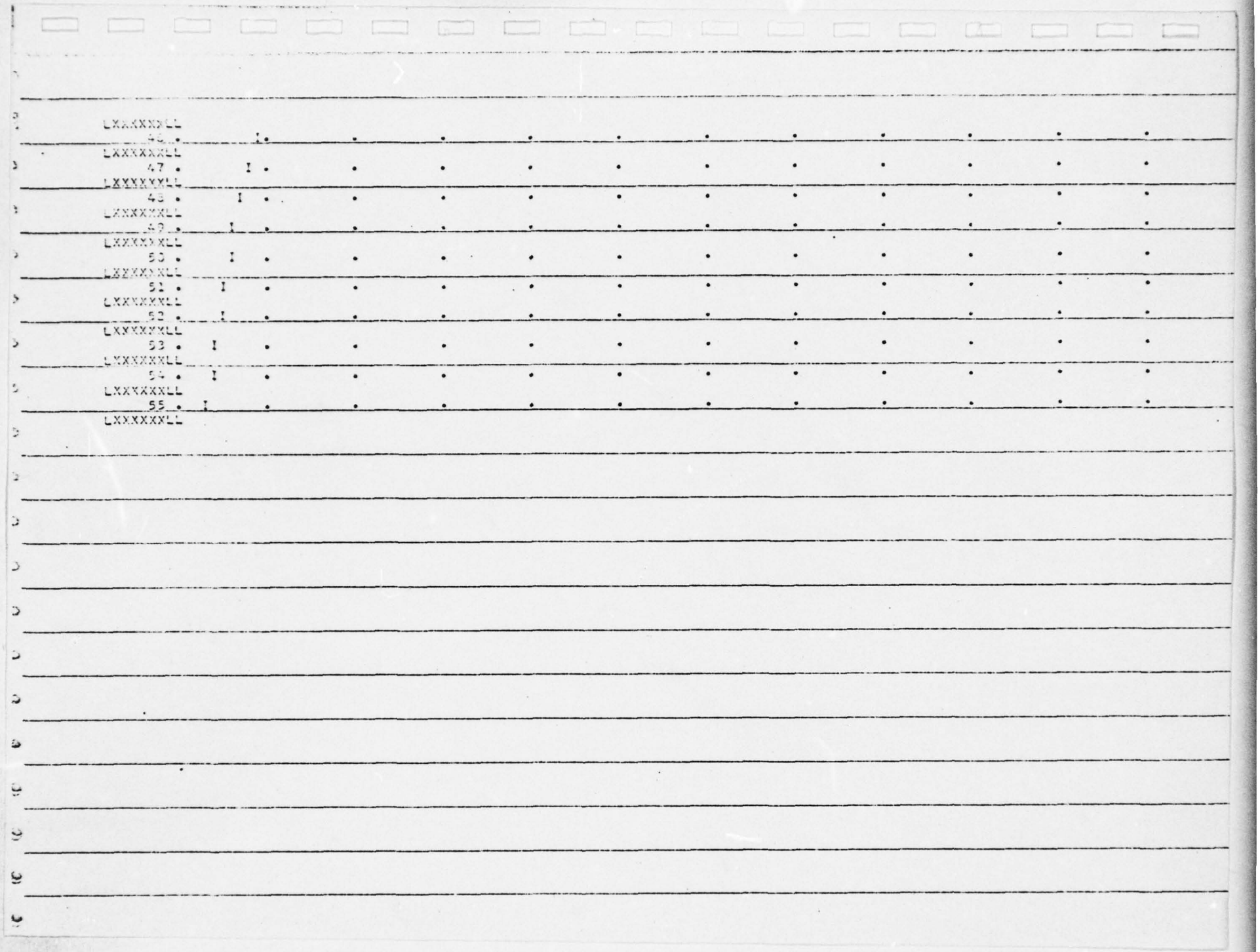
22 I





RUNOFF SUMMARY, AVERAGE FLOW

		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	1	13321.	12355.	8740.	2739.	34.39
ROUTED TO	2	8014.	7804.	2823.	2489.	34.39

APPENDIX C

PHOTOGRAPHS

Photograph Index

1. Upstream slope from near right abutment.
   Note: rip rap and intake building.

2. Downstream slope from right abutment.

3. Emergency spillway weir from left abutment.

4. Emergency spillway exit channel.

5. Outlet end of blowoff line.

6. Downstream exposures from top of dam.

PLATE 1

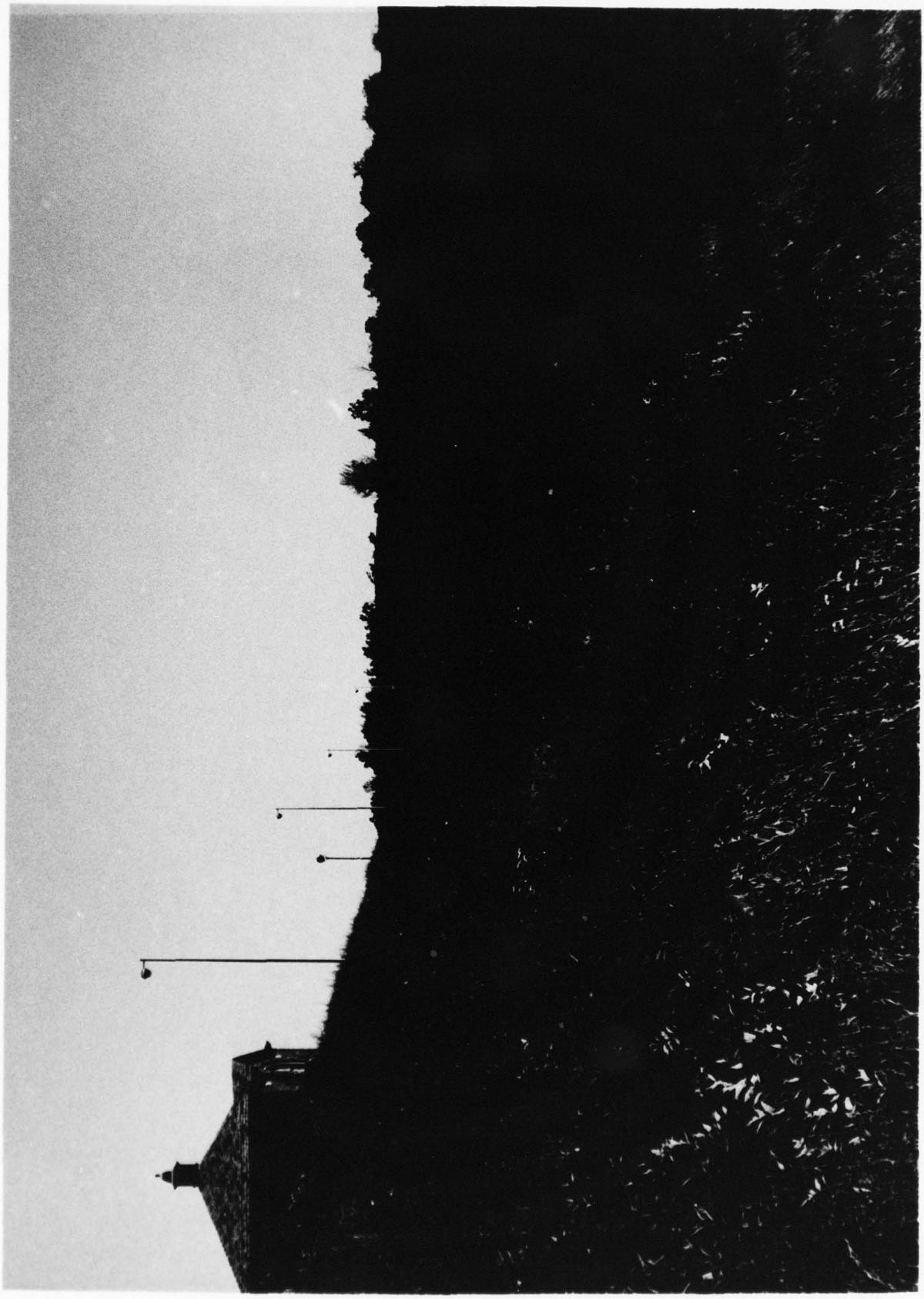


PLATE 2

PLATE 3

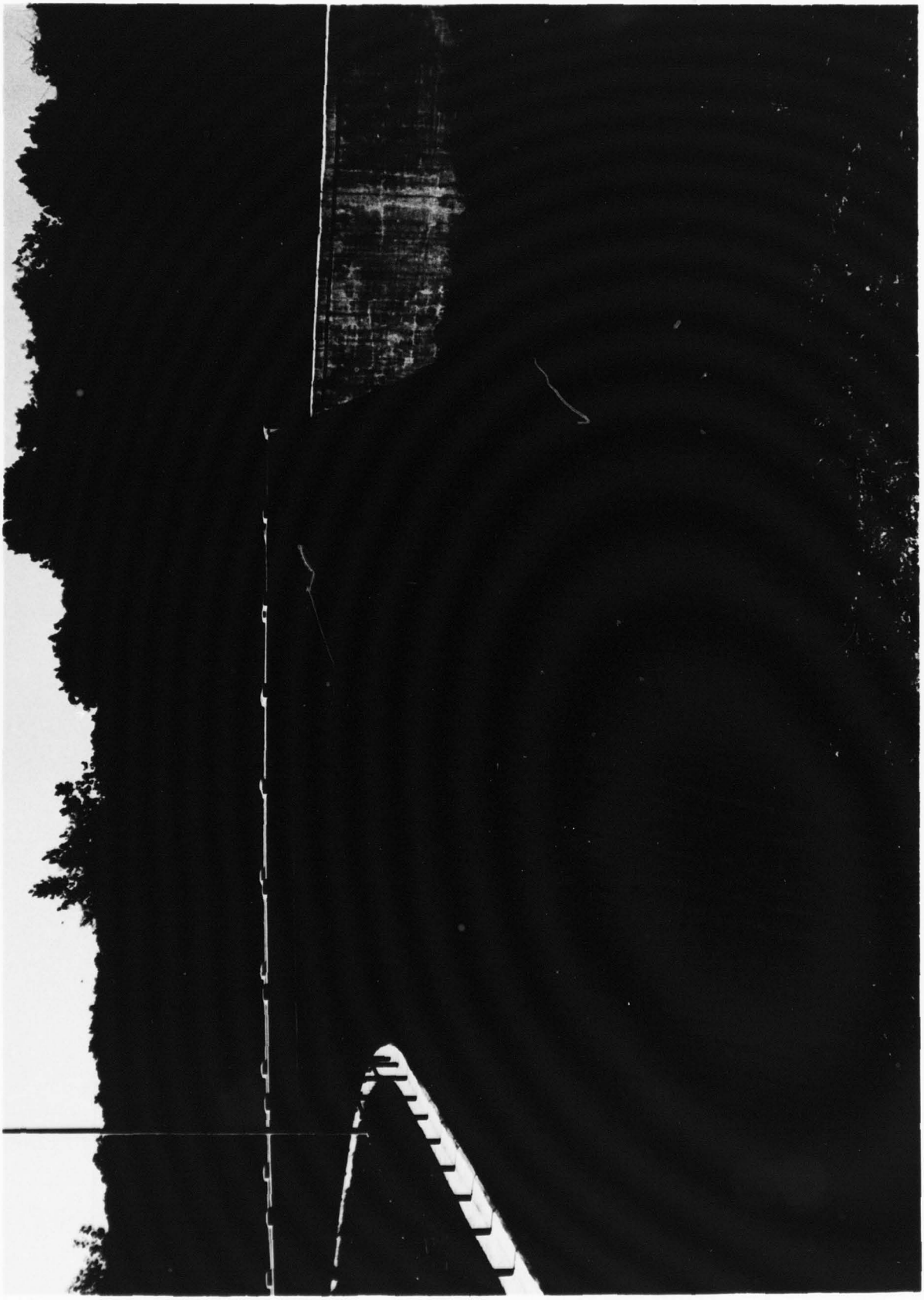


PLATE 4

PLATE 5

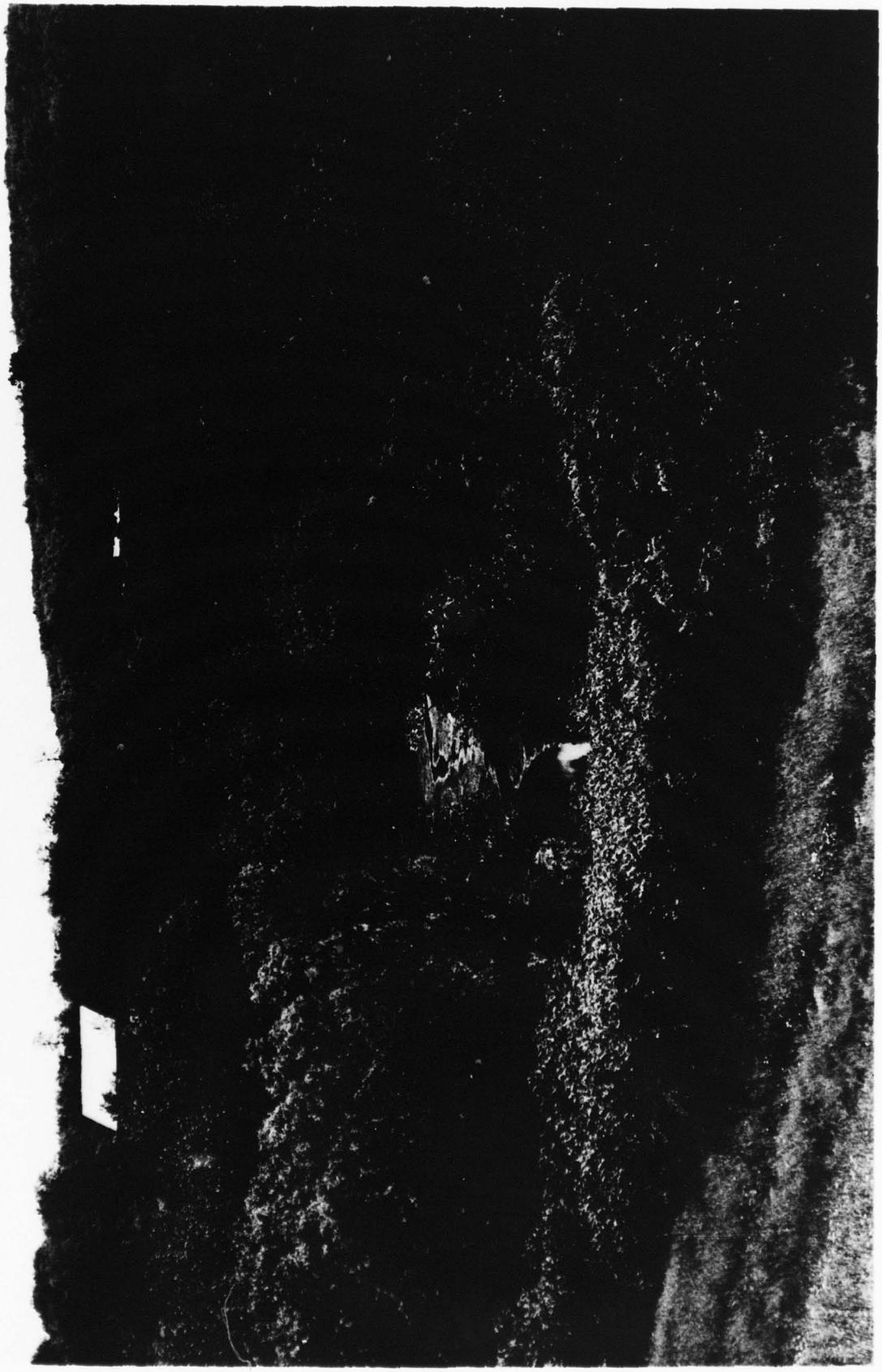


PLATE 6

APPENDIX D

PERTINENT CORRESPONDENCE AND REPORTS

THOMSEN ASSOCIATES
CONSULTANTS IN SOILS & FOUNDATION ENGINEERING
BENT L. THOMSEN, P.E., DAVID F. McCARTHY, P.E., 105 CORONA AVENUE, GROTON, N. Y., 13073 TEL. 607-898-5881

ALCOVE DAM
REPORT ON SITE INSPECTION
APRIL 7, 1976

FOR

Smith and Mahoney

Consulting Engineers

Albany, New York

OWNER

CITY OF ALBANY

BY

Thomsen Associates

Consulting Geotechnical Engineers & Geologists

THOMSEN ASSOCIATES
CONSULTANTS IN SOILS & FOUNDATION ENGINEERING
BENT L. THOMSEN, P.E., DAVID F. McCARTHY, P.E., 105 CORONA AVENUE, GROTON, N. Y., 13073 TEL. 607-898-5881

April 12, 1976

Smith and Mahoney
Consulting Engineers
40 Steuben Street
Albany, New York 12207

Attention: Mr. Steven Alexander, P. E.

Re: Alcove Dam

Gentlemen:

This correspondence relates the observations and conclusions resulting from our inspection of the Alcove Dam on April 7, 1976 and our subsequent review of the original plans and the recent inspection well data. Our inspection and review was directed towards the geotechnical aspects of the structure and did not encompass the performance or condition of structural components or appurtenances.

1. Substantial portions of the downstream slope, both above and below the berm, were covered with excessive growth including sumac and brush. This growth obscures ready and detailed inspection of the downstream slope faces. We strongly recommend that the downstream slope be cleared of the excessive growth and that the originally intended smooth grass covered surfaces be restored and maintained.

2. Considerable tailwater was ponding at the downstream toe near and around the outlet structures. The tailwater was resulted through construction of a nearby fire protection pond. The presence of the tailwater obscures detailed inspection of the toe of the dam at a most important location. We strongly recommend that the ponding be eliminated.

3. Considerable areas of ponding or excessive wetness were observed along the toe of slope on both abutments, and along the berm. Areas of excessive wetness were also observed near the downstream

toe on the lower slope extending from the outlet structures towards the north abutment. The approximate extent of these areas were sketched by one of our engineers on the day of inspection. Copies of the sketches are attached to this report.

Since frost may still have been in the ground at the time of inspection, and considering recent precipitation and surficial thawing, the significance of the above observations cannot readily be assessed. It was our distinct impression however, that to a large extent the ponding and wetness had resulted by seepage emerging out of the embankment. We were further informed that at least one of the wet areas was of permanent nature. Seepage out of downstream faces of earth dams warrants detailed consideration. We recommend that a renewed inspection of these areas be made after a period of stable weather.

4. There was no indication of erosion of soil particles (or piping) out of the embankment within or around the areas just discussed, nor was there any indications of slope sloughing or slope failure having occurred or being on the verge of occurring. Consequently, although the presence of these areas warrants additional consideration we see no need for any immediate concern relative to the safety of the dam.

5. Suppmentary Sheet No. 5 to the 1929 plans for the Alcove Dam outlines details for stone gutters along the toe of the berm and along the interfaces between embankment and the adjacent natural downstream ground. We do not recall the presence of these drainage facilities. We strongly recommend that the gutters, if present be restored to function as intended. If the gutters are not present we strongly recommend that such, or similar, facilities be built.

6. The water levels in the inspection wells recently installed by Empire Soils Investigations, Inc. appear in several cases higher than desirable. It is possible that the levels are affected by the ponding discussed above through vertical downward seepage. We have prepared embankment cross-sections at each well location

and copies are attached to this report. Seepage may reach the wells through embankment and/or foundation soils. The water may originate through the concrete core wall or through the rock underlying the dam, or through both.

7. In connection with future inspection and evaluations, we recommend that it be considered to recover cores to examine the condition of the concrete membrane and to install additional inspection wells. (Inspection wells of the multi-piezometer type sealing off porous stones at several levels just downstream of the concrete core could be very helpful in evaluating the source of water believed to be contained within the embankment).

8. The Alcove Dam is a structure of major category and importance. Inspection, monitoring and maintenance of the structure must therefore continue in accord with the best procedures and methods available through the State of the Art.

Our review of the plans shows that the structure was excellently planned and detailed in full accord with the State of the Art at the time. The concrete core wall is an important feature of the structure. Since 1929, when the Alcove Dam was designed, the use of concrete core walls has been largely discontinued. It has been recognized that select soil cores offer barriers that are equally watertight and less vulnerable. Concurrent with the use of soil core barriers, it has become customary to provide downstream drainage blankets and/or downstream toe drains. Such features are not included in the Alcove Dam. It is the purpose of these drainage facilities to maintain the seepage lines well within the embankment outlines and they are designed to intercept the seepage without release of soil particles or development of "piping" that could lead to embankment failure.

Since design and construction of the Alcove Dam, exploration techniques for foundation materials have been substantially refined. It has become customary to grout the rock for some distance beneath the dam if the rock exhibits excessive leakage. Aside from reducing the seepage quantities, it is also the purpose

of the "grout curtain" to control seepage forces, erosion, and uplift under the downstream sections of the dam. A "grout curtain" is not provided under the Alcove Dam. It is not known whether the rock is of a condition which would have warranted a grout curtain using todays criteria. (A study* for the nearby Silver Creek Reservoir which has been under consideration by the City of Albany definately indicated the need for a "grout curtain").

We have brought to attention these two items (i.e. the absence of downstream drainage facilities and rock grout curtain) to amplify the need for adherence to the recommendations presented in this report. As previously expressed, we see no reasons for urgent concern relative to the stability of the structure. We wish to point out, nevertheless, that several factors on a long term basis potentially can contribute to deterioration of the safety. Such factors include underground erosion, chemical reactions, or seismic activities.

We appreciate to have been entrusted with this inspection. Do not hesitate to contact us if you have any questions in connection with this correspondence, or if we can be of further assistance.

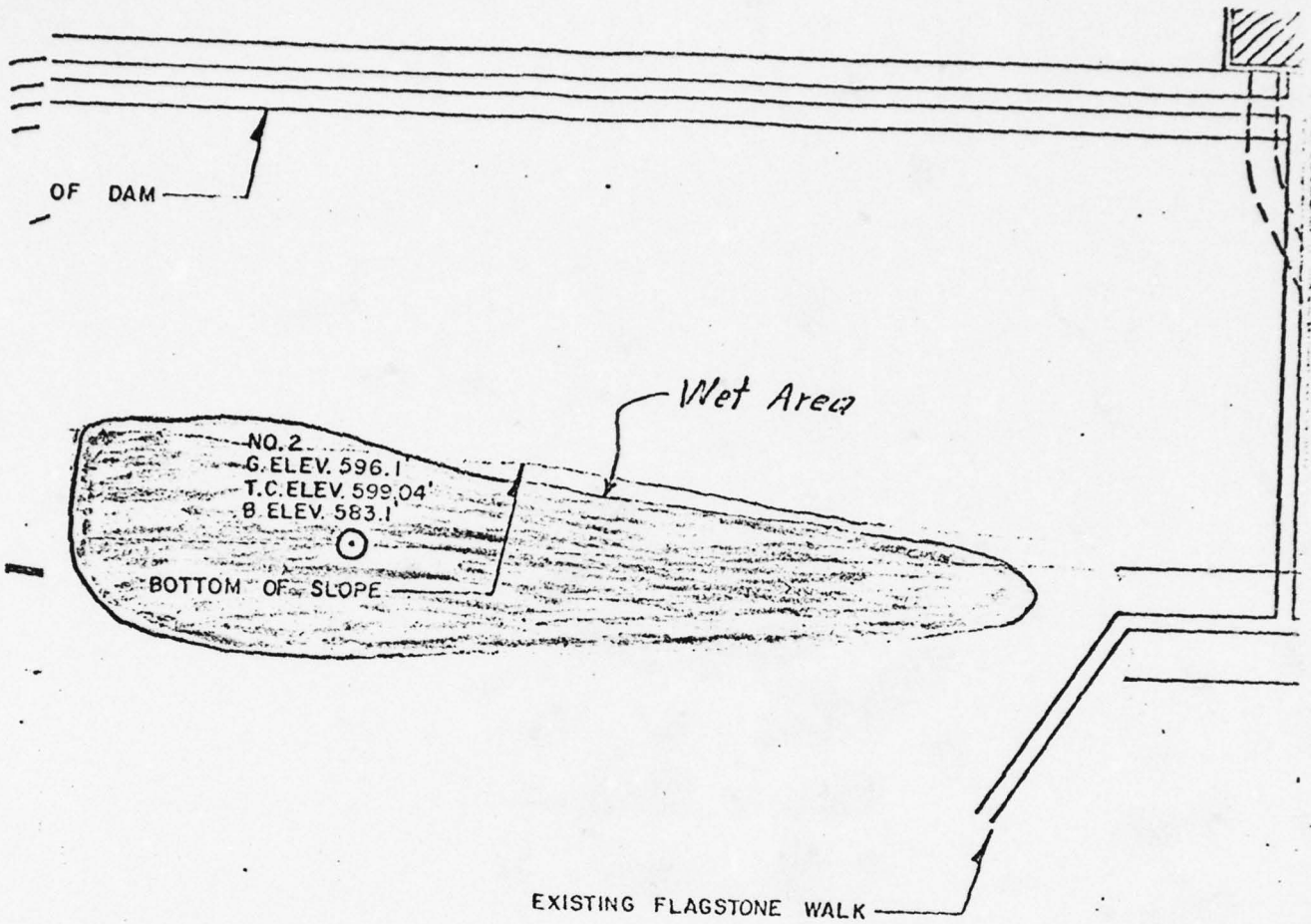
Very truly yours,

THOMSEN ASSOCIATES

Bent L. Thomsen, P. E.

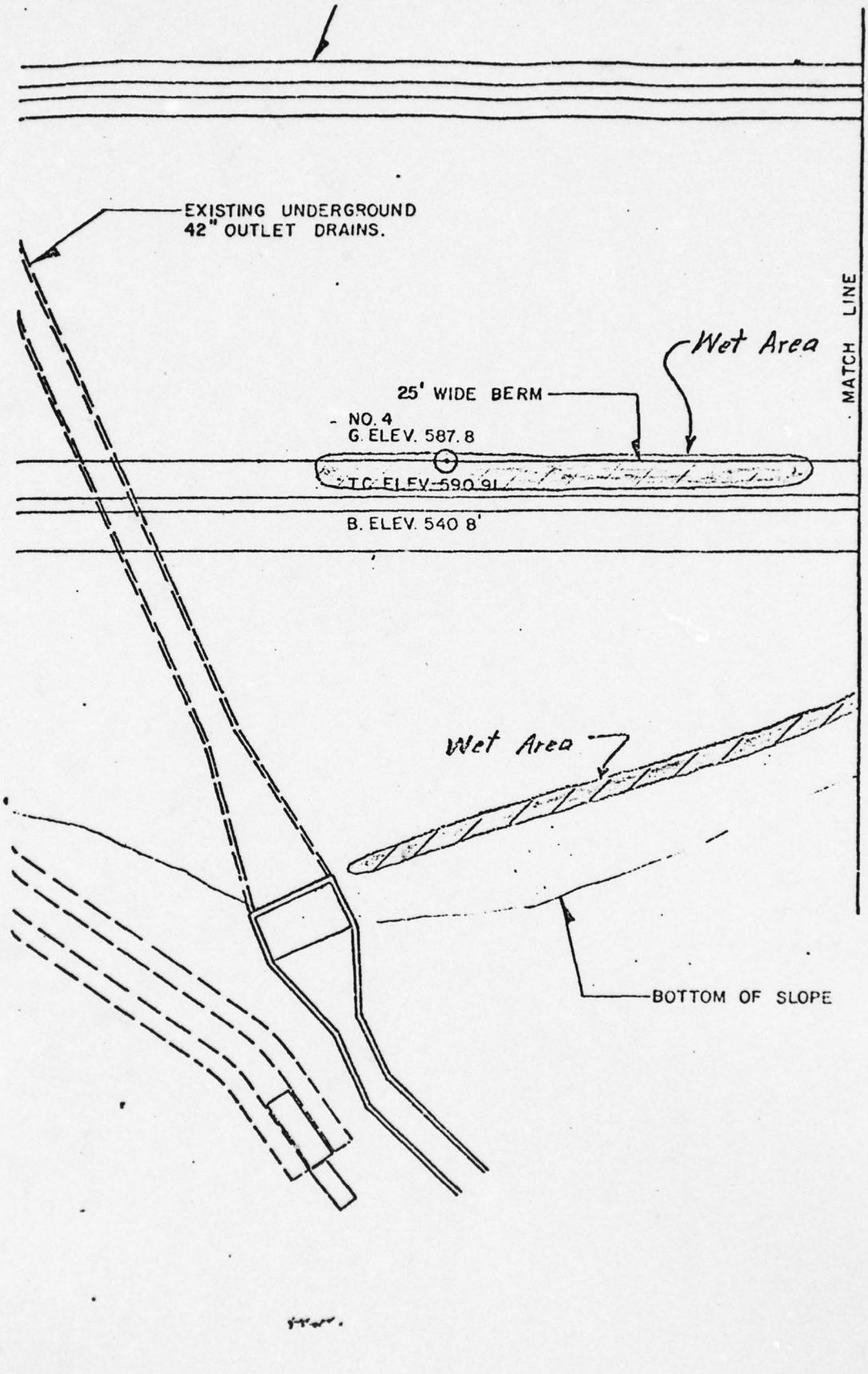
BLT:er

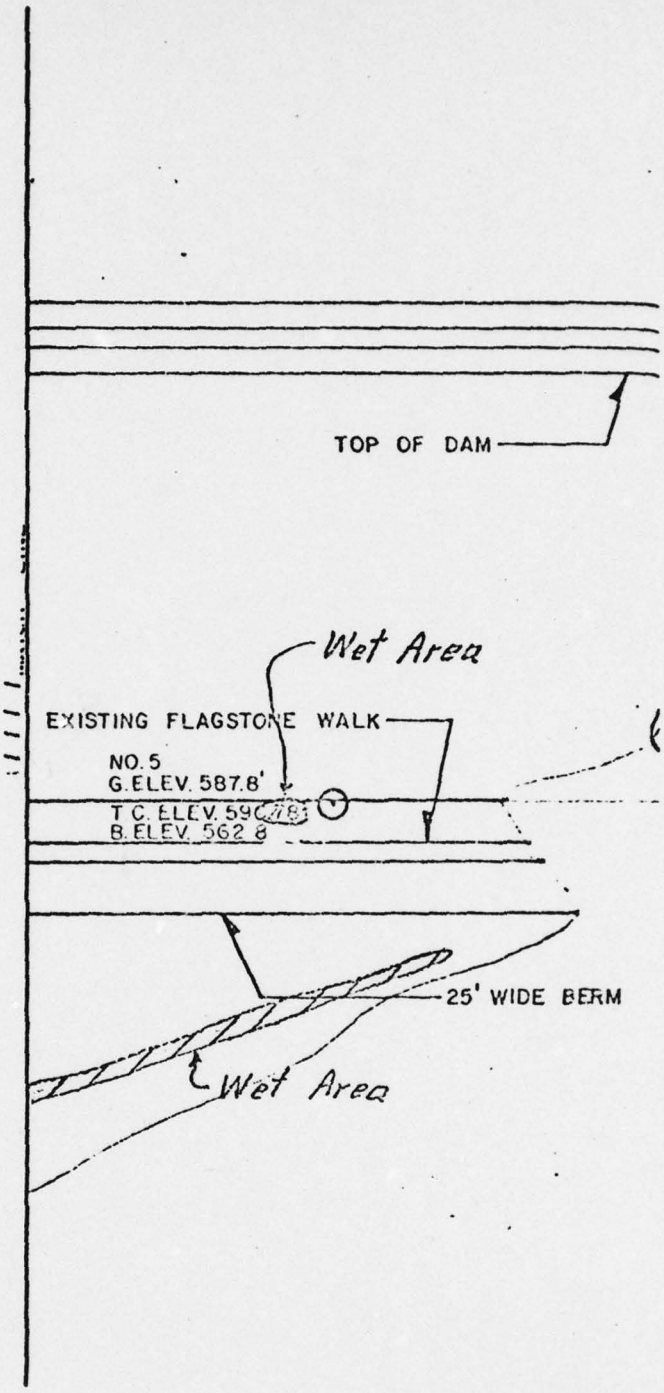
*See SOIL AND FOUNDATION STUDY, SILVER CREEK RESERVOIR, February 1967, Empire Soils Investigations, Inc., Bent L. Thomsen, P. E., Consulting Soils Engineer.

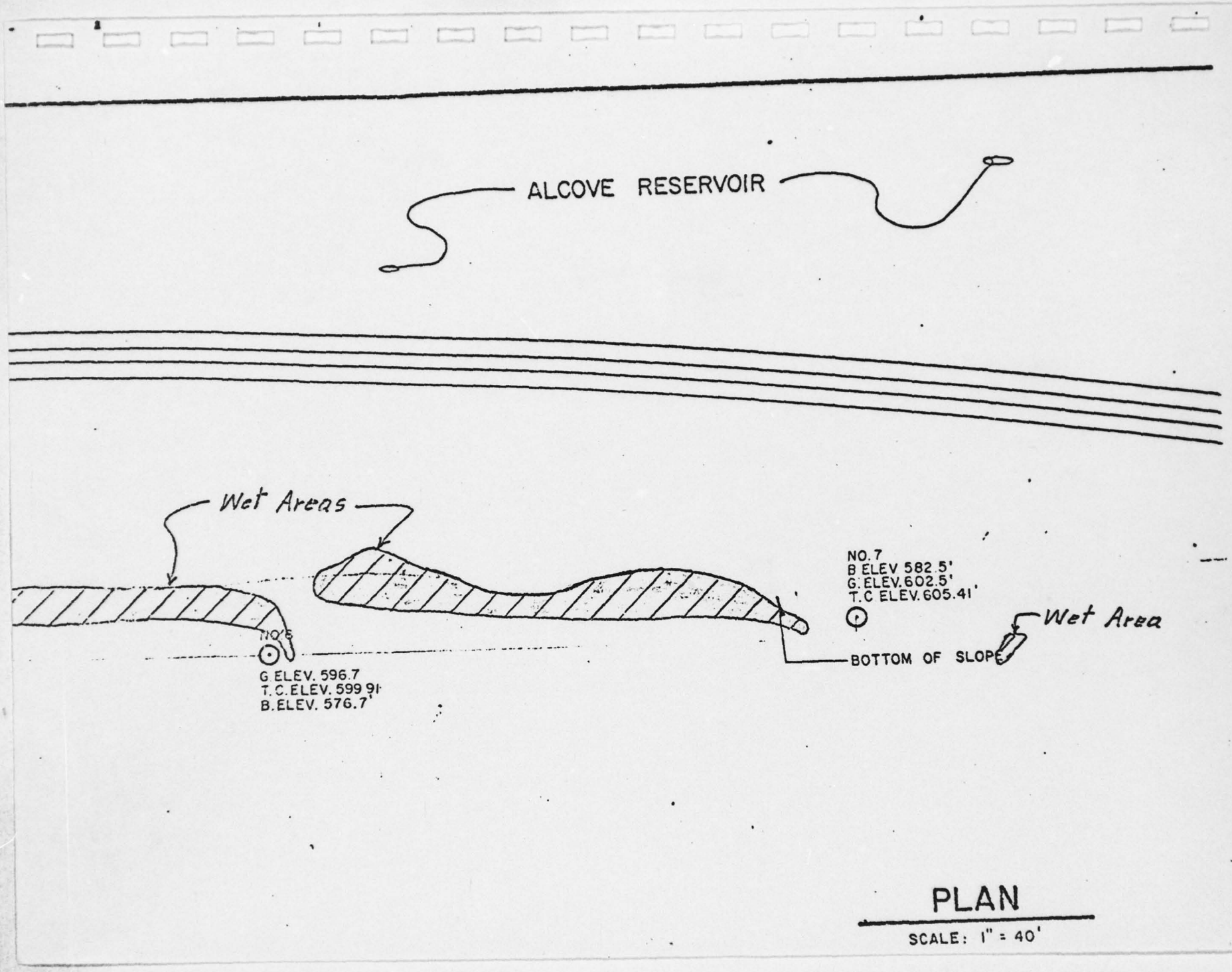


PLAN

SCALE: 1" = 40'


EXISTING UNDERGROUND
42" OUTLET DRAINS.
MATCH LINE
Wet Area
25' WIDE BERM
NO. 4
G. ELEV. 587.8
TC ELEV. 590.91
B. ELEV. 540.8'
Wet Area
BOTTOM OF SLOPE


TOP OF DAM
Wet Area
EXISTING FLAGSTONE WALK
NO. 5
G. ELEV. 587.8'
T.C. ELEV. 590.78
B. ELEV. 562.8
25' WIDE BERM
Wet Area



PLAN

SCALE: 1" = 40'

THOMSEN ASSOCIATES
CONSULTANTS IN SOILS & FOUNDATION ENGINEERING
BENT L. THOMSEN, P.E., DAVID F. McCARTHY, P.E., 105 CORONA AVENUE, GROTON, N. Y., 13073 TEL. 607-898-5881

ALCOVE DAM
REPORT ON PERIODIC INSPECTION
WELL WATER LEVELS
MARCH through SEPTEMBER, 1976

FOR

Smith and Mahoney

Consulting Engineers

Albany, New York

OWNER

CITY OF ALBANY

BY

Thomsen Associates

Consulting Geotechnical Engineers & Geologists

THOMSEN ASSOCIATES
CONSULTANTS IN SOILS & FOUNDATION ENGINEERING
BENT L. THOMSEN, P.E., DAVID F. McCARTHY, P.E., 105 CORONA AVENUE, GROTON, N. Y., 13073 TEL. 607-898-5881

October 25, 1976

Smith and Mahoney
Consulting Engineers
40 Steuben Street
Albany, New York 12207

Attention: Mr. Steven Alexander, P. E.

Re: Alcove Dam

Gentlemen:

This correspondence relates our review of the Periodic Inspection Well Water Levels which were recorded at the Alcove Dam during the period of March 26 through September 24, 1976. The data are depicted on Figures 1 through 10 included with this correspondence. Figure 1 shows the precipitation recorded at the Alcove Dam Weather Station. Figure 2 shows the Reservoir level. The remaining Figures depict the water levels measured in the Inspection Wells installed in early 1976 by Empire Soils Investigations, Inc. under your supervision. In connection with the review of the water levels, we have also reviewed "ALCOVE DAM, REPORT ON SITE INSPECTION, APRIL 7, 1976". In that report we expressed that in several cases, the water levels in the then recently installed Inspection Wells, appeared higher than desirable.

During the period of May 26 through September 24 the reservoir water level gradually lowered about 4 feet with intermittent water level increases following substantial rainfalls on July 1 and on August 10. The Inspection Well water levels are not as readily summarized. We offer the following general observations:

Well No. 1

Following the heavy rain on July 1, the water level in the well rose about 1 foot during the following week. The ground around the well was dry. Following the heavy rain on August 10, the water level in the well rose immediately more than two feet and reached a level of 0.5 foot above the ground surface. The water level in the well lowered about 1.5 feet between May 26 and September 24 at which time it was about 2 feet beneath the ground surface.

Well No. 2

Following the heavy rain on July 1, the water level in the well rose about 0.5 feet during the following week. The level was barely affected by the heavy rain on August 10. Between May 26 and September 24 the water level has increased about 0.3 feet to about 1.3 feet beneath the ground surface.

Well No. 3

Following the heavy rain on July 1, the water level in the well rose about 0.5 feet during the following week. During and after the August 10 heavy rain, the level rose 1.3 feet. Between May 26 and September 24 the level decreased about 1 foot corresponding to about 14 feet beneath the ground level (berm).

Well No. 4

The heavy rains on July 1 and August 10 both caused water level increases of about 0.5 feet during a one week period. About a 1 foot water level drop, to about 7.5 feet beneath ground level (berm) occurred between May 26 and September 24.

Well No. 5

The July 1 and August 10 rains caused less than 0.5 foot water level increases. During the last half of August, however, the level rose 0.5 foot. An abnormally high reading on September 7 may be erroneous. Between May 26 and September 24 the water level dropped about 1.3 feet to about 6 feet beneath the ground level (berm).

Well No. 6

The water level in Well No. 6 rose steadily from the installation date through September 1, however, with only a minor increase during August. It did not appear affected by the heavy rainfall on August 10. The water level rose to 0.1 feet above the ground surface on August 27 and on September 3.

Well No. 7

The July 1 and August 10 heavy rains affected water level increases of about 0.5 and 2.0 feet, respectively. The August 10 level rose to 0.2 feet above the ground level. Between May 26 and September 24 a decrease of about 1 foot occurred.

Well No. 8

The July 1 and August 10 heavy rains caused water level increases of about 0.5 feet. Between May 26 and September 24, the level lowered less than 0.5 foot to 2.8 feet beneath the ground surface.

Our review of the readings generally indicate that the water levels in the wells fluctuate with rainfalls to some degree, thus indicating that water may reach the wells through vertical seepage from the ground surface. These fluctuations appear, however, to be overridden by a general trend of water level lowering occurring between May 26 through September 24. During this period, the reservoir lowered 4.2 feet and the inspection well levels lowered in 6 out of the 8 wells an average of about 1 foot. The ground surfaces around the wells were dry during substantial periods. It is our opinion that the water levels in the wells primarily are being maintained by the hydraulic head and related seepage imposed by the reservoir. On basis of this information, it is not possible to determine whether the water originates through the concrete core wall or through the rock underlying the dam. Furthermore, it is not possible to determine whether the seepage quantities that must be associated with the water level changes are of significant magnitudes.

As expressed in our report on the April 7, 1976 site inspection, it is our opinion that the water levels in the inspection wells appear higher than desirable. We point out that in some instances water levels in the wells rose above the surrounding ground levels. We believe that the periodic Inspection Well Water Levels we have reviewed amplify the opinions and recommendations we expressed in our previous Inspection Report. The review indicates that substantial portions of the downstream embankment slope may be saturated. Without detailed knowledge of the embankment composition and strength characteristics it is difficult to speculate on the magnitude of the safety factor against an overall slope failure or the possibility of a failure caused by "piping". As we have previously expressed, the conditions which have been revealed do not necessarily demand urgent concern relative to the stability of the structure. We do believe however, that the conditions demand continued surveillance, more detailed studies, and some remedial maintenance. More extensive instrumentation and monitoring, a detailed evaluation of the slope stability, infrared air photos to detect areas of leakage, clearing of the downstream slope, elimination of

tailwater, and improved drainage of the berm are some of the factors to consider for implementation.

Do not hesitate to contact us if you have questions in connection with this correspondence.

Very truly yours,

THOMSEN ASSOCIATES

Bent L. Thomsen, P. E.

BLT:er

ALCOVE

Form E-61. 7-10-50-1M (D-111)
Ord. 7-05-73

STATE OF NEW YORK

DEPARTMENT OF PUBLIC WORKS

RECEIVED
DEP. OF PUBLIC WORKS
DEC 18 1950
FLOOD CONTROL CANALS
RED TO Column 1

ALBANY

Received .....

Dam No. 209-1491 (see 209-792)

Disposition Approved 1/17/51

Watershed Lower Hudson Riv.

Foundation inspected .....

Structure inspected .....

Application for the Construction or Reconstruction of a Dam

Application is hereby made to the Superintendent of Public Works, Albany, N. Y., in compliance with the provisions of Section 948 of the Conservation Law (see third page of this application) for the approval of specifications and detailed drawings, marked Installation of Flashboards on the Alcove Dam - City of Albany, New York.

herewith submitted for the { ~~construction~~ reconstruction } of a dam herein described. All provisions of law will be complied with in the erection of the proposed ~~dam~~ Flashboards. It is intended to complete the work covered by the application about December 1, 1951 (Date)

1. The dam ~~will be on~~ is located on Hannacrois Creek flowing into the Hudson River in the town of Coeymans County of Albany and one-quarter mile west of the Village of Alcove
(Give exact distance and direction from a well-known bridge, dam, village main cross-roads or mouth of a stream)

2. Location of dam is shown on the Coxsackie quadrangle of the United States Geological Survey.

3. The name of the owner is City of Albany, New York

4. The address of the owner is City Hall, Albany, New York

5. The dam ~~will be used for~~ is now used for water supply purposes — dam #209-792

6. Will any part of the dam be built upon or its pond flood any State lands? No

7. The watershed above the proposed dam is 32.55 square miles.

8. The proposed dam ~~will create~~ creates a pond area at the spillcrest elevation of 618 1434 acres and will impound 1,606,684,000 cubic feet of water.
with flashboards at elevation 620, pond area is 1487 acres and storage is 1,733,957,000 cubic feet

superintendent of public works who shall thereupon pay the same into the state treasury. Any amount so levied shall thereupon become and be a lien upon the real property affected thereby, to the same extent as any tax levy becomes and is a lien thereon.

Any person in interest may, within thirty days from the service of any such order, appeal to the supreme court to determine the reasonableness of such order. At any time during such appeal to the supreme court upon at least three days' notice, the party appealing may apply for an order directing any question of fact to be tried and determined by a jury, and the court shall thereupon cause such question to be stated for trial accordingly and the findings of the jury upon such question shall be conclusive. Appeals may be taken from the supreme court to the appellate division of the supreme court and to the court of appeals in such cases, subject to the limitations provided in the civil practice act.

This section shall not apply to a dam where the area draining into the pond formed thereby does not exceed one square mile, unless the dam is more than ten feet in height above the natural bed of the stream at any point or unless the quantity of water which the dam impounds exceeds one million gallons; nor to a dock, pier, wharf or other structure under the jurisdiction of the department of docks, if any, in a city of over one hundred and seventy-five thousand population. This section as hereby amended shall not impair the effect of an order heretofore made by the conservation commission or commissioner under this section prior to the taking effect of chapter four hundred and ninety-nine of the laws of nineteen hundred and twenty-one, nor require the approval by the superintendent of public works, of plans and specifications theretofore approved by such commission or commissioner under this section.

The foregoing information is correct to the best of my knowledge and belief, and the construction will be carried out in accordance with the approved plans and specifications.

CITY OF ALBANY, NEW YORK, Owner

BENJAMIN L. SMITH & ASSOCIATES,

By Benjamin L. Smith, authorized agent of owner.

Address of signer 11 North Pearl Street, Albany, New York Date

present

9. The maximum height of the ~~proposed~~ dam above the bed of the stream is 81 feet --- inches.

10. The lowest part of the natural shore of the pond is 12 feet vertically above the spillcrest, and everywhere else the shore will be at least 20 feet above the spillcrest.

11. State if any damage to life or to any buildings, roads or other property could be caused by any possible failure of the ~~proposed~~ present dam Possible flood damage to homes in the Village of Alcove

12. The natural material of the bed on which the proposed dam will rest is (clay, sand, gravel, boulders, granite, shale, slate, limestone, etc.) Present spillway founded on blue stone and shale

13. Facing downstream, what is the nature of material composing the right bank? Paved spillway channel

14. Facing downstream, what is the nature of the material composing the left bank? paved spillway channel

15. State the character of the bed and the banks in respect to the hardness, perviousness, water bearing, effect of exposure to air and to water, uniformity, etc. Bed of spillway channel is of rock, terminating in earth of natural stream valley, at lower end.

16. Are there any porous seams or fissures beneath the foundation of the ~~proposed~~ present dam? No known or visible seams or fissures

17. WASTES. The spillway of the above proposed dam will be 300 feet long in the clear; the waters will be held at the right end by an abutment wall the top of which will be 7 feet above the spillcrest, and have a top width of 15 feet; and at the left end by an abutment wall the top of which will be 7 feet above the spillcrest, and have a top width of 15 feet.

18. The spillway is designed to safely discharge 12,410 cubic feet per second. at 5 foot depth

19. Pipes, sluice gates, etc., for flood discharge will be provided through the dam as follows:

None

20. What is the maximum height of flash boards which will be used on this dam? 2 feet

21. APRON. Below the ~~proposed~~ present dam there ~~will be~~ is an integral apron built of concrete on rock, 300 feet long across the stream, 4 feet wide and 5 feet thick. No extended apron was required, as spillway channel is on rock.

22. Does this dam constitute any part of a public water supply? Yes, City of Albany, New York.

INSTRUCTIONS

Read carefully on the third page of this application the law setting forth the requirements to be complied with in order to construct or reconstruct a dam.

Each application for the construction or reconstruction of a dam must be made on this standard form, copies of which will be furnished upon request to the Department of Public Works, Albany, N. Y. The application must be accompanied by three sets of plans, and specifications. The information furnished must be in sufficient detail in order that the stability and safety of the dam can be determined. In cases of large and important dams assumptions made in calculating stresses and stability should be given.

Samples of materials to be used in the dam and of the material on which the dam is to be founded may be asked for, but need not be furnished unless reguested.

If the dam constitutes a part of a public water supply, application should be made to the Water Power and Control Commission under Article XI of the Conservation Law.

An application for the construction or reconstruction of a dam must be signed by the prospective owner of the dam or his duly authorized agent. The address of the signer and the date must be given as provided for on the last page of the application form.

SECTION 948 OF THE CONSERVATION LAW

§ 948. Structures for impounding water; inspection of docks; penalties. No structure for impounding water and no dock, pier, wharf or other structure used as a landing place on waters shall be erected or reconstructed by any public authority or by any private person or corporation without notice to the superintendent of public works, nor shall any such structure be erected, reconstructed or maintained without complying with such conditions as the superintendent of public works may by order prescribe for safeguarding life or property against danger therefrom. No order made by the superintendent of public works shall be deemed to authorize any invasion of any property rights, public or private, by any person in carrying out the requirements of such order. The superintendent of public works shall have power, whenever in his judgment public safety shall so require, to make and serve an order, setting forth therein his findings of fact and his conclusions therefrom, directing any person, corporation, officer or board, constructing, maintaining or using any structure hereinbefore referred to, either remove the said structure or to repair or reconstruct the same within such reasonable time and in such manner as shall be specified in such order, and it shall be the duty of every such person, corporation, officer or board, to obey, observe and comply with such order and with the conditions prescribed by the superintendent of public works for safeguarding life or property against danger therefrom, and every person, corporation, officer or board failing, omitting or neglecting so to do, or who hereafter erects or reconstructs any such structure hereinbefore referred to without submitting to the superintendent of public works and obtaining his approval of plans and specifications for such structures when required so to do by his order or hereafter fails to remove, erect or to reconstruct the same in accordance with the plans and specifications so approved shall forfeit to the people of this State a sum not to exceed five hundred dollars to be fixed by the court for each and every offense; every violation of any such order shall be a separate and distinct offense, and, in such case of a continuing violation, every day's continuance thereof shall be and be deemed to be a separate and distinct offense. Such order shall not contain any provision to compel the owner to make repairs or proceed with reconstruction as specified in this section by any type of construction other than that of the dam itself. In addition to said forfeiture upon the violation of any such order, the superintendent of public works shall have power to enter upon the lands and waters where such structures are located, for the purpose of removing, repairing or reconstructing the same, and to take such other and further precautions which he may deem necessary to safeguard life or property against danger therefrom. In removing, repairing and reconstructing such dam the superintendent shall not deviate from the method, manner or specifications contained in the original order. The superintendent of public works shall certify the amount of the costs and expenses incurred by him for the removal, repair or reconstruction aforesaid, or in anywise connected therewith, to the board of supervisors of the county or counties in which the said lands and waters are located, whereupon it shall be the duty of such board of supervisors to add the amount so certified to the assessment rolls of such locality or localities as a charge against the real property upon which the dam is located designated or described by the superintendent of public works as chargeable therewith, and to issue its warrant or warrants for the collection thereof. Thereupon it shall become the duty of such locality or localities through their proper officers to collect the amount so certified in the same manner as other taxes are collected in such locality or localities, and when collected to pay the same to the

RB	CTY	YR AP.	DAM NO.	INS. DATE	USE	T
[10]	[11]	[11]	[9 5 1 7 1]	[8 6 0 2 2 6]	[0 3]	

AS BUILT INSPECTION

[1] Location of Sp'way and outlet		[1] Elevations	
[1] Size of Sp'way and Outlet		[1] Geometry of Non-overflow section	

GENERAL CONDITION OF NON-OVERFLOW SECTION

[1]

[1] Settlement	[1] Cracks	[1] Deflecti
[1] Joints	[1] Surface of Concrete	[1] Leakage
[1] Undermining	[1] Settlement of Embankment	[1] Crest of
[1] Downstream Slope	[1] Upstream Slope	[1] Toe of Slope

GENERAL COND. OF SP'WAY AND OUTLET WORKS

[1]

[1] Auxiliary Spillway	[1] Service or Concrete Sp'way	[1] Stilling Basin
[1] Joints	[1] Surface of Concrete	[1] Spillway Toe
[1] Mechanical Equipment	[4] Plunge Pool	[1] Drain

[1] Maintenance		[3] Hazard Class	
[3] Evaluation		[3 4] Inspector	

COMMENTS:

ALL IN GOOD SHAPE

F-8-27-500 (6-7068)

STATE OF NEW YORK

DEPARTMENT OF PUBLIC WORKS
DIVISION OF ENGINEERING
ALBANY

Received June 8, 1928 Dam No. 209-792
Disposition Approved June 11, 28 Watershed Hudson River
Foundation inspected
Structure inspected

Application for the Construction or Reconstruction of a Dam

Application is hereby made to the Superintendent of Public Works, Albany, N. Y., in compliance with the provisions of Chapter LXV of the Consolidated Laws and Chapter 647, Laws of 1911, Section 22 as amended and amendatory laws for the approval of specifications and detailed drawings, marked "Section No.2, Contract No.2, Alcove Dam" herewith submitted for the { construction ~~reconstruction~~ } of a dam located as stated below. All provisions of law will be complied with in the erection of the proposed dam. It is intended to complete the work covered by the application about July 1, 1930 (Date)

1. The dam will be on Hannacrois Creek flowing into Hudson River in the town of Coeymans, County of Albany and near village of Alcove
(Give exact distance and direction from a well-known bridge, dam, village main cross-roads or mouth of a stream)

2. The name and address of the owner is Board of Water Supply, City of Albany, 100 St

3. The dam will be used for Storage of water for water supply of Albany, N.Y.

4. Will any part of the dam be built upon or its pond flood any State lands? No

5. The watershed at the proposed dam draining into the pond to be formed thereby is 32.55 square miles.

6. The proposed dam will have a pond area at the spillcrest elevation of 1440 acres and will impound 1,600,000,000 cubic feet of water.

7. The lowest part of the natural shore of the pond is 10 feet vertically above the spillcrest,; and everywhere else the shore will be at least 40 feet above the spillcrest.

8. The maximum known flow of the stream at the dam site was 1255 cubic feet per second on Nov. 3, 192 (Date)

9. State if any damage to life or to any buildings, roads or other property could be caused by any possible failure of the proposed dam Damage buildings and bridges and cause some loss of li towns of Alcove, Stephensville and Coeymans Hollow

10. The natural material of the bed on which the proposed dam will rest is (clay, sand, gravel, boulders, granite, shale, slate, limestone, etc.) Masonry on rock, earth fill on clay and hard pan.

0

11. The material of the right bank, in the direction with the current, is [illegible] rock; at the spillcrest elevation this material has a top slope of 3/4 inches vertical to a foot horizontal on the center line of the dam, a vertical thickness at this elevation of 10 feet, and the top surface extends for a vertical height of 40 feet above the spillcrest.

clay

12. The material of the left bank is loam & bly has a top slope of 1½ inches to a foot horizontal, a thickness of 90 feet, and a height of 10 feet and more

13. State the character of the bed and the banks in respect to the hardness, perviousness, water bearing, effect of exposure to air and to water, uniformity, etc. Bed of stream is hard Hamilton Shale and blue stone. Overlying clay is non-porous.

14. If the bed is in layers, are the layers horizontal or inclined? Layers horizontal If inclined what is the direction of the horizontal outcropping relative to the axis of the main dam and the inclination and direction of the layers in a plane perpendicular to the horizontal outcropping. Rock has a slight dip in an upstream direction.

15. What is the thickness of the layers? Several inches to 4 or 5 feet.

16. Are there any porous seams or fissures? None known - grouting will be provided

17. WASTES. The spillway of the above proposed dam will be 300 feet long in the clear; the waters will be held at the right end by a concrete abutment & earth dam the top of which will be 7 feet above the spillcrest, and have a top width of 15 feet; and at the left end by a concrete abutment & earth dam the top of which will be 7 feet above the spillcrest, and have a top width of 15 feet.

18. There will be also for flood discharge a pipe 6ft x 8 ft ~~inches~~ inside diameter and the bottom will be 71 feet below the spillcrest, a sluice or gate 42 inches in diameter ~~feet wide in the clear by XXX feet high~~, and the bottom will be 71 feet below the spillcrest.

19. APRON. Below the proposed dam there will be an apron built of Concrete 300 feet long across the stream, 6 feet wide and 5 feet thick. The downstream side of the apron will have a thickness of 5 feet for a width of 6 feet.

20. PLANS. Each application for a permit of a dam over 12 feet in height must be accompanied by a location map and complete working drawings in triplicate of the proposed structure, one set of which will be returned if they are approved. Each drawing should have a title giving the parts shown, the name of the town and county in which the dam site is located, and the name of the owner and of the engineer.

The location map (U. S. Geological Quadrangle or other map) should show the exact location of the proposed dam; of buildings below the dam which might be damaged by any failure of the dam; of roads adjacent to or crossing the stream below the dam, giving the lowest elevation of the roadway above the stream bed and giving the shape,

the height and the width of stream openings; and of any embankments or steep slopes that any flood could pass over. Also indicate the character and use made of the ground below the dam.

The complete working drawings should give all the dimensions necessary for the calculations of the stability of the structure, and all the information asked for below under "Sketches." There may be attached to the application any written reports, calculations, investigations or opinions that may aid in showing the data and method used by the designer. State the assumed ice and uplift pressures and the conditions on which based.

21. SKETCHES. For small and unimportant structures, if plans have not been made, on the back of this application make a sketch to scale for each different cross-section at the highest point; giving the height and the depth from the surface of the foundation, the bottom width, the top width (for a concrete or masonry spill at 18 inches below the crest), the elevation of the top in reference to the spillcrest, the length of the section, and the material of which the section is to be constructed; on the spillway section show a cross section of the apron, giving its width, thickness and material, and show the abutment or wash wall at the end of the spillway, giving its heights and thickness. Mark each section with a capital letter. Also sketch a plan; show the above sections by their top lines, giving the mark and the length of each; the openings by their horizontal dimensions; the abutments by their top width and top lengths from the upstream face of the spillcrest; and outline the apron. Also sketch an elevation of each end of the dam with a cross section of the banks, giving the depth and width excavated into the banks.

22. ELEVATIONS. Also give the elevations, if possible from the Mean Sea Level, of at least two permanent Bench Marks; of the spillcrest for any existing dam on the proposed dam site, at the middle and at the ends of the spill; of the spillcrest for the above proposed dam; and of the spillcrest of any adjacent dams.

23. SAMPLES. When so instructed, send samples of the materials to be used in the construction of the proposed dam, using shipping tags which will be furnished. For sand, one-half a cubic foot is desired (exclusive of any stone over ¼ inch in size mixed therewith); for cement, three pints; and for the natural bed, twenty cubic inches if of ledge and one-half a cubic foot if of soil.

24. INSPECTION. State how inspection is to be provided for during construction Resident Engineer and assistants

25. WATER SUPPLY. Are the waters impounded by the above dam to be used for a public water supply?..... Has an application under the provisions of Article IX of the Conservation Law for such use been made to the Water Control Commission, Albany, N. Y.? Yes

The above information is correct to the best of my knowledge and belief.

100 State St - Albany N.Y.
(Address of signer)

J. Murray Pries

Jan 8 - 1918
(Date)

Secretary - Board of Water Supply
(A person signing for owner should indicate his title or authority)

Dam # 209-1491 Alcove Dam 1/18/13 DJS

Impoundment Capacity stated as 1,606,684,000 cu ft

$\frac{1,607,000,000\ ft^3}{43,560\ ft^2}$ = acre feet ≈ 37,300 ac ft

Volume of Dam = L x W x H / 27

L = 2,000'

H = ~~80~~ 81'

W = ave 170'

V = 1,020,000

slope = 3 : 1

Bank #1 slope = 3 x 81'

243'

Bank #2 = 91'

Dam Width = 2324'

Top Width = 15'

ave = 339' / 2

≈ 170'

RB	CTY	YR AP.	DAM NO.	INS. DATE	USE	TYPE
1	11	68	00212	1-3-	20	H

AS BUILT INSPECTION

- [1] Location of Sp'way and outlet
- [1] Elevations
- [1] Size of Sp'way and Outlet
- [1] Geometry of Non-overflow section

- [1] GENERAL CONDITION OF NON-OVERFLOW SECTION
- [1] Settlement
- [1] Cracks
- [1] Deflections
- [1] Joints
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- [1] GENERAL COND. OF SP'WAY AND OUTLET WORKS
- [4] Auxiliary Spillway
- [1] Service or Concrete Sp'way
- [1] Stilling Basin
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- [1] Mechanical Equipment
- [1] Plunge Pool
- [1] Drain

- [1] Maintenance
- [3] Evaluation
- [3] Hazard Class
- [1 1] Inspector

COMMENTS: 1. FLASHBOARDS & TAINTER GATE APPROVED. 1-17-51 BUT NOT BEING USED AS OF 5-5-69.

CITY OF ALBANY, NEW YORK

BOARD OF WATER SUPPLY

Commissioners
Neile F. Towner, President
Edward Easton
J. Murray Prior, Secretary

100 State Street, Albany, N. Y.

Information for Bidders, Proposal, Contract and Specifications and Bond

For

SECTION No. 2, CONTRACT No. 2

ALCOVE DAM

in the

Town of Coeymans, Albany County, N. Y.

Whitman, Requardt & Smith
Engineers

Robert E. Horton
Cons. Engineer

ALBANY
THE ARGUS CO., PRINTERS
1928

CITY OF ALBANY

BOARD OF WATER SUPPLY

THE ALCOVE DAM

SECTION No. 2, CONTRACT No. 2

INFORMATION FOR BIDDERS

(a) Sealed bids or proposals, addressed to the Board of Water Supply, City of Albany, N. Y., and marked "Bids for the Construction of the Alcove Dam," will be received at the office of the Board of Water Supply, 100 State Street, Albany, N. Y. until ..July 9th....., 1928, at 3 P. M. o'clock (Daylight Saving Time), at which time they will be publicly opened by the Board and read.

(b) Plans and specifications may be obtained at the office of the Board of Water Supply upon deposit of fifteen (15) dollars, which deposit will be refunded only to bona fide bidders if the plans and specifications are returned to the office of the Board of Water Supply in good condition within 24 hours after the time set for opening bids.

(c) All bids must be made on the blank forms of proposal attached hereto and must give the price for each item of the proposed work, both in words and in figures, and be signed by the bidder with his name and address. Each bid must be enclosed in a sealed envelope and delivered to the Secretary of the Board of Water Supply.

(d) Proposals must be signed by the bidder with his signature in full. If the proposal is made by an individual his name and post-office address must be given. If made by a firm or partnership the name and post-office address of each member of the firm or partnership must be given. If made by a corporation the person signing the proposal must show the name of the State under the laws of which the corporation is chartered and the names, titles and business addresses of the president, secretary and treasurer.

(e) A certified check of the bidder upon a solvent bank or trust company made payable to the Treasurer, City of Albany, N. Y., for the sum of five per cent of the total bid will be required and must accompany each bid. Such amount, however, need not in any case exceed fifty thousand dollars.

(f) The work to be done is located in the town of Coeymans, in Albany County, New York, on Hannacrois Creek and on land owned or controlled by the City of Albany.

(g) The work consists in furnishing labor and materials, tools and equipment for the complete construction of an earthen dam embankment with concrete corewall, masonry overflow dam section with masonry abutments, gate chamber, and inlet structure, outlet conduits, reservoir drain, spillway channel, roadway, highway bridge, earth dikes, open channels and appurtenant works.

(h) The work shall be done in all respects in accordance with the specifications, the contract drawings and any detail drawings which may be issued subsequently. The contract drawings referred to are:

No. 1.—Locality Map and Design Data.
2.—Location Plan, South End of Dam.
3.—Location Plan, North End of Dam.
4.—Rock Outcrops and Sub-Surface Data.
5.—Plan and Profile of Core Wall.
6.—Spillway and Embankment Details.
7.—Intake Structure.
8.—Gate House Substructure.
9.—Gate House Details.
10.—Gate House Superstructure.
11.—Outlet Conduits and Meter Pit.
12.—Reservoir Drain.
13.—Spillway Abutment Walls.
14.—Plan and Elevation of Highway Bridge.
15.—Details of Highway Bridge.
16.—Spillway Waste Channel and Highway Details.

(i) The quantities of work to be done under this contract are given here and in the bid or proposal sheets and are approximate statements of the extent of the work. They shall be used to compute, test and canvass the bids received and are given as a basis for the uniform comparison of bids. The Board of Water Supply does not expressly or by implication agree that the actual amount of work will correspond therewith. All extensions in the proposal forms including column entitled "Total Amounts" shall be computed and filled in and the totals of all extensions shall be summed up by the bidder. In case of discrepancy, the unit prices shall govern and shall be considered the official bid.

APPROXIMATE QUANTITIES OF WORK.

1.	Stream Control	Lump Sum
2.	Clearing and Grubbing	Lump Sum
3.	Stripping Excavation	16,000 Cu. Yds.
4.	General Earth Excavation	25,000 Cu. Yds.
5.	Trench Earth Excavation, 0 to 10 Feet	3,500 Cu. Yds.
6.	Trench Earth Excavation, 10 to 15 Feet	800 Cu. Yds.
7.	Trench Earth Excavation, 15 to 20 Feet	600 Cu. Yds.
8.	Trench Earth Excavation over 20 Feet	350 Cu. Yds.
9.	General Rock Excavation	8,100 Cu. Yds.
10.	Rock Excavation, No Blasting	2,900 Cu. Yds.
11.	Grout	200 Cu. Yds.
12.	Drilling Holes in Rock or Masonry	1,000 Lin. Ft.
13.	Consolidated Embankment	320,000 Cu. Yds.
14.	Top Soil	25,500 Sq. Yds.
15.	Grassing	35,000 Sq. Yds.
16.	Slope Paving	11,200 Cu. Yds.
17.	Grouted Slope Paving	770 Cu. Yds.
18.	Concrete Masonry, Heavy Sections	17,800 Cu. Yds.
19.	Concrete Masonry, Moderate Sections	8,800 Cu. Yds.
20.	Concrete Masonry, Thin Sections	1,800 Cu. Yds.

21.	Concrete Masonry, Hand Rail	32 Cu. Yds.
22.	Concrete Protection	145,000 Sq. Ft.
23.	Membrane Water Proofing	540 Sq. Yds.
24.	Reinforcing Steel	680,000 Lbs.
25.	Sluice Gates	Lump Sum
26.	Gate and Miscellaneous Valves	Lump Sum
27.	Miscellaneous Iron and Steel	23,000 Lbs.
28.	Iron Castings	57,000 Lbs.
29.	Steel Pipe	Lump Sum
30.	Cast Iron Pipe	17,000 Lbs.
31.	Flanged Pipe and Special Castings	46,000 Lbs.
32.	Venturi Meter	Lump Sum
33.	Gate House Screens	Lump Sum
34.	Gate House Superstructure	Lump Sum
35.	Overhead Crane	Lump Sum
36.	Electrical Work	Lump Sum
37.	Road Paving	2,800 Sq. Yds.
38.	Guard Rail	1,050 Lin. Ft.
39.	Stop Planks	Lump Sum
40.	Lumber Left in Place	175 M.B.M.
41.	Cleaning Up	Lump Sum

(j) The bidder is required to examine carefully the site of, and the proposal, plans, specifications and contract form for, the work contemplated and it will be assumed that he has judged for and satisfied himself as to the conditions to be encountered, as to the character, quality and quantities of work to be performed and materials to be furnished and as to the requirements of these specifications and contract.

(k) Explorations looking toward a determination of the location and character of soils and rock beneath the ground surface have been made and the results thereof are on file and can be seen by intending bidders at the office of the Engineer. Bidders may, upon the approval of the Board of Water Supply, investigate for themselves underground conditions at the location of the structures.

(l) The bidder is assumed to have made himself familiar with all federal and state laws and local laws, ordinances and regulations which in any manner affect those engaged or employed in the work or the materials or equipment used in or upon the work or in any way affect the conduct of the work and no plea of misunderstanding will be considered on account of the ignorance thereof.

(m) If the bidder or contractor shall discover any provisions in the plans, specifications or contract which are contrary to or inconsistent with any such law, ordinance or regulation, he shall forthwith report it to the Board in writing.

(n) The bidder's attention is especially called to the provisions of Chapter 643 of the Laws of 1926, of the State of New York and acts amendatory thereof, as to the letting of contracts and payment for work; to the "Labor Law," as amended; to the laws and regulations relating to mines, quarries and tunnels promulgated by the Commissioner of Labor of the State of New York; to the "Workmen's Compensation Law;" to the "Public Health Law," as amended, and to statutes relating to the City of Albany.

(o) Before the award of the contract, any bidder may be required to show that he has the necessary facilities, personnel, equipment, experience, ability and financial resources to perform the work in a satisfactory manner and within the time stipulated and that he has had experience in constructing works of the same nature.

(p) Before the award of the contract any bidder may be required to furnish a complete statement of the origin, composition and manufacture of any or all materials to be used in the work, together with samples, which samples may be subjected to the tests provided for in these specifications to determine their quality and fitness for the work.

(q) The work embraced under this contract shall begin within ten (10) days after notice so to do and shall be sufficiently completed so that the storage of water can be started on December 1, 1929, and the entire contract work shall be completed by June 1, 1930.

(r) Bids which are incomplete, conditional or obscure or which contain additions not called for, erasures, alterations or irregularities of any kind, may be rejected as informal.

(s) Bids when filed shall be irrevocable.

(t) No bid will be accepted from nor contract awarded to any person who is in arrears to the Corporation of the City of Albany upon debt or contract; nor who is in default as surety or otherwise upon any obligation to the Corporation of the City of Albany.

(u) The successful bidder will be required to give bond in the full amount of the contract for the faithful performance of the work.

(v) The successful bidder will be required to carry casualty insurance in full compliance with State insurance and compensation laws.

(w) The Board reserves the right to select the bid, the acceptance of which will, in its judgment, best secure the efficient performance of the work or to reject any or all bids.

(x) The checks of the unsuccessful bidders shall be returned to them three days after awarding the contract to the successful bidder. Upon the execution of the contract and bond by the successful bidder, his check will be returned to him.

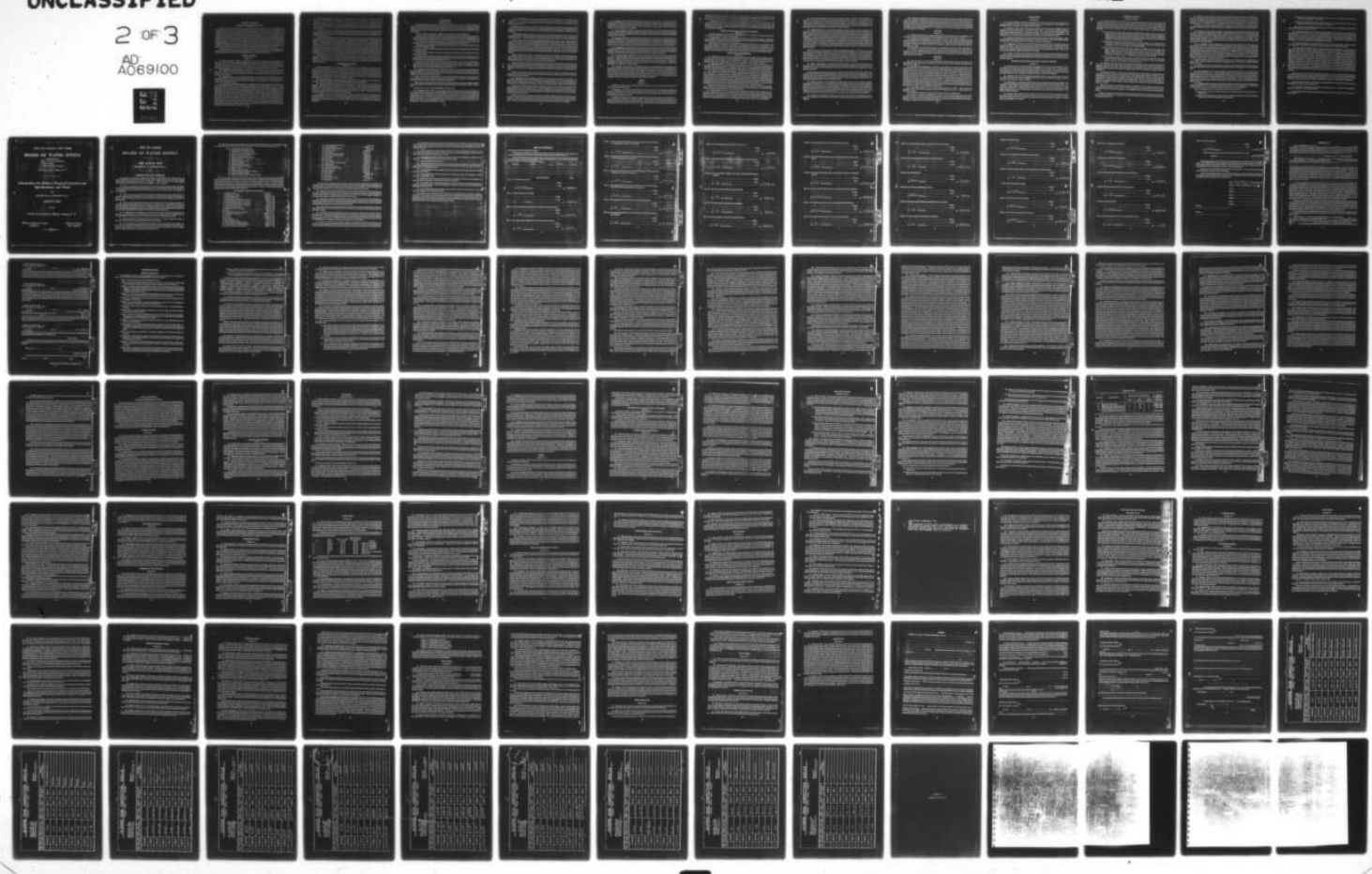
(y) The successful bidder shall promptly execute a formal contract to be approved as to its form, terms and conditions by the Corporation Counsel.

(z) Failure to comply with any of the requirements of the specifications and contract, or failure to enter bond in a sum equal to the full amount of the award or to execute the contract within ten (10) days, shall be just cause for the annulment of the award, and it is understood by the Bidder in the event of the annulment of the award, that the amount of the certified check filed with the proposal shall be forfeited to the use of the City, not as a penalty, but as liquidated damages.

AD-A069 100 KIMBALL (L ROBERT) AND ASSOCIATES EBENSBURG PA F/G 13/2
NATIONAL DAM SAFETY PROGRAM. ALCOVE DAM (INVENTORY NUMBER NY-93--ETC(U)
AUG 78 R J KIMBALL DACW51-78-C-0025

UNCLASSIFIED NL

2 OF 3
AD A069100



SPECIAL PROVISIONS

GENERAL DESCRIPTION OF WORK

The work to be done under this contract consists of an earthen embankment approximately 1,875 feet long, with a top width 15 feet, inside slope 1 on 3, outside slope 1 on 2½, with a concrete reinforced core wall in the body of the dam resting on a cut-off wall extending below the ground surface to a firm foundation with a thickness varying from 4 foot minimum to maximum of 8 feet, 2 inches; the inside slope of earth embankment to be covered with hand paving, while the top and outside slope to be covered with suitable top soil; a gravity concrete spillway section 300 feet long, two gravity concrete abutment walls extending upstream from the spillway and downstream along the spillway channel to the highway bridge, and below the highway bridge for a distance of approximately 65 feet; a concrete arch highway bridge of 120 feet clear span and the connecting highways at either end of the bridge; a concrete intake structure, gate house, reservoir drain including gate chamber; sluice gates, outlet conduits, Venturi meter and pit, cast iron piping, and gate valves, excavation, embankment, and paving for spillway channel; and various appurtenances to complete the work as shown on the plans and described in these specifications and as may be directed by the Engineer.

All structures are located on land owned or to be acquired by the City which will permit the Contractor to have access to the work from the adjacent public highway. All clearing, grading and road surfacing necessary for the transportation of materials and supplies will be at the contractor's expense.

STREAM CONTROL

Item No. 1

(1) Work to be Done.—During all phases of the construction, the Contractor shall control stream flow so that the least possible interruption to the progress of the work and no damage to the work shall occur. For this purpose the Contractor shall build coffer-dams, channels, conduits, canals, embankments and other structures and shall plan the stages of the work so that no damage or interruption to the work shall occur. He shall provide pumps, pipes, timber and all other equipment, materials, tools and labor necessary.

(2) Drainage Area and Flood Flows.—Hannacrois Creek at the dam site has a water shed of 32.55 square miles. The area is hilly and flood flows occur suddenly with, at times, considerable volume. Information as to the daily flow of the stream during 1927 and the calculated flows for other years may be obtained at the office of the Engineer.

(3) Approval of Plans.—The Contractor shall obtain approval from the Engineer of his plans for constructing the dam, with regard to protection from flood flows. It will be necessary to provide one or more openings through suitable parts of the dam so that no pressure be exerted against the core wall and that no erosion of the earth fill shall occur.

(4) Suggested Plan for Stream Control.—It is suggested that the Contractor proceed with the construction of the dam on both sides of the existing stream channel and practically complete this work. He will also complete the construction of the reservoir drain before attempting to fill in the dam across the existing stream bed. After the completion of the two ends of the dam and the reservoir drain and during a period when the minimum flow of the stream may be expected, he can proceed to build the earthen embankment at its upstream edge, carrying this rapidly to an elevation of 572 feet. Sufficient and adequate equipment must be provided in advance to prosecute and complete the final closure up to elevation specified within a period of fifteen days. If necessary, in order to complete this work in the time specified, the Contractor shall work day and night and holidays and Sundays without extra compensation. This will divert all the flow of the stream through the reservoir drain. He shall then continue the construction of the earth embankment at the upstream edge to an elevation of 580 feet and at the same time the cut-off trench and the core wall across the stream bed can be pushed to completion, after which the embankments on both sides of the corewall shall be brought to their full heights as rapidly as possible.

(5) Reservoir Drain.—As the full waterway of the drain is required for stream control, the drain and drain well shall first be constructed without placing the 42-inch sluice gate or concrete cross wall. As soon as the drain is completed and before the closure sections of core wall and embankment are started, the Contractor shall build in the drain well a substantial wooden bulkhead, which will serve as a roof for the drain where it passes through the well. This bulkhead shall be made water tight and shall be sufficiently anchored to the side walls of the well to withstand an upward pressure of 25 feet of water or a downward suction of 15 feet of water.

After the main embankments and corewall in the closure section have been carried up to final height or elevation 625, the temporary wooden bulkhead may then be removed and the Contractor can erect the 42-inch sluice gate in position and place the concrete crosswall around the sluice gate and in the construction grooves, as indicated on the plans.

(6) Ravena Water Supply.—The village of Ravena takes its water supply from Hannacrois Creek approximately six miles below the new Alcove Dam. During periods of low stream flow after protracted dry weather, the amount of water flowing in the stream is barely sufficient to supply the water supply needs of Ravena. Therefore, the Contractor shall arrange his work so as not to interfere with the flow of the stream at times when the water may be needed for water supply purposes by Ravena. And, because Hannacrois Creek is used as a source of water supply for domestic and other purposes by several thousand people, the Contractor is required to take every precaution to see that the specifications regarding sanitary precautions are carefully and fully observed both in regard to his own operations and the actions of his employees and any other persons who may visit the site of the work on any business connected with the carrying out of his contract, so that at all times water released into said Hannacrois Creek shall be pure, potable and free from pollution.

(7) Payment.—Payment to the Contractor for stream control works shall be at the lump sum price bid and shall include all costs expended in the control of stream flow and all damages and delays occasioned by flood flow. Embankment, concrete and other work and materials shown on the plans as part of the finished structures and necessary in the construction of the work but used for stream control, will be paid for under the respective items.

CLEARING AND GRUBBING
Item No. 2

(1) Work to Be Done.—The Contractor shall remove all brush, fences, saplings, trees, stumps and other perishable materials, and all loose boulders and stones within the area and extending 50 feet beyond the limits of the dam embankment, and spillway section of the dam. He shall also clear in a similar manner the area occupied by the spillway channel highway and highway bridge and for other structures extending beyond the limits described. The removal of houses, barns, sheds or other buildings or structures will not be paid for under this item, but will be paid for as part of the last lump sum item, " Cleaning Up." The Contractor shall not damage trees within this area which are ordered left in place.

(2) Saplings and Brush.—Contractor shall cut down and burn all saplings, brush and fences encountered. The roots shall be cut below the surface of subgrade of the dam sections.

(3) Trees and Stumps.—The Contractor shall cut down all trees and remove same from within area specified. All timber will become the property of the Contractor. He shall excavate around stumps and shall cut roots so that whole stump may be removed. All stump holes shall be refilled with suitable material, which shall be well consolidated by tamping in layers or by puddling or by both. Especial care shall be exercised in tamping those holes from which stumps have been removed by blasting. No payment other than under this item will be made for such filling and consolidating.

(4) Payment.—Payment to the Contractor for clearing and grubbing shall be at the lump sum price bid and shall include and cover the removal and destruction of all brush, trees, stumps and other perishable materials within the area indicated and all necessary refilling, together with the furnishing of all labor; tools, materials and equipment and the doing of all work necessary and proper to complete this item as required and as specified.

EXCAVATION

Items Nos. 3 to 10

(1) **Work to Be Done.**—Under Items 3 to 10 the Contractor shall strip the site within the outlines of the dam down to suitable material, and shall make such excavation as directed for the dam, cut-off trench, spillway, spillway channel, intake structure, gatehouse, reservoir drain, outlet conduits, highways, bridge abutments, spillway channel and all purposes incidental to the work for which the specifications do not otherwise provide.

In Item 3 shall be included the stripping of the site under the dam embankment.

In Item 4 shall be included general earth excavation for spillway section, intake structure, gate house, reservoir drain, spillway waste channel and abutment walls on either side of waste channel, bridge abutments and highway and all other required excavation which may not be covered in the succeeding items.

In Item 5 shall be included earth excavation in cut-off wall, outlet conduits, meter pit and other trenches, except for the reservoir drain, from ground surface to 10 feet or less in depth.

In Item 6 shall be included the earth excavation for that part of the trenches in depth between 10 and 15 feet below the ground surface.

In Item 7 shall be included excavation for that part of the trenches in depth between 15 and 20 feet below ground surface.

In Item 8 shall be included excavation for that part of the trenches in depth greater than 20 feet below ground surface.

In Item 9 shall be included rock excavation necessary to be done for the spillway section of the dam, spillway channel and side walls, bridge abutments, intake structure and gate house and other parts of the work except the excavation included under Item No. 10.

In Item 10 shall be included rock excavation in cut-off trenches, reservoir drain, outlet conduits, cut-off trench under the spillway and for rock excavated according to orders by wedging or barring or other approved methods where blasting is not permitted, by channeling or other accepted methods followed by the use of light charges of explosives where permitted.

(2) **Classification of Rock and Earth.**—"Solid rock" wherever used as a name of excavated material shall mean the hard, live, durable, solid, ledge rock removed or to be removed most economically by means of blasting, channeling, wedging or barring; also boulders or solid masonry of one-half cubic yard or larger volume removed or to be removed from the excavation.

"Loose rock" shall mean hard and shaly rock of a naturally shattered or seamy character as evidenced by its condition either in place or after having been removed and which after having been loosened by pick, bar or blast is found in pieces of volume not greater than 2 cubic feet.

"Earth" shall mean all gravel, clay, silt, sand, loam or other earthy matter, stones, boulders or masonry of volume not greater than ½ cubic yard, and all other material not properly classified under "solid" or "loose" rock.

(In this contract "loose" rock will be classified as "solid" rock.)

(3) **Stripping the Site.**—After removal of brush, trees and stumps the Contractor shall loosen the overlying soil and shall remove same to a depth sufficient to fully uncover material suitable for bonding with and supporting earth embankments and other structures. In stripping the surface the Contractor shall separate satisfactory top soil where found and shall store the same in piles for use upon the top and sides of the finished embankments. All other materials stripped from site shall be wasted. On finishing, the uncovered surface shall be picked, harrowed in longitudinal furrows or stepped so that complete bond can be made with embankment. All material loosened shall be removed.

(4) **Earth Excavation.**—The Contractor shall make all earth excavation to neat dimensions and to solid foundations as directed by the Engineer. Where masonry is placed against excavated surfaces, final trimming may be ordered to be done just before masonry is placed so as to obtain the most satisfactory condition of such surfaces.

The Contractor shall protect excavations by bracing and otherwise for safety and shall conform in all respects to the requirements of the Engineer. All excavation outside the lines and grades done without permission of the Engineer shall be refilled with suitable materials and well consolidated, at the expense of the Contractor.

(5) Rock Excavation.—Rock shall be excavated for the masonry portions of the dam and all other concrete structures to a sufficient depth to secure a foundation on sound, ledge rock, free from seams or other objectionable defects. It is the intention to build the masonry against the surfaces of these rock excavations.

To preserve the surfaces in the soundest possible condition and to obtain over the whole foundation a surface free from open seams or cracks, unusual precautions will be required in excavating. The cut-off trench will extend under the whole length of the masonry dam section. Rock for the foundations may be removed by blasting to the extent directed, with explosives of such power and in such quantities and positions as will neither crack nor damage the rock upon or against which the masonry is to be built. Wherever in the opinion of the Engineer further blasting is liable to injure the rock upon or against which masonry shall be built, blasting shall be discontinued and the excavation of the rock prosecuted by wedging and barring or other approved methods.

Whenever directed, the method of excavating shall be changed from blasting to wedging and barring, or, from wedging and barring to blasting. In order not to disturb the rock along the sides of the cut-off trench and to maintain these sides as nearly vertical as practicable, channeling or other acceptable methods in connection with light charges of explosives to the extent directed shall be used.

Rock excavation for the spillway channels shall be made in a manner similar to that for the dam foundation. Particular care shall be taken to make the excavation conform closely to the prescribed lines, which shall be parallel to the finished surfaces, and to leave no deep holes or depressions. To this end such rock as required shall be removed by barring and wedging or other approved methods and shall be paid for under the appropriate item.

Rock excavation shall in general be made to the lines given by the Engineer and shall be carried only deep enough to obtain a foundation sufficiently strong to bear the loads imposed; but if directed, the excavation shall be carried to greater depths.

(6) Preparation of Rock Foundations.—Whenever directed during the progress of excavation, all loosened materials shall be removed from designated areas and the surface of the rock shall be cleaned, using steam and water under pressure if necessary. The water shall subsequently be removed from depressions so that the whole area designated can be minutely inspected to determine whether seams or other defects exist.

The surfaces of rock foundations shall be left sufficiently rough to bond well with the masonry and if required shall be cut to rough benches or steps. Before any masonry is built on or against the rock, the latter shall be scrupulously freed from all dirt, gravel, boulders, scale, loose fragments, films of dust and other objectionable substances. Streams of water under sufficient pressure, stiff brushes and other effective means shall be used to accomplish this cleaning.

Wherever directed, the rock surfaces forming the foundation of masonry sections shall receive special treatment Seams and cavities shall be traced as far as directed by drilling holes or by other approved means. All such seams and cavities shall then be carefully cleaned out and, if required, filled with concrete, mortar or grout. Payment will be made to the Contractor for such treatment when required by the Engineer.

(7) **Pumping.**—The Contractor shall keep the excavations free from water at all times during construction, shall build all dams or other works necessary for this purpose and shall provide and keep in operation suitable pumps to maintain the excavation dry and free from water at all times. He shall dispose of the water removed from excavations in such a manner as will not cause injury or damage to the public or to private property or to work completed or in progress.

(8) **Control of Springs.**—Springs encountered in the foundations of the dam, on the sites of embankments and elsewhere shall be controlled by approved methods. Masonry, pipes, grout, broken stone, cement or other materials used or excavations made for such control shall be paid for when ordered by the Engineer and approved by the Board.

(9) **Sheeting and Shoring.**—The Contractor shall, at his own cost and expense, support the sides and ends of excavations wherever necessary or ordered with suitable approved sheeting, sheet piling, braces, shores, stringers and waling strips. Such sheeting, etc., shall be withdrawn as the excavations are filled, except where and to such an extent as the Engineer orders the same to be left in place, in which case payment will be made for same, or where he permits the Contractor, at the Contractor's request and cost, to leave the same in place.

(10) **Backfilling.**—Trenches and other excavated areas not refilled with masonry structures or rolled embankments shall be refilled with suitable materials obtained from excavations or otherwise. Such refill shall be placed in layers in such a manner as not to disturb the structure and shall be consolidated by tamping or puddling to the original surfaces of the ground so that no subsequent settlement takes place.

(11) **Removal of Surplus Materials**—The Contractor shall use the excavated materials when suitable and as far as needed for refilling trenches and excavations, for building embankments and roads and for other purposes. All other material removed from the site of the work shall be transported to areas satisfactory to the Engineer and deposited in layers or otherwise so that such areas have a neat appearance. Localities for depositing such wasted materials shall be not farther from the site of the work than is necessary for the safety, permanence and appearance of the structures.

(12) **Payment.**—The quantities to be paid for under items of excavation shall be the actual number of cubic yards of material measured as before excavation and within the dimensions given by the Engineer and shall extend from the natural ground surface to the subgrades as established. Dimensions of excavations will extend to the outside face of sheeting where same is used. The prices paid for excavation shall include and cover the doing of all excavation, pumping, bracing, cleaning of finished surfaces, all backfilling and removal of surplus material, together with the furnishing of all labor, tools and equipment and the doing of all work necessary and proper to complete these items as specified and as required.

GROUT

Item No. 11

(1) **Work to be Done.**—The Contractor shall force grout into seams and fissures in the ledge rock wherever directed by the Engineer.

(2) **Materials.**—Grout shall be mixed of Portland Cement and water and either with or without sand. Cement and sand shall be free from lumps and shall be screened if required. Sand used for grout shall be of such fineness that 45 per cent of the sand shall pass a screen having wires 0.013 inches in diameter and having 1,600 openings per square inch.

(3) **Methods of Mixing and Placing**—The apparatus for mixing and placing the grout shall be of a type having for its essential part an air tight chamber in which the grout is kept properly stirred and from which it is forced into the work by air or water pressure. The amount of water added to the cement shall be just sufficient to permit of the grout flowing freely. Grout shall be forced under the pressures directed up to

90 pounds per square inch through hose or pipe not less than two inches in diameter, which shall be connected to the pipes furnished and set under other items. Grouting shall be carried out in such manner and under such detailed procedure and pressures as the Engineer shall from time to time prescribe.

(4) **Payment.**—Quantity of grout to be paid for shall be the number of cubic yards placed in the work in accordance with the provisions of the preceding sections under this item, and as directed, measured in its liquid state before placing. The Contractor shall provide suitable and convenient means for measuring. The price stipulated under this item shall include all labor, apparatus and material incidental to the furnishing and placing of grout as specified.

DRILLING SMALL HOLES IN ROCK OR MASONRY

Item No. 12

(1) **Work to be Done.**—The Contractor shall drill holes in rock or masonry for grouting, for inspection of grouting, and for other purposes wherever ordered.

(2) **Size of Holes.**—The size of the holes shall be not greater than 2½ inches in diameter. Where such holes are drilled for grouting, the Contractor shall furnish the necessary piping to go in these holes and connect with the pressure piping from the grouting apparatus.

(3) **Payment.**—The quantities to be paid for under these items shall be the actual number of linear feet drilled in accordance with orders, no hole, however, being reckoned at less than one foot in depth. The price paid for drilling holes in rock or masonry shall include all expenses incidental to the drilling the holes as required, and furnishing the necessary piping for grouting, together with the furnishing of all labor, tools and equipment and the doing of all work necessary and proper to complete this item as specified and required.

CONSOLIDATED EMBANKMENT.

Item No. 13.

(1) **Work to be Done.**—The Contractor shall procure materials and shall make consolidated embankments in dam and dike sections, for filling in depressions in reservoir, and for building the embankment for a roadway and for work of similar nature as directed by the Engineer. The backfilling behind the walls of the spillway channel will be considered disposal of excavation and will not be compacted embankment.

(2) **Preparation of Base.**—Embankments shall in general start from a firm base from which top soil and other perishable matter shall have been removed to the extent directed. Loose stones and boulders shall be removed from embankment sites. If required, the base under any rolled embankment shall be picked to make a bond with the embankment material and any sloping ground shall be stepped where and as directed.

(3) **Materials for Consolidated Embankment.**—The embankments shall be made of acceptable materials from the excavations or from borrow pits. Various qualities of material will be required in various portions of the embankments. In general the material required shall be a mixture of sand, gravel, clay and earthy soils, mixed in such proportion that the embankments may be well and tightly consolidated and that the mass is practically impervious to the passage of water. Materials of the finer texture shall be reserved for placing on the upstream side of the corewalls, while those materials having the qualities of compacting and of hindering the passage of water but have coarser sized grains shall be placed on the downstream side. It is expected that suitable material will be found in the vicinity of the structures to be built under this contract.

The material for embankments shall be sensibly free from top soil, roots, bits of wood or other perishable matter and all stones which are in least dimension greater than the maximum thickness of layers after rolling. All stones nesting in pockets shall be removed from the material.

(4) **Frozen Materials.**—Under no circumstances shall materials which are frozen be used in the construction of embankments and no material shall be placed on portions of these embankments which are frozen or which have been loosened by freezing. The construction of embankments resumed after the end of a winter season or after any long protracted period of inactivity shall not be started again until the existing surfaces receiving the embankment shall be treated by picking, furrowing, rolling or other means of preparation.

(5) **Allowance for Shrinkage.**—The embankment shall be built to a height above the finished grade which will, in the opinion of the Engineer, allow for the shrinkage of the material. If such ordered overfills result in an excess section of any embankment, the Contractor will be allowed payment for such excess. If any of the refills or embankments settle so as to be below the required levels for the proposed finished surface at any place before the final acceptance of the work to be done under this contract, the Contractor shall at his own cost supply approved materials and build up the low places as directed.

(6) **Making Embankments.**—Materials for embankments shall be placed in horizontal layers or with slight slopes away from the axis as required. In placing the layers they shall be leveled by machine or by hand to approximately uniform thickness. Layers shall when compacted be six inches or less in thickness. Each layer shall be rolled to thoroughly consolidate it and to the full area of the layer to the satisfaction of the Engineer. Just before placing the next layer, the last rolled layer shall be wetted with sufficient water through spray nozzles to moisten the last layer so that material from the new layer will be forced into it and so that moisture is forced upward into the new layer. Material too wet to properly consolidate under rolling or in such a condition as to hinder or retard the rolling shall not be placed in embankments. Material in the embankment in a too wet condition or which becomes quaky and jelly-like under rolling shall be removed from the embankment. All stones thicker than the rolled layers, or stones which roll or rock under the roller, shall be removed.

Should the character of the material of which the consolidated embankment is being made, be of such nature that it does not compact under the roller, then, if directed by the Engineer, the Contractor shall build the embankment by rolling to within fifteen (15) feet of the core-wall. He shall then carry up the embankment by rolling at this distance from the core-wall to such height as the Engineer may direct, and, shall then pump water into the space between the core-wall and the embankment, to the depth directed by the Engineer. Then the fifteen (15) foot strip of embankment next to the core-wall shall be made by depositing the material in this water in such manner that all of it shall be thoroughly saturated or puddled.

(7) **Extent of Consolidating.**—To determine the proper degree of rolling and thickness of layers in the embankments so as to obtain the desired consolidation, exploratory trenches shall be excavated by the Contractor at the direction of the Engineer from time to time to note whether the embankments are being properly compacted.

Compacting in general shall be done by power rollers but embankments around pipes, behind walls or other portions which cannot be reached by rollers or in the vicinity of walls which may be harmed or moved by heavy rollers, the compacting shall be done by means of extra heavy tampers, energetically used, or by depositing the earth through water in such a manner that all of it shall be thoroughly saturated or by other means of compacting equivalent to that obtained by rolling.

(8) **Rollers.**—Compacting of embankments in general shall be done by power rollers or machines with grooved or banded rolls. The rear wheel or wheels of the rollers shall be of such width and diameter and shall bear such a proportion to the total weight on the roller that with a penetration of one inch there shall be caused an average pressure on the embankment of at least thirty pounds to the square inch of bearing surface, calculated to be the width of the roll multiplied by half the arc bounding a segment of the roll at the bottom of the grooves having a middle ordinate of one inch. The roller shall pass over every part of each layer that can be traversed as many times as may be necessary to thoroughly compact the layer.

(9) **Trimming of Embankment.**—After all materials have been placed in embankments the Contractor shall trim and cut the surfaces of embankments to the neat dimensions and grades as given by the Engineer.

(10) **Payment.**—Consolidated Embankment shall be measured in cubic yards within the dimensions of the dams and dikes and above the prepared base. No material for embankment shall be measured at its place of excavation. Prices paid for embankment shall include the procurement of material from borrow pits, excavations and storage piles, the hauling to the site, the spreading of material in layers, the moistening with water and the rolling, tamping, puddling, and trimming to neat dimensions, together with the furnishing of all labor, tools, materials and equipment and the doing of all work necessary and proper to complete this item as specified and as required.

TOP SOIL

Item No. 14.

(1) **Work To Be Done.**—The Contractor shall procure top soil from the sites of excavations, from storage piles or elsewhere and shall place same upon designated surfaces of embankments and fills.

(2) **Materials and Workmanship.**—Top soil shall be of good earthy quality, suitable for growing grass and sensibly free from stones and other inert matter. Top soil shall be taken from bottom lands at no greater depth then twelve inches and shall contain no sub-soil. Top soil shall be placed upon embankment and surface of fills and after being consolidated by hand roller, tampers or otherwise, shall have a minimum thickness of four inches.

The final surfaces of top soil shall be trimmed to the dimensions and grades as given by the Engineer.

(3) **Payment.**—Payment for top soil shall be made at the price bid per square yard, which price will include and cover the furnishing and placing of top soil, rolling, and maintaining the same, together with the furnishing of all tools, labor and equipment and the doing of all work necessary and proper to complete the item as specified and required.

GRASSING

Item No. 15

(1) **Work to be Done.**—The Contractor shall furnish and place fertilizer and grass seed upon all top soil furnished and upon such other areas adjacent to the dam structures as may be shown on the drawings or indicated by the Engineer.

(2) **Materials and Workmanship.**—Immediately upon placing the top soil, the Contractor shall furnish fertilizer with a base of bone material and an analysis of 2% nitrogen, 10% phosphoric acid and 1% potash and shall spread same at rate of one ton per acre. He shall then furnish and spread at the rate of 200 pounds per acre a mixture of one-half Pacey's small seeded or perennial rye grass, to serve as a nurse grass and the remaining half consisting of Kentucky blue grass, red fescue and red top in suitable proportions. Fertilizer and grass seed shall be of Stumpp and Walter Co. quality or approved equal. Fertilizer and grass seed shall be spread and sown evenly over all top soil placed. He shall moisten the surface of top soil and otherwise care for same until a good stand of grass is procured. The Contractor shall maintain all top soil and grassing and shall fill up any eroded areas as they occur. In addition to planting grass seed on the areas covered by top soil, the Contractor shall plow and harrow other areas adjacent to the dam structures shown on the drawings or as directed by the Engineer and shall roll these areas and then treat with fertilizer and grass the surfaces in the same manner as specified for the top soil.

(3) **Time of Planting Grass.**—The best times for planting grass are as follows: Best—August 15th to September 25th; Next—Thaw in Spring to May 1st; Next—May 1st to June 1st. Avoid June, July and first half of August.

The work shall be scheduled so that grass seed is planted at the best possible time.

(4) **Payment.**—Payment for grassing shall be made at the price bid per square yard, which price will include and cover the furnishing and placing of fertilizer and grass seed, rolling, moistening and maintaining the same, together with the furnishing of all tools, labor and the equipment and doing of all work necessary and proper to complete the item as specified and as required.

SLOPE PAVING.

Item No. 16.

(1) **Work To Be Done.**—The Contractor shall furnish and place slope paving on the upstream face of earth embankments, dikes and refills, for flagstone steps and walk-ways and at other places to the dimensions shown on the plans and as directed by the Engineer.

(2) **Materials.**—Slope paving shall consist of sound, durable stone having established weathering qualities, imbedded in crushed stone. The stone blocks shall have even top faces and shall in general be placed with reeding planes normal to the surfaces of paving. The crushed stone for the foundation of the paving shall be sound, durable stone, similar to that accepted for concrete under these specifications. The maximum size of crushed stone shall be 2½ inches and the run of the crusher may be used.

(3) **Flagstones.**—Flagstones for steps and sidewalks shall be selected sandstone, rectangular in shape, random lengths and widths and shall not be less than 2 inches in thickness. They shall have smooth faces and shall be laid with close joints and well bedded in broken stone foundation.

(4) **Workmanship.**—The slope paving shall be not less than eighteen (18) inches thick including the broken stone bedding. Not over ten per cent of stone shall have a depth less than two-thirds that of the total thickness and at least one-third of the stones shall extend entirely through the paving. Stones shall be placed by hand close together, thoroughly bedded in the broken stone and all voids shall be filled. Joints in the face of the paving shall be tightened with tightly driven spalls.

(5) **Payment.**—The Contractor will be paid for slope paving at the price bid per cubic yard, which price shall include the furnishing and the placing of the stones and bedding, together with the furnishing of all labor, tools and equipment and the doing of all work necessary and proper to complete this item as specified and as required.

GROUTED SLOPE PAVING FOR SIDES OF SPILLWAY CHANNEL.

Item No. 17.

(1) **Work to be Done.**—On the side slopes of the spillway channel where the excavation is in earth, the Contractor shall place slope paving of the same thickness and in a manner similar to that specified in the preceding item, except that the long axes of the stone shall be at right angles to the axes of the channel, and, shall furnish and place cement grout in this slope paving. Grouted slope paving shall also be placed at such other locations as may be required to complete the work as directed by the Engineer.

(2) **Materials.**—The stone for the slope paving shall be similar to that specified in Item 16 and the grout shall be composed of one part of Portland cement and two parts of sand and mixed with a sufficient amount of water to produce a soupy consistency.

(3) **Workmanship.**—Grout shall be poured between slope paving stones until all joints are filled. Wires or sticks shall be prodded into joints during the pouring to assure the grout running to bottom of stones. At completion a mortar of stiffer consistency shall be used to point up the joints so that the surface of the paving presents a neat appearance. In placing slope paving where grout is to be poured, the Contractor at no extra expense shall build weep holes two inches square along bottom of paving and twenty-five feet apart. These shall not be filled with grout.

(4) **Payment.**—The Contractor will be paid for grouted slope pavement at the price bid per cubic yard, which price shall include the furnishing and placing of the stone, the grout and the mortar, together with the furnishing of all labor, materials and equipment, and the doing of all labor necessary to complete this item as specified and as required.

CONCRETE MASONRY.

Items Nos. 18 to 21.

(1) **Work to be Done.**—The Contractor shall furnish all materials and shall do all work necessary for placing concrete in cut-off and core walls, in gravity masonry section of the dam, in abutment walls on both sides of the spillway section and along the spillway channel, in the channel, in the channel paving, intake structure and gate house, bridge and abutments, reservoir drain and gate well, outlet conduits, meter pits, foundations, piers, columns, floor slabs, walkways and at all other places as shown or required, to complete the work.

In Item 18 shall be included concrete masonry in cut-off trenches, spillway section of the dam, the gravity abutment walls on both sides of the spillway and the spillway channel, including the bridge abutments, channel paving, intake structure and other concrete of similar nature placed in large masses and requiring little form work; also all foundation concrete used to fill voids below sub-grade. See Class C for quality and expected strength.

In Item 19 shall be included all concrete masonry in core walls, gate house, weir in spillway channel, well for the reservoir drain and other structures of moderately thick sections requiring forming on both sides. See Class C for quality and expected strength.

In Item 20 shall be included concrete masonry in the arch rib, spandrel walls, and sidewalk of the highway bridge, the reservoir drain, outlet conduits, meter pit and other structures which require a considerable amount of forming for unit volume and which may carry heavy proportions of reinforcing bars. Metal curb armor and expansion joint material shall be included in this item at no extra expense. See Class B for quality and expected strength.

In Item 21 shall be included concrete masonry in the hand railing of the bridge, and such other concrete of similar character which may be necessary to complete the work in an acceptable manner. See Class A for Quality and expected strength.

(2) **Cement.**—All cement used on the work shall be true Portland Cement of a well known brand which has been in successful use on large engineering works in the United States and of which recent reliable and satisfactory tests have been made. All cement shall be new and shall pass the standard specifications and tests (See C-9-21) of the American Society for Testing Materials and will be rejected if it does not meet these requirements

(3) **Inspection and Tests.**—All cement used under this contract shall be subject to inspection and such rigorous tests as may be ordered by the Engineer, and the Contractor shall provide every facility to assist in the inspection and sampling of the cement for testing. The Engineer shall be notified in writing when each consignment of cement is ready for inspection and sampling, and a period of at least twelve days after the delivery of the notification shall be allowed for the necessary tests. The results of the tests made under the direction of the Engineer will be accepted as a final criterion for the acceptance or rejection of any particular shipment of cement.

Every bag or barrel of cement shall be marked by the Inspector; or other precautions may be taken so as to identify the lot from which it is taken and to insure that no cement is delivered for use in the work which has not passed the tests of the Engineer. Any packages of cement which cannot be identified may be rejected.

Before any cement will be allowed to be used, the brand and the name of the maker must be submitted to and receive the approval of the Engineer and no cement will be permitted to be used which is not in all respects satisfactory to him.

(4) **Storing.**—In order to allow ample time for inspection and testing, the cement shall be stored in a suitable weather-tight building having a floor properly blocked or raised above the ground. The building shall be large enough to hold a sufficient supply of cement to prevent delays or interruptions to the work due to testing. The cement shall be stacked so as to permit easy access for inspection, sampling and identification of each shipment. The Engineer shall be permitted to enter at any time any place where cement is stored.

The Contractor or any of his employees shall not destroy, alter or otherwise disturb any cards, marks or numbers the Engineer may place upon the storage bins or packages of cement as an aid to their future identification.

(5) **Packages.**—Cement shall be delivered in cooperage or in strong cloth bags with the brand and name of the manufacturer plainly marked thereon. Before delivering cement in bulk the Contractor must secure the written approval of the Engineer for the handling of cement in this manner. A bag of cement shall contain 94 pounds of cement net. Packages received in a broken or damaged condition shall be received only as fractional packages. Each barrel of cement shall contain four bags of the above net weight. A bag shall be considered as measuring 0.95 cubic feet and a barrel as 3.80 cubic feet of volume; thus 1 cubic foot will be considered to weigh 100 pounds.

(6) **Fine Aggregate.**—The fine aggregates used for concrete and for mortar in all parts of the work shall consist of sand, stone screenings or other inert materials with similar characteristics or a combination thereof having clean, hard, strong, durable, uncoated grains with no grains larger than one-quarter inch and with a grading in size of grains, particularly if crushed stone screenings are used, as will produce a smoothly working concrete without tendency for the water to drain away. Such parts of the very fine material resulting from the crushing of rock as may be directed shall be removed by screening or washing or both. Fine aggregates shall have not more than 5 per cent by weight of vegetable matter nor of loam or clay or dirt, organic matter, soft flaky particles, dust or other harmful materials. Fine aggregate for mortar or grout shall be especially screened so as to contain no large particles.

Standard methods for tests of fine aggregates as adopted by the American Society for Testing Materials shall be used: For sieve analysis see C–41–24; for decantation test, see D–136–22T; for organic impurities test, see C–40–22.

Fine aggregate shall make a reasonably close comparison with Standard Ottawa Sand when tested in briquettes using equal amounts of the same cement and will be rejected if strength tests are not reasonably close.

(7) **Coarse Aggregates.**—The coarse aggregates used for concrete in all parts of the work shall be composed of gravel or broken stone. If gravel is used it shall be free from sticks or other foreign matter and shall contain no clay or other materials adhering to the pebbles in such quantity that they cannot be lightly brushed off with the hand or removed by dipping in water. If broken stone is used it shall consist of pieces of hard, insoluble and durable rock subject to the approval of the Engineer. If the coarse aggregate is dirty, the dust, dirt, perishable matter and other improper substances shall be removed by washing or screening or both if necessary.

Coarse aggregates shall be graded in various sizes between the limits of dimensions as given below. Broken stone shall be crushed in such manner that less than five per cent of the pieces shall have their longest dimension greater than two and one-half times the average of the other two dimensions.

The coarse aggregate for use in concrete shall be graded in size as follows:

For gravity dam sections and walls 2 feet thick or over, shall pass a 2-inch ring and be held on a ¼-inch ring.

For reinforced walls from 12 inches to 24 inches thick, and unreinforced walls from 9 to 24 inches thick; shall pass a 1½-inch and be held on a ¼-inch ring.

For roadway and sidewalks slabs and reinforced concrete 5 inches to 12 inches thick, shall pass a 1-inch ring and be held on a ¼-inch ring

For concrete encasing structural steel, in hand railings and in reinforced sections less than 5 inches thick, shall pass ¾-inch ring and be held on a ¼-inch ring.

Sieve analysis of coarse aggregate shall be made in accordance with the specifications of the American Society for Testing Materials (See C–41–24).

(8) **Cyclopean Aggregate.**—The stone for cyclopean aggregate shall be sound, hard, durable, insoluble, of irregular shape and free from seams or other imperfections and shall not have thin feather edges or long, thin projections. Stones must be clean and, if required, shall be cleaned with water under pressure from a nozzle, by the use of brushes, or as otherwise directed and shall be satisfactorily clean when placed in the masonry; all stones shall be wetted before being placed in final position. Hammers or other tools shall be used if necessary, to remove objectionable materials adhering to any stone.

(9) **Storage of Aggregate.**—Aggregate shall be so stored as to avoid the inclusion of foreign material. Frozen aggregate or aggregate containing lumps of frozen material shall be thawed before using.

(10) **Water Used in Mixing Concrete.**—The water for mixing concrete shall be clean and free from injurious amounts of oil, acid, alkali or organic matter or other harmful substances. The water should preferably be of such quality as to be suitable for potable uses. The quantity of water used in making concrete shall be the minimum amount in excess of that required for maximum strength of the concrete which will produce a satisfactory, workable mixture. The total quantity of water to be used per bag of cement will be determined by the Engineer but in general will range from 6.5 to 7 gallons including water already in the coarse and fine aggregates. The quantity of water in the coarse and fine aggregates will be determined by the Engineer. The quantity of water to be added in the mixer to provide a concrete of requisite strength and workability will also be determined by the Engineer. The Contractor shall provide a suitable, convenient and accurate measuring device, approved by the Engineer, by which the quantity of water specified can be added to each batch of concrete in the mixer. The operation of this water-measuring device shall at all times be under the direct supervision and control of the Engineer and no other pipes, hose, buckets, pails or other methods or devices shall be used or provided for the purpose of adding water to the concrete materials either in or outside the mixer.

The supply of water to be used for mixing concrete shall be stored in a suitable covered storage tank approved by the Engineer having a single inlet pipe controlled by a valve fitted with a lock and the refilling of the storage supply tank shall be controlled by the Engineer. The valve shall be kept locked in a closed position at all times except when the storage tank is being refilled under the supervision of the Engineer.

The storage tank shall have a suitable gauge or scale calibrated to show at all times the quantity of water in gallons remaining in the storage tank.

(11) **Proportions.**—Materials for concrete shall be measured by volume. The volume of fine aggregate shall be measured under an inundated condition.

Concrete shall be mixed to produce the strength and to the proportions not leaner than are shown in the following table:

DEPT OF WATER & WATER SUPPLY

CITY OF ALBANY, NEW YORK

BOARD OF WATER SUPPLY

Commissioners
Neile F. Towner, President
Edward Easton
J. Murray Prior, Secretary

100 State Street, Albany, N. Y.

Information for Bidders, Proposal, Contract and Specifications and Bond

For

SECTION No. 2, CONTRACT No. 2

ALCOVE DAM

in the

Town of Coeymans, Albany County, N. Y.

Whitman, Requardt & Smith
Engineers

Robert E. Horton
Cons. Engineer

ALBANY
THE ARGUS CO., PRINTERS
1928

CITY OF ALBANY

BOARD OF WATER SUPPLY

THE ALCOVE DAM

SECTION No. 2, CONTRACT No. 2

INFORMATION FOR BIDDERS

(a) Sealed bids or proposals, addressed to the Board of Water Supply, City of Albany, N. Y., and marked "Bids for the Construction of the Alcove Dam," will be received at the office of the Board of Water Supply, 100 State Street, Albany, N. Y. until ...July 9th..., 1928, at 3 P. M. o'clock (Daylight Saving Time), at which time they will be publicly opened by the Board and read.

(b) Plans and specifications may be obtained at the office of the Board of Water Supply upon deposit of fifteen (15) dollars, which deposit will be refunded only to bona fide bidders if the plans and specifications are returned to the office of the Board of Water Supply in good condition within 24 hours after the time set for opening bids.

(c) All bids must be made on the blank forms of proposal attached hereto and must give the price for each item of the proposed work, both in words and in figures, and be signed by the bidder with his name and address. Each bid must be enclosed in a sealed envelope and delivered to the Secretary of the Board of Water Supply.

(d) Proposals must be signed by the bidder with his signature in full. If the proposal is made by an individual his name and post-office address must be given. If made by a firm or partnership the name and post-office address of each member of the firm or partnership must be given. If made by a corporation the person signing the proposal must show the name of the State under the laws of which the corporation is chartered and the names, titles and business addresses of the president, secretary and treasurer.

(e) A certified check of the bidder upon a solvent bank or trust company made payable to the Treasurer, City of Albany, N. Y., for the sum of five per cent of the total bid will be required and must accompany each bid. Such amount, however, need not in any case exceed fifty thousand dollars.

(f) The work to be done is located in the town of Coeymans, in Albany County, New York, on Hannacrois Creek and on land owned or controlled by the City of Albany.

(g) The work consists in furnishing labor and materials, tools and equipment for the complete construction of an earthen dam embankment with concrete corewall, masonry overflow dam section with masonry abutments, gate chamber, and inlet structure, outlet conduits, reservoir drain, spillway channel, roadway, highway bridge, earth dikes, open channels and appurtenant works.

(h) The work shall be done in all respects in accordance with the specifications, the contract drawings and any detail drawings which may be issued subsequently. The contract drawings referred to are:

No. 1.—Locality Map and Design Data.
2.—Location Plan, South End of Dam.
3.—Location Plan, North End of Dam.
4.—Rock Outcrops and Sub-Surface Data.
5.—Plan and Profile of Core Wall.
6.—Spillway and Embankment Details.
7.—Intake Structure.
8.—Gate House Substructure.
9.—Gate House Details.
10.—Gate House Superstructure.
11.—Outlet Conduits and Meter Pit.
12.—Reservoir Drain.
13.—Spillway Abutment Walls.
14.—Plan and Elevation of Highway Bridge.
15.—Details of Highway Bridge.
16.—Spillway Waste Channel and Highway Details.

(i) The quantities of work to be done under this contract are given here and in the bid or proposal sheets and are approximate statements of the extent of the work. They shall be used to compute, test and canvass the bids received and are given as a basis for the uniform comparison of bids. The Board of Water Supply does not expressly or by implication agree that the actual amount of work will correspond therewith. All extensions in the proposal forms including column entitled "Total Amounts" shall be computed and filled in and the totals of all extensions shall be summed up by the bidder. In case of discrepancy, the unit prices shall govern and shall be considered the official bid.

APPROXIMATE QUANTITIES OF WORK.

1.	Stream Control	Lump Sum
2.	Clearing and Grubbing	Lump Sum
3.	Stripping Excavation	16,000 Cu. Yds.
4.	General Earth Excavation	25,000 Cu. Yds.
5.	Trench Earth Excavation, 0 to 10 Feet	3,500 Cu. Yds.
6.	Trench Earth Excavation, 10 to 15 Feet	800 Cu. Yds.
7.	Trench Earth Excavation, 15 to 20 Feet	600 Cu. Yds.
8.	Trench Earth Excavation over 20 Feet	350 Cu. Yds.
9.	General Rock Excavation	8,100 Cu. Yds.
10.	Rock Excavation, No Blasting	2,900 Cu. Yds.
11.	Grout	200 Cu. Yds.
12.	Drilling Holes in Rock or Masonry	1,000 Lin. Ft.
13.	Consolidated Embankment	320,000 Cu. Yds.
14.	Top Soil	25,500 Sq. Yds.
15.	Grassing	35,000 Sq. Yds.
16.	Slope Paving	11,200 Cu. Yds.
17.	Grouted Slope Paving	770 Cu. Yds.
18.	Concrete Masonry, Heavy Sections	17,800 Cu. Yds.
19.	Concrete Masonry, Moderate Sections	8,800 Cu. Yds.
20.	Concrete Masonry, Thin Sections	1,800 Cu. Yds.

21.	Concrete Masonry, Hand Rail	32 Cu. Yds.
22.	Concrete Protection	145,000 Sq. Ft.
23.	Membrane Water Proofing	540 Sq. Yds.
24.	Reinforcing Steel	680,000 Lbs.
25.	Sluice Gates	Lump Sum
26.	Gate and Miscellaneous Valves	Lump Sum
27.	Miscellaneous Iron and Steel	23,000 Lbs.
28.	Iron Castings	57,000 Lbs.
29.	Steel Pipe	Lump Sum
30.	Cast Iron Pipe	17,000 Lbs.
31.	Flanged Pipe and Special Castings	46,000 Lbs.
32.	Venturi Meter	Lump Sum
33.	Gate House Screens	Lump Sum
34.	Gate House Superstructure	Lump Sum
35.	Overhead Crane	Lump Sum
36.	Electrical Work	Lump Sum
37.	Road Paving	2,800 Sq. Yds.
38.	Guard Rail	1,050 Lin. Ft.
39.	Stop Planks	Lump Sum
40.	Lumber Left in Place	175 M.B.M.
41.	Cleaning Up	Lump Sum

(j) The bidder is required to examine carefully the site of, and the proposal, plans, specifications and contract form for, the work contemplated and it will be assumed that he has judged for and satisfied himself as to the conditions to be encountered, as to the character, quality and quantities of work to be performed and materials to be furnished and as to the requirements of these specifications and contract.

(k) Explorations looking toward a determination of the location and character of soils and rock beneath the ground surface have been made and the results thereof are on file and can be seen by intending bidders at the office of the Engineer. Bidders may, upon the approval of the Board of Water Supply, investigate for themselves underground conditions at the location of the structures.

(l) The bidder is assumed to have made himself familiar with all federal and state laws and local laws, ordinances and regulations which in any manner affect those engaged or employed in the work or the materials or equipment used in or upon the work or in any way affect the conduct of the work and no plea of misunderstanding will be considered on account of the ignorance thereof.

(m) If the bidder or contractor shall discover any provisions in the plans, specifications or contract which are contrary to or inconsistent with any such law, ordinance or regulation, he shall forthwith report it to the Board in writing.

(n) The bidder's attention is especially called to the provisions of Chapter 643 of the Laws of 1926, of the State of New York and acts amendatory thereof, as to the letting of contracts and payment for work; to the "Labor Law," as amended; to the laws and regulations relating to mines, quarries and tunnels promulgated by the Commissioner of Labor of the State of New York; to the "Workmen's Compensation Law;" to the "Public Health Law," as amended, and to statutes relating to the City of Albany.

(o) Before the award of the contract, any bidder may be required to show that he has the necessary facilities, personnel, equipment, experience, ability and financial resources to perform the work in a satisfactory manner and within the time stipulated and that he has had experience in constructing works of the same nature.

(p) Before the award of the contract any bidder may be required to furnish a complete statement of the origin, composition and manufacture of any or all materials to be used in the work, together with samples which samples may be subjected to the tests provided for in these specifications to determine their quality and fitness for the work.

(q) The work embraced under this contract shall begin within ten (10) days after notice so to do and shall be sufficiently completed so that the storage of water can be started on December 1, 1929, and the entire contract work shall be completed by June 1, 1930.

(r) Bids which are incomplete, conditional or obscure or which contain additions not called for, erasures, alterations or irregularities of any kind, may be rejected as informal.

(s) Bids when filed shall be irrevocable.

(t) No bid will be accepted from nor contract awarded to any person who is in arrears to the Corporation of the City of Albany upon debt or contract; nor who is in default as surety or otherwise upon any obligation to the Corporation of the City of Albany.

(u) The successful bidder will be required to give bond in the full amount of the contract for the faithful performance of the work.

(v) The successful bidder will be required to carry casualty insurance in full compliance with State insurance and compensation laws.

(w) The Board reserves the right to select the bid, the acceptance of which will, in its judgment, best secure the efficient performance of the work or to reject any or all bids.

(x) The checks of the unsuccessful bidders shall be returned to them three days after awarding the contract to the successful bidder. Upon the execution of the contract and bond by the successful bidder, his check will be returned to him.

(y) The successful bidder shall promptly execute a formal contract to be approved as to its form, terms and conditions by the Corporation Counsel.

(z) Failure to comply with any of the requirements of the specifications and contract, or failure to enter bond in a sum equal to the full amount of the award or to execute the contract within ten (10) days, shall be just cause for the annulment of the award, and it is understood by the Bidder in the event of the annulment of the award, that the amount of the certified check filed with the proposal shall be forfeited to the use of the City, not as a penalty, but as liquidated damages.

BID OR PROPOSAL

To the Board of Water Supply, City of Albany:

For building dam structures and appurtenant works for the City of Albany, New York, as shown on plans on file in the office of the Board of Water Supply, 100 State Street, Albany, New York.

(Note: The Bidder's name and residence must be inserted here, and in case of firms, the name of each and every member of the firm must be inserted. In case a bid be submitted by or in behalf of any corporation the name of such a corporation must be written here.)

Made this 9th day of July 192 8

by .....

.....

.....

Item and Price Bid.	Total
Item 1.—For All Stream Control:	
.....Dollars	
.....Cents	
($ 4.000.00) Lump Sum.....	($ 4,000.00)
Item 2.—For all Clearing and Grubbing:	
.....Dollars	
.....Cents	
($.....) Lump sum.....	($ 3,000.00)
Item 3.—For approximately 16,000 cubic yards Excavation in Stripping of site:	
.....Dollars	
.....Cents	
($ 1.00) Per cubic yard.....	($ 16,000.00)
Item 4.—For approximately 25,000 cubic yards General Earth Excavation:	
.....Dollars	
.....Cents	
($ .60) Per cubic yard.....	($ 15,000.00)

Item 5.—For approximately 3,500 cubic yards Earth Excavation in Trenches from Ground Surface to ten feet or less in depth:

.....Dollars

.....Cents

($ 2.00) Per cubic yard..... ($ 7,000.00)

Item 6.—For approximately 800 cubic yards Earth Excavation in Trenches between ten feet and fifteen feet below ground:

.....Dollars

.....Cents

($ 4.00) Per cubic yard..... ($ 3,200.00)

Item 7.—For approximately 600 cubic yards Earth Excavation in Trenches between fifteen and twenty feet below ground:

.....Dollars

.....Cents

($ 6.50) Per cubic yard..... ($ 3,900.00)

Item 8.—For approximately 350 cubic yards Earth Excavation in Trenches Greater Than Twenty Feet In Depth Below Ground Surface:

.....Dollars

.....Cents

($ 8.00) Per cubic yard..... ($ 2,800.00)

Item 9.—For approximately 8,100 cubic yards General Rock Excavation:

.....Dollars

.....Cents

($ 1.30) Per cubic yard..... ($ 10,530.00)

Item 10.—For approximately 2,900 cubic yards Rock Excavation Where Blasting Is Not Permitted:

.....Dollars

.....Cents

($ 2.80) Per cubic yard..... ($ 8,120.00)

Item 11.—For approximately 200 cubic yards of Grout in Place:

.....Dollars

.....Cents

($ 8.00) Per cubic yard..... ($ 1,600.00)

Item 12.—For approximately 1,000 linear feet Drilling Holes in Rock or Masonry:

.....Dollars

.....Cents

($ 1.00) Per linear foot..... ($ 1,000.00)

Item 13.—For approximately 320,000 cubic yards Consolidated Embankment In Place:

.....Dollars

.....Cents

($ .60) Per cubic yard..... ($ 192,000.00)

Item 14.—For approximately 25,500 square yards Top Soil:

.....Dollars

.....Cents

($ .20) Per square yard..... ($ 5,100.00)

Item 15.—For approximately 35,000 square yards Grassing:

.....Dollars

.....Cents

($ .02) Per square yard..... ($ 700.00)

Item 16.—For approximately 11,200 cubic yards Slope Paving:

.....Dollars

.....Cents

($ 4.00) Per cubic yard..... ($ 44,800.00)

Item 17.—For approximately 770 cubic yards Grouted Slope Paving:

.....Dollars

.....Cents

($ 6.50) Per cubic yard..... ($ 5,005.00)

Item 18.—For approximately 17,800 cubic yards Concrete Masonry in Heavy Sections:

.....Dollars

.....Cents

($ 9.50) Per cubic yard..... ($ 169,100.00)

Item 19.—For approximately 8,800 cubic yards Concrete Masonry in Moderate Sections:

.....Dollars

.....Cents

($ 14.00) Per cubic yard..... ($ 123,200.00)

Item 20.—For approximately 1,800 cubic yards Concrete Masonry in Thin Sections:

.....Dollars

.....Cents

($ 20.00) Per cubic yard..... ($ 36,000.00)

Item 21.—For approximately 32 cubic yards Concrete Masonry in Hand Rail:

.....Dollars

.....Cents

($ 40.00) Per cubic yard..... ($ 1,280.00)

Item 22.—For approximately 145,000 square feet Concrete Protection:

.....Dollars

.....Cents

($ .03) Per square foot..... ($ 4,350.00)

Item 23.—For approximately 540 square yards Membrane Water Proofing:

.....Dollars

.....Cents

($ 1.00) Per square yard..... ($ 540.00)

Item 24.—For approximately 680,000 pounds of Reinforcing Steel:

.....Dollars

.....Cents

($ .05) Per pound..... ($ 34000.00)

Item 25.—For all Sluice Gates:

.....Dollars

.....Cents

($ 8,500.00) Lump sum..... ($ 8,500.00)

Item 26.—For all Gate and Miscellaneous Valves:

.....Dollars

.....Cents

($ 600.00) Lump sum..... ($ 600.00)

Item 27.—For approximately 23,000 pounds Miscellaneous Iron and Steel:

.....Dollars

.....Cents

($ .14) Per pound..... ($ 3,220.00)

Item 28.—For approximately 57,000 pounds Iron Castings:

.....Dollars

.....Cents

($ .07) Per pound..... ($ 3,990.00)

Item 29.—For all Steel Pipe:

.....Dollars

.....Cents

($ 10,000.00) Lump sum..... ($ 10,000.00)

Item 30.—For approximately 17,000 pounds Cast Iron Pipe:

.....Dollars

.....Cents

($ .05) Per pound..... ($ 850.00)

Item 31.—For approximately 46,000 pounds Flanged Pipe and Special Castings:

.....Dollars

.....Cents

($ .10) Per pound..... ($ 4,600.00)

em 32.—For Venturi Meter Complete:

.....Dollars

.....Cents

($ 1200.00) Lump sum..... ($ 1,200.00)

Item 33.—For Gate House Screens Complete:

.....Dollars

.....Cents

($ 900.00) Lump sum..... ($ 900.00)

Item 34.—For Gate House Superstructure Complete:

.....Dollars

.....Cents

($ 9,000.00) Lump sum..... ($ 9,000.00)

Item 35.—For Overhead Crane Complete:

.....Dollars

.....Cents

($ 750.00) Lump sum..... ($ 750.00)

Item 36.—For all Electrical Work Complete:

.....Dollars

.....Cents

($ 4,500.00) Lump sum..... ($ 4,500.00)

Item 37.—For approximately 2,800 square yards Road Paving:

.....Dollars

.....Cents

($ 1.00) Per square yard..... ($ 2,800.00)

Item 38.—For approximately 1,050 linear feet Guard Rail:

.....Dollars

.....Cents

($ 1.25) Per linear foot..... ($ 1,312.50)

Item 39.—For all Stop Planks:

.....Dollars

.....Cents

($ 2000.00) Lump sum..... ($ 2,000.00)

Item 40.—For approximately 175 M. B. M. Lumber Left in Place:

.....Dollars

.....Cents

($ .01) Per M. B. M..... ($ 1.75)

Item 41.—For all Cleaning Up:

.....Dollars

.....Cents

($ 1000.00) Lump sum..... ($ 1000.00

Work embraced under this contract shall be completed by June 1, 1930.

Total Bid..... ($ 747,449.2

The foregoing prices are to include and cover the furnishing of all materials and labor, requisite a proper, the providing of all necessary machinery, tools, appurtenances and other means for performing t work, and the doing of all the above mentioned work in the manner set forth, described and shown in t specifications and on the drawings for the work and in the form of contract.

Each and every person bidding and named above must sign here. In the case of firms, give the fir and last names of each party, in full with residence.

In case a bid shall be submitted by or in behalf of any corporation, it must be signed in the name of su corporation by some authorized agent or officer thereof, who shall also subscribe his name and office. practicable, the seal of the corporation shall be affixed.

Name... Winston + Company

Address... Winston, N.H.

Name.....

Address.....

Name.....

Address.....

Name.....

Address.....

Witness:

.....

Witness:

.....

CONTRACT

THIS AGREEMENT, made this.....of....., 192 , by and between "The City of Albany" a municipal corporation organized under the laws of the State of New York, acting by and through its Board of Water Supply, by virtue of and pursuant to the power vested in it by Chapter 643 of the Laws of 1926, State of New York, and Acts amendatory thereof and supplementary thereto, which statutes are made a part of this contract, party of the first part, and.....

.....

.....Contractor, part.... of the second part,

WITNESSETH, that said part.... of the second part, for the consideration hereinafter mentioned to be paid to the said part.... of the second part, shall and will at.....own cost and expense, furnish all the materials and do all the work called for by this agreement, to wit:.....

.....

.....

in the manner and under the conditions herein specified, and in strict conformity, in every part and particular, with the specifications hereto annexed and the plans therein mentioned, which specifications and plans, and each and everything therein contained, is and are part of this contract, and that the said part.... of the second part will furnish and use all the required materials as in said specifications provided to be furnished and used and furnish and perform all the required labor as in said specifications provided to be furnished and performed, and will erect, finish, furnish and deliver the specified work done in a thorough, workmanlike and substantial manner under the direction and to the full and complete satisfaction of the Board of Water Supply of the said party of the first part within.....

.....

It is mutually agreed that time is of the essence of this contract, and if the Contractor shall fail to complete his work within the time above fixed, the Board of Water Supply may declare the contract abandoned and at an end and in such case the Contractor shall have no claim for compensation for work performed or materials furnished beyond what he may have already received, and the City shall not in any manner be liable therefor, except to the extent of any payments theretofore issued, and the Contractor shall still remain liable to the City on account of any injury sustained by it, arising from the neglect or default of said Contractor in respect to said work. The time for the completion of the work may, however, be extended by the Board of Water Supply upon the application of the Contractor for good and sufficient cause shown. In case of any such extension, the surety upon the bond accompanying the proposal of the Contractor and this contract shall not be released from any liability on said bond by reason of such extension.

The Mayor of the City of Albany, or the Board of Water Supply of said City, has the power at any time to suspend the execution of the work under this contract, and the Board of Water Supply shall have the power to continue such suspension, and in its discretion, to vacate this contract, either for neglect or refusal to proceed with the work, or for a violation of any or either of the covenants, terms, conditions and provisions of this contract, without rendering the said City liable for any damages therefor and without in any degree affecting any liability upon the bond given to the City by or on behalf of the Contractor.

The said parties hereto also declare that this agreement is made with reference to the proposal submitted by the contractor for the above-described work, and hereto annexed, which is to be taken as part and parcel of this contract.

And the said part.... of the second part hereby stipulate, covenant and agree for .....sel..... heirs, executors, administrators, successors and assigns: that ..... ha the right, power, authority and license to furnish all said materials and do all the work, in said specifications and hereinbefore described, and that ..... and ..... heirs, executors, administrators, successors and assigns, will, at ..... and ..... own costs and charge, defend any and all actions or proceedings that may be brought against

STATE OF NEW YORK,
CITY AND COUNTY OF ALBANY, } ss.:

On this.....day of.....19.., before me pe-
sonally came ....., Mayor of the City of ban-
N. Y., to me known and who being by me duly sworn did depose and say that he resides in the City of any
and that he is the Mayor of the City of Albany, the corporation described in and which executed the abov
instrument, and that he knows the seal of said corporation; that the seal affixed to said instrument is suc
corporate seal and that he signed his name thereto pursuant to the authority given to him by statute.

.....

.....

STATE OF NEW YORK,
CITY AND COUNTY OF ALBANY. } ss.:

On this .....day of....., 192.. before me.
personally came....., President Secretary, of t
Board of Water Supply of the City of Albany, to me known, who being by me duly sworn, did depose a
say that he resides in the City of Albany, N. Y.; that he is the President Secretary of the Board of Water Sup
of the City of Albany, the board described in and which executed the above instrument; that he kno
the seal of said Board of Water Supply; that the seal affixed to said instrument is such corporate seal, a
it was so affixed pursuant to a resolution of the Board of Water Supply, and that he signed his name there
by like order.

.....

.....

STATE OF NEW YORK,
CITY AND COUNTY OF ALBANY, } ss.:

On this.....day of.....19..., before
personally came....., to me known, who being by me du
sworn, deposes and says that he resides in the city of.....; that
.....of the.....one o e co
porations described in and which executed the above instrument; that he knows the seal of said corporatio
that the seal affixed to said instrument is such corporate seal; that it was so affixed by order of the board
directors of said corporation and that he signed his name thereto by like order.

.....

STATE OF NEW YORK,
CITY AND COUNTY OF ALBANY, } ss :

On this.....day of.....19.., before me p-
sonally appeared.....
to me personally known and known to me to be the person named in and who executed the foregoing instrume
and severally acknowledged that he executed the same.

.....
Notary Public.

I HEREBY CERTIFY, that in my opinion, the City of Albany, by its Board of Water Supply, had th
authority and power to make the foregoing contract, and that such contract is in proper form and properl
executed.

.....

Albany, N. Y.,.....19....

.....
Corporation Counsel.

This contract is approved by the Board of Estimate and Apportionment of the City of Albany. N. Y
on this ..... day of ....., 192..

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Secretary, Board of Estimate and Apportionment.

SPECIFICATIONS

GENERAL PROVISIONS.

(1) Definitions.—Whenever in these specifications and contract the following terms or pronouns in place of them, are used, the intent and meaning shall be interpreted as follows:

"City".—The Corporation of the City of Albany, New York.

"Board".—The Board of Water Supply of the City of Albany or any commission or officer duly authorized to act for the City in the execution of the work required by this contract.

"Engineer".—The firm of Whitman, Requardt and Smith, 11 North Pearl Street, Albany, N. Y., duly appointed by the Board of Water Supply, acting through the firm members, its Consulting Engineers, or its properly authorized agents, such agents acting severally within the scope of the particular duties entrusted to them.

"Inspector".—An authorized representative of the Engineer, assigned to make any or all necessary inspections of the work performed and materials furnished by the Contractor.

"Laboratory".—The official testing laboratory of the City as may be selected by the Engineer and with the approval of the Board.

"Bidder".—Any individual, firm or corporation submitting a proposal for the work contemplated, acting directly or through a duly authorized representative.

"Contractor".—Party of the second part to the contract, acting directly or through his agents or employees.

"Sub-Contractor".—An individual, firm or corporation, who contracts with a contractor to perform part or all of the latter's contract.

"Surety".—The body, corporate or individual approved by the Board, which is bound with and for the Contractor, who is primarily liable, and which engages to be responsible for his acceptable performance of the work for which he has contracted.

"Proposal".—The approved prepared form on which the Bidder is to or has submitted his proposal for the work contemplated.

"Certified Check".—To all bids there shall be attached a certified check of the bidder upon a solvent bank or trust company, and the bidder who has had the contract awarded to him, and who fails to promptly and properly execute the required contract and bond shall forfeit said check.

"Plans".—All drawings, or reproductions of drawings, pertaining to the construction under the contract.

'Specifications".—The directions, provisions and requirements contained herein, pertaining to the method and manner of performing the work, or to the quantities and qualities of materials to be furnished under the contract.

"Contract".—The agreement covering the furnishing of materials and the performance of the work. The Contract shall include the "Information to Bidders," ''Proposal," "Plans," and "Specifications."

"Contract Bond".—The approved form of security to be approved by the Board, furnished by the Contractor and his Surety as a guaranty of good faith on the part of the Contractor to execute the work in accordance with the terms of the specifications and Contract.

"Notice to Proceed".—A Notice to the Contractor of the date on or before which he is to be prosecution of the work contracted for.

"Work".—The performance of the project covered by the specifications or the furnishing o materials, machinery, equipment, tools or any other article or thing being purchased by th

In order to avoid cumbersome and confusing repetition of expressions in these specifications, wh it is provided that anything is, or is to be, or to be done, if, or as, or when, or where "contemplated," "rec "directed," "specified," "authorized," "ordered," "given," "designated," "indicated," "considered nece "deemed necessary," "permitted," "suspended," "approved," "acceptable," "unacceptable," "su "unsuitable," "satisfactory," "unsatisfactory," or "sufficient" it shall be taken to mean and intend templated," "required," "directed," "specified," "authorized," "ordered," "given," "designated," "indi "considered necessary," "deemed necessary," "permitted," "suspended," "approved," "acceptable," ceptable," "suitable," "unsuitable," "satisfactory," "unsatisfactory," or "sufficient" by or to the Engi

The Sub-headings printed in these Specifications are intended for convenience of reference on shall not be considered as having any bearing on the interpretation thereof.

(2) **All Parts Considered One Instrument.**—All things contained in the "Information for Bi "Proposal," and notices referred to therein and in these specifications and all plans are made a part o specifications and the contract and are all to be considered as one instrument.

(3) **Bond.**—The successful bidder will be required to give bond within ten days after the dat award of contract in the amount of the contract price, conditioned that he shall comply in all respects terms and conditions of his contract, and his obligations thereunder, including the specifications, a indemnify and save harmless the City of Albany against or from all costs, expenses, damages, injury which the said City of Albany may be subjected by reason of any wrongdoing, misconduct, want negligence or default upon the part of the Contractor, his agents or employees in or about the ex performance of this contract, including said specifications, and shall save and keep harmless said City against and from all claims or losses to it from any cause whatever, including patent infringements in t of the performance of said contract. Said bond shall contain the requirements set forth in the fo annexed.

Whenever the surety or sureties on the bond so furnished shall be deemed by the Board to be in or unsatisfactory, the Contractor, within ten days after notice to that effect, shall furnish and deli bond to the City of Albany, in the same penalty and on the same conditions, with surety satisfacto Board, and this duty shall continue on the part of the Contractor, whenever and so often as the Bo require a new bond with a satisfactory surety or sureties. If the Contractor shall fail to furnish su within ten days after said notice mailed to his address, the Board, through its proper agents or agent, m all further work under said contract and re-let the unfinished work at the expense of the Contractor.

(4) **Insurance.**—The Contractor shall carry casualty insurance in compliance with the state ins and compensation laws in sufficient amount, and shall save harmless the City from any and all clai damages to his employees or those of other contractors, and to the general public, on account of injuries re from any cause in connection with this work. The Contractor shall file with the City satisfactory ev that such casualty insurance is in force. Premiums on all such insurance is to be paid by the Contrac

(5) **Scope of Work.**—The work to be done under these specifications is to cover the complete shown on the plans or called for in the specification. The Contractor shall furnish all implements, mach tools, equipment, material and labor necessary to the performance of the work and shall furnish every sary thing to make the work perfect, complete, neat and finished.

(6) Permits and Licenses.—The Contractor shall procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work.

(7) Plans, Etc., to be Followed.—The approved plans, elevations and cross-sections on file in the office of the Board will show the location, details and dimensions of the work contemplated, which shall be performed in strict accordance therewith and in accordance with the specifications. Any deviation from the plans, specifications, etc., as may be required by the exigencies of construction, in all cases, will be determined by the Engineer and authorized in writing and approved by the Board.

(8) Interpretation of Plans, Etc.—On all plans, drawings, etc., the figured dimensions shall govern in the case of discrepancy between the scales and figures. The Contractor shall take no advantage of any error or omission in the plans or of any discrepancy between the plans and specifications, and the Engineer shall make such corrections and interpretations as may be deemed necessary for the fulfillment of the intent of the specifications and of the plans as construed by him, and his decision, approved by the Board, shall be final.

(9) Alteration of Plans or of Character of Work.—The Engineer, subject to approval by the Board, reserves the right to make such alterations in the plans or in the character of the work as may be considered necessary or desirable from time to time to complete fully, and perfectly the construction of the work, provided such alterations do not change materially the original plans and specifications, and such alterations shall not be considered as a waiver of any condition of the contract nor to invalidate any of the provisions thereof. Should such alterations in the character of the work be productive of increased cost or result in decreased cost to the Contractor, a fair and equitable sum therefor, to be agreed upon in writing by the Contractor and the Engineer before such work is begun, shall be added to or deducted from the contract price, as the case may be. No allowance will be made for anticipated profits.

(10) Extra Work.—The Contractor shall perform extra work, for which there is no provision included in the contract, whenever, to complete fully the work as contemplated, it is deemed necessary or desirable, and such extra work shall be done in accordance with the specifications therefor, or in the best workmanlike manner as directed. This extra work will be paid for at a unit price or lump sum to be agreed upon previously in writing by the Contractor and the Engineer, or where such a price or sum cannot be agreed upon by both parties, or where this method of payment is impracticable, the Engineer may order the Contractor to do such work on a "Force Account" basis. Agreements between the Engineer and Contractor for extra work to be valid must have the approval of the Board and the approval of the Board of Estimate and Apportionment.

(11) Force Account Work.—All extra work done on a "force account" basis will be paid for in the following manner:

(a) For all labor, teams, trucks and foremen in direct charge of the specific operation, the Contractor shall receive the current local rate of wage, to be agreed upon in writing before starting such work, for each and every hour that said labor, teams and foremen are actually engaged in such work, to which shall be added an amount equal to fifteen per centum (15%) of the sum thereof. The Contractor will be reimbursed for his expenditures for Workmen's Compensation Insurance covering the men actually employed on such extra work, to which, however, no percentage shall be added.

(b) For all materials used; the Contractor shall receive the actual cost of such materials, including freight charges, as shown by original receipted bills, to which shall be added an amount equal to fifteen per centum (15%) of the sum thereof.

(c) For any machine-power tools or equipment, including fuel and lubricants, which it may be deemed necessary or desirable to use, the Engineer shall allow the Contractor a reasonable rental price, to be agreed upon in writing before such work is begun, for such time as the Engineer shall deem necessary for the work, and to which sum no percentage shall be added.

The compensation as herein provided shall be received by the Contractor as payment, in full, for ex work done on a "force account" basis, and shall include superintendence, use of tools and equipment for wh no rental is allowed, and profit. The Contractor's representative and the Inspector shall compare reco of extra work done on a "force account" basis at the end of each day. Copies of these records shall be made duplicate, upon the Engineer's "force account forms" provided for this purpose, by the Inspector and sig by both the Inspector and the Contractor's representative, one copy being forwarded respectively to Engineer and the Contractor. All claims for extra work done on a "force account" basis shall be submitted the Engineer, by the Contractor, upon certified triplicate statements, which shall also include the value o material used in such work, at the prevailing market price, and said statements shall be filed not later than fifteenth (15th) day of the month following that in which the work was actually performed and shall incl all labor charges, etc., and material charges in so far as they can be verified.

Should the Contractor refuse or fail to prosecute the work as directed or to submit his claim as requi then the Engineer may withhold payment of all current estimates until the Contractor's refusal or failu eliminated, or after giving the Contractor due notice, of abrogation of his contract, the Engineer may m payment for said work on the basis of a reasonable estimate of the value of the work performed.

(12) **Unauthorized Work.**—Work done without lines and grades being given, work done beyond lines and grades shown on the plans or as given, except as herein provided, or any extra work done with written authority, will be considered as unauthorized and at the expense of the Contractor and will not be p for by the City. Work so done may be ordered removed and replaced by the Engineer at the Contract expense.

(13) **Prosecution of Work.**—The Contractor shall begin the work to be performed under the con within ten days after service of a notice of the Board to proceed. Commencement of work by the Contr shall be deemed and taken as a waiver of this notice on his part. The place where the work is to be st either will be stated in the "Notice to Proceed" or will be designated on the ground. The work shall be pr cuted from as many different points, in such part or parts and at such times as may be directed, and sh conducted in such a manner and with sufficient materials, equipment and labor as is considered necess insure its completion within the time set forth in the contract. Should the prosecution of work for any re be temporarily discontinued by the Contractor, with the consent of the Engineer, he shall notify the Engi at least twenty-four (24) hours before again resuming operations.

(14) **Co-operation of Contractor Required.**—The Contractor will be supplied by the Engineer two copies of the plans and specifications, and he shall have available on the work at all times, during prosecution of the work, one copy each of said plans and specifications. He shall give the work his cons attention to facilitate the progress thereof and shall co-operate with the Engineer in every way possible. shall have at all times a competent and reliable English-speaking representative on the work, authorize receive orders and to act for him.

(15) **Skillful Workmen.**—The Contractor shall employ only competent, skillful men to do the w and whenever the Engineer shall notify the Contractor that in his opinion any man employed on the wo incompetent, disobedient, unfaithful, disorderly, discourteous, profane or otherwise unsatisfactory, such shall be immediately discharged from the work and shall not again be employed on it except with the con of the Engineer.

(16) **Laws to be Observed.**—The Contractor at all times shall observe and comply with all Fe and State Laws and local laws, ordinances and regulations in any manner affecting the conduct of the w and all such orders or decrees as exist at present and those which may be enacted later, of bodies or trib having any jurisdiction or authority over the work, and shall indemnify and save harmless the City an its officers, agents and servants against any claim or liability arising from or based on the violation of any law, ordinance, regulation, order or decree, whether by himself or his employees.

(17) **Compliance with Labor Law Required.**—The Contractor shall comply with the provisions of the "Labor Law," as amended. No laborer, workman or mechanic in the employ of the Contractor, subcontractor or other person doing or contracting to do the whole or part of the work contemplated by the contract shall be permitted or required to work more than 8 hours in any one calendar day, except in cases of extraordinary emergency caused by fire, flood or danger to life or property. The wages to be paid for a legal day's work to all classes of such laborers, workmen or mechanics upon such work or upon any material to be used thereon shall not be less than the prevailing rate for a day's work in the same trade or occupation in the locality where such work is being constructed. Each such laborer, workman or mechanic shall receive the prevailing rate of wages. But the above provisions relating to hours of labor and wages shall not apply to employees engaged in the construction, maintenance and repair of highways and in water works construction outside of the limits of cities and villages.

(18) **Sanitary Precautions.**—The Contractor and his employees shall promptly and fully carry out the sanitary and medical requirements as hereinafter described or as may from time to time be promulgated by the Engineer to the end that the health of his employees, of the local communities and of the people using water from the drainage areas affected by his operations may be conserved and safeguarded. The Contractor shall also obey regulations and orders of the properly constituted authorities, Municipal and State. His attention is particularly called to Chapter V of the Sanitary Code of the New York State Department of Health relating to camps. The Contractor shall summarily dismiss and shall not again engage, except with the written consent of the Engineer, any employee who violates the sanitary and medical requirements; nor shall any person be employed, without the written consent of the Engineer, who is known to have violated the sanitary regulations on other works of the City.

The Engineer shall have the right in order to determine whether the requirements of this contract as to sanitary matters are being complied with, to enter and inspect any camp or building or any part of the works, and to cause any employee to be examined physically or medically or to be vaccinated or otherwise treated; also to inspect the drinking water and food supplied to the employees.

The Contractor shall provide suitable and satisfactory buildings for the housing, feeding and sanitary necessities of the men, and suitable stabling for the animals, employed upon the work. All buildings for these or kindred purposes shall be built only in accordance with approved drawings and specifications at approved sites. All houses occupied by employees shall be thoroughly screened to exclude mosquitoes and flies. In sleeping rooms at least 400 cubic feet of space shall be provided per occupant. The quarters for the men shall be grouped in properly arranged camps.

The Contractor shall submit the locations proposed for his camps and buildings, and drawings and specifications for the buildings, to the Engineer for approval at earliest practicable dates to permit examination and any needed revision without delay to the work, and no buildings shall be erected until such approval shall have been obtained.

Buildings for the sanitary necessities of all persons employed on the work, beginning with the first man employed to build camps or for other preliminary operations, shall be constructed and maintained by the Contractor in the number, manner and places ordered. Satisfactory precautions shall be taken to render the interior of the incinerators or other closets inaccessible to flies. The requirement for sanitaries in any locality shall be one unit of closet for each 20 persons, including both those on duty and those in camp off duty, it being further stipulated that the required number of closets are always reasonably near the work, and that closets are always in sufficient number in any locality to permit a reasonable proportion to be out of service for incineration of their contents. The Contractor shall rigorously prohibit the committing of nuisances about the completed or partially completed structures or upon the land of the City, or upon adjacent private property.

The Contractor shall retain the services of acceptable, qualified medical and surgical practitioners, who shall have the care of his employees, shall inspect their dwellings, the stables and the sanitaries as often as required, by the Engineer and shall supply medical attendance and medicines to the employees whenever needed.

At intervals as required, the Contractor shall give the Engineer, in such detail as may be prescrib from time to time, a written report, signed by a physician in regular attendance, setting forth clearly t health conditions of the camp or camps and of the employees. If any case of communicable disease be covered, or any case of doubtful diagnosis, it shall be reported at once to the Engineer, by telephon messenger, and confirmed in writing.

The water furnished by the Contractor shall include a sufficient supply of drinking water of ac able quality for all his employees, to be obtained from approved sources. He shall provide ample ba and clothes-washing facilities for his employees and sufficient water of acceptable quality therefor. I water-supply for domestic uses should become contaminated, the Contractor shall promptly provide a supply from an approved source and abandon the contaminated supply, or shall provide works for puri the contaminated water, when and as ordered.

Drainage from kitchens, laundries, sinks, stables, and from other places yielding water unfit for discharge into the stream shall be conducted in tight drains or other approved conveyors to places nated, and treated as directed to produce an acceptable effluent which can be safely discharged int stream. Drainage from kitchens, laundries, sinks and stables may be disposed of in leaching cesspo approved places. Combined closet and sink waste from a limited number of dwellings and offices h water-flushed fixtures may be treated by tight septic tank and subsurface irrigation or other me methods approved by the Engineer. The disposal works shall be operated by the Contractor as di drains and ditches being kept intact and unstopped, cesspools kept serviceable, chlorinating machine in proper operation and supplied plentifully with chlorine, and all other necessary work done to ma the disposal works in efficient service.

The Contractor shall supply corrosive sublimate, quicklime, chlorinated lime, sulphur and other fectants and fumigants in ordered quantities, and perform the labor necessary to apply these materials and as directed in disinfecting and fumigating camp and other buildings and disinfecting stables

Garbage, both liquid and solid, shall be promptly and satisfactorily removed from the building immediately placed in approved tight receptacles of sufficient capacity for about one day's ordinary pro tion. At least once in every twenty-four hours all such garbage shall be incinerated or otherwise thoro and satisfactorily disposed of in an approved manner.

Manure will not be permitted to accumulate upon the premises but shall be removed daily to approved distance or daily incinerated. Removable stall racks shall be provided to permit thorough clean

The Contractor shall build, in accordance with drawings and directions furnished from time to by the Engineer, such disposal plants, sewers, drains and other structures and shall do such other work, not h particularly specified, as may be ordered for carrying out the intent of the sanitary precautions of contract.

The Contractor shall pay all costs incurred in the taking of these sanitary precautions.

(19) Water Supply.—The Contractor shall supply at convenient points ample supplies of wate all the operations under this contract. Water may be obtained for all purposes other than for domestic from the stream or where available from City mains when the water is of the proper quality and condi Water shall not be used when turbidity or chemical constituents are of a nature harmful to the oper for which the water is used. The Contractor shall impound sufficient water to permit his continuous o tion and will interfere with the continuous flow of the stream as little as possible. Where water is avai from City mains it will be supplied to the Contractor at standard municipal charges and under the re tions as established by the City.

The Contractor shall install a proper piping system and shall maintain and extend same when n sary. Water under pressure for cleaning ledge rock, for washing masonry and stones, for wetting eml ments and for other purposes shall be available and the Contractor shall supply sufficient pumping e

ment. Hose connections, hose, casks and buckets and other sufficient means shall be provided by the Contractor for fighting fires in those structures subject to fire risks.

(20) Public Convenience and Safety.—The Contractor at all times shall conduct the work in such a manner as to insure the least obstruction to traffic practicable. The convenience of the general public and of the residents along and adjacent to the work shall be provided for in an adequate and satisfactory manner. Materials stored upon the highway shall be placed so as to cause as little obstruction to the traveling public as is reasonably possible. Fire hydrants on or adjacent to the work shall be kept accessible to fire apparatus at all times, and no material or obstruction shall be placed within ten (10) feet of any such hydrant. Footways and portions of highways adjoining the work under construction shall not be obstructed more than is absolutely necessary. All gutters and sewer inlets shall be kept unobstructed at all times. Work closed down for the winter and at all other times shall be left entirely accessible at all points to fire apparatus.

(21) Barricades, Danger, Warning and Detour Signs.—The Contractor shall provide, erect and maintain all necessary barricades, suitable and sufficient red lights, danger signals and signs, provide a sufficient number of watchmen and take all necessary precautions for the protection of the work and safety of the public. Highways closed to traffic shall be protected by effective barricades on which shall be placed acceptable warning signs.

(22) Use of Explosives.—When the use of explosives is necessary for the prosecution of the work, the Contractor shall observe the utmost care, so as not to endanger life or property, and whenever directed the number and size of the charges shall be reduced. All explosives shall be stored in a secure manner and all such storage places shall be marked clearly, "DANGEROUS—EXPLOSIVES," and shall be in care of competent watchmen at all times. The Contractor MUST familiarize himself with and obey all laws, ordinances and regulations pertaining thereto, and govern himself and his employees accordingly.

(23) Preservation and Restoration of Property.—The Contractor shall not enter upon private property for any purpose without obtaining permission, and he shall be responsible for the preservation of all public and private property, trees, monuments, pipes, conduits, overhead pole lines and wires, sidewalks, paving and other structures above and below ground, along and adjacent to the work, and shall use every precaution, by bracing, supporting and covering or as may be otherwise necessary to prevent damage or injury thereto. He shall be responsible for all damage or injury to property of any character during the prosecution of the work, resulting from any act, omission, neglect or misconduct in his manner or method of executing said work or due to his non-execution of said work, or at any time due to defective work or materials, and if he does such damage, he shall restore, at his own expense, such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, rebuilding, or otherwise restoring, as may be directed, or he shall make good such damage or injury in an acceptable manner.

(24) Contractor's Responsibility for Work.—Until acceptance of the work by the Engineer, it shall be under the charge of and care of the Contractor, and he shall take every necessary precaution against injury or damage to the work or to any part thereof by the action of the elements or from any other cause whatsoever, whether arising from the execution or from the non-execution of the work. The Contractor shall rebuild, repair, restore and make good, at his own expense, all injuries or damages to any portion of the work occasioned by any of the above causes before its completion and acceptance.

(25) Use of a Section of the Work.—Whenever, in the opinion of the Engineer, any portion of the work is completed or is in acceptable condition for use, it shall be used for the purpose it was intended, as may be directed, and such use shall not be held to be in any way an acceptance of that portion of the work used, or as a waiver of any of the provisions of these specifications and contract.

Necessary repairs or renewals made in any section of the work, under instructions from the Engineer, due to defective materials or work, natural causes, to ordinary wear and tear or otherwise, pending final completion and acceptance of the entire work, shall be performed at the expense of the Contractor.

(26) **Tests of Samples of Materials.**—All tests of materials shall be made by the Engineer in accordan with the official approved methods as described or designated, at the Laboratory or such other places as a indicated. When tests are made at places other than the Laboratory, the Contractor shall furnish eve facility for the verification of all scales, measures, etc.

(27) **Quality of Materials.**—The source of supply and the quality of each of the materials shall approved by the Engineer before the delivery is started. Representative preliminary samples of the charac and quality herein described shall be submitted by the Contractor when indicated or directed, for examinati or test. Only materials conforming to the requirements of these specifications shall be used in the work. materials proposed to be used may be inspected at any time during the progress of their preparation and u All materials shall be approved before being incorporated in the work. Where any article or thing is specif by proprietary name, it is to be understood that the article named or the equal thereof is intended, subject the approval of the Engineer. Representative samples of all materials requiring laboratory tests shall be tal and such materials shall be used only after written approval has been received by the representative of Engineer in charge of the work, and only so long as the quality of said materials remains equal to the requi ments. If, after trial, it is found that partially developed quarries, ledges, banks or other sources of sup which have been approved upon samples or otherwise do not furnish a uniform product, or if, for any rea the product from any source, at any time before commencing or during the prosecution of the work, pro unacceptable, the Contractor shall furnish approved material from other sources. After approval, any mat which has become mixed with or coated by dirt or other foreign substances, during its delivery and handl shall not be used in the work.

(28) **Storage of Materials.**—Materials shall be stored so as to insure the preservation of their qua and fitness for the work. When considered necessary, they shall be placed on wooden platforms, or other h clean surface, and not on the ground, and shall be placed under cover when directed. Stored materials sha located so as to facilitate prompt inspection. Lawns, grass plots, or other private property shall be u for storage purposes without written permission of the owner or lessee.

(29) **Line, Grade and Measurement Stakes.**—The Engineer will furnish the Contractor with all g and lines and necessary information to construct the work according to the plans and specifications. Contractor shall furnish, free of charge, all stakes, all templets and other materials necessary for marking maintaining points and lines given, and shall furnish the Engineer such assistance as he may require in gi points and lines necessary to the prosecution of the work. Finished surfaces, in all cases, shall conform the lines and grades given and as shown on the approved plans.

The Contractor shall preserve all lines and grades given by the Engineer. When new sections of are started he shall give the Engineer ample notice so that lines and grades may be established.

(30) **Authority and Duties of Inspectors.**—Inspectors, employed by the Engineer shall be autho to inspect all work done and materials furnished. Such inspection may extend to any or all parts of the and to the preparation or manufacture of the materials to be used. An inspector will be stationed on the to report to the Engineer as to the progress of the work and the manner in which it is being performed; a report whenever it appears that the materials furnished and the work performed by the Contractor fulfill the requirements of the specifications and contract, and to call to the attention of the Contracto such failure or other default, but such inspection, however, shall not relieve the Contractor from any oblig to perform all of the work strictly in accordance with the requirements of the specifications.

In case of any dispute arising between the Contractor and the Inspector as to materials furnished manner of performing the work, the Inspector shall have the authority to reject materials or suspend the until the question at issue can be referred to and decided by the Engineer. The Inspector shall perform other duties as are assigned to him. He shall not be authorized to revoke, alter, enlarge, relax or relea

requirements of these specifications, nor to approve or accept any portion of work, nor to issue instructions contrary, to the plans and specifications. The Inspector shall in no case act as foreman or perform other duties for the Contractor nor interfere with the management of the work by the latter. Any instructions which the Inspector may give the Contractor shall in no wise be construed as releasing the Contractor from the fulfillment of the terms of the contract.

(31) **Authority of the Engineer.**—To prevent disputes and litigations, the Engineer shall in all cases determine the amount or quantity, quality and acceptability of the work and materials which are to be paid for under this contract; he shall decide all disputes, questions and doubts relating to the work and the performance thereof, and shall in all cases decide every question which may arise relative to the contract or the obligations of the Contractor thereunder. His decision shall be final and conclusive upon the Contractor, and all whom he may employ to execute the various branches of the work, whether as sub-contractors or otherwise, and upon all parties from whom materials may be purchased, either by the Contractor or any sub-contractor. He shall have authority to direct the time and order in which the various parts of the work shall be executed, and shall give all orders or directions contemplated herein or hereby, or that may be necessary in every or any case where a difficult or unforeseen condition arises in the performance of the work. He shall make all necessary explanation as to the true meaning and intention of the specifications and plans and shall give all orders and directions to carry out their true meaning, and his decision shall be final and binding upon the Contractor.

(32) **Obligation of the Contractor.**—The Contractor shall do all the work and furnish all the materials, tools and appliances, except as herein otherwise specified, necessary or proper for the performing and completing the work required by this contract, in the manner and within the time hereinafter specified. He shall furnish, erect, maintain and remove the construction plant and such temporary works as may be required. He shall provide such materials and give such assistance for establishing lines and grades and for sampling and testing materials and for necessary inspection whenever and as may be required and the marks given shall be carefully preserved. If at any time before the commencement or during the progress of the work or any part of it, the Contractor's methods or appliances appear to the Engineer to be unsafe, inefficient or inadequate for securing the safety of the workmen, the quality of work or the rate of progress required, he may order the Contractor to increase their safety and efficiency or to improve their character, and the Contractor shall comply with such orders; but the failure of the Engineer to make such demand shall not relieve the Contractor of his obligation to secure the safe conduct, the quality of work and the rate of progress required by the contract, and the Contractor alone shall be responsible for the safety, efficiency and adequacy of his plant, appliances and methods, and for any damage which may result from their failure or their improper construction, maintenance or operation. All the work, labor and materials to be done and furnished under this contract shall be done and furnished strictly pursuant to, and in conformity with, the attached specifications, and the lines and grades and other directions of the Engineer as given from time to time during the progress of the work, under the terms of this contract, and also in accordance with the contract drawings and with working drawings to be furnished from time to time, which said specifications and drawings form part of this agreement. He shall complete the entire work to the satisfaction of the Board, and in accordance with the specifications and drawings herein mentioned, at the prices herein agreed upon and fixed therefor. The Bid submitted by the Contractor and accepted by the Board and the information for Bidders thereto attached are also made parts of this contract.

(33) **Inspection of Materials and Work.**—The Contractor shall furnish the Engineer with every reasonable facility for ascertaining whether or not the work as performed is in accordance with the requirements and intent of the specifications and contract. If the Engineer request it, the Contractor, at any time before acceptance of the work, shall remove or uncover such portions of the finished work as may be directed. After examination, the Contractor shall restore said portions of the work to the standard required by the specifications. Should the work thus exposed or examined prove acceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed, shall be paid for as "extra work," but should the work exposed or examined prove unacceptable, the uncovering, or removing, and the replacing of the covering or

making good of the parts removed, shall be at the Contractor's expense. Any work done or materials us without suitable supervision or inspection by a representative of the City may be ordered removed and replac at the Contractor's expense.

(34) **Materials Found at the Work.**—All timber, fences, buildings, stone, sand and other materi found in the excavations and upon the lands of the City are and shall remain the property of the City. T City may at its discretion permit, without charge therefor, the use by the Contractor of materials so found f incorporation into the work which are acceptable for the purposes intended. Upon approval the Contract may open borrow pits, quarries, sand-pits, etc., upon land controlled by the City at the points designated.

(35) **Defective Materials and Work.**—All materials not conforming to the requirements of the specifications shall be considered as defective, and all such materials, whether in place or not, shall be rejec and shall be removed immediately from the work unless otherwise permitted. No material which has b rejected, the defects of which have been corrected or removed, shall be used until approval has been giv All work which has been rejected or condemned shall be remedied, or, if necessary, removed and replaced in acceptable manner by the Contractor at his own expense.

(36) **Failure to Remove and Renew Defective Material and Work.**—Should the Contractor fail refuse to remove and renew any defective materials used or work performed previously or to make any nec sary repairs in an acceptable manner and in accordance with the requirements of these specifications, wit the time indicated in writing, the Engineer shall have authority to cause the unacceptable or defective mater or work to be removed and renewed or such repairs to be made at the Contractor's expense. Any expe incurred by the City in making these removals, renewals, or repairs, which the Contractor has failed or refu to make, shall be paid out of any moneys due or which may become due to the Contractor, or may be char against the "Contract Bond" deposited; and continued failure or refusal on the part of the Contractor to ma any or all necessary repairs promptly, fully and in an acceptable manner, shall be sufficient cause fo e Ci to declare the contract forfeited, in which case the City, at its option, may purchase materials, ols a equipment and employ labor, or may contract with any other individual, firm or corporation to perform t work. All costs and expenses incurred thereby shall be charged against the defaulting Contractor and t amount thereof deducted from any moneys due or which may become due him, or shall be charged agai the "Contract Bond" deposited. Any work performed, as described in this paragraph, shall not relieve t Contractor in any way from his responsibility for the work performed by him.

(37) **Temporary Suspension of Work.**—The Engineer shall have the authority to suspend the wo wholly or in part, for such period or periods as he may deem necessary, due to unsuitable weather, or su other conditions as are considered unfavorable for the suitable prosecution of the work, or for such time as necessarily due to the failure on the part of the Contractor to carry out orders given or perform any or provisions of the contract. If it should become necessary to stop work for an indefinite period, the Contract shall store all materials in such manner that they will not obstruct or impede the traveling public unnecessar nor become damaged in any way, and he shall take every precaution to prevent damage or deterioration of t work performed, provide suitable drainage by opening ditches, shoulder drains, etc., and erect tempora structures where necessary. The Contractor shall not suspend the work without authority. Neither t failure of the Engineer to notify the Contractor to suspend work on account of bad weather nor permission the Engineer to continue work during bad weather shall be a cause for the acceptance of any work which do not comply in every respect with the contract and specifications. No compensation to the Contractor w be made for such suspension of the work.

(38) **Computation of Contract Time for Completion of the Work.**—The Contractor accepts this contr with the understanding and intention to perform fully, entirely and in an acceptable manner the work co tracted for within the time specified.

The rate of progress and the times in which the various portions and the whole of this contract are to be performed and the work is to be completed are of the essence of this contract.

In order to determine the time for the completion of the work the Engineer will make up a statement showing the actual length of time consumed in performing the Contract from date of notice to begin to the completion. He will calculate the actual number of working days the Contractor was delayed by any act or omission on the part of the Board and these working days will be allowed the Contractor beyond the date set for completion. If the satisfactory execution and completion of the contract shall require work or material in greater amounts or quantities than those set forth in the contract, then the contract time shall be increased in the same proportion as the additional work bears to the original work contracted for.

The above computation having been made, the Engineer shall so certify to the Board with his recommendations for the Board's decision and action, which shall be binding and conclusive upon all parties to this contract.

(39) **Failure to Complete the Work on Time.**—Should the Contractor fail to complete fully, and to all intents and purposes, the work specified in the proposal and contract, on or before the time specified, or within the time as it may have been extended by the Board, said Contractor shall pay to the City the sum of One Hundred and Fifty Dollars for each and every day thereafter (not including Sundays) and to and until and including the day when the said work shall be completed to all intents and purposes as specified in the proposal and contract, and to the satisfaction of the Engineer. This sum is herewith agreed upon, not as a penalty, but as liquidated damages and the City shall have the right to deduct the amount of such damages from any moneys due to or to become due the Contractor under this contract.

(40) **Annulment of Contract.**—If the Contractor fails to begin the work under contract within the time specified, or fails to perform the work with sufficient workmen and equipment or with sufficient materials to insure the prompt completion of said work, or shall perform the work unsuitably or shall neglect or refuse to remove materials or perform anew such work as shall be rejected as defective and unsuitable or shall discontinue the prosecution of the work, or if the Contractor shall become insolvent or be declared bankrupt, or commit any act of bankruptcy or insolvency, or allow final judgment to stand against him unsatisfied for a period of forty-eight (48) hours, or shall make an assignment for the benefit of creditors, or from any other cause whatsoever shall not carry on the work in an acceptable manner, the Engineer shall give notice in writing to the Contractor and his Surety of such delay, neglect or default, specifying the same, and if the Contractor, within a period of ten (10) days after such notice, shall not proceed in accordance therewith, then the Board shall, upon written certificate from the Engineer of the fact of such delay, neglect or default, and the Contractor's failure to comply with such notice, have full power and authority, without violating the contract, to take the prosecution of the work out of the hands of said Contractor, to appropriate or use any or all materials and equipment on the ground as may be suitable and acceptable and may enter into an agreement for the completion of said contract according to the terms and provisions thereof, or use such other methods as in its opinion shall be required for the completion of said contract in an acceptable manner. All costs and charges incurred by the City, together with the costs of completing the work under contract, shall be deducted from any moneys due or which may become due said Contractor. In case the expense so incurred by the City shall be less than the sum which would have been payable under the contract, if it had been completed by said Contractor, then the said Contractor shall be entitled to receive the difference, and in case such expense shall exceed the sum which would have been payable under the contract, then the Contractor and the surety shall be liable and shall pay to the City the amount of said excess.

(41) **Indemnification of the City.**—The Contractor shall indemnify and save harmless the City from all suits, actions and damages or costs of every name and description to which the City may be subjected or put by reason of injury to persons or property resulting from negligence or carelessness on the part of the Contractor, his servants or agents, in the delivery of materials and supplies, or by or on account of any act or

omission of the Contractor, his servants or agents; and the whole, or so much of the moneys due to or to be due the Contractor under the contract as may be considered necessary by the Engineer, shall be retained by the City until such suits or claims for damages shall have been settled or otherwise disposed of, and satisfactory evidence to that effect furnished to the Engineer.

(42) **Indemnification in Case of Extra Work.**—The Contractor shall be responsible for all damages caused by carelessness, lack of care or skill, negligence or default on the part of himself, his agents, employees or sub-contractors, and shall indemnify and save harmless the City from all actions, costs, damages arising out of extra work, in the same manner as any other part of the contract. He shall assume all risk in connection with such extra work, as in any other part of the work, without additional compensation therefor except as set forth in these specifications and the special specifications.

No order for extra work at any time or place shall in any manner relieve the Contractor or the sureties of his bond from any of his obligations under the contract or specifications; all extra work orders being executed in accordance with the contract and specifications, and to be considered a part of the same and subject to each and every one of the terms and requirements thereof, and fully covered by the bond given to guarantee the performance of the same.

(43) **No Damages to be Claimed for Delay.**—No claim for damages shall be made or allowed on account of postponement or delay occasioned by the precedence of other contracts which may be either executed before the execution of this contract, or on account of the streets or structures adjacent to the work not being in the condition contemplated by the parties at the time of making contract, or on account of delay in the removal of obstructions; but if the Contractor shall be delayed in the performance of his work by reason of the streets or structures adjacent to the work, not being in the condition contemplated or on account of delay in the removal of obstructions beyond the time hereinbefore specified, or by reason of the work or part thereof being suspended on account of other contracts, such allowance of time will be made as the Engineer shall deem reasonable.

(44) **No Limitation of Liability.**—The mention of any specific duty or liability of the Contractor in any part of the specifications shall not be construed as a limitation or restriction upon any general liability or duty imposed upon the Contractor by the specifications, said reference to any specific duty or liability for purposes of explanation only.

(45) **Remedies Cumulative.**—All remedies provided in the specifications shall be taken and construed to be cumulative, that is, in addition to any and all other remedies provided therein and to any remedy in law or equity which the City would have in any case.

(46) **Legal Address.**—The address given in the bid or proposal is hereby designated as the legal address of the Contractor. Such address may be changed at any time by notice in writing delivered to the Engineer. The delivering at such legal address or the depositing in any post-office, in a postpaid, registered envelope directed to the above-named address of any notice, letter or other communication to the Contractor shall be deemed to be a legal and sufficient service thereof upon the Contractor.

The delivering at or the mailing to the Contractor's business address in the City or County of (written notice of which address shall be given to the Engineer), or the delivering to the Contractor or to his authorized representative, of any notice, letter or other communication shall also be an deemed to be a legal and sufficient service thereof upon the Contractor.

(47) **Night, Sunday and Holiday Work.**—No night work requiring the presence of an Engineer or Inspector will be permitted, except in case of emergency, and then only to such extent as is absolutely and with written permission of the Engineer, provided, however, that this clause shall not operate in gang organized for regular continuous night work.

No operating of hoisting or other steam engines, or other work of a noisy character, will be permitted between the hours of 11:00 P. M. and 7:00 A. M., except in case of great emergency, and then only with the written consent of the Engineer and to such an extent as he may judge to be necessary.

The Contractor shall, so far as possible, refrain from work on days which are legal holidays in the State of New York. In case he desires to work upon any such holidays, he shall notify the Engineer in writing, at least two (2) days in advance of such holiday, that he desires to work, stating the places where said work will be conducted. In case the Contractor fails to give such notice in advance of any holiday, such failure shall be considered as a notification that no work requiring the presence of an Engineer or Inspector is to be done by the Contractor on such holiday.

(48) **Obstructions Shown on Contract Drawings.**—In addition to showing the structures to be built under this contract, the drawings may show certain information obtained by the City regarding the tracks, pipes, conduits, and other structures which exist along the lines of the work, both at, and below, the surface of the ground. The City expressly disclaims any responsibility for the accuracy or completeness of the information given on the drawings with regard to existing structures, and the Contractor will not be entitled to any extra compensation on account of inaccuracy or incompleteness of such information, said structures being shown only for the convenience of the Contractor, who must verify the information given to his own satisfaction.

The giving of this information on the contract drawings will not relieve the Contractor of his obligation to support and protect all pipes, conduits and other structures which may be met with during the construction of the work, and to make good all damage done to such pipes, conduits and other structures, as provided in the specifications.

(49) **Rights-of-Way.**—Where the work called for extends upon or through private property, the Board will procure all necessary rights and deeds for access to the property, and the Contractor shall not proceed with this part of the work until the City has completed its negotiations with the property holders.

(50) **Final Inspection.**—Final inspection of all work, appurtenances, or other structures built under the contract, will be made under the supervision of and in such manner as directed by the Engineer. The Contractor shall furnish all appliances excepting engineering instruments, and all materials and labor which may be required for final inspection. No compensation will be made to the Contractor for any labor, tools or appliances which may be used or expended in final inspection.

(51) **Cleaning Up.**—The Contractor shall at his own expense, keep the site of his operations clean during construction and remove all rubbish as it accumulates.

Upon failure of the Contractor to keep the sites of his operations clean to the satisfaction of the Engineer, the Board will upon twenty-four (24) hours notice to the Contractor, remove any rubbish, materials, earth, etc., which the Engineer may deem necessary, charging the cost thereof to the Contractor and deducting the amount from any money that may be due him. On or before the completion of the work the Contractor shall, without charge therefor, tear down and remove all buildings and other structures built by him, shall remove all rubbish of all kinds from any grounds which he has occupied, and shall leave the site of the work in a clean and neat condition.

(52) **Partial Estimates and Payments.**—The Engineer will make current estimates in writing, once each month or from time to time as the work progresses, of the materials in place in the structures, and the amount of work performed in accordance with the contract, during the preceding month or period, and the value thereof figured at the unit prices bid. From the total of the amounts so ascertained will be deducted an amount equivalent to fifteen (15) per centum of the whole, to be retained by the City until after the completion of the entire contract in an acceptable manner, and the balance, or a sum equivalent to eighty-five (85) per centum of the whole, shall be paid to the Contractor by the City, except when such balance amounts to less than five thousand dollars ($5,000.00).

Materials which may be on the ground but which are not yet incorporated into the work will no included in partial estimates for payment.

(53) Acceptance and Final Payment.—Whenever, in the opinion of the Engineer, the Contractor have completed the work in an acceptable manner in accordance with the terms of the contract, the Engi shall make a final inspection of the entire work and, upon completion of all necessary repairs or renewal shall certify to the Board in writing as to said completion, and as to the value thereof. The Board, u receipt and approval of said certificate, and the approval of the Board of Estimate and Apportionmer the City of Albany, shall pay, or cause to be paid, the said Contractor, the whole amount of money then the said Contractor under the contract, except such sums which have already been paid and excepting sum or sums as may be lawfully retained under any of the provisions of the contract and specifica herein set forth, and shall notify the Contractor of the acceptance of the work. The action of the Eng by which the Contractor is to be bound according to the terms of the contract, shall be evidenced by aforesaid certificate and final payment, all prior certificates or estimates upon which payments may have made being partial estimates and subject to correction in the final payment.

(54) Five Per Cent. to be Retained.—Upon the return of the certificate of completion and accep of the work by the Engineer, the City shall reserve and retain five per cent. (5%) of the total value of the done under the contract, as shown by the final estimate, over and above any and all other reservations w the City is by the terms thereof entitled or required to retain, and shall hold the said five per cent. (5%) period of eight (8) months from and after the date of such certificate of completion and acceptance, an City shall be authorized to apply such part of said five per cent. (5%) so retained to any and all costs of re and renewals of the work or appurtenances as may become necessary during such period of eight (8) mo on account of any failures or defects in said work or appurtenances, due to improper work done or mai furnished by the Contractor, if the Contractor shall fail to make such repairs or renewals within twenty (24) hours after receiving notice from the Engineer so to do.

Upon the expiration of said eight (8) months from and after the date of the certificate of completion acceptance of the work, the City shall pay to the Contractor the said five per cent. (5%) hereby retained such sums as may have been expended under the provisions of the contract.

(55) Evidence of Payment for Labor and Material.—When written notice is given to the Board b or within thirty days after the completion and acceptance of the entire work under this contract, by per having done work or furnished materials for such contract, that there is money due and unpaid for said w and materials, the Contractor shall furnish the Board with satisfactory evidence that said money has been paid or satisfactorily secured by him. And in case such evidence is not furnished as aforesaid, such amou may be necessary to meet the claims of the persons aforesaid may be retained from any moneys due the tractor under the contract until the liabilities aforesaid shall be fully discharged or such notices withdr The City or the Engineer may also, with the written consent of the Contractor, use any money retained, d to become due under the contract, for the purpose of paying for both labor and material for the work, for w claims have been filed in the office of the Engineer.

(56) Last Payment to Terminate Liability of the City.—The acceptance by the Contractor of the payment made as aforesaid shall operate as and be a release to the City and every agent thereof, from all c and liabilities to the Contractor for anything done or furnished for or relating to the work, or for any neglect of the City or of any person relating to or affecting this work, except the claim against the City fo remainder, if any there be, of the amount kept and retained as provided in these specifications.

SPECIAL PROVISIONS

GENERAL DESCRIPTION OF WORK

The work to be done under this contract consists of an earthen embankment approximately 1,875 feet long, with a top width 15 feet, inside slope 1 on 3, outside slope 1 on 2½, with a concrete reinforced core wall in the body of the dam resting on a cut-off wall extending below the ground surface to a firm foundation with a thickness varying from 4 foot minimum to maximum of 8 feet, 2 inches; the inside slope of earth embankment to be covered with hand paving, while the top and outside slope to be covered with suitable top soil; a gravity concrete spillway section 300 feet long, two gravity concrete abutment walls extending upstream from the spillway and downstream along the spillway channel to the highway bridge, and below the highway bridge for a distance of approximately 65 feet; a concrete arch highway bridge of 120 feet clear span and the connecting highways at either end of the bridge; a concrete intake structure, gate house, reservoir drain including gate chamber; sluice gates, outlet conduits, Venturi meter and pit, cast iron piping, and gate valves, excavation, embankment, and paving for spillway channel; and various appurtenances to complete the work as shown on the plans and described in these specifications and as may be directed by the Engineer.

All structures are located on land owned or to be acquired by the City which will permit the Contractor to have access to the work from the adjacent public highway. All clearing, grading and road surfacing necessary for the transportation of materials and supplies will be at the contractor's expense.

STREAM CONTROL

Item No. 1

(1) **Work to be Done.**—During all phases of the construction, the Contractor shall control stream flow so that the least possible interruption to the progress of the work and no damage to the work shall occur. For this purpose the Contractor shall build coffer-dams, channels, conduits, canals, embankments and other structures and shall plan the stages of the work so that no damage or interruption to the work shall occur. He shall provide pumps, pipes, timber and all other equipment, materials, tools and labor necessary.

(2) **Drainage Area and Flood Flows.**—Hannacrois Creek at the dam site has a water shed of 32.55 square miles. The area is hilly and flood flows occur suddenly with, at times, considerable volume. Information as to the daily flow of the stream during 1927 and the calculated flows for other years may be obtained at the office of the Engineer.

(3) **Approval of Plans.**—The Contractor shall obtain approval from the Engineer of his plans for constructing the dam, with regard to protection from flood flows. It will be necessary to provide one or more openings through suitable parts of the dam so that no pressure be exerted against the core wall and that no erosion of the earth fill shall occur.

(4) **Suggested Plan for Stream Control.**—It is suggested that the Contractor proceed with the construction of the dam on both sides of the existing stream channel and practically complete this work. He will also complete the construction of the reservoir drain before attempting to fill in the dam across the existing stream bed. After the completion of the two ends of the dam and the reservoir drain and during a period when the minimum flow of the stream may be expected, he can proceed to build the earthen embankment at its upstream edge, carrying this rapidly to an elevation of 572 feet. Sufficient and adequate equipment must be provided in advance to prosecute and complete the final closure up to elevation specified within a period of fifteen days. If necessary, in order to complete this work in the time specified, the Contractor shall work day and night and holidays and Sundays without extra compensation. This will divert all the flow of the stream through the reservoir drain. He shall then continue the construction of the earth embankment at the upstream edge to an elevation of 580 feet and at the same time the cut-off trench and the core wall across the stream bed can be pushed to completion, after which the embankments on both sides of the corewall shall be brought to their full heights as rapidly as possible.

(5) Reservoir Drain.—As the full waterway of the drain is required for stream control, the d drain well shall first be constructed without placing the 42-inch sluice gate or concrete cross wall. A the drain is completed and before the closure sections of core wall and embankment are started, t tractor shall build in the drain well a substantial wooden bulkhead, which will serve as a roof for t where it passes through the well. This bulkhead shall be made water tight and shall be sufficiently to the side walls of the well to withstand an upward pressure of 25 feet of water or a downward s 15 feet of water.

After the main embankments and corewall in the closure section have been carried up to fin or elevation 625, the temporary wooden bulkhead may then be removed and the Contractor can erect th sluice gate in position and place the concrete crosswall around the sluice gate and in the constructio as indicated on the plans.

(6) Ravena Water Supply.—The village of Ravena takes its water supply from Hanna approximately six miles below the new Alcove Dam. During periods of low stream flow after pr weather, the amount of water flowing in the stream is barely sufficient to supply the water sup Ravena. Therefore, the Contractor shall arrange his work so as not to interfere with the flow o at times when the water may be needed for water supply purposes by Ravena. And, because Creek is used as a source of water supply for domestic and other purposes by several thousand Contractor is required to take every precaution to see that the specifications regarding sanitary are carefully and fully observed both in regard to his own operations and the actions of his emplo other persons who may visit the site of the work on any business connected with the carrying out of so that at all times water released into said Hannacrois Creek shall be pure, potable and free fro

(7) Payment.—Payment to the Contractor for stream control works shall be at the lump bid and shall include all costs expended in the control of stream flow and all damages and delays oc flood flow. Embankment, concrete and other work and materials shown on the plans as p of t structures and necessary in the construction of the work but used for stream control, will pai the respective items.

CLEARING AND GRUBBING

Item No. 2

(1) Work to Be Done.—The Contractor shall remove all brush, fences, saplings, trees, stum perishable materials, and all loose boulders and stones within the area and extending 50 feet beyo of the dam embankment, and spillway section of the dam. He shall also clear in a similar man occupied by the spillway channel highway and highway bridge and for other structures extending limits described. The removal of houses, barns, sheds or other buildings or structures will not under this item, but will be paid for as part of the last lump sum item, " Cleaning Up." The Con not damage trees within this area which are ordered left in place.

(2) Saplings and Brush.—Contractor shall cut down and burn all saplings, brush and countered. The roots shall be cut below the surface of subgrade of the dam sections.

(3) Trees and Stumps.—The Contractor shall cut down all trees and remove same from specified. All timber will become the property of the Contractor. He shall excavate around shall cut roots so that whole stump may be removed. All stump holes shall be refilled with suitab which shall be well consolidated by tamping in layers or by puddling or by both. Especial exercised in tamping those holes from which stumps have been removed by blasting. No paymea under this item will be made for such filling and consolidating.

(4) Payment.—Payment to the Contractor for clearing and grubbing shall be at the lu bid and shall include and cover the removal and destruction of all brush, trees, stumps and othe materials within the area indicated and all necessary refilling, together with the furnishing of all materials and equipment and the doing of all work necessary and proper to complete this item as as specified.

EXCAVATION

Items Nos. 3 to 10

(1) Work to Be Done.—Under Items 3 to 10 the Contractor shall strip the site within the outlines of the dam down to suitable material, and shall make such excavation as directed for the dam, cut-off trench, spillway, spillway channel, intake structure, gatehouse, reservoir drain, outlet conduits, highways, bridge abutments, spillway channel and all purposes incidental to the work for which the specifications do not otherwise provide.

In Item 3 shall be included the stripping of the site under the dam embankment.

In Item 4 shall be included general earth excavation for spillway section, intake structure, gate house, reservoir drain, spillway waste channel and abutment walls on either side of waste channel, bridge abutments and highway and all other required excavation which may not be covered in the succeeding items.

In Item 5 shall be included earth excavation in cut-off wall, outlet conduits, meter pit and other trenches, except for the reservoir drain, from ground surface to 10 feet or less in depth.

In Item 6 shall be included the earth excavation for that part of the trenches in depth between 10 and 15 feet below the ground surface.

In Item 7 shall be included excavation for that part of the trenches in depth between 15 and 20 feet below ground surface.

In Item 8 shall be included excavation for that part of the trenches in depth greater than 20 feet below ground surface.

In Item 9 shall be included rock excavation necessary to be done for the spillway section of the dam, spillway channel and side walls, bridge abutments, intake structure and gate house and other parts of the work except the excavation included under Item No. 10.

In Item 10 shall be included rock excavation in cut-off trenches, reservoir drain, outlet conduits, cut-off trench under the spillway and for rock excavated according to orders by wedging or barring or other approved methods where blasting is not permitted, by channeling or other accepted methods followed by the use of light charges of explosives where permitted.

(2) Classification of Rock and Earth.—"Solid rock" wherever used as a name of excavated material shall mean the hard, live, durable, solid, ledge rock removed or to be removed most economically by means of blasting, channeling, wedging or barring; also boulders or solid masonry of one-half cubic yard or larger volume removed or to be removed from the excavation.

"Loose rock" shall mean hard and shaly rock of a naturally shattered or seamy character as evidenced by its condition either in place or after having been removed and which after having been loosened by pick, bar or blast is found in pieces of volume not greater than 2 cubic feet.

"Earth" shall mean all gravel, clay, silt, sand, loam or other earthy matter, stones, boulders or masonry of volume not greater than ½ cubic yard, and all other material not properly classified under "solid" or "loose" rock.

(In this contract "loose" rock will be classified as "solid" rock.)

(3) Stripping the Site.—After removal of brush, trees and stumps the Contractor shall loosen the overlying soil and shall remove same to a depth sufficient to fully uncover material suitable for bonding with and supporting earth embankments and other structures. In stripping the surface the Contractor shall separate satisfactory top soil where found and shall store the same in piles for use upon the top and sides of the finished embankments. All other materials stripped from site shall be wasted. On finishing, the uncovered surface shall be picked, harrowed in longitudinal furrows or stepped so that complete bond can be made with embankment. All material loosened shall be removed.

(4) Earth Excavation.—The Contractor shall make all earth excavation to neat dimensions a solid foundations as directed by the Engineer. Where masonry is placed against excavated surfaces, trimming may be ordered to be done just before masonry is placed so as to obtain the most satisfactory dition of such surfaces.

The Contractor shall protect excavations by bracing and otherwise for safety and shall conform respects to the requirements of the Engineer. All excavation outside the lines and grades done without mission of the Engineer shall be refilled with suitable materials and well consolidated, at the expense o Contractor.

(5) Rock Excavation.—Rock shall be excavated for the masonry portions of the dam and all concrete structures to a sufficient depth to secure a foundation on sound, ledge rock, free from seams or objectionable defects. It is the intention to build the masonry against the surfaces of these rock excava

To preserve the surfaces in the soundest possible condition and to obtain over the whole founda surface free from open seams or cracks, unusual precautions will be required in excavating. The cut-off will extend under the whole length of the masonry dam section. Rock for the foundations may be re by blasting to the extent directed, with explosives of such power and in such quantities and positions neither crack nor damage the rock upon or against which the masonry is to be built. Wherever in the o of the Engineer further blasting is liable to injure the rock upon or against which masonry shall be built, b shall be discontinued and the excavation of the rock prosecuted by wedging and barring or other app methods.

Whenever directed, the method of excavating shall be changed from blasting to wedging and barring from wedging and barring to blasting. In order not to disturb the rock along the sides of the cut-off tr and to maintain these sides as nearly vertical as practicable, channeling or other acceptable met s in nection with light charges of explosives to the extent directed shall be used.

Rock excavation for the spillway channels shall be made in a manner similar to that for the dam fou tion. Particular care shall be taken to make the excavation conform closely to the prescribed lines, which be parallel to the finished surfaces, and to leave no deep holes or depressions. To this end such rock as requ shall be removed by barring and wedging or other approved methods and shall be paid for under the appro item.

Rock excavation shall in general be made to the lines given by the Engineer and shall be carried deep enough to obtain a foundation sufficiently strong to bear the loads imposed; but if directed, the excava shall be carried to greater depths.

(6) Preparation of Rock Foundations.—Whenever directed during the progress of excavation, loosened materials shall be removed from designated areas and the surface of the rock shall be cleaned, u steam and water under pressure if necessary. The water shall subsequently be removed from depressio that the whole area designated can be minutely inspected to determine whether seams or other defects e

The surfaces of rock foundations shall be left sufficiently rough to bond well with the masonry an required shall be cut to rough benches or steps. Before any masonry is built on or against the rock, the la shall be scrupulously freed from all dirt, gravel, boulders, scale, loose fragments, films of dust and other objecti able substances. Streams of water under sufficient pressure, stiff brushes and other effective means shal used to accomplish this cleaning.

Wherever directed, the rock surfaces forming the foundation of masonry sections shall receive spe treatment. Seams and cavities shall be traced as far as directed by drilling holes or by other approved mea All such seams and cavities shall then be carefully cleaned out and, if required, filled with concrete, mortar grout. Payment will be made to the Contractor for such treatment when required by the Engine

(7) Pumping.—The Contractor shall keep the excavations free from water at all times during construction, shall build all dams or other works necessary for this purpose and shall provide and keep in operation suitable pumps to maintain the excavation dry and free from water at all times. He shall dispose of the water removed from excavations in such a manner as will not cause injury or damage to the public or to private property or to work completed or in progress.

(8) Control of Springs.—Springs encountered in the foundations of the dam, on the sites of embankments and elsewhere shall be controlled by approved methods. Masonry, pipes, grout, broken stone, cement or other materials used or excavations made for such control shall be paid for when ordered by the Engineer and approved by the Board.

(9) Sheeting and Shoring.—The Contractor shall, at his own cost and expense, support the sides and ends of excavations wherever necessary or ordered with suitable approved sheeting, sheet piling, braces, shores, stringers and waling strips. Such sheeting, etc., shall be withdrawn as the excavations are filled, except where and to such an extent as the Engineer orders the same to be left in place, in which case payment will be made for same, or where he permits the Contractor, at the Contractor's request and cost, to leave the same in place.

(10) Backfilling.—Trenches and other excavated areas not refilled with masonry structures or rolled embankments shall be refilled with suitable materials obtained from excavations or otherwise. Such refill shall be placed in layers in such a manner as not to disturb the structure and shall be consolidated by tamping or puddling to the original surfaces of the ground so that no subsequent settlement takes place.

(11) Removal of Surplus Materials—The Contractor shall use the excavated materials when suitable and as far as needed for refilling trenches and excavations, for building embankments and roads and for other purposes. All other material removed from the site of the work shall be transported to areas satisfactory to the Engineer and deposited in layers or otherwise so that such areas have a neat appearance. Localities for depositing such wasted materials shall be not farther from the site of the work than is necessary for the safety, permanence and appearance of the structures.

(12) Payment.—The quantities to be paid for under items of excavation shall be the actual number of cubic yards of material measured as before excavation and within the dimensions given by the Engineer and shall extend from the natural ground surface to the subgrades as established. Dimensions of excavations will extend to the outside face of sheeting where same is used. The prices paid for excavation shall include and cover the doing of all excavation, pumping, bracing, cleaning of finished surfaces, all backfilling and removal of surplus material, together with the furnishing of all labor, tools and equipment and the doing of all work necessary and proper to complete these items as specified and as required.

GROUT

Item No. 11

(1) Work to be Done.—The Contractor shall force grout into seams and fissures in the ledge rock wherever directed by the Engineer.

(2) Materials.—Grout shall be mixed of Portland Cement and water and either with or without sand. Cement and sand shall be free from lumps and shall be screened if required. Sand used for grout shall be of such fineness that 45 per cent of the sand shall pass a screen having wires 0.013 inches in diameter and having 1,600 openings per square inch.

(3) Methods of Mixing and Placing—The apparatus for mixing and placing the grout shall be of a type having for its essential part an air tight chamber in which the grout is kept properly stirred and from which it is forced into the work by air or water pressure. The amount of water added to the cement shall be just sufficient to permit of the grout flowing freely. Grout shall be forced under the pressures directed up to

90 pounds per square inch through hose or pipe not less than two inches in diameter, which shall be con to the pipes furnished and set under other items. Grouting shall be carried out in such manner and such detailed procedure and pressures as the Engineer shall from time to time prescribe.

(4) Payment.—Quantity of grout to be paid for shall be the number of cubic yards placed in the in accordance with the provisions of the preceding sections under this item, and as directed, measured liquid state before placing. The Contractor shall provide suitable and convenient means for measuring. price stipulated under this item shall include all labor, apparatus and material incidental to the furnishi placing of grout as specified.

DRILLING SMALL HOLES IN ROCK OR MASONRY

Item No. 12

(1) Work to be Done.—The Contractor shall drill holes in rock or masonry for grouting, for insp of grouting, and for other purposes wherever ordered.

(2) Size of Holes.—The size of the holes shall be not greater than 2½ inches in diameter. Where holes are drilled for grouting, the Contractor shall furnish the necessary piping to go in these holes and co with the pressure piping from the grouting apparatus.

(3) Payment.—The quantities to be paid for under these items shall be the actual number of l feet drilled in accordance with orders, no hole, however, being reckoned at less than one foot in depth. price paid for drilling holes in rock or masonry shall include all expenses incidental to the drilling the h required, and furnishing the necessary piping for grouting, together with the furnishing of all labor, too equipment and the doing of all work necessary and proper to complete this item as specified and requi

CONSOLIDATED EMBANKMENT.

Item No. 13.

(1) Work to be Done.—The Contractor shall procure materials and shall make consolidated er ments in dam and dike sections, for filling in depressions in reservoir, and for building the embankm a roadway and for work of similar nature as directed by the Engineer. The backfilling behind the walls spillway channel will be considered disposal of excavation and will not be compacted embankment.

(2) Preparation of Base.—Embankments shall in general start from a firm base from which to and other perishable matter shall have been removed to the extent directed. Loose stones and boulders be removed from embankment sites. If required, the base under any rolled embankment shall be pick make a bond with the embankment material and any sloping ground shall be stepped where and as directe

(3) Materials for Consolidated Embankment.—The embankments shall be made of acceptable mate from the excavations or from borrow pits. Various qualities of material will be required in various portio the embankments. In general the material required shall be a mixture of sand, gravel, clay and earthy mixed in such proportion that the embankments may be well and tightly consolidated and that the m practically impervious to the passage of water. Materials of the finer texture shall be reserved for placi the upstream side of the corewalls, while those materials having the qualities of compacting and of hind the passage of water but have coarser sized grains shall be placed on the downstream side. It is expected t suitable material will be found in the vicinity of the structures to be built under this contract.

The material for embankments shall be sensibly free from top soil, roots, bits of wood or other perish matter and all stones which are in least dimension greater than the maximum thickness of layers after rol All stones nesting in pockets shall be removed from the material.

(4) Frozen Materials.—Under no circumstances shall materials which are frozen be used in the c struction of embankments and no material shall be placed on portions of these embankments which are fro or which have been loosened by freezing. The construction of embankments resumed after the end of a wi season or after any long protracted period of inactivity shall not be started again until the existing surfa receiving the embankment shall be treated by picking, furrowing, rolling or other means of prepa on.

(5) **Allowance for Shrinkage.**—The embankment shall be built to a height above the finished grade which will, in the opinion of the Engineer, allow for the shrinkage of the material. If such ordered overfills result in an excess section of any embankment, the Contractor will be allowed payment for such excess. If any of the refills or embankments settle so as to be below the required levels for the proposed finished surface at any place before the final acceptance of the work to be done under this contract, the Contractor shall at his own cost supply approved materials and build up the low places as directed.

(6) **Making Embankments.**—Materials for embankments shall be placed in horizontal layers or with slight slopes away from the axis as required. In placing the layers they shall be leveled by machine or by hand to approximately uniform thickness. Layers shall when compacted be six inches or less in thickness. Each layer shall be rolled to thoroughly consolidate it and to the full area of the layer to the satisfaction of the Engineer. Just before placing the next layer, the last rolled layer shall be wetted with sufficient water through spray nozzles to moisten the last layer so that material from the new layer will be forced into it and so that moisture is forced upward into the new layer. Material too wet to properly consolidate under rolling or in such a condition as to hinder or retard the rolling shall not be placed in embankments. Material in the embankment in a too wet condition or which becomes quaky and jelly-like under rolling shall be removed from the embankment. All stones thicker than the rolled layers, or stones which roll or rock under the roller, shall be removed.

Should the character of the material of which the consolidated embankment is being made, be of such nature that it does not compact under the roller, then, if directed by the Engineer, the Contractor shall build the embankment by rolling to within fifteen (15) feet of the core-wall. He shall then carry up the embankment by rolling at this distance from the core-wall to such height as the Engineer may direct, and, shall then pump water into the space between the core-wall and the embankment, to the depth directed by the Engineer. Then the fifteen (15) foot strip of embankment next to the core-wall shall be made by depositing the material in this water in such manner that all of it shall be thoroughly saturated or puddled.

(7) **Extent of Consolidating.**—To determine the proper degree of rolling and thickness of layers in the embankments so as to obtain the desired consolidation, exploratory trenches shall be excavated by the Contractor at the direction of the Engineer from time to time to note whether the embankments are being properly compacted.

Compacting in general shall be done by power rollers but embankments around pipes, behind walls or other portions which cannot be reached by rollers or in the vicinity of walls which may be harmed or moved by heavy rollers, the compacting shall be done by means of extra heavy tampers, energetically used, or by depositing the earth through water in such a manner that all of it shall be thoroughly saturated or by other means of compacting equivalent to that obtained by rolling.

(8) **Rollers.**—Compacting of embankments in general shall be done by power rollers or machines with grooved or banded rolls. The rear wheel or wheels of the rollers shall be of such width and diameter and shall bear such a proportion to the total weight on the roller that with a penetration of one inch there shall be caused an average pressure on the embankment of at least thirty pounds to the square inch of bearing surface, calculated to be the width of the roll multiplied by half the arc bounding a segment of the roll at the bottom of the grooves having a middle ordinate of one inch. The roller shall pass over every part of each layer that can be traversed as many times as may be necessary to thoroughly compact the layer.

(9) **Trimming of Embankment.**—After all materials have been placed in embankments the Contractor shall trim and cut the surfaces of embankments to the neat dimensions and grades as given by the Engineer.

CONCRETE MASONRY.

Items Nos. 18 to 21.

(1) Work to be Done.—The Contractor shall furnish all materials and shall do all work necessary f placing concrete in cut-off and core walls, in gravity masonry section of the dam, in abutment walls on bo sides of the spillway section and along the spillway channel, in the channel, in the channel paving, inta structure and gate house, bridge and abutments, reservoir drain and gate well, outlet conduits, meter pit foundations, piers, columns, floor slabs, walkways and at all other places as shown or required, to comple the work.

In Item 18 shall be included concrete masonry in cut-off trenches, spillway section of the dam, th gravity abutment walls on both sides of the spillway and the spillway channel, including th bridge abutments, channel paving, intake structure and other concrete of similar nature place in large masses and requiring little form work; also all foundation concrete used to fill voids belo sub-grade. See Class C for quality and expected strength.

In Item 19 shall be included all concrete masonry in core walls, gate house, weir in spillway channel well for the reservoir drain and other structures of moderately thick sections requiring formin on both sides. See Class C for quality and expected strength.

In Item 20 shall be included concrete masonry in the arch rib, spandrel walls, and sidewalk of the highway bridge, the reservoir drain, outlet conduits, meter pit and other structures which require a considerable amount of forming for unit volume and which may carry heavy pro- portions of reinforcing bars. Metal curb armor and expansion joint material shall be include in this item at no extra expense. See Class B for quality and expected strength.

In Item 21 shall be included concrete masonry in the hand railing of the bridge, and such oth concrete of similar character which may be necessary to complete the work in an acceptable manner. See Class A for Quality and expected strength.

(2) Cement.—All cement used on the work shall be true Portland Cement of a well known brand whic has been in successful use on large engineering works in the United States and of which recent reliable and satisfactory tests have been made. All cement shall be new and shall pass the standard specifications and tests (See C-9-21) of the American Society for Testing Materials and will be rejected if it does not meet these requirements

(3) Inspection and Tests.—All cement used under this contract shall be subject to inspection and such rigorous tests as may be ordered by the Engineer, and the Contractor shall provide every facility to assist in the inspection and sampling of the cement for testing. The Engineer shall be notified in writing when each consignment of cement is ready for inspection and sampling, and a period of at least twelve days after the delivery of the notification shall be allowed for the necessary tests. The results of the tests made under the direction of the Engineer will be accepted as a final criterion for the acceptance or rejection of any particular shipment of cement.

Every bag or barrel of cement shall be marked by the Inspector; or other precautions may be taken so as to identify the lot from which it is taken and to insure that no cement is delivered for use in the work which has not passed the tests of the Engineer. Any packages of cement which cannot be identified may be rejected.

Before any cement will be allowed to be used, the brand and the name of the maker must be submitted to and receive the approval of the Engineer and no cement will be permitted to be used which is not in all respects satisfactory to him.

(4) Storing.—In order to allow ample time for inspection and testing, the cement shall be stored in a suitable weather-tight building having a floor properly blocked or raised above the ground. The building shall be large enough to hold a sufficient supply of cement to prevent delays or interruptions to the work due to testing. The cement shall be stacked so as to permit easy access for inspection, sampling and identification of each shipment. The Engineer shall be permitted to enter at any time any place where cement is stored.

The Contractor or any of his employees shall not destroy, alter or otherwise disturb any cards, marks or numbers the Engineer may place upon the storage bins or packages of cement as an aid to their future identification.

(5) Packages.—Cement shall be delivered in cooperage or in strong cloth bags with the brand and name of the manufacturer plainly marked thereon. Before delivering cement in bulk the Contractor must secure the written approval of the Engineer for the handling of cement in this manner. A bag of cement shall contain 94 pounds of cement net. Packages received in a broken or damaged condition shall be received only as fractional packages. Each barrel of cement shall contain four bags of the above net weight. A bag shall be considered as measuring 0.95 cubic feet and a barrel as 3.80 cubic feet of volume; thus 1 cubic foot will be considered to weigh 100 pounds.

(6) Fine Aggregate.—The fine aggregates used for concrete and for mortar in all parts of the work shall consist of sand, stone screenings or other inert materials with similar characteristics or a combination thereof having clean, hard, strong, durable, uncoated grains with no grains larger than one-quarter inch and with a grading in size of grains, particularly if crushed stone screenings are used, as will produce a smoothly working concrete without tendency for the water to drain away. Such parts of the very fine material resulting from the crushing of rock as may be directed shall be removed by screening or washing or both. Fine aggregates shall have not more than 5 per cent by weight of vegetable matter nor of loam or clay or dirt, organic matter, soft flaky particles, dust or other harmful materials. Fine aggregate for mortar or grout shall be especially screened so as to contain no large particles.

Standard methods for tests of fine aggregates as adopted by the American Society for Testing Materials shall be used: For sieve analysis see C–41–24; for decantation test, see D–136–22T; for organic impurities test, see C–40–22.

Fine aggregate shall make a reasonably close comparison with Standard Ottawa Sand when tested in briquettes using equal amounts of the same cement and will be rejected if strength tests are not reasonably close.

(7) Coarse Aggregates.—The coarse aggregates used for concrete in all parts of the work shall be composed of gravel or broken stone. If gravel is used it shall be free from sticks or other foreign matter and shall contain no clay or other materials adhering to the pebbles in such quantity that they cannot be lightly brushed off with the hand or removed by dipping in water. If broken stone is used it shall consist of pieces of hard, insoluble and durable rock subject to the approval of the Engineer. If the coarse aggregate is dirty, the dust, dirt, perishable matter and other improper substances shall be removed by washing or screening or both if necessary.

Coarse aggregates shall be graded in various sizes between the limits of dimensions as given below. Broken stone shall be crushed in such manner that less than five per cent of the pieces shall have their longest dimension greater than two and one-half times the average of the other two dimensions.

The coarse aggregate for use in concrete shall be graded in size as follows:

For gravity dam sections and walls 2 feet thick or over, shall pass a 2-inch ring and be held on a ¼-inch ring.

For reinforced walls from 12 inches to 24 inches thick, and unreinforced walls from 9 to 24 inches thick; shall pass a 1½-inch and be held on a ¼-inch ring.

For roadway and sidewalks slabs and reinforced concrete 5 inches to 12 inches thick, shall pass a 1-inch ring and be held on a ¼-inch ring.

For concrete encasing structural steel, in hand railings and in reinforced sections less than 5 inches thick, shall pass ¾-inch ring and be held on a ¼-inch ring.

Sieve analysis of coarse aggregate shall be made in accordance with the specifications of the American Society for Testing Materials (See C-41-24).

(8) Cyclopean Aggregate.—The stone for cyclopean aggregate shall be sound, hard, durable, insoluble, of irregular shape and free from seams or other imperfections and shall not have thin feather edges or long, thin projections. Stones must be clean and, if required, shall be cleaned with water under pressure from a nozzle, by the use of brushes, or as otherwise directed and shall be satisfactorily clean when placed in the masonry; all stones shall be wetted before being placed in final position. Hammers or other tools shall be used, if necessary, to remove objectionable materials adhering to any stone.

(9) Storage of Aggregate.—Aggregate shall be so stored as to avoid the inclusion of foreign material. Frozen aggregate or aggregate containing lumps of frozen material shall be thawed before using.

(10) Water Used in Mixing Concrete.—The water for mixing concrete shall be clean and free from injurious amounts of oil, acid, alkali or organic matter or other harmful substances. The water should preferably be of such quality as to be suitable for potable uses. The quantity of water used in making concrete shall be the minimum amount in excess of that required for maximum strength of the concrete which will produce a satisfactory, workable mixture. The total quantity of water to be used per bag of cement will be determined by the Engineer but in general will range from 6.5 to 7 gallons including water already in the coarse and fine aggregates. The quantity of water in the coarse and fine aggregates will be determined by the Engineer. The quantity of water to be added in the mixer to provide a concrete of requisite strength and workability will also be determined by the Engineer. The Contractor shall provide a suitable, convenient and accurate measuring device, approved by the Engineer, by which the quantity of water specified can be added to each batch of concrete in the mixer. The operation of this water-measuring device shall at all times be under the direct supervision and control of the Engineer and no other pipes, hose, buckets, pails or other methods or devices shall be used or provided for the purpose of adding water to the concrete materials either in or outside the mixer.

The supply of water to be used for mixing concrete shall be stored in a suitable covered storage tank approved by the Engineer having a single inlet pipe controlled by a valve fitted with a lock and the refilling of the storage supply tank shall be controlled by the Engineer. The valve shall be kept locked in a closed position at all times except when the storage tank is being refilled under the supervision of the Engineer.

The storage tank shall have a suitable gauge or scale calibrated to show at all times the quantity of water in gallons remaining in the storage tank.

(11) Proportions.—Materials for concrete shall be measured by volume. The volume of fine aggregate shall be measured under an inundated condition.

Concrete shall be mixed to produce the strength and to the proportions not leaner than are shown in the following table:

Strength of Concrete.

Class	Type of Work	Not leaner than a proportion of:			Expected Strength in lbs. per sq. in. 28 Day Test
		Cement	Fine aggregate	Coarse aggregate	
A	Thin, reinforced sections.....	1	1½	3	2800 to 3000
B	Moderately thin sections, slabs, etc.	1	2	4	2400 to 2600
C	Moderately thick sections and walls.	1	2½	5	1700 to 1900
D	Thick sections, concrete in heavy masses with little or no forming..	1	3	6	1200 to 1500

The Contractor shall use fine and coarse aggregate procurable within the Albany district and may vary the proportions upon approval of the Engineer but in no case shall the mixtures be leaner than those specified. The Engineer shall have the right to make any changes in the proportions or materials that may be necessary or desirable. When such changes entail the use of added materials, the Contractor shall be compensated therefor upon submitting sworn statements and receipted bills for such added materials.

The Contractor may place cyclopean aggregate in sections of concrete masonry over three (3) feet in thickness.

In the concrete paving of the spillway channel, boulders shall be set in the concrete at a spacing of approximately six (6) feet centers. These boulders shall be of hard durable rock of the same quality as specified for stone for cyclopean masonry and shall be cleaned and prepared in the same manner before the concrete is poured around them. They shall have a least dimension of at least twelve (12) inches and shall project above the 12-inch concrete paving for a distance not less than six (6) inches and not over approximately twelve (12) inches. No extra payment will be made for these boulders, but the Contractor will be paid for the twelve (12) inches of concrete paving over the entire area where boulders are placed.

(12) Tests of Concrete.—Concrete furnished on the work shall be tested for strength and other qualities whenever the Engineer so directs. Routine tests will be made by the Engineer at no cost to the Contractor except the furnishing of the concrete materials for such tests. Tests shall follow the standard specifications of the American Society for Testing Materials and results of tests will be made available to the Contractor.

(13) Admixture.—To provide for greater workability and as a means to prevent the coarse aggregate separating from the cement and fine aggregates during transportation and depositing, the Contractor shall mix with the materials a diatomaceous silica as prepared by the Celite Products Co. or an equal approved material. The proportions of celite to cement shall be not less than 3 pounds per bag.

(14) Mixing.—The mixing of concrete, unless otherwise authorized by the Engineer, shall be done in a batch mixer of approved type which will insure a distribution of the materials throughout the mass so that the mix is uniform in color and homogeneous. The mixer shall be equipped with a suitable charging hopper, water storage, and a water measuring device controlled from a case which can be kept locked and so constructed that the water is discharged only while the mixer is being charged. It shall also be equipped with an attachment for automatically locking the discharge lever until the batch has been mixed the required time after all materials are in the mixer.

The entire contents of the drum shall be discharged before recharging. The mixer shall be cleaned at frequent intervals while in use. The volume of the mixed material per batch shall not exceed the manufacturer's rated capacity of the mixture. Measurement of concrete ingredients shall be made accurately. Meas-

urement by wheelbarrow volumes will not be permitted. The mixing of each batch shall continue not less than one minute after all the materials are in the mixer, during which time the mixer shall rotate at a peripheral speed of about 200 feet per minute.

When hand mixing is authorized by the Engineer it shall be done on a water-tight platform. The cement and fine aggregates shall be first mixed dry until the whole is of a uniform color. The water and coarse aggregates shall then be added and the entire mass turned at least three times or until a homogeneous mixture of the required consistency is obtained.

The retempering of concrete or mortar which has partially hardened, that is, re-mixing with or without additional cement, aggregate or water, will not be permitted.

(15) Depositing.—Before depositing concrete, all debris shall be removed from the space to be occupied by the concrete and forms shall be thoroughly wetted (except in freezing weather) or oiled.

Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which shall prevent the separation or loss of the ingredients. It shall be deposited in the forms as nearly as practicable in its final position to avoid rehandling. It shall be so deposited as to maintain until the completion of the unit a plastic surface approximately horizontal. Forms for walls or other thin sections of considerable height shall be provided with openings or other devices that will permit the concrete to be placed in a manner that will avoid accumulations of hardened concrete on the forms or metal reinforcement. Under no circumstances shall concrete that has partially hardened be deposited in the work.

When concrete is conveyed by chute, the plant shall be of such size and design as to insure the practically continuous flow in the chute. The angle of the chute with the horizontal shall be such as to allow the concrete to flow without separation of the ingredients. The delivery end of the chute shall discharge into a hopper and in no case shall concrete be discharged from a chute directly into place of final deposit. The chute shall be thoroughly flushed with water before and after each run; the water used for this purpose shall be discharged outside the forms.

Concrete during and immediately after depositing shall be thoroughly compacted by means of thin spades, rammers, tampers or other suitable tools. Sufficient laborers shall be employed in ramming and spading the concrete to insure a minimum of voids or honeycomb spots in the work. For thin walls or inaccessible portions of the forms, where rodding or forking is impracticable, the concrete shall be assisted into place by tapping or hammering the forms opposite the freshly deposited concrete. The concrete shall be thoroughly worked around the reinforcement and around embedded castings and fixtures and into corners of the forms.

Exposed surfaces of concrete shall be protected from premature drying for a period of at least seven days after being deposited.

Concrete shall be deposited continously and as rapidly as possible until the unit of operation, approved by the Engineer, is completed.

The stones for cyclopean concrete shall be carefully placed and bedded in the mortar. There shall be at least 6 inches of mortar between stones and no stone shall be less than 6 inches from any concrete moulded face. Stones shall not be dropped into the concrete from bucket, skip or other carrier. Stones shall be selected and placed so they interlock vertically and horizontally and care shall be taken to prevent the formation of beds or planes of stone.

The Engineer shall have full charge and authority over the manner of transporting and depositing concrete and may order the discontinuing of the mixing of concrete or refuse to accept concrete when in his opinion it is advisable for the best interests of the City to do so.

(16) Forms.—Forms shall conform to the shape, lines and dimensions of the concrete as called for on the plans. Lumber used in forms for exposed surfaces shall be dressed to a uniform thickness, and shall be free from loose knots or other defects. For unexposed surfaces and rough work, undressed lumber may

be used. Lumber once used in forms shall have nails withdrawn, and surfaces to be in contact with concrete thoroughly cleaned, before being used again.

Forms shall be substantial and sufficiently tight to prevent leakage of mortar; they shall be properly braced or tied together so as to maintain position and shape. If adequate foundation for shores cannot be secured, trussed supports shall be provided.

The centering for the arch rib of the highway bridge shall be so designed and built that there will be no movement of the centers during or after the pouring of the concrete. All main connections of the centering shall be fastened with bolts of the proper size and spikes shall not be relied upon. For the foundations of the centering, if it is necessary in order to secure an even bearing the Contractor shall place enough concrete to obtain this result. If in the opinion of the Engineer, the centering is not of sufficient strength or rigidity, the Contractor shall strengthen the centering so directed. But the sole responsibility for the strength and rigidity of the centering shall fall upon the Contractor.

Bolts and rods shall preferably be used for internal ties; and be left in the concrete; they shall be so arranged that when the forms are removed no metal shall be within one inch of any surface. Wire ties will be permitted only on light and unimportant work; they shall not be used through surfaces where discoloration would be objectionable. Shores supporting successive stories shall be placed directly over those below, or so designed that the load will be transmitted directly to them. Forms shall be set to line and grade and so constructed and fastened as to produce true lines. Special care shall be used to prevent bulging.

Unless otherwise specified, suitable moldings or bevels shall be placed in the angles of forms to round or bevel the edges of the concrete.

The inside of forms shall be coated with non-staining mineral oil or other approved material or thoroughly wetted (except in freezing weather). Where oil is used, it shall be applied before the reinforcement is placed.

Temporary openings shall be provided at the base of column and wall forms, and at other points where necessary to facilitate cleaning and inspection immediately before depositing concrete.

Forms shall not be disturbed until the concrete has adequately hardened. Shoring shall not be removed until the member has acquired sufficient strength to safely support its weight and the load upon it. Members subject to additional loads during construction shall be adequately shored to support both the member and construction loads in such a manner as will protect the member from damage by the loads; this shoring shall not be removed until the member has acquired sufficient strength to safely support its weight and the load upon it.

(17) Clearing of Form Spaces.—The space inside the forms shall be thoroughly cleaned of shavings, sawdust, loose lumps of hardened concrete or other material immediately before the placing of the concrete. The forms shall be constructed so as to permit ready inspection of the spaces to be filled with concrete. Temporary openings shall be provided at the bottom of the forms for washing concrete and for sweeping out and removing waste. All blocks of wood or other material used as spacers shall be removed from the forms as soon as the concrete reaches the level of the spacer.

(18) Defective Work.—Should any voids or other defects be discovered in any part of the work when the forms are taken down or otherwise, the defective work shall be removed, the hole cleaned and the space refilled with suitable material in a proper manner at the expense of the Contractor. Mortar used for patching shall be made of cement and sand mixed, to give the same color and strength as surrounding concrete. All patches shall be rubbed smooth and even. If required, anchor bolts shall be set in drilled holes and wire mesh or other reinforcement shall be used for securing the patch. No patch shall be made until the recesses to receive them have been inspected and passed upon by the Engineer.

(19) **Freezing and Inclement Weather.**—Special precautions shall be taken in freezing or inclement weather to protect all concrete against injury or damage. No concrete shall be deposited when the temperature of the air is below 32 degrees Fahrenheit or at night except as permitted in writing by the Engineer. No concrete shall be deposited on frozen ground. If concrete is deposited when the temperature of the air is below 32 degrees, the Contractor shall at his own cost and expense take such precautions as the Engineer may direct by building covers, or by heating any or all of the ingredients or otherwise to prevent damage or injury to the concrete.

(20) **Joints in Concrete.**—Where new work is jointed to old, a bed of mortar 1 inch thick, composed of 1 part cement to 2 parts sand or a slush of neat cement grout shall be used to secure a bond between the surfaces. Before placing this mortar the surface of the work shall be thoroughly brushed and washed clean of laitance, all loose stone, and other foreign substances.

All joints in concrete shall be made in the manner and at the points shown upon the drawings. Where details of the joint are not so shown, the direction of the Engineer shall be carefully followed as to intersections and locations, as joints must not impair the strength, water-tightness nor appearance of the structures. All key-ways, grooves or dovetails shall be continuous and straight and of the dimensions shown or required. All materials in joints shall be furnished by the Contractor.

(21) **Finish on Exposed Surfaces.**—For all concrete work exposed to view, forms should be well constructed to produce plane surfaces and straight, sharp lines and true angles in the finished concrete.

The forms shall be removed before concrete has completely hardened and the surface shall be gone over to point up all voids and depressions with mortar of the same color and strength as surrounding concrete, and all wings and shoulders shall be cut off flush. After this work has been done the surface shall be wetted and rubbed with a carborundum or emery brick or by suitable wire brushes so that the surface film and all marks of forms and grains of wood are removed. Near the end of this operation the surface shall be completely washed and a thin cement grout shall be applied to completely fill the pores and small depressions. This grout shall be rubbed in and care shall be taken to remove all grout on the plane surfaces of the concrete. The surfaces shall be kept wetted until the concrete has completely hardened and set. If the concrete has been allowed to obtain too hard a set, the Contractor will be required to sandblast the surface to remove form marks or other defective scars.

The top surfaces of concrete not built against forms shall be brought accurately to grade, using drier mix to absorb all excess water. The surface shall be screeded to produce straight planes and the concrete shall be worked with wood floats to depress the coarse aggregate and to bring cement and fine aggregate to the top. Dry cement shall be dusted on the surface to take up any excess water, after which the surface shall be steel troweled to produce a dense, smooth finish. Walkway surfaces shall be produced above and in addition the surfaces shall be indented and lined with sidewalk tools or washed down with a weak solution of acid to produce the desired appearance.

Contractor shall employ concrete finishing men who have had experience in the work and who can produce the appearance on surfaces as desired.

All surfaces on being finished shall be protected from the direct rays of the sun and from too rapid drying out and from damages caused by adjacent work.

(22) **Drainage for Walls.**—In all concrete abutment or retaining walls, the Contractor shall furnish and place a drainage system at the level of the existing rock line, this system to consist of 3-inch fibre pipes extending through the wall and spaced not over 25 feet apart and broken stone or other dry wall material in trench, 2 feet by 3 feet, extending for the full length of the walls. Payment for this drainage system is to be included in the unit price bid for concrete under Item 18.

(23) **Measurement.**—Concrete will be measured within the neat dimensions shown upon the plans or within the lines and grades established by the Engineer. Where concrete is poured against excavated rock surfaces the Engineer will measure the average excess of dimensions, if any, and the Contractor will be allowed the extra volume but in no case will an allowance in excess of 6 inches at any surface be made.

(24) **Payment.**—The Contractor shall be paid for concrete masonry at the prices bid per cubic yard for the various classifications, which prices shall include the furnishing and placing of all material, the protection of the work, the making of proper finishes on exposed surfaces, together with the furnishing of all labor, tools and equipment and the doing of all work necessary and proper to complete the items as specified and as required.

CONCRETE PROTECTION.

Item No. 22.

(1) **Work to be Done.**—The Contractor shall furnish all materials and shall cover all exposed surfaces of the spillway section, all surfaces of the intake structure, gate house, and highway bridge and the exposed surfaces, top and strips 4 feet wide of the inside surfaces of abutment walls along the spillway channel and abutments of the bridge, and the top and upstream face of the core wall and other concrete surfaces as directed by the Engineer, with a surface preservative material as specified.

(2) **Material.**—Material used to protect concrete shall be composed of sufficient applications of magnesium fluo silicate solutions and gum preparation known as "Hard-wear", manufactured by the Slingluff Concrete Processing Co., 738 Eisen St., Baltimore, Md., or an approved equal material.

(3) **Workmanship.**—Surfaces to be treated shall be thoroughly washed and scrubbed to remove all dust, laitance, inert surface skins and other foreign materials. All surface scars, honeycombs and indentations shall be pointed up, after which all surfaces shall be allowed to become perfectly dry. The preservative material shall then be mopped or sprayed on and sufficient applications of the material shall be made until the concrete will not absorb further applications. The method of placing and the number of applications shall be strictly in accord with the manufacturer's directions and specifications. A foreman or superintendent shall be employed on this work who shall have had experience on similar work with the same material. Care shall be taken to maintain a uniform color throughout the extent of the work. On finishing a section of the work it shall be fully protected from rain, cold, heat and sunlight until it has reached its final condition.

(4) **Payment.**—The Contractor shall be paid for concrete protection at the price bid per square foot, which price shall include the furnishing and the placing of the material, the cleaning and preparation of surfaces and the protection of same, together with the furnishing of all labor, tools and equipment and the doing of all work necessary and proper to complete this item as specified and as required.

MEMBRANE WATER PROOFING.

Item No. 23.

(1) **Work to be Done.**—The Contractor shall furnish and place a membrane water proofing on the upper surface of the arch barrel and on the inside surface of the spandrel wall up to the point and halfway through the road surfacing material of the bridge. At either end of the barrel of the arch rib, the water-proofing shall extend across the top of the bridge abutment where it is horizontal and 6 feet down the sloping surface of this bridge abutment. At the ends of the spandrel walls, the water-proofing shall extend across the ends of the retaining walls of the channel, and then turning at right angles shall be carried 6 feet along the retaining walls to a point within one foot of the retaining walls and to a point 6 feet below the top of the arch rib. The membrane shall also be carried down the sides of the bridge abutment for a distance of 6 feet beyond the retaining walls and to a point 6 feet below the top of the arch rib.

(2) **Preparation of Concrete Surfaces.**—The concrete surfaces shall be brushed clean, all sharp depressions shall be filled, washed with cement mortar and the surfaces shall be allowed to thoroughly dry.

(3) **Placing Membrane Water-Proofing.**—After the concrete surfaces have thoroughly dried, two plies of saturated cotton fabric and two applications of water-proofing asphalt shall be laid on. Fabric shall be lapped at sides and ends and joints in rolls, and plies shall be staggered. Materials shall not be placed in

freezing or rainy weather. In placing the water-proofing membrane, the Contractor shall exercise care to prevent puncturing the asphalt or fabric or harming the adhesion to the concrete. Backfill shall be carefully done with materials sensibly free from stones.

(4) **Quality of Materials.**—Membrane water-proofing shall be Minwax cottoncord cloth and Minwax water-proofing asphalt as manufactured by the Minwax Company or of materials approved by the Engineer as equal in all respects. Water-proofing materials shall be laid in strict accordance with the manufacturer's directions and under his supervision or by a sub-contractor approved or recommended by him.

(5) **Payment.**—Water-proofing shall be measured in square yards of concrete surface covered. The prices paid for water-proofing shall include the furnishing of all materials and their application to the concrete surfaces in the manner above specified, together with the furnishing of all labor, tools, materials and equipment and the doing of all work necessary to complete this item as specified and as required.

REINFORCING STEEL.

Item No. 24.

(1) **Work to be Done.**—The Contractor shall furnish and place all steel bars that may be required for the reinforcement of the concrete of whatever size, shape and length, as shown on the drawings and as directed by the Engineer.

(2) **Quality of Steel.**—The reinforcing bars shall meet the requirements of the standard specifications for "Billet Steel Concrete Reinforcement Bars" of the American Society for Testing Materials. Bars shall be deformed, of structural or intermediate steel grade and shall be made from new billet steel (See Standard Specification A-15-14 and subsequent revisions).

All bars shall be free from rust scale or excessive rust when placed in the work. A thin coating of rust resulting from short exposure will not be considered objectionable but any bars having rust scale or black coating of rust shall be carefully cleaned. All bars shall be thoroughly cleaned of all dirt and grease before being placed in the work.

(3) **Inspection and Testing.**—The Contractor shall furnish to the Engineer satisfactory evidence that the material offered for use is of the character and grade specified, either by affidavits from the makers of the steel, copies of mill tests of the material used, or otherwise, as may be required. The Engineer reserves the right to make further tests for his own information should special conditions arise which would indicate the desirability of such tests.

(4) **Placing of Reinforcing Steel.**—All steel reinforcing shall be placed accurately in the position shown on the drawings and as directed by the Engineer and shall be so fastened and supported in position as to prevent displacement while the concrete is being deposited. Adjoining bars at splices shall overlap at least forty diameters unless otherwise specified or as shown on the drawings. All bars shall be wired together at intersections. The bars shall be bent accurately to the shape shown on the drawings or as required, the ends of bars shall be hooked or bent if required.

(5) **Measurement of Steel.**—All reinforcing steel shall be measured in pounds to the neat lengths and sizes as shown on the drawings and as directed by the Engineer with no allowance being made for laps of longitudinal steel. Dowels, laps and hooks placed by order of the Engineer shall be paid for at their full lengths. Reinforcing steel shall be assumed to weigh 489.6 pounds per cubic foot.

(6) **Payment.**—The Contractor shall be paid for reinforcing steel at the price bid per pound, which price shall include the furnishing, bending and the placing of the steel, the cleaning, wiring and the supporting of the same, together with the furnishing of all labor, tools and equipment and the doing of all work necessary and proper to complete this item as specified and as required.

SLUICE GATES.

Item No. 25

(1) **Work to be Done.**—The Contractor shall furnish 5—42-inch wide by 60-inch high sluice gates and 3—42-inch circular sluice gates of the Chapman Valve Mfg. Co. or approved equal make, complete with frames, thimbles, stems, supports, operating stands, together with bolts, nuts and other materials which may be required to complete the sluice gates as operating units, and shall erect the same as shown or as directed by the Engineer. Under this Item the Contractor shall also set in the Screen Wells "E" and "F," Recording Water Level Apparatus which will be furnished him by the Board of Water Supply.

(2) **Schedule of Sluice Gates.**—In the schedule below is given a list of the sluice gates required, the number, maximum head of water to the center of gates, the distance between the center of gates and base of operating stands and their location.

No.	Size Inches	Head on Center in Feet	Center of Gate to Base Operating Stand	Location
1.....	42 x 60	5′—0″	12′—0″	Well "B" Gate House
1.....	42 x 60	19′—4″	26′—4″	Well "C" Gate House
1.....	42 x 60	33′—8″	40′—8″	Well "A" Gate House
1.....	42 x 60	48′—0″	55′—0″	Well "D" Gate House
1.....	42 x 60	48′—0″	55′—0″	Well "H"
2.....	42	48′—0″	55′—0″	Well "G" and "J" Gate House
1.....	42	68′—0″	75′—0″	Drain Well

The wall castings to which the sluice gates connect shall be considered as parts of the sluice gates to be paid for under this item.

(3) **Types.**—The four sluice gates located in Wells "A," "B," "C," and "D" in the gate house shall all be of the rectangular, rising stem type with four adjustable wedges on each side and each shall be designed for a water pressure of 55 feet only on one side. The sluice gate in Well "H" in the gate house shall be of the rectangular, rising stem type designed for water pressure on either side and with four adjustable wedges on each side and two adjustable wedges on both top and bottom. The two sluice gates in Wells "G" and "J" in the gate house shall be of the square frame, circular opening, rising stem type designed for water pressure on either side and with three adjustable wedges on each side and two adjustable wedges on both top and bottom. The sluice gate in the drain well shall be of the rectangular frame, circular opening, rising stem type designed for water pressure on one side only, and with three adjustable wedges on each side but none on top and bottom

(4) **Bronze Mountings**—All bearing or wearing parts of the sluice gates, lifting shafts, guides and operating stands shall be either solid bronze or faced with bronze unless otherwise specified. Where bronze facings are used they shall be dove-tailed to the iron castings or securely fastened in other approved manner.

(5) **Gates and Frames.**—The gates and frames shall all be of cast iron. The gates shall be substantially ribbed both vertically and horizontally and a rib shall extend around the rim of the gate just back of the bronze seat. The frames shall be provided with an inner flange on the rear for bolting to the wall or thimble castings.

(6) **Guides.**—The guides shall consist of heavy iron castings with an inner flange which shall be bolted and keyed to the frames to prevent lateral movement and shall be long enough so that at least one-half the disc of the gates is within the guides when fully opened. The guides on each side of the gates shall have a substantial groove into which a corresponding tongue on the gate shall fit. The grooves and tongues shall be planed all over and the clearance between them shall be one-sixteenth (1/16) inch.

(7) **Bronze Seats.**—The seats on the gates and frames shall be made of bronze and shall be well hammered into dove-tailed grooves of uniform width and depth and shall be fastened to the cast iron with 3/8-inch diameter brass screws spaced not more than 8 inches apart. If not made in one piece the seat facings shall be made in strips not less than 16 inches in length, but if such construction is used the joints shall be mitred and adjacent strips shall be thoroughly pinned together at the joints to form a continuous facing. The iron castings shall be machined on the back all over, and after they have been secured in place and fastened to the front faces shall be machined to a perfectly true and smooth bearing, and all joints shall be made water-tight, the faces to be hand scraped if necessary.

(8) **Adjustable Wedges**—The wedges shall be adjustable, shall be of bronze and shall be properly distributed. A tongue shall be provided on the back of each wedge and a corresponding groove on the gate for the tongue to slide in. Each wedge shall be provided with an adjusting bolt and a set bolt, with bronze lock nuts, which shall be set up tight after the wedge has been correctly adjusted. The wedge seats on the side guides shall be of bronze. The bearing and wearing parts of wedges, wedge seats and grooves and braces under the wedge seats shall be machined.

(9) **Bolts and Nuts.**—Bolts and nuts shall be of the best quality wrought iron or mild steel with good sound well-fitting threads, the nuts to be cold punched. Heads and nuts shall be hexagonal and shall be trimmed and chamfered.

(10) **Lifting Shaft.**—The lifting shaft shall be 3 inches in diameter and of cold rolled steel except that portion which is to be threaded which shall be of Tobin bronze. The shaft shall be made of suitable lengths coupled together with approved couplings and shall be finished all over. The shaft shall be threaded for a length sufficient for the full operation of the gate, the thread to be cut in a lathe.

Length of shaft. The lifting shaft shall be of such length as to extend above the operating stand, when the gate is fully closed, a distance of 1 inch, the exposed end of the shaft to be neatly finished.

Guides for Lifting Shaft. The lifting shafts shall be provided with adjustable cast-iron guides, for guiding and steadying the shaft, the guides to be fitted with bronze bushings for the shaft to pass through. Guides shall be provided as shown on the drawings and in no case shall the shaft be unsupported for a length greater than 11 feet. The guides shall be properly adjusted and then be firmly bolted in place with anchor bolts or other approved fastenings.

Setting Shaft. The lifting shaft shall be set exactly plumb. The guides shall be accurately aligned along the shaft and shall be securely bolted in place.

(11) **Operating Stands.**—The operating stands for opening and closing the gates in Wells "B" and "C" shall be Chapman Valve Manufacturing Co. make Type M-10 or approved equal. The operating stands for the remaining sluice gates shall be of Chapman Valve Mfg. Co. make Type N-29, or approved equal. The operating stands shall be carefully and accurately set so that there will be no binding of the lifting shaft when opening or closing the gates, and shall be firmly bolted in place. The base shall be bedded in mortar if required.

(12) **Fastenings.**—All necessary bolts, nuts and washers and other fastenings for setting the sluice gates and appurtenances complete and ready for operation shall be furnished and placed. The fastenings shall be especially adapted to the work required of them.

(13) **Tests.**—The sluice gates shall be tested in the shop and made water-tight under the hydrostatic head on the center of the gates specified. After the sluice gates and their appurtenances have been erected and adjusted they shall be inspected and tested for operation under working pressure and condition and the gates shall be water-tight. Any defects which may be found due to poor workmanship or fault of design shall be made good in a satisfactory manner.

(14) **Cleaning and Painting.**—The sluice gates shall be thoroughly cleaned and all iron and steel surfaces, except those which have been finished and except the outer exposed surfaces of the operating stand, shall be painted before leaving the shop, with two heavy coats of black varnish composed of pure Trinidad asphaltum and linseed oil. The outer exposed surfaces of the operating stands shall receive two heavy coats of an approved black enamel paint. Finished surfaces shall be slushed with a mixture of grease and white lead. All bronze tool finished work shall be left bright. After erection and testing and when no longer exposed to adhesive substances, the several parts shall be cleaned and the painted surfaces shall receive a third coat of the paint specified.

(15) **Wall Castings or Thimbles.**—The wall castings or thimbles included in this item shall be of the same quality and workmanship of iron as specified under iron castings. While the wall castings are being placed the sluice gates shall be assembled and bolted to the thimbles and kept in place until the wall castings are firmly held in the concrete masonry. In the bottom section of wall thimbles, 3-inch grout holes shall be provided in the center and 1-inch air holes at each end, to permit the placing of grout under these castings.

(16) **Payment.**—Contractor shall be paid the lump sum price bid for furnishing and erecting sluice gates, thimbles and appurtenances and for erecting water level apparatus, which price shall include the furnishing and placing of all dowels, expansion bolts, nuts, washers and bolts, and all painting of exposed metal, together with the furnishing of all labor, tools and equipment and the doing of all work necessary and proper to complete this item as specified and as required.

GATE AND MISCELLANEOUS VALVES.

Item No. 26.

(1) **Work to be Done.**—The Contractor shall furnish and place gate valves in the meter pit, plug valves in the gate house and a tide flap valve at the upper end of the drain running through the small dam in the spillway channel.

(2) *Gate Valves.*—The Contractor shall furnish 3—10-inch gate valves of Chapman make or approved equal, with rising stem provided with an operating wheel to be placed in the meter pit. These gate valves shall conform in all particulars to the standard specifications for valves of the American Water Works Association. They shall be iron body, bronze mounted and the seats in the body against which the gates close shall be mounted with bronze rings, threaded and screwed into the body. The discs shall be cast iron and mounted with bronze rings thoroughly rolled into machined dove-tails after which the bearing surfaces or faces shall be machined to a smooth finish. The stems shall be rolled or forged bronze.

(3) **Plug Valves.**—The Contractor shall furnish 4—12-inch plug valves of Chapman make, or approved equal, similar to that shown on page 194, figure 492 of the Chapman Valve Company catalog No. 60. The valves shall be of cast-iron bronze mounted with bronze seat and faces on the disc. The stem shall also be of bronze and the nut through which the operating stem passes. The valve shall have a flange frame to bolt to a 12-inch flanged casting set on the floor of the gate house. The stem of the lifting shaft shall be of cold rolled steel of suitable size to provide for the satisfactory operation of the valve under all conditions and shall be made of suitable length coupled with approved couplings and shall be finished all over. An operating nut shall be provided at the top end of the shaft and the lifting shaft shall be provided with adjustable cast-iron guides, fitted with bronze bushings for the shaft to pass through. In no case shall the unsupported length of shaft be greater than 11 feet. The guides shall be properly adjusted and bolted in place with anchor bolts or other approved fastenings.

(4) **Tide Flap Valve.**—The Contractor shall place at the upper end of the cast-iron drain through the body of the weir in the spillway channel an 8-inch tide flap valve of Chapman make, or approved equal, as shown on page 192 in the catalog of the Chapman Valve Manufacturing Co., figure 487G. The valve shall be

cast iron with bronze seat and facing on the flap which shall be fastened to the cast iron in an approved manner. The valve shall be provided with a flange to bolt to an 8-inch flanged pipe passing through the body of the weir.

(5) Payment.—The Contractor shall be paid a lump sum price for furnishing and erecting the gate valves, plug valves and tide flap valve and appurtenances which price shall include the furnishing and placing of all valves, expansion bolts, nuts, washers and bolts, and painting of all exposed metal together with the furnishing of all labor, tools and equipment to the doing of all work necessary and proper to complete this item as specified and as required.

MISCELLANEOUS IRON AND STEEL.

Item No. 27.

(1) Work to be Done.—The Contractor shall furnish and place in the structures as shown, all manhole steps, trash racks, floor gratings, railings, steel doors and frames, and manhole covers as called for in the plans and as directed by the Engineer.

(2) Materials.—Cast iron shall conform to the specifications for gray iron castings of the American Society for Testing Materials. Steel shapes shall be of the structural steel grade.

(3) Manhole Steps.—The Contractor shall furnish and place ¾-inch round galvanized-iron manhole steps with 12-inch rung placed 5 inches from the wall and with a 3-inch drop for safety tread.

(4) Trash Racks or Screens.—The Contractor shall furnish and place 6 feet by 6 feet 6-inch trash racks or screens in front of the four openings, of the intake structure. These shall be made as shown in detail in the drawings. The flats shall be constructed of steel of structural grade and shall be galvanized. All parts of this trash rack, including the rivets and one-inch rods, shall also be galvanized.

(5) Floor Grating.—The Contractor shall place floor grating of the Irving Subway type or approved equal over the floor openings in the gate house. Sizes of these various openings are shown on the drawings and around each opening there shall be furnished a cast iron or steel edging, set in the concrete, so that the grating can be placed flush with the floor and so that it is easily removable. The grating shall be capable of supporting 200 pounds per square foot of live load. The gratings shall be placed in sections so that the section over the manhole steps can be easily removed by one man.

(6) Steel Doors.—The Contractor shall place steel doors at the meter pit and over the drain well of sizes and dimensions shown on the drawings. Around each opening there shall be furnished a cast iron or steel edging, set in concrete, so that the doors can be closed flush with the concrete. Suitable hinges shall be fastened to these edgings and to the doors and when closed the doors shall overlap 2 inches. A suitable staple shall be fastened to the lower door which extends through a slot in the upper door so that a lock can be placed on these doors. After the doors are placed they shall be thoroughly cleaned of all dirt, loose scale and then the doors and edging shall be given a coat of hermastic enamel of similar quality to that which will be used for painting the interior of the steel pipe conduit.

(7) Pipe Railing.—The Contractor shall place on top of both walls of the spillway channel between the bridge and dam, pipe railing. The railing shall be of black iron pipe and shall consist of two 2-inch strings supported on 2½ inch posts spaced about 8 feet center to center. The top string shall be 42 inches high and railing posts shall be set in steel thimbles placed in the top of the wall into which melted sulphur will be poured. The railing joints between posts and stringers and against walls shall be made with modern railing fitting. After erection the railing and fittings shall be cleaned of all rust and scale and coated with hermastic enamel.

(8) **Painting.**—Before leaving the shop all steel and iron work shall be given a coat of red lead paint. After erection the iron and steel shall be thoroughly cleaned and given two coats of approved asphalt paint unless otherwise specified.

(9) **Details of Design.**—The Contractor shall make detailed shop drawings of materials to be furnished under this item. These drawings shall receive the approval of the Engineer before the work is started.

(10) **Payment.**—The Contractor shall be paid at the price bid per pound for the material shown and specified in this item, which price shall include manhole steps, trash racks, screens, floor gratings, railings, doors, manhole covers, together with the furnishing of all labor, tools and equipment and doing of all labor necessary and required to complete the work as specified and required.

IRON CASTINGS.

Item No. 28.

(1) **Work to be Done.**—The Contractor shall furnish and place cast iron grooves for stop planks and screens, and other iron castings shown on the drawings or which may be found necessary to complete the work.

(2) **Quality of Iron.**—Iron castings shall meet the requirements of the specifications for gray iron castings, adopted by the American Society for Testing Materials, and in force at the date of signing of this contract, and which requirements, except as modified herein, are hereby made a part of these specifications. The castings shall be smooth, clean and free from scales, lumps, blisters and other defects and shall be out of wind. No plugging or filling will be allowed.

(3) **Workmanship.**—All castings shall be made accurately to the dimensions shown and where marked or otherwise necessary to secure perfectly flat and true surfaces, they shall be planed, but allowance shall be made in patterns so that the specified thickness will not be reduced. In the bottom pieces of stop log groove lining 3-inch grout holes shall be provided in the center and 1-inch air holes at each end, to permit the placing of grout under these castings.

(4) **Cleaning and Painting.**—All castings shall be thoroughly cleaned and painted before rusting begins and before leaving the shop, with two coats of high grade asphaltum or other varnish that the Engineer may direct. After the castings have been placed in a satisfactory manner, all foreign adhering substances shall be removed and the castings given one additional coat of asphaltum.

(5) **Weight to be Paid For.**—No casting shall be accepted, the weight of which shall be less than that due to its dimensions by more than 5 per cent. The total weight to be paid for under this item shall not exceed the sum of the weights of the several castings due to their dimensions by more than 2 per cent.

(6) **Payment.**—The price bid per pound for iron castings shall include the furnishing, painting and placing of the iron castings, together with the furnishing of all labor, tools, materials and equipment, and the doing of all work necessary and proper to complete this item as required and as specified.

STEEL PIPE FOR OUTLET CONDUIT.

Item No. 29.

(1) **Work to be Done.**—The Contractor shall furnish and place two steel pipes of 42-inch internal diameter, connecting with the cast iron flanged pipe near the gate house and terminating at the flanged ends at the piece of 48-inch cast iron pipe shown on the drawings. A 10-inch outlet piece from each of the two pipes shall be provided at the meter chamber to connect with standard cast iron flanged fittings leading to the Venturi meter as shown on the drawings.

(2) Materials.—All steel shall be made by the open hearth process and shall conform to the following specifications:

(a) For welded steel pipe.—The steel for plates shall be of a composition suitable for welding and satisfactory to the Engineer. The steel for rivets shall conform to the specifications of the American Society for Testing Materials.

(b) For lock bar steel pipe.—The steel for plates shall conform to the specifications of the American Society for Testing Materials for flanged steel, and the rivets shall conform to the requirements for rivet steel of the specifications of the same Society. Lock bars shall be made of extra soft open hearth steel with an ultimate tensile strength of from 40,000 to 50,000 pounds per square inch.

(c) For riveted steel pipe.—The steel plates and rivets shall conform to the same specifications as those for lock bar pipe.

(3) Place of Manufacture.—The Contractor shall notify the Engineer where the steel plates for the pipe are to be rolled and the rivets made and also where the pipe is to be fabricated and the dates on which the various operations will be begun.

(4) Protection of Steel.—All plates, rivets and bars are to be carefully protected from rust from the time of their manufacture until after a coating is applied. In case the steel becomes rusted, the rust shall be removed by a process satisfactory to the Engineer.

(5) Inspection.—The Contractor shall furnish the Engineer with certified copies of the mill analyses and physical tests of the various melts of all steel used in the work. No steel shall be fabricated until after the mill analyses and tests have been received and approved by the Engineer. The work of fabricating the pipes and coating them will be inspected by an authorized inspector who will be instructed to reject any plate which proves to be less than the specified thickness or which is otherwise defective, although the plate may have been passed by the mill inspector.

(6) Rivets.—All longitudinal seams shall be double riveted. Rivets shall have cone heads at least equal in strength to and concentric with the shanks of the rivets and the shanks of the rivets shall completely fill the rivet holes in which they are driven. Before riveting, the plates shall be thoroughly cleaned and all scale removed.

(7) Shop Caulking.—After the pipes are riveted, they shall be caulked both inside and outside in a workmanlike manner and with approved tools.

(8) Shop Test.—Each length of pipe, after its completion and before the coating has been applied, shall be subjected to a hydrostatic pressure test of 100 pounds per square inch. During the test the pipe shall be absolutely tight and free from any signs of leakage or weakness.

(9) Cleaning.—Before the interior coating is applied, the pipe shall be thoroughly cleaned from all grease, oil, paint, moisture, rust, dust, earth and other foreign materials removed, both inside and out. Cleaning shall be done in an efficient manner, satisfactory to the Engineer.

(10) Coating.—Concrete will be placed around the outside of the pipe in the manner shown on the drawings. The inside surfaces of the pipe after erection shall be coated with Hermastic Enamel as manufactured by the Wailes, Dove-Hermiston Corporation, 17 Battery Place, New York City, or equal approved coating having a coal tar base. Coating shall be applied in accordance with the manufacturer's requirements.

(11) Imperfect Coating.—In case the coating of any section of steel is found to be imperfect or unsatisfactory, such section or sections shall be thoroughly cleaned of all coating and a new coating applied in a manner approved by and satisfactory to the Engineer.

Item No.29, Paragraph 2 (d)
Add:
"The thickness of metal shall be determined by a designed
100 pounds per square inch, a unit stress on net section c
pounds per square inch, but in no case shall the thickness
less than three-eighths (3/8) of an inch."

(12) **Transportation.**—The pipes and specials shall be transported from the shop to the line of the trench by such means as will not injure the pipe. They shall be carefully loaded on cars, wagons or trucks with skids and blocking. In unloading pipe or in transferring it from one car or vehicle to another, it shall be rolled on skids or lifted by a derrick. In no case shall pipe be allowed to be dropped or be dragged. In no case shall pipe be rolled on stony ground or on pavement.

(13) **Repairing Pipe.**—Before the pipe is laid in the trench, it shall be carefully examined and all damage or indentations which it has received, shall be repaired and if, in the opinion of the Engineer, this cannot be done, the pipe will be rejected.

(14) **Laying Pipe.**—Suitable derricks and slings shall be provided for laying the pipe and assembling it in place. The ends of each length of pipe shall be carefully scraped, inside and outside, and the coating entirely removed for a distance of about 3 inches to insure a perfect contact of the plates. All coating shall be removed from the rivet holes. When lowered into place, the pipe shall be adjusted to grade and line and properly pulled together to secure fair alignment of rivet holes. The pipes shall be fitted together by such means as will not injure the plates or distort the rivet holes. When the pipes are joined they shall be bolted together with a sufficient number of bolts to hold them securely in place and to prevent their pulling apart until the seams are riveted.

(15) **Field Riveting.**—Before the lengths of pipe are riveted together the plates shall be laid up and bolted securely together with a sufficient number of bolts to hold them closely in contact. Rivet holes which are slightly unfair shall be reamed with a taper reamer. Such slight drifting only as will not, in the opinion of the Engineer, injure the plates, will be allowed. All field rivets for connecting lengths of pipe or attaching fittings shall be driven with compressed air tools from the outside of the pipe. Field rivets shall completely fill the holes in which they are driven and shall have perfect heads. All loose rivets and rivets with imperfect heads shall be cut out and replaced with perfect ones.

(16) **Field Caulking.**—After the rivets are driven the pipe shall be properly caulked both inside and outside in a workmanlike manner by the most approved tools.

(17) **Placing of Concrete Around Steel Pipe.**—The steel piping shall be laid on wooden blocks which will keep the steel pipe at such height above the sub-grade as will permit of the proper thickness of concrete to be placed under the pipe after it is in place and riveted. The concrete shall be brought up evenly on both sides of the pipe so as not to disturb its alignment. As the bottom concrete is placed, care shall be taken by the Contractor not to bring the concrete to such height on the sides of the steel pipe as will float it out of grade. A construction joint will be permitted between the concrete for the lower part of the pipe and the concrete for the upper part of the pipe. Such joint will be made in the manner to be approved by the Engineer.

(18) **Placing the Inside Coating.**—After the pipe has been laid and riveted the Contractor shall then thoroughly cleanse the interior surface of the pipe from all grease, oil, moisture, rust, dust, earth and foreign material, and then the hermastic enamel shall be applied in accordance with the directions of the manufacturers of this material.

(19) **Payment.**—Payment to the Contractor for furnishing and placing the two lines of steel pipe as shown on the drawings, including the flanges at either end of the two pipes, and the 10 inch special at the meter pit, and the 42 inch to 48 inch increaser with flange, shall be at the lump sum bid by the Contractor, which price shall include the furnishing and placing of the steel pipe and specials, the interior coating of the pipes, together with the furnishing of all labor, tools, equipment and the doing of all work necessary and proper to complete this item as specified and as required. Excavation and concrete shall be paid for under other items.

CAST IRON PIPE AND FITTINGS.

Items Nos. 30 to 31.

(1) **Work to be Done.**—The Contractor shall set and lay all iron pipe and special fittings of the sizes and at the grades and locations shown and as required, and he shall furnish all jointing materials, including bolts, gaskets, lead and yarn and place them in the work.

(2) **Materials.**—Bell and spigot pipe and specials shall be of the American Waterworks Association specification as to dimensions, weight, quality, cutting and marking. Pipe, unless otherwise noted, will be Class B. In laying bell and spigot pipe and specials and in setting valves and other appurtenant work, such blocking and wedges as may be required will be furnished by the Contractor. Blocking shall be placed close up to and back of the bell before each joint is poured.

Lead for bell and spigot joints shall be soft, malleable lead, practically free from impurities. No cold lead shall be used for caulking or filling in. The jute shall be square flax packing, unlubricated, and of such size as to be suitable for the joint. In jointing the pipe, care shall be observed to have the spigot properly cleaned and seated in the bell of the next adjacent pipe and to be truly centered. One strand of jute completely encircling pipe shall be thoroughly driven home with a roping tool, and leave a depth of joint of 2½ inches for a pipe up to 12 inches in diameter. Joints shall be poured full of lead at one pouring, after which the lead shall be well caulked with proper tools and made water tight. In pouring the joints, sufficient metal shall be provided so that when the joint is caulked, the joint will be flush with the face of the pipe.

(3) **Flanged Cast Iron Pipe and Specials.**—Flanged cast iron pipe and specials shall be of dimensions and of approximate weights as shown in the catalog of the U. S. Cast Iron Pipe and Foundry Co., while quality, coating and marking shall conform to the American Water Works Association specification. In laying flanged pipe, the Contractor shall furnish bolts, nuts and gaskets for making connections. Gaskets shall be of the ring type made of vellumoid No. 10 thickness, as manufactured by the Chas. D. Brown Co., or approved equal. Bolts shall have square or hexagonal heads and shall have sound, well fitting threads of the U. S. standard with the underside of heads and nuts to be made true surfaces at right angles to the axis of the bolt. All bolts shall be provided with chamfered hexagonal nuts.

(4) **Cutting Pipe.**—When it becomes necessary for any reason to cut the pipe, the Contractor shall do so at his own expense. The pipe shall be cut to leave a smooth edge at right angles to the axis. The Contractor shall be responsible for the correctness of the cutting and shall stand the loss of any sections which are injured or incorrectly cut.

(5) **Testing.**—Pipe work shall be tested for leakage under a pressure which shall be 50 per cent. in excess of the maximum conditions prevalent during the operations. Contractor shall furnish water pumps and gauges and shall repair leakage in cast iron pipe work so that no leaks whatsoever occur in exposed piping within buildings or structures and on lines outside of structures the leakage shall not be greater than 200 gallons per inch of diameter per mile of length per day.

(6) **Classification.**—All bell and spigot straight lengths of cast iron pipe will be classified as cast iron pipe under Item No. 30. All flanged pipe, bell and spigot fittings and flanged fittings will be classified as special castings and paid for under Item No. 31.

(7) **Payment.**—Payment to the Contractor for furnishing and laying cast iron pipe and special fittings shall be at the price bid per pound and shall include and cover the furnishing and laying of all cast iron pipe and fittings, together with the furnishing of all jointing material, bolts, gaskets, the testing for leakage and the furnishing of all labor, tools and equipment and the doing of all work necessary and proper to complete these items as required and specified.

VENTURI METER

Item No. 32.

(1) **Work to be Done.**—The Contractor shall furnish and set one 10-inch Venturi meter with a 5-inch throat which shall be of the Builders Iron Foundry Company of Providence, Rhode Island, make, or approved equal, of standard weight, style N. S., with a Type M register indicator and recorder. Contractor shall also furnish all connecting pipe between the throat and up-stream end of the Venturi meter, the register indicator and recorder.

(2) **Appurtenances.**—The Contractor shall provide necessary mercury, a year's supply of weekly charts recording rate of flow in gallons per day, a full equipment of wrenches, pen, ink and similar accessories with a neat tool cabinet for containing the same. He shall also provide printed instructions for the installation, care and operation of the registering device.

(3) **Payment.**—The Contractor will be paid for the meter and appurtenant apparatus at the lump sum bid for furnishing and placing the meter and the register indicator and recorder and the connecting piping, together with the furnishing of all labor, tools and equipment and the doing of all work necessary and proper to complete this item as specified and required.

GATE HOUSE SCREENS.

Item No. 33.

(1) **Work to be Done.**—The Contractor shall furnish and place two screens in the gate house as detailed on the drawings.

(2) **Frame.**—The frame shall be composed of 6-inch steel channels with cross braces of 6-inch I-Beams. Clip angles shall be used to connect the main members and shall be fastened by sufficient rivets of the proper size and spacing to develop the full strength of the members. Cast-iron rollers shall be provided on the sides of the screen as detailed on the drawings to prevent the screen from binding in the grooves. The axle of the rollers shall be of bronze and shall revolve in a bronze bushing attached securely to the cast-iron rollers. On the top of the screen two suitable hooks or rings shall be riveted to the top member above the vertical braces, to provide means for lifting the screen out of the well.

(3) **Screen Wire Mesh.**—The Wire mesh for the screen shall be composed of bronze wires of No. 10 gage (Birmingham Wire Gage) and the mesh shall be of square pattern with clear openings of ½-inch. The wire mesh for each screen shall be of one piece. The mesh shall be clamped to the flanges of the 6-inch I-Beams and channels by means of bronze strips. These bronze strips are to be of the same width as the flanges of the steel members to which they are attached and are to be 3/8 inches thick. The bronze strips are to be fastened to the steel members by 3/8-inch bronze machine screw bolts with slotted countersunk heads and bronze nuts, the bolts to be spaced 9 inches apart.

(4) **Painting.**—After the screen frame is fabricated and before the wire mesh is attached, it shall be thoroughly cleaned of all dirt, loose scale and rust and shall be given a coat of Hermastic Enamel of similar quality to that which will be used for painting the interior of the steel pipe conduit. After the screens are delivered to the work and before they are placed in position, any painting which has been damaged shall be retouched with Hermastic Enamel.

(5) **Details of Design.**—The Contractor shall make detailed shop drawings of the screens to be furnished under this item. These drawings shall receive the approval of the Engineer before work is started.

(6) **Payment.**—The Contractor shall be paid at the lump sum price bid for furnishing and placing and painting of the screens, together with the furnishing of all labor, tools and equipment and the doing of all work necessary and proper to complete this item as specified and required.

GATE HOUSE.

Item No. 34.

(1) Work to be Done.—Contractor shall furnish all materials and shall build the gate house complet. as shown on the plans, as specified and as directed. All work covered by this item shall be above elevation 625.0. He shall also place bronze tablet furnished by the Board of Water Supply.

(2) Stone Work.—The Contractor shall build all walls of gate house as shown on drawings, of good local quarry stone, samples of which must be submitted to the Engineer for approval. All stone work to be laid in the best style of rubble masonry with through stones not more than two feet apart in height nor fou feet in length of wall. Stones to be laid random and in their natural bed, in cement mortar composed of one part approved, undamaged, American Portland Cement to three parts clean sharp sand and not more than 10 per cent by volume of hydrated lime. No spalls shall show in face of wall and all joints shall be hammer dressed.

All joints in exterior walls shall be ¾-inch in width neatly pointed with a tool to show an even flat joint recessed about 1/16-inch subject to approval of the Engineer. Interior joints shall be straight and regula and smoothly pointed with the trowel. Form arches over openings in stonework both outside and inside and support flat arches on steel lintels as indicated on drawings. Properly install anchor bolts where indicated on drawings. Furnish and properly install Standard Grey Indiana limestone sills to door and windows, same to be made with washes, drips, seats, etc., according to detail drawings. All exposed surfaces shall be finished to smooth even surface free from imperfections of any kind.

At completion all stonework shall be thoroughly cleaned with acid and water and all work shall be first-class in every particular subject to the approval of the Engineer.

(3) Slate Roof.—All surfaces of roof, except roof to cupola, shall be covered with an approved asph saturated felt weighing 30 pounds to the square, with all joints lapped 6 inches and fastened with clips and nails to the roof sheathing. Line the valleys and properly flash and counterflash with 16-ounce soft rolled copper so as to make the roof perfectly weather tight. At all eaves provide a wood strip of sufficient thickness to give the slate the proper cant. Over the felt lay a thatch slate roof designed and produced by the John D. Emack Co. or substitute, satisfactory to the Engineer.

Roof to be laid in strict accordance with roof layout and instruction sheet to be submitted to the Engineer for approval. The slate shall be fastened to roof with copper nails of proper length. High grade elastic roofers cement shall be used in valleys, hips, ridges and other places where necessary. Straight closed valleys shall be used. The roofing contractor shall guarantee all workmanship and materials free from defects for a period of two years after completion and shall make good at his own expense any and all defects that may appear within that time.

(4) Sheet Metal.—In addition to flashing, etc., before specified under slate roofing the Contractor shall cover the roof of cupola and line all gutters with 16-ounce copper, including copper finial as shown on drawings. Furnish and properly erect 2½ inches by 4 inches down spouts as shown of 16-ounce copper same to be secured to building by means of heavy copper bands.

(5) Iron and Steel.—Furnish and install bolts, anchors, lintels and other steel work to complete the building. Lintels shall extend 6 inches into stone work on each side of openings.

Furnish and properly erect steel beams and crane rails as indicated on drawings. Beams shall rest on steel bearing plates, all well anchored to stone piers and rails shall be fastened to flanges of steel beams with steel clips in most approved manner as may be directed by the Engineer. All steel work shall receive one shop coat of red lead before delivery and one coat immediately after delivery.

(6) **Steel Sash.**—Furnish and erect standard steel casement sash and rear doors and transom, as manufactured by Truscon Steel Co., David Lupton Company, or approved equal, of sizes shown on drawings. Same to be equipped with all necessary heavy solid bronze hardware. Caulk with elastic pointing cement so that all will be perfectly weather tight. All work shall be subject to the approval of the Engineer.

(7) **Metal Door and Jamb.**—Furnish and properly install Art-Metal Construction Co. or Dahlstrom or approved equal doors, frame and transom. To be constructed according to best standard practice allowing for hardware, reinforcing, etc. Doors to be three-panel, built up of No. 16 gauge sheet steel, using mouldings similar to Art Metal type No. 90 with meeting stile No. 10. Jamb to be buck, jamb and trim type similar to Art Metal type No. 2, using moulding similar to No. 013526 on both sides. Same to be constructed of No. 16 gauge sheet steel. Door, transom sash and frame to be primed with an approved metallic paint before delivery. Contractor for this work shall furnish all necessary shop drawings illustrating construction, and shall receive the Engineer's approval before fabricating.

Doors shall be equipped with heavy bronze ball bearing butts, three to each leaf; bronze top and bolts, cast bronze 2 1/2 inch diameter; knobs and escutcheons, latch and cylinder lock of Yale and Towne manufacture or approved equal. Design shall be submitted to the Engineer for approval.

Transom sash shall be glazed with double standard thickness glass properly secured in place with metal beads.

Under Item No. 34 the Contractor shall furnish and erect at the entrance to the meter pit, one wooden door, 2 feet 6 inches by 7 feet 0 inches by 1 3/8 inches thick, of best quality clear white pine; the door to be fitted with two loose pin solid bronze butts properly secured to the steel door frame and with striker, bronze knobs and escutcheons, extra heavy mortise lock and 3 nickel plated keys. The steel channel door frame will be paid for under Item No. 27: miscellaneous iron and steel.

(8) **Carpentry Work.**—All carpenter work that may be necessary and incidental to the completion of this building shall be furnished and done by the Contractor.

All framing lumber shall be thoroughly seasoned, dry, good merchantable dressed North Carolina pine, free from large or unsound knots and other imperfections.

Roof framing shall be constructed as shown on drawings and in a first class workmanlike manner.

Gutters and cornices, cupola, etc., shall be of No. 1 Gulf cypress, put together in a manner satisfactory to the Engineer, properly primed with thick white lead, puttied and all nails set. Same to be made according to detail drawing and gutter lined with copper as before specified. Sheathing to be 7/8 inch North Carolina pine, tongue and groove.

(9) **Painting and Glazing.**—All exterior woodwork, including entrance doors, jamb and transom, and door to meter pit, shall receive three coats of pure linseed oil and Lewis lead in colors to be selected by the Engineer. All surfaces to be sandpapered before and after priming coat is applied and all nail holes shall be puttied after priming.

All iron and steel work, in addition to paint before specified, shall receive two coats of lead and oil paint, color to be approved by the Engineer.

The Contractor shall do all glazing throughout, using first quality double standard thicknessed glass. All glass shall be well bedded in steel sash putty and shall be well secured in place with metal clips and putty according to standard practice.

(10) **Finally.**—At completion the Contractor shall remove all rubbish from and about the building, together with all tools, scaffolding and surplus materials and shall leave the building clean and ready for use.

(11) **Payment.**—The Contractor will be paid at the lump sum price bid for the gate house, which price shall include the furnishing and placing of all materials, together with the furnishing of all labor, tools and equipment and the doing of all work necessary and proper to complete the gate house as specified and as required.

OVERHEAD TRAVELING CRANE.

Item No. 35.

(1) **Work to be Done.**—The Contractor shall furnish and erect in the gate house and place on crane rails built as part of the gate house, an overhead traveling crane of 2 1/2 tons capacity.

(2) **Design Data.**—The clear span from center to center of the crane rails is 28 feet 0 inches and the distance from the center of rails to walls is 6 inches. The maximum height of any part of crane above crane rail shall not be over 24 inches. The crane rail is A. S. C. E. standard 20 pound rail and the distance from the base of rail to gate house floor is 10 feet 10 inches. The hook shall in its highest position be at least 8 feet 4 inches above the floor and shall have a maximum travel from its highest to its lowest point of 68 feet. Crane members and details shall be figured for a factor of safety of not less than 5.

(3) **Bridge.**—The bridge shall be built of a single I beam of sufficient strength to carry the load specified in addition to its own weight and shall be of sufficient stiffness to prevent any undue deflection with the full working load in the center of the span. The bridge girders shall be securely fastened at the ends of the end carriages or truck frames in such manner that it will be impossible for the crane to get out of square.

(4) **Trucks or End Carriages.**—These shall be of structural steel channel and plate construction and shall carry double flanged truck wheels having chilled and ground treads and fitted with heavy roller bearings. Heavy filling plates shall be riveted to the web of the channels to provide a long bearing for the steel axles.

(5) **Bridge Travel.**—Bridge travel shall be effected by means of a hand chain over a large sprocket wheel which shall be secured to the bridge shaft at the center of the bridge. At each end of the bridge or parallel shaft there shall be fastened a pinion which shall engage a spur gear fastened to the truck wheels at opposite ends of the crane. All gears shall be machine cut and of such pitch and face as to insure maximum strength and wearing qualities.

(6) **Hoist and Trolley.**—The hoist shall be fastened to a trolley which shall travel on the lower flanges of the bridge beam. The hoist shall be hand operated from the floor by means of a chain over a sprocket wheel. The trolley shall be geared and operated from the floor by a chain over a sprocket wheel.

(7) **Limits of Travel.**—The construction of the crane shall be such that the hook shall be able to hang within 26 inches of the side walls and within 28 inches of the end walls.

(8) **Painting.**—All parts of the crane except bright or finished surfaces and hand chains shall be given a shop coat of red lead, and a coat of approved black asphalt paint upon completion of erection.

(9) **Payment.**—The Contractor will be paid for the crane and appurtenances at the lump sum bid for furnishing and erecting the crane, together with the furnishing of all labor, tools and equipment and the doing of all work necessary and proper to complete this item as specified and required.

ELECTRICAL WORK.

Item No. 36

(1) **Work to be Done.**—The Contractor shall furnish, install, test and place in satisfactory working condition, a complete lighting system as specified below indicated on the plans or as may be necessary for a complete piece of work. The equipment or materials required shall include 9 outdoor lighting units with standards, underground cable, gate house lighting, meter-pit lighting, plug receptacle outlets together with all necessary wiring, metal duct, boxes, switches, lighting panel and service equipment.

(2) **Service and N. E. Code.**—All fixtures and wiring shall be arranged for 60-cycle alternating current, three-wire 110/220 volt feeder from service pole to distributing panel and two-wire 110-volt branch circuits. Arrangement of service connection shall be satisfactory to the Power Company. Unless otherwise specified, all work shall comply with the requirements of the National Electrical Code.

(3) **Metal Conduit.**—All wiring except underground armored cable shall be run in rigid metal conduit. Conduit shall be Greenfielduct, Sherarduct or equal galvanized conduit. No conduit smaller than ¾-inch shall be used except in fixture stems where ½-inch may be used. Where it becomes necessary to cut a length of conduit such cutting shall be done with a hack saw and the edges shall then be reamed to remove all burrs and sharp edges. All conduits shall be provided with the necessary couplings, bends, locknuts and bushings. Ends of conduit during construction shall be kept plugged so that no concrete, sand or dirt will lodge therein.

All conduit shall be thoroughly cleaned before conductors are installed. All boxes shall be of galvanized pressed steel or brass. Outlet boxes for ceiling fixtures in gatehouse shall be galvanized cast iron with cover and short nipple to support fixture. Boxes for wall switches and plug receptacles in the gate house shall be of galvanized pressed steel and designed for its particular application. Outlet boxes for fixtures, switches or receptacles used in meter pit, drain well or out of doors shall be of cast brass.

(4) **Wiring.**—All wiring shall be new and in first-class condition. All conductors shall be rubber insulated with 30 per cent pure rubber compound of N. E. Code thickness and protected by a double braid or a tape and braid depending on size. Leaded Conductors shall be insulated as above and encased in a continuous sheath of pure lead of uniform thickness corresponding to manufacturer's standard for N. E. Code wire. Armored cable shall be insulated and leaded as above and then protected by a double spiral wrap of steel tape between two layers of treated jute, General Electric Co. CLAI finish or equal. No splices will be permitted in underground cable.

No conductors smaller than No. 12 B&S gauge shall be used for branch lighting circuits. Armored cable shall be 3 conductor No. 4 between service pole and service cabinet in gate house and 2 conductor No. 6 between out-door lights. Between gate house, drain well and meter pit 2 conductor No. 10 armored cable shall be used.

Armored cable shall be buried at least 18 inches underground and shall be brought up into lamp pole bases through 2-inch conduit bends to about 4 inches above the base where splices shall be made to rubber insulated braided conductors leading up the pole to the lamp socket. Splices shall be thoroughly insulated with insulating gum rubber, taped and covered with waterproofing compound. All splices shall be thoroughly soldered using a non-acid soldering flux. Standard copper connectors shall be used.

(5) **Service Equipment.**—At the point marked "Service Pole" on the plans, the Contractor shall furnish and erect a 2½-inch conduit extending from a standard bend 18 inches below the surface of the ground to a point about 20 feet above the ground where it shall terminate in a Type FEA condulet with CF 174 composition cover. Conduit shall be secured to pole with Hubbard hot galvanized straps and ½-inch lag screws. Pole shall be of wood about 25 feet long and complying with the requirements of the Power Company. The exact location of the pole will be determined in the field.

The 3-conductor armored cable shall be installed in the conduit with 10 feet of cable projecting from the condulet, the end of the cable at this point shall be leaded over to prevent the entrance of moisture. From the bottom of the pole the armored cable shall be run to and through the entrance conduit in the gate house to a metal cabinet about 4 feet high, 2 feet wide and 1 foot deep attached to the wall in which the Power Company will install their switch and meter. From this cabinet three No. 4 rubber-insulated conductors shall be run in conduit to the adjacent distributing panel. Arrangements and size of service cabinet and conduit shall comply with the requirements of the Power Company.

(6) **Distributing or Lighting Panel.**—Panel shall be Crouse-Hinds or equal Safety panel No. 3–2–wire, 125-volt branches with 30-ampere tumbler switches and cartridge fuse clips, main fusible switch together with flush cabinet, fuses and a complete set of space fuses. Number of branch circuits, six.

(7) **Lighting Fixtures, Switches and Receptacles.**—The lighting fixtures shall be as follows: The four fixtures in the gate house shall be Benjamin or equal Vaporproof fixture No. 1545 with 200-watt Mazda Type C lamp. This fixture shall be mounted so that bottom of enclosing globe is not lower than wall plate. The two fixtures on the ceiling of meter pit shall be Benjamin or equal all brass steam tight junction box Type No. 405 mounted on No. 332 brass junction box, with brass round wire guard No. 700 and 75-watt Mazda type C lamp. At the entrance to the meter pit shall be located a switch for these lights. This switch shall be Benjamin or equal water-tight switch No. 6710 complete with 4½-inch brass water-tight double-pole switch. Armored cable shall be brought to a short piece of conduit extending from one of the outlets of this box, armor shall be stripped off sufficiently to allow conductors to be connected to switch and conduit sealed with compound. Armored cable shall be secured to short conduit in a substantial manner.

A plug receptacle outlet shall be installed in drain well about two feet below the ground surface. It shall be Benjamin or equal Edison screw base receptacle in 3¼-inch water-tight brass outlet box Catalog 6730 armored cable shall be brought to short piece of conduit, stripped and sealed with compound as for switch 6710 above.

One water-tight hand portable with screw globe and guard Benjamin 6842, brass body and 75-watt Mazda type C lamp together with 100 feet of special flexible 2-conductor " deck cable " and screw plug shall be furnished.

Wall receptacles in the gate house shall be Bryant or equal, screw-plug flush receptacle 1708, with solid brass plate with door.

Wall switches shall be Bryant or equal flush tumbler switch 2962 or 2963 as required with solid brass plates.

Three-way switch on lamp standard near road shall be mounted on pole and shall be enclosed in Crouse-Hinds or equal Type FS condulet with vapor-proof cover for key operation. Standard shall be drilled and tapped near condulet for conduit to lead to inside of the standard.

The 10 outdoor multiple lighting units shall be General Electric Co. or equal Novalux fixtures equipped with Catalog No. 174270 20-inch Dome Radial Wave Reflector. These ten fixtures shall be mounted on pipe poles made up from galvanized conduit reducing in size from 3-inch to 2-inch to 1¼ (Bishops Crook) and giving a finished distance from base to lamp center of 10 feet. The 3-inch pipe shall be set into a cast iron base about 2 feet high and held in position with type metal. The cast iron base shall be of a neat design curving to meet the lines of the 3-inch pipe and shall be provided with hand hole and cover to give access to cables. Anchor bolts (4) may be on the outside. Bolts shall be ¾-inch and shall be set in a concrete base 18 inches square and extending from 6 inches above to 4 feet below the ground surface. The three outdoor units between the gate house and the highway shall be controlled by three-way switches, one switch located inside of the gate house, the other on the pole near the highway. The necessary 2-conductor No. 6 armored cable shall be provided to connect these switches.

(8) Branch Circuits From Lighting Panel.—The branch circuits of the lighting panel shall be arranged to balance the load as nearly as possible and switches shall control circuits about as follows:

Switch 1—4 ceiling lights in gate house
Switch 2—6 outside lights south of gate house
Switch 3—1 outside light north of gate house
Switch 4—3 outside lights on three-way circuit
Switch 5—7 plug receptacle outlets in gate house
Switch 6—circuit to drain well and meter pit.

(9) Payment.—Payment for electrical work will be made at the lump sum contract price therefor, which price shall include the cost of all labor and materials as indicated on the plans, called for by the specifications or as may be necessary for a complete piece of work including all electrical materials, concrete bases, excavation and backfill for bases, pole and underground armored cable, conduit, condulets, fastenings and supports, service equipment and all other incidental details.

ROAD PAVING.

Item No. 37.

(1) Work to be Done.—Under this item Contractor shall furnish and place upon properly prepared sub-grade, broken stone of the proper sizes and quality, as hereinafter specified, to form a two-course water-bound macadam roadway, the finished thickness of the bottom course after rolling to be 6 inches, and the finished thickness of the top course after rolling to be 3 inches.

No stones shall be spread until the roadbed has been completed according to the plans and specifications and accepted by the Engineer. Nor when the roadbed contains frost, or is muddy, or is soft, or in any way unfit, in the opinion of the Engineer, to receive the macadam.

The placing and rolling of the stones shall follow immediately upon the completion and acceptance of the sub-grade. Should the sub-grade become washed or otherwise injured before the placing, it shall be redressed and accepted by the Engineer before the macadam is placed.

No stone shall be dumped upon the surface to be covered with macadam but shall be spread by suitable spreader wagons or placed upon the shoulders or upon dumping boards and spread by hand to the required thickness. Nor shall any stone be dumped upon any macadam surface but shall be placed and spread as above.

(2) Shoulders.—The shoulders shall be brought up and rolled simultaneously with the macadam and shall be of approved material, free from roots, loam, organic matter, or large stones, and consisting of a mixture of clay, earthy matter and small stones which will compact well and meet with the approval of the Engineer. As many passes shall be made over the shoulders as over the macadam and the finished shoulder shall conform to the lines shown on the drawings or as given by the Engineer. The placing of shoulders on fill sections of roadway will be paid for under "Compacted Embankment".

(3) Quality of Material.—The broken stone shall consist of clean, durable, sharp angled fragments of rock of uniform quality throughout, free from thin or elongated pieces, soft or disintegrated stone, dirt or other objectionable features. Stone shall conform to the standards of the American Society for Testing Materials as to abrasive qualities, hardness and toughness. Suitable samples of the stone to be used for the macadam shall be submitted to the Engineer. If approved, the material used on the road shall be of the same class, quality and durability as the samples submitted.

(4) Sizes of Stone.—The stone used will be designated as screenings, No. 1, No. 3 and No. 4. Screenings shall pass 1/4 inch square or 3/8 inch circular openings. No. 1 shall be retained on 1/4 inch

square or 3/8 inch circular openings and shall pass 3/4 inch circular openings No. 3 shall be retained on 1 1/2 inch circular openings and shall pass 2 3/4 inch circular openings. No. 4 shall be retained on 2 3/4 inch circular openings and shall pass 3 3/4 inch circular openings.

(5) Bottom Course.—After the sub-grade or foundation course shall have been properly prepared and proper drainage provided, a course of broken stone of graded No. 4 or a uniform mixture of No. 3 and No. 4 shall be spread evenly so that it will have, after rolling, the required thickness. The broken stone for the bottom courses shall be spread, rolled and filled in two separate layers neither of which shall be of greater depth than 6 inches measured loose.

The depth of loose stone, in all cases, shall be gauged by the use of cubical blocks of suitable size.

After the bottom course of stone has been laid loose it shall be thoroughly rolled with an approved roller weighing not less than 10 tons, the rolling to begin at the sides and proceeding to the center.

This rolling shall continue until there is no movement of the course ahead of the roller. After the course is thoroughly compacted, No. 1 stone and screenings shall be uniformly spread upon the surface and swept in with rattan or steel brooms and rolled dry. After the completion of the rolling no teaming other than that necessary for bringing material for the next course shall be allowed over the rolled material. It is the intention to bind this course with the small stone, but no surplus of filler will be allowed on this course. This course shall not be laid in excess of 500 lineal feet without being rolled and thoroughly filled so as to render it waterproof and thereby prevent the softening up of the sub-grade.

Each of the two layers shall be treated by rolling and adding fine material as described above.

If the sub-grade material shall become churned up into or mixed with the bottom or sub-bottom courses through the Contractor's hauling over it or working on it when the sub-grade is in a wet condition, the Contractor shall, at his own expense, remove such mixture of sub-grade material and broken stone and replace it with clean broken stone, of the proper size, and shall roll or otherwise compact the materials so as to produce a uniform, firm and even bottom course.

All filler shall be delivered and piled alongside the road before the course in which it is to be used is placed.

(6) Top Course.—The top course shall, except as noted below, consist of No. 3 broken stone as shown on the plans and of a thickness of 3 inches, together with the binder necessary to properly fill and bind the course. The binder shall consist of screenings and No. 1 stone mixed.

All binder for this course shall be delivered and placed in piles alongside the road before the course is placed

The required thickness of top course shall be composed of No. 3 stone and spread evenly upon the bottom course, using cubical blocks for gauging, to such a depth as to insure the required thickness after it shall have been thoroughly rolled and compacted. Care shall be used in the spreading of the stone that no irregularities in the contour shall develop in the rolling; every such irregularity that does occur the Contractor shall remove before adding the smaller material. The rolling shall be done with a 10 to 12 ton self-propelled roller of approved pattern, and shall be continued until the layer of stone does not creep or wave ahead of the roller.

After the stone has been compacted to the satisfaction of the Engineer, a light coating of binder shall be spread on dry by shoveling from piles previously placed alongside the pavement, and immediately swept in and thoroughly rolled. Care must be taken throughout to add the binder only in light applications and to thoroughly sweep each application in order that the maximum amount of binder may be worked in to fill the voids. The spreading, sweeping and rolling shall be continued until no more binder will go in dry, after which the macadam shall be sprinkled and immediately rolled. Water shall not be used so long as it is possible to introduce more dry screenings into the surface. If the sub-grade should become wet to such an

extent that the pavement becomes unstable and waves under the roller it is an indication that the top course was not thoroughly filled dry and the roller shall be taken off and this portion left to dry out before puddling is resumed. Small V-shaped surface drains shall be cut through the shoulders to accelerate the drying out of macadam.

More screenings shall be added where necessary, and the sweeping, sprinkling and rolling shall continue until no more screenings can be forced into the voids. This condition will be apparent when a wave of water and excess screenings shows in front of the roller wheels. After the wave of grout has been produced over the whole section of the macadam this portion shall be left to dry out, after which it shall be opened to traffic. The macadam shall be repuddled and back-rolled on succeeding days as much as may be necessary to secure satisfactory results. The macadam shall then be covered with a wearing carpet of screenings at least 3/8 inch thick. After the road has been opened to traffic for ten days, or as the Engineer may direct, this wearing carpet shall be again spread by sweeping the surplus from the side to the center of the pavement, and it shall be maintained and renewed until the whole road is accepted. During all the working hours when the roller is not used for rolling the fills, sub-grade, shoulders and finished courses of the pavement, it shall be employed in back-rolling the earlier portions of the macadam.

(7) Maintenance of Traffic.—Since the existing road will be eliminated and traffic on this road will be impeded by the construction work as contemplated in this contract, it will be necessary for the Contractor to provide, at his own cost and expense, a temporary roadway in order that traffic can be maintained on this road with the least interruption. To this end, it is suggested that the Contractor proceed at the beginning of this contract with the construction of the concrete highway bridge and the grading along the relocated highway.

On the completion of the bridge and grading, traffic may then be diverted upon this section of roadway. This subgrade must be maintained in such condition by temporary surfacing or by any other acceptable method, so that through traffic can be maintained on this road throughout the period of this contract.

The Contractor may construct the permanent macadam surfacing on this roadway at any time during this contract, if he so desires, but must maintain this roadway in good condition during the course of the work. At the completion of the contract and, before the acceptance of the road by the Engineer, the Contractor shall make all necessary repairs to the road by the application of stone and screenings and shall do all necessary re-rolling, so that the completed road surface will be in a satisfactory condition, acceptable to the Engineer.

(8) Payment.—The road paving shall be measured on a basis of a net width of 18 feet as shown on the plans or of a width that may be designated by the Engineer and the road paving will be paid for at the price bid per square yard, which price will include the furnishing, placing, and rolling, of the broken stone materials, the necessary labor and materials to maintain traffic during construction, the necessary maintenance of completed roadway, the furnishing of all labor, tools and equipment and the doing of all work necessary and proper to complete this item as specified and as required.

CABLE GUARD RAIL.

Item No. 38.

(1) Work to be Done.—The Contractor shall furnish and erect cable guard rail, of the design shown on the plans, at such places as indicated on the plans or as otherwise directed by the Engineer.

(2) Materials.—The posts shall be made of concrete, Class A, of the mix and quality as described in these specifications under concrete. The posts shall be reinforced as shown on the plans with steel bar reinforcement of a quality as specified under reinforcing steel.

All exposed surfaces shall be finished true to line and no plastering of any surface will be permitted.

After erection all exposed surfaces shall be treated with the surface preservative as specified under Item No. 22 "Concrete Protection," and after this application is thoroughly set, the posts shall receive two coats of white guide rail paint of a quality specified by the Division of Highways, State of New York.

Cable shall be three-strand, seven wire to the strand, double galvanized steel wire cable of ¾-inch diameter and of the quality as given in the Specifications of the Division of Highways of New York State, as adopted January 2, 1928. All cable fittings shall likewise be galvanized and meet these specifications.

(3) Payment.—The quantity of guard rails to be paid for under this item shall be the number of linear feet outside to outside of posts, completed in place, as shown on the plans or as directed by the Engineer. The price bid shall cover the furnishing and placing of all material, the application of concrete protection and paint, the excavation and backfilling and all other labor and incidental expenses necessary to satisfactorily complete the work.

STOP PLANKS.

Item No. 39.

(1) Work to be Done.—The Contractor shall furnish stop planks for the gate chamber and gate well of the outlet drain, together with stop plank lifter, all constructed in accordance with the details shown on the drawings.

(2) Materials and Workmanship.—All materials shall be of the best quality expecially adapted for the work required of them and the workmanship shall be the best throughout. All stop planks shall be constructed of well seasoned Southern long leaf yellow pine, dressed all over, sawed through and out of wind and of the stock known as No. 1, common dimension. The timber for the stop planks shall be tongue and groove. All timber shall be creosoted in a closed retort in a satisfactory manner so that each cubic foot of lumber will absorb at least 10 pounds of dead oil of coal tar or creosote. All joints shall be true and close and all holes for bolts shall be carefully and accurately bored. The members shall be firmly bolted together and all metal work shall be coated with two coats of asphaltum varnish, one before and one after fabrication. All stop planks shall be chamfered as shown. A stop plank lifter shall be furnished as shown in detail drawings.

(3) Payment.—The Contractor shall be paid for furnishing the stop planks and lifter, the lump sum bid for this item, which price shall include the furnishing of all material, creosoting, painting, together with the furnishing of all labor, tools and equipment and the doing of all work necessary and proper to complete this item as specified and required.

LUMBER LEFT IN PLACE.

Item No. 40.

(1) Work to be Done.—The Contractor shall furnish and place lumber sheeting, piling, braces, shores, stringers and waling strips to support the sides and ends of excavations and at other places where required. All such lumber left in place by order of the Engineer shall be paid for under this item. Sheeting and shoring removed as refill is made shall not be paid for.

(2) Materials.—Lumber shall be of oak, spruce or pine free from cracks, shakes, rot, bark or loose knots. Lumber shall be of adequate strength and of dimensions to satisfactorily support the pressures and weights and the Contractor shall be responsible for the sufficiency and for the placing and maintenance of all lumber. Nails and other hardware necessary for lumber shall be provided by the Contractor.

(3) Lumber left in place by order of the Engineer shall be measured to the exact dimensions in board feet. Pieces cut off of two feet or less in length shall be paid for as if left in place.

(4) **Payment.**—The Contractor shall be paid for lumber left in place at the price bid per M. B. M., which price shall include the furnishing and placing of all lumber, nails and hardware, together with the furnishing of all labor, tools and equipment and the doing of all work necessary and proper to complete this item as specified and required.

CLEANING UP.

Item No. 41.

(1) **Work to be Done.**—On or before the completion of the work, the Contractor, excepting as otherwise expressly directed or permitted in writing, shall tear down or burn all temporary structures built by him and all buildings, bridges or other structures now upon any part of the lands of the City within the limits of this contract; shall remove the rails and all ties and other woodwork of any railways built by him, shall trim and grade unsightly slopes and fill tie depressions, shall remove all rubbish of all kinds from all contract structures and from any grounds which he shall have occupied within the limits of the ownership of the City; shall remove from the structures or land of the City, burn or bury in approved places under acceptable cover, all abandoned materials and plants; shall cut off flush with the ground the stumps of all trees and bushes that have been damaged in the work of the contract; shall remove and dispose of old fences and walls and fences and other structures built in connection with the works of sanitation, clean up dead wood and trim out underbrush from any City land within 100 feet of a highway, permanent access road, or permanent building or structure; shall remove the farmhouses, barns and outbuildings adjacent to the spillway section of the dam and shall destroy the foundations and fill in any cellars or other excavations so that the ground occupied by such buildings will have a neat appearance; and shall leave the spoil banks, borrow pits, sand and gravel pits and other parts of the grounds owned by the City, and the adjacent territory which may have been affected by his operation, in a neat and satisfactory condition. To this end the Contractor shall do such additional trimming, grading, grassing, moving materials and other work as may be ordered. All materials salvaged shall be the property of the Contractor.

(2) **Payment.**—For all work, materials and incidentals required to accomplish the purposes set forth in the preceding paragraph, so as to leave all the grounds, the dam and all appurtenant structures covered by this contract in a clean, neat and sanitary condition, the Contractor shall receive the lump sum bid for this item. He shall furnish all labor, tools, materials and equipment and do all the work necessary and proper to complete this item as required and as specified. No part of the sum paid for this item shall be paid before the final payment to be made at the termination of this contract.

BOND

KNOW ALL MEN BY THESE PRESENTS, That we, ...

.....

.....principal, and

.....

.....

.....as suret are held and firmly bound unto "The City of Albany," in the penal sum of.....

.....

.....($.....)

dollars, lawful money of the United States of America, to be paid to the said "The City of Albany," its successors or assigns, for which payment, well and truly to be made, we bind ourselves and each of our heirs, executors and administrators, successors and assigns, jointly and severally, firmly by these presents.

Sealed with our seals. Dated the ..... day of .....one thousand nine hundred and.....

THE CONDITION OF THIS OBLIGATION IS SUCH, That if the annexed bid or proposal of.....

.....

the principal hereto, be accepted by " The City of Albany," through its Board of Water Supply, and approved by its Board of Estimate and Apportionment, and if the contract be awarded to the above-named proposer that then if said proposer shall enter into the contract to do the work within ten days from the date of the awarding of the same to.....

.....

and provide the materials therein provided for, and shall fully and faithfully perform the same in accordance with the terms of the contract therefor and the plans and specifications therein referred to, then this obligation to be void, otherwise they (the said principal and suret.... hereto) jointly and severally agree to pay to "The City of Albany" any difference between the sum to which the said proposer or Contractor would be entitled on the completion of the contract, and that which "The City of Albany" may be obliged to pay to any bidder or bidders to whom the contract may be subsequently awarded, and any other damage, direct or indirect, or consequential, which said City may sustain on account of such work and letting, or on account of the failure of the said Contractor to properly and in all things keep and execute all the provisions of the contract.

And the said principal and suret hereby further bind themselves, jointly and severally, that in case of failure by said Contractor to perform said contract, they or either of them, will pay to said City of Albany in addition to the damages actually arising therefrom liquidated damages amounting to one-tenth of the amount in the contract provided to be paid for the whole items of work and materials, as to which, or part of which, the said Contractor shall be in default.

And said principal and suret.... hereby further bind themselves, jointly and severally, that they will pay any and all amounts, damages, costs and judgments, which they, or either of them, may be required or adjudged to pay to said city or to any other person or persons, under or by virtue of any proceeding taken pursuant to the provisions of Chapter 298 of the Laws of 1883, and/or Chapter 55 of the Laws of 1909, and any Act or Acts amendatory thereof or supplementary thereto.

And the said principal and suret.... hereby further bind themselves, their heirs, executors and administrators, successors and assigns, jointly and severally, that they will amply and fully protect the said "The City of Albany" against and will pay any and all amounts, damages, costs and judgments which may be recovered against or which the said "The City of Albany" may be called upon to pay, to any person or corporation by reason of any damages arising or growing out of the doing of the said work, or of the repair or maintenance thereof, or the manner of doing the same, or the neglect of the said principal, or ..... agents or servants, or the improper performance of the said work by the principal, or ..... agents or servants, or the infringement..... of any patents or patent rights by reason of the use of any materials furnished or work done as aforesaid, or otherwise.

And the said suret.... hereby stipulate.... and agree.... that no change, extension, alteration or addition to the terms of the contract or specifications shall in anywise affect ..... obligation on this bond.

The said proposer and his suret.... have hereunto affixed their seals and subscribed these presents, the day and year above written.

.....(L. S.)

.....(L. S.)

.....(L. S.)

STATE OF NEW YORK }
CITY AND COUNTY OF ALBANY } ss.:

On this ..... day of ..... 19 , before me personally came..... to me known, who being by me duly sworn did depose and say, that he resides in the city of..... that he is the ..... of the ..... the corporation described in and which executed the above instrument; that he knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that it was so affixed by order of the board of directors of said corporation and that he signed his name thereto by like order.

.....

STATE OF NEW YORK }
CITY AND COUNTY OF ALBANY } ss.:

On this ..... day of ..... 19 , before me personally came .....
to me known, who being by me duly sworn did depose and say, that he resides in the city of.....

that he is the ..... of the .....
the corporation described in and which executed the above instrument; that he knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that it was so affixed by order of the board of directors of said corporation and that he signed his name thereto by like order.

.....

STATE OF NEW YORK }
CITY AND COUNTY OF ALBANY } ss.:

On this ..... day of ..... 19 , before me personally appeared.....
to me personally known and known to me to be the person named in and who executed the foregoing instrument and severally acknowledged that he executed the same.

.....

STATE OF NEW YORK }
CITY AND COUNTY OF ALBANY } ss.:

..... being duly sworn, deposes and says that he is one of the sureties named in and who subscribed the foregoing bond, and a resident and freeholder of this State, residing at No. ..... street, in the ..... of ..... county of .....
that he is worth the sum of .....
dollars over and above all the debts and liabilities which he owes or has incurred, exclusive of property exempt by law from levy and sale under an execution, and that deponent is the owner in fee simple absolute of the following described real estate, situated within the State of New York, to wit:

.....
.....
.....

that said premises are free and clear from encumbrances of any kind except.....
.....

And deponent further says that he is not now surety on any other bond or undertaking, except.....
.....
.....

Subscribed and sworn to before me, this } ss.: .....
.....day of.....19 . }

.....

STATE OF NEW YORK }
} ss.:
CITY AND COUNTY OF ALBANY }

..... being duly sworn, deposes and says that he is one of the sureties named in and who subscribed the foregoing bond, and a resident and freeholder of this State, residing at No. ..... street, in the ..... of ..... county of ..... that he is worth the sum of ..... dollars over and above all the debts and liabilities which he owes or has incurred, exclusive of property exempt by law from levy and sale under an execution, and that deponent is the owner in fee simple absolute of the following described real estate, situated within the State of New York, to wit:

.....

.....

.....

that said premises are free and clear from encumbrances of any kind except.....

.....

.....

And deponent further says that he is not now surety on any other bond or undertaking, except.....

.....

.....

Subscribed and sworn to before me, this
.....day of.....19 . } ss.: .....

.....

I hereby certify that the foregoing bond is proper in form and properly executed and that it appears on the face thereof that the suret.... properly justified and executed the same.

Dated Albany .....19 .

.....
Corporation Counsel.

I hereby approve of the sufficiency of the suret in the foregoing bond.

Dated Albany ..... 19 .

.....
Mayor.

ALCOVE DAM INSPECTION WELLS

PERIODIC WATER LEVEL REPORT

Date 3-26-76
Temperature 60°
Weather Sunny

Reservoir
Elevation (ft.) 618

Well No.	Elev. Top of casing	Water Level (ft.) From top of casing	Water Level Elev. in casing	Ground Elev.	Elev. Bottom of casing	Remarks (General Remarks)
1	604.69'	3.8	600.89	601.5'	593.5'	Dry around the well
2	599.04'	12.65	586.39	596.1'	583.1'	Muddy Ground
3	590.46'	15.95	574.51	587.8'	554.8'	Muddy Ground
4	590.91'	9.72	581.19	587.8'	540.8'	Muddy Ground
5	590.78'	8.28	582.50	587.8'	562.8'	Muddy Ground
6	599.91'	18.02	581.89	596.7'	576.7'	Muddy Ground
7	605.41'	3.32	602.09	602.5'	582.5'	Muddy Ground
8	611.77'	6.58	605.19	608.7'	599.7'	Dry around well

ALCOVE DAM INSPECTION WELLS

PERIODIC WATER LEVEL REPORT

Date 3-30-76
Temperature 54°
Weather Sunny

Reservoir
Elevation (ft.) 617.96

Well No.	Elev. Top of casing	Water Level (ft.) From top of casing	Water Level Elev. in casing	Ground Elev.	Elev. Bottom of casing	Remarks (General Remarks)
1	604.69'	3.82	600.87	601.5'	593.5'	Dry around well
2	599.04'	12.02	587.02	596.1'	583.1'	Muddy
3	590.46'	15.91	574.55	587.8'	554.8'	Muddy
4	590.91'	9.90	581.01	587.8'	540.8'	Muddy
5	590.78'	7.92	582.86	587.8'	562.8'	Muddy
6	599.91'	17.20	582.71	596.7'	576.7'	Muddy
7	605.41'	3.40	602.01	602.5'	582.5'	Dry
8	611.77'	6.50	605.27	608.7'	599.7'	Dry.

ALCOVE DAM INSPECTION WELLS

PERIODIC WATER LEVEL REPORT

Date 4-5-76
Temperature 48°
Weather Sunny

Reservoir
Elevation (ft.) 618.02

Well No.	Elev. Top of casing	Water Level (ft.) From top of casing	Water Level Elev. in casing	Ground Elev.	Elev. Bottom of casing	Remarks (General Remarks)
1	604.69'	3.51	601.18	601.5'	593.5'	Dry
2	599.04'	11.05	587.99	596.1'	583.1'	Very wet
3	590.46'	15.38	575.08	587.8'	554.8'	damp
4	590.91'	8.86	582.05	587.8'	540.8'	Very wet
5	590.78'	7.96	582.82	587.8'	562.8'	Very wet
6	599.91'	16.02	583.89	596.7'	576.7'	Very wet
7	605.41'	3.30	602.11	602.5'	582.5'	Very wet
8	611.77'	6.48	605.29	608.7'	599.7'	damp

ALCOVE DAM INSPECTION WELLS

PERIODIC WATER LEVEL REPORT

Date 4-10-78
Temperature 50
Weather Sunny

Reservoir Elevation (ft.) 618-18

Well No.	Elev. Top of casing	Water Level (ft.) From top of casing	Water Level Elev. in casing	Ground Elev.	Elev. Bottom of casing	Remarks (General Remarks)
1	604.69'	2.95	601.74	601.5'	593.5'	wet
2	599.04'	2.63	596.41	596.1'	583.1'	wet
3	590.46'	11.41	579.05	587.8'	554.8'	wet
4	590.91'	8.07	582.84	587.8'	540.8'	wet
5	590.78'	6.77	584.01	587.8'	562.8'	wet
6	599.91'	6.00	594.91	596.7'	576.7'	wet
7	605.41'	3.09	602.32	602.5'	582.5'	wet
8	611.77'	3.20	608.57	608.7'	599.7'	wet

ALCOVE DAM INSPECTION WELLS

PERIODIC WATER LEVEL REPORT

Date 4-13-78
Temperature 68
Weather sunny

Reservoir Elevation (ft.) 618-D.

SMITH & MAHONEY
CONSULTING
APR 17 1978
ALBANY, N.Y.

Well No.	Elev. Top of casing	Water Level (ft.) From top of casing	Water Level Elev. in casing	Ground Elev.	Elev. Bottom of casing	Remarks (General Remarks)
1	604.69'	2.92	601.77	601.5'	593.5'	wet
2	599.04'	2.54	596.50	596.1'	583.1'	wet
3	590.46'	10.62	579.84	587.8'	554.8'	wet
4	590.91'	7.87	583.40	587.8'	540.8'	wet
5	590.78'	6.54	584.24	587.8'	562.8'	wet
6	599.91'	6.00	594.91	596.7'	576.7'	wet
7	605.41'	3.05	602.36	602.5'	582.5'	wet
8	611.77'	3.15	608.62	608.7'	599.7'	wet

ALCOVE DAM INSPECTION WELLS

PERIODIC WATER LEVEL REPORT

Date 4-17-78
Temperature 50
Weather sunny

Reservoir Elevation (ft.) 618.04

Well No.	Elev. Top of casing	Water Level (ft.) From top of casing	Water Level Elev. in casing	Ground Elev.	Elev. Bottom of casing	Remarks (General Remarks)
1	604.69'	3.25	601.44	601.5'	593.5'	wet
2	599.04'	2.70	596.34	596.1'	583.1'	wet
3	590.46'	10.40	580.06	587.8'	554.8'	wet
4	590.91'	7.53	582.39	587.8'	540.8'	wet
5	590.78'	6.55	584.23	587.8'	562.8'	wet
6	599.91'	4.65	595.26	596.7'	576.7'	wet
7	605.41'	3.13	602.28	602.5'	582.5'	wet
8	611.77'	3.22	608.55	608.7'	599.7'	wet

ALCOVE DAM INSPECTION WELLS

PERIODIC WATER LEVEL REPORT

Date 4-20-78
Temperature 46
Weather rainy

Reservoir Elevation (ft.) 610

APR 21 1978
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Well No.	Elev. Top of casing	Water Level (ft.) From top of casing	Water Level Elev. in casing	Ground Elev.	Elev. Bottom of casing	Remarks (General Remarks)
1	604.69'	2.93	601.76	601.5'	593.5'	wet
2	599.04'	2.76	596.28	596.1'	583.1'	wet
3	590.46'	11.29	579.17	587.8'	554.8'	wet
4	590.91'	8.03	582.88	587.8'	540.8'	wet
5	590.78'	6.71	584.97	587.8'	562.8'	wet
6	599.91'	4.90	595.01	596.7'	576.7'	wet
7	605.41'	3.01	602.40	602.5'	582.5'	wet
8	611.77'	3.12	608.65	608.7'	599.7'	wet

ALCOVE DAM INSPECTION WELLS

PERIODIC WATER LEVEL REPORT

Date 5-26-26
Temperature 59°
Weather Cloudy & rain

Reservoir
Elevation (ft.)____

Well No.	Elev. Top of casing	Water Level (ft.) From top of casing	Water Level Elev. in casing	Ground Elev.	Elev. Bottom of casing	Remarks (General Remarks)
1	604.69'	3.81	600.88'	601.5'	593.5'	wet
2	599.04'	4.56	594.48	596.1'	583.1'	wet
3	590.46'	15.59	574.87'	587.8'	554.8'	wet
4	590.91'	Depth 38.32 9.57	581.34'	587.8'	540.8'	wet
5	590.78'	7.84	582.94'	587.8'	562.8'	wet
6	599.91'	8.51	591.4'	596.7'	576.7'	wet
7	605.41'	3.26	602.15'	602.5'	582.5'	damp
8	611.77'	5.56	606.21'	608.7'	599.7'	damp

ALCOVE DAM INSPECTION WELLS

PERIODIC WATER LEVEL REPORT

Date MAY 28, 1976
Temperature 60°
Weather SUNNY

Reservoir
Elevation (ft.) 618.00'

Well No.	Elev. Top of casing	Water Level (ft.) From top of casing	Water Level Elev. in casing	Ground Elev.	Elev. Bottom of casing	Remarks (General Remarks)
1	604.69'	4.0'	600.69' ✓	601.5'	593.5'	DRY
2	599.04'	4.25'	594.79' ✓	596.1'	583.1'	VERY WET
3	590.46'	16.03'	574.43' ✓	587.8'	554.8'	DRY (SURFACE)
4	590.91'	10.00'	580.91' ✓	587.8'	540.8'	VERY WET & MUDDY (SURFACE)
5	590.78'	7.88'	582.90' ✓	587.8'	562.8'	DRY (SURFACE)
6	599.91'	8.41'	591.50' ✓	596.7'	576.7'	MUDDY (SURFACE)
7	605.41'	4.15'	601.26' ✓	602.5'	582.5'	MUDDY (SURFACE)
8	611.77'	5.87'	605.90' ✓	608.7'	599.7'	DRY (SURFACE)

ALCOVE DAM INSPECTION WELLS

PERIODIC WATER LEVEL REPORT

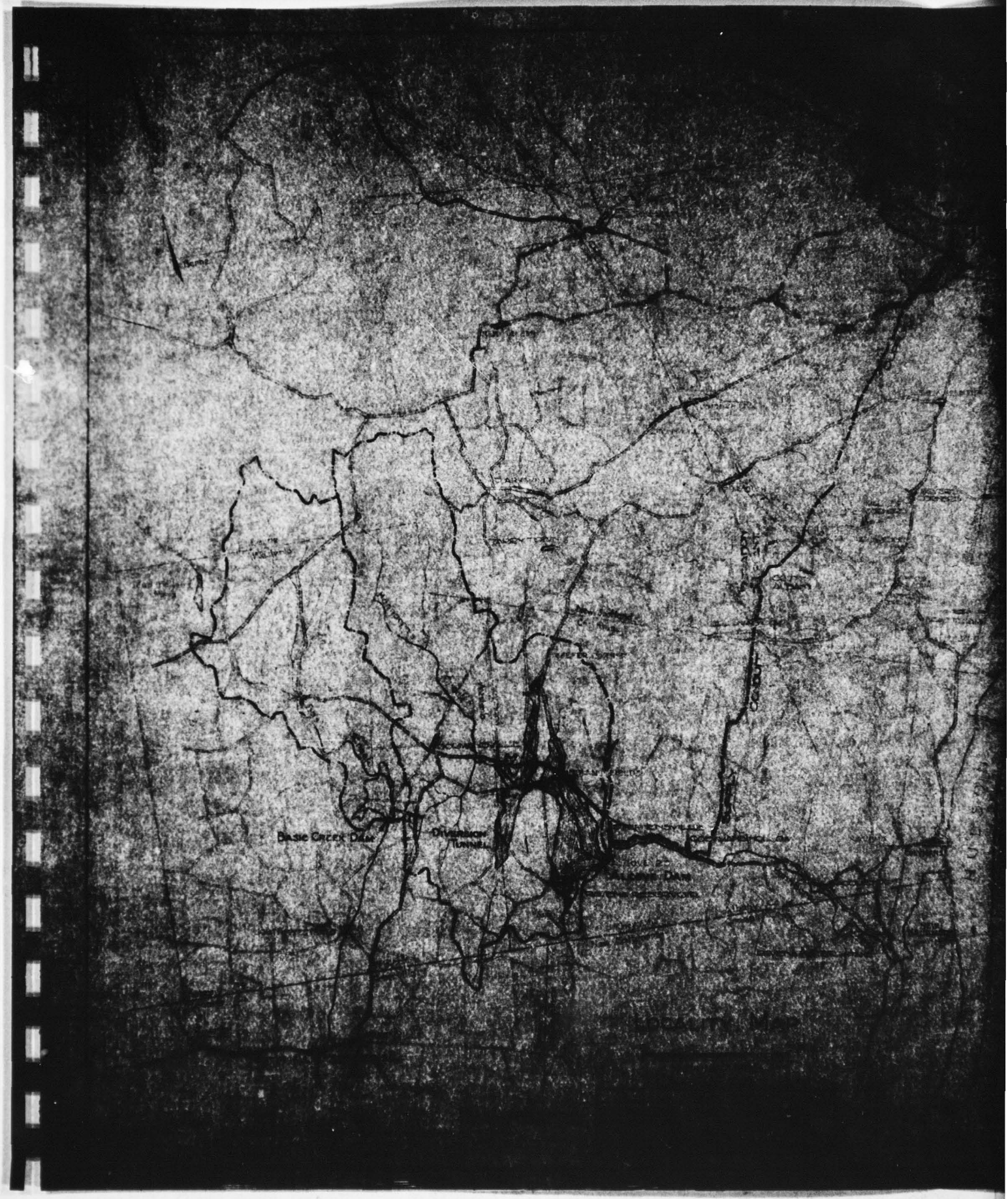
Date JUNE 1 1976
Temperature 55°
Weather RAIN- CLOUDY

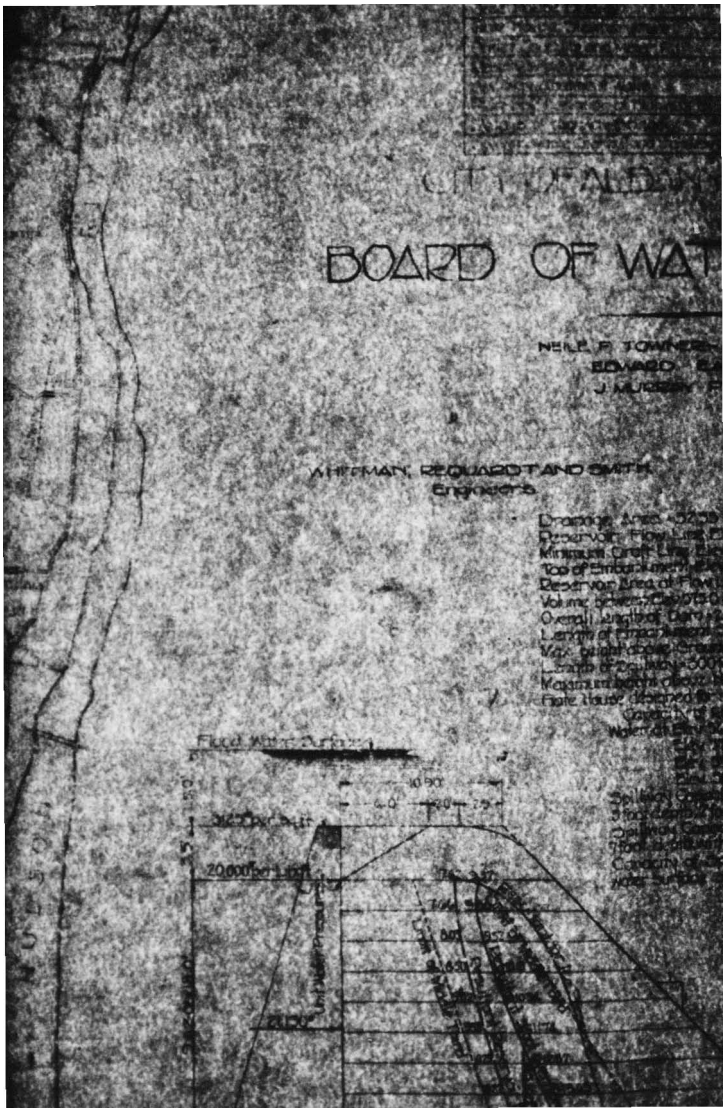
Reservoir
Elevation (ft.) 617.98'

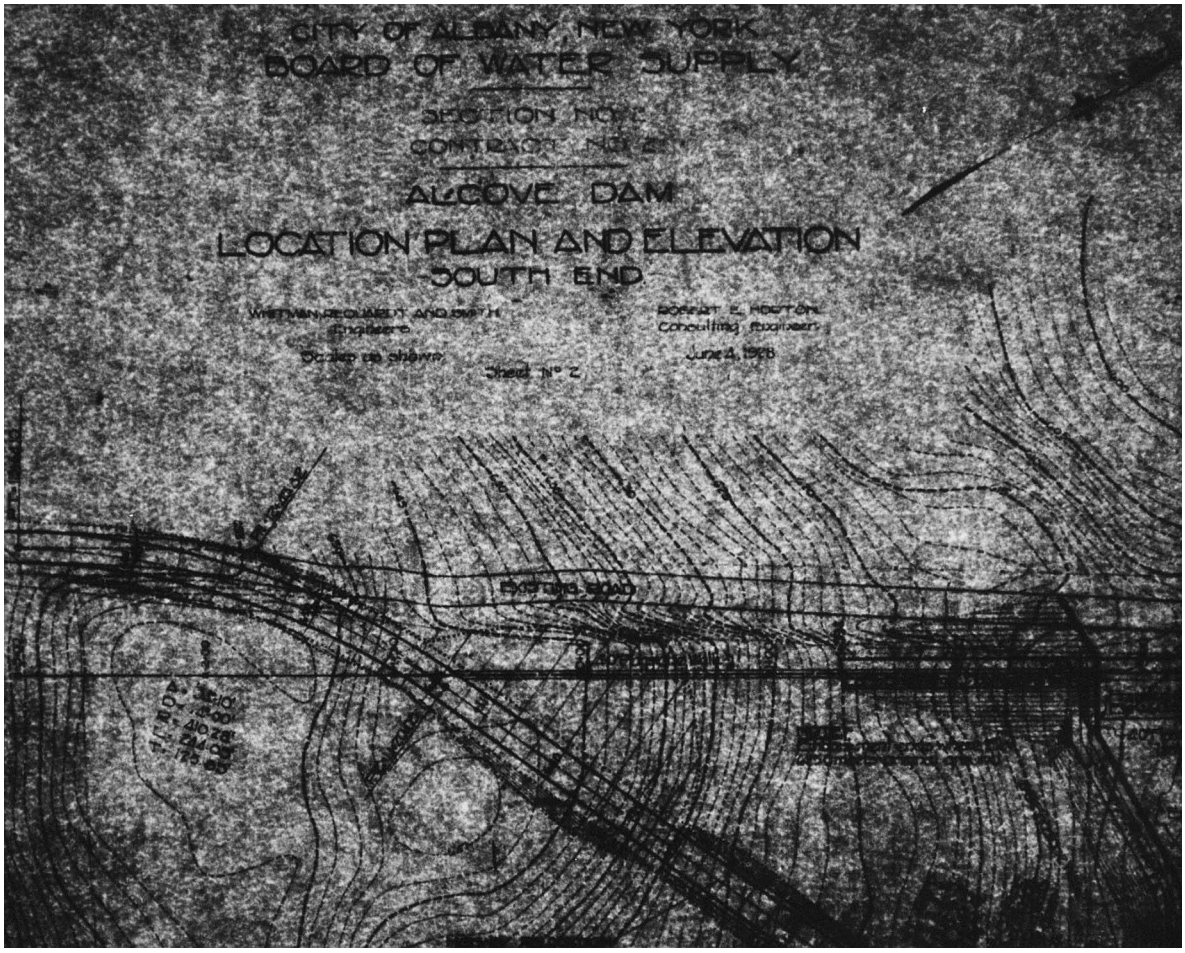
Well No.	Elev. Top of casing	Water Level (ft.) From top of casing	Water Level Elev. in casing	Ground Elev.	Elev. Bottom of casing	Remarks (General Remarks)
1	604.69'	4.15'	~~597.54'~~ 600.54'	601.5'	593.5'	DRY
2	599.04'	3.95'	595.09'	596.1'	583.1'	WET
3	590.46'	15.75'	574.71'	587.8'	554.8'	DRY
4	590.91'	9.73'	581.18'	587.8'	540.8'	WET
5	590.78'	7.83'	582.95'	587.8'	562.8'	DRY
6	599.91'	7.88'	592.03'	596.7'	576.7'	WET
7	605.41'	3.35'	602.06'	602.5'	582.5'	WET
8	611.77'	6.02'	605.75'	608.7'	599.7'	DRY

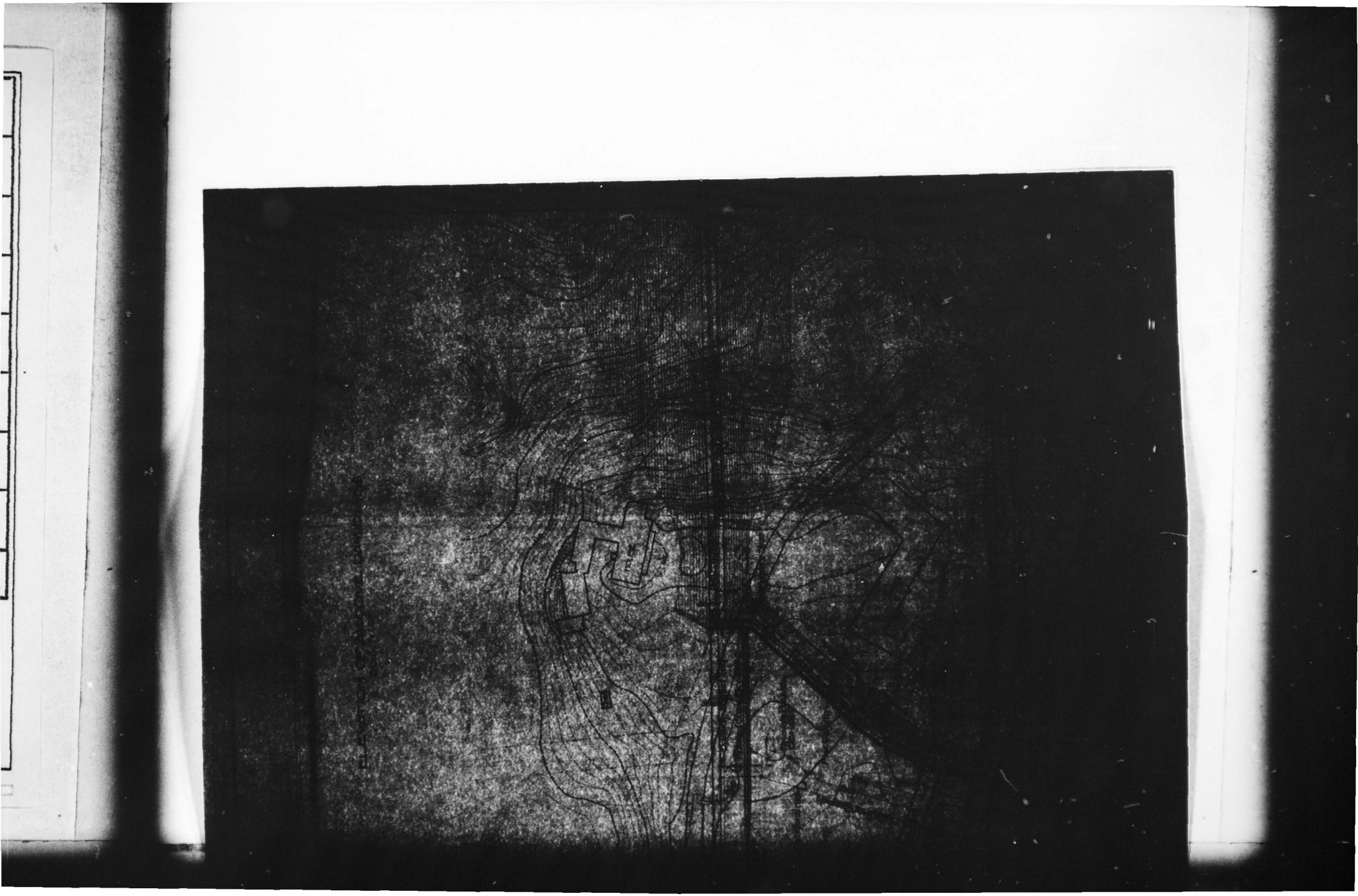
APPENDIX E

CONSTRUCTION DRAWINGS


Basie Creek Dam
Diversion Tunnel


BOARD OF WA
WHITMAN, REQUARDT AND SMITH
Engineers

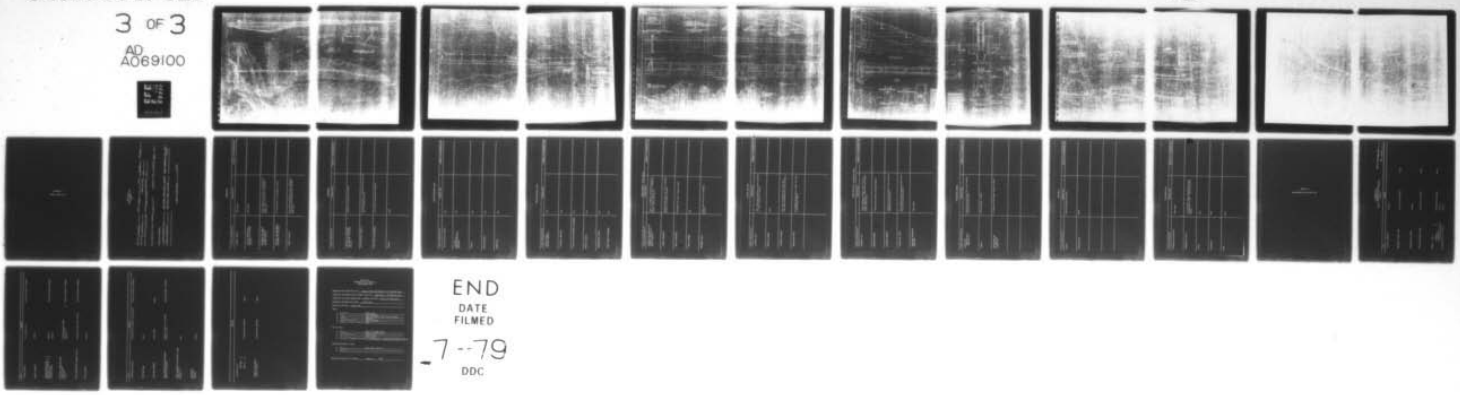

CITY OF ALBANY, NEW YORK
BOARD OF WATER SUPPLY
ALCOVE DAM
LOCATION PLAN AND ELEVATION
SOUTH END
June 4, 1928
Sheet N° 2
EXISTING ROAD



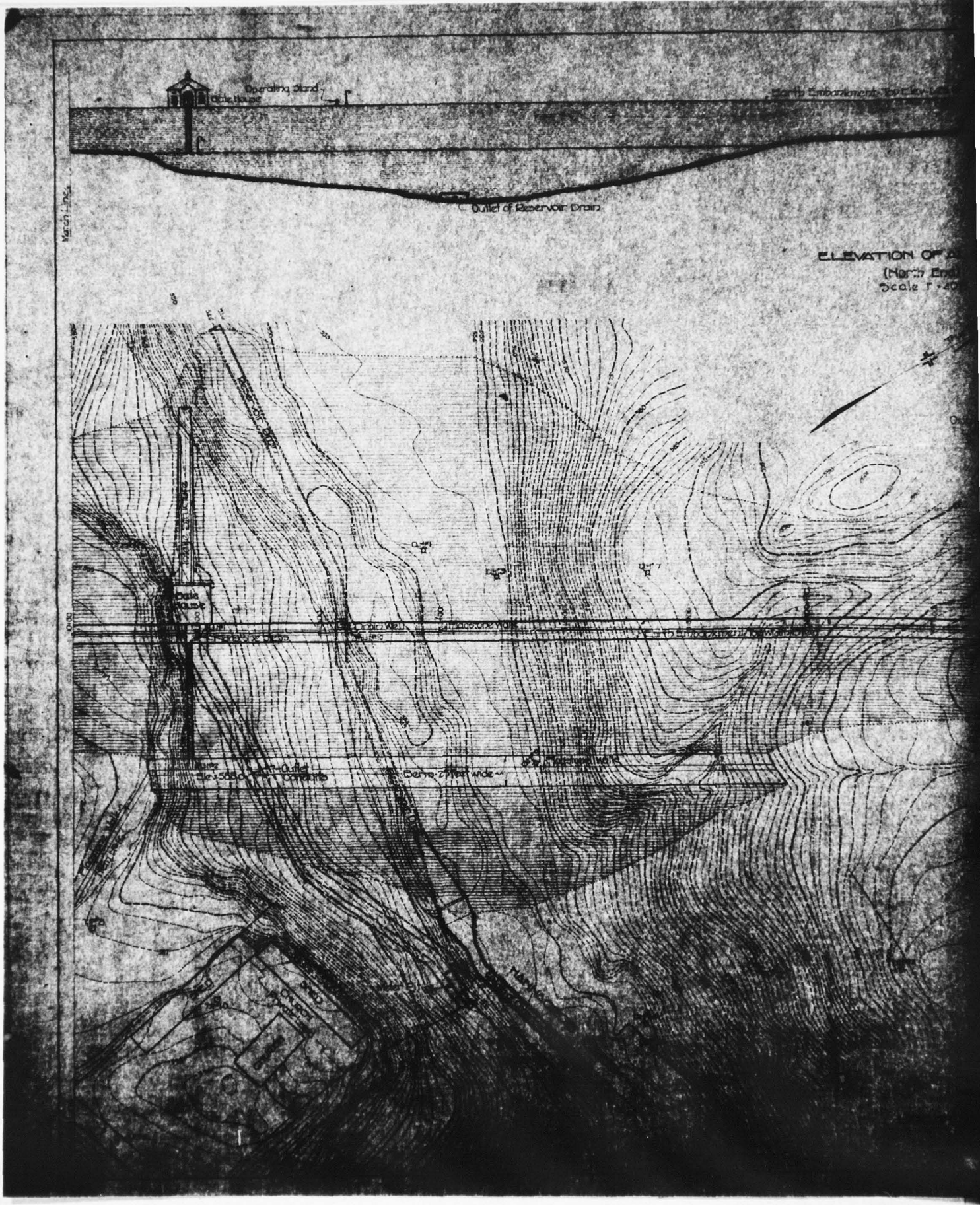
AD-A069 100 KIMBALL (L ROBERT) AND ASSOCIATES EBENSBURG PA F/G 13/2
NATIONAL DAM SAFETY PROGRAM. ALCOVE DAM (INVENTORY NUMBER NY-93--ETC(U)
AUG 78 R J KIMBALL DACW51-78-C-0025

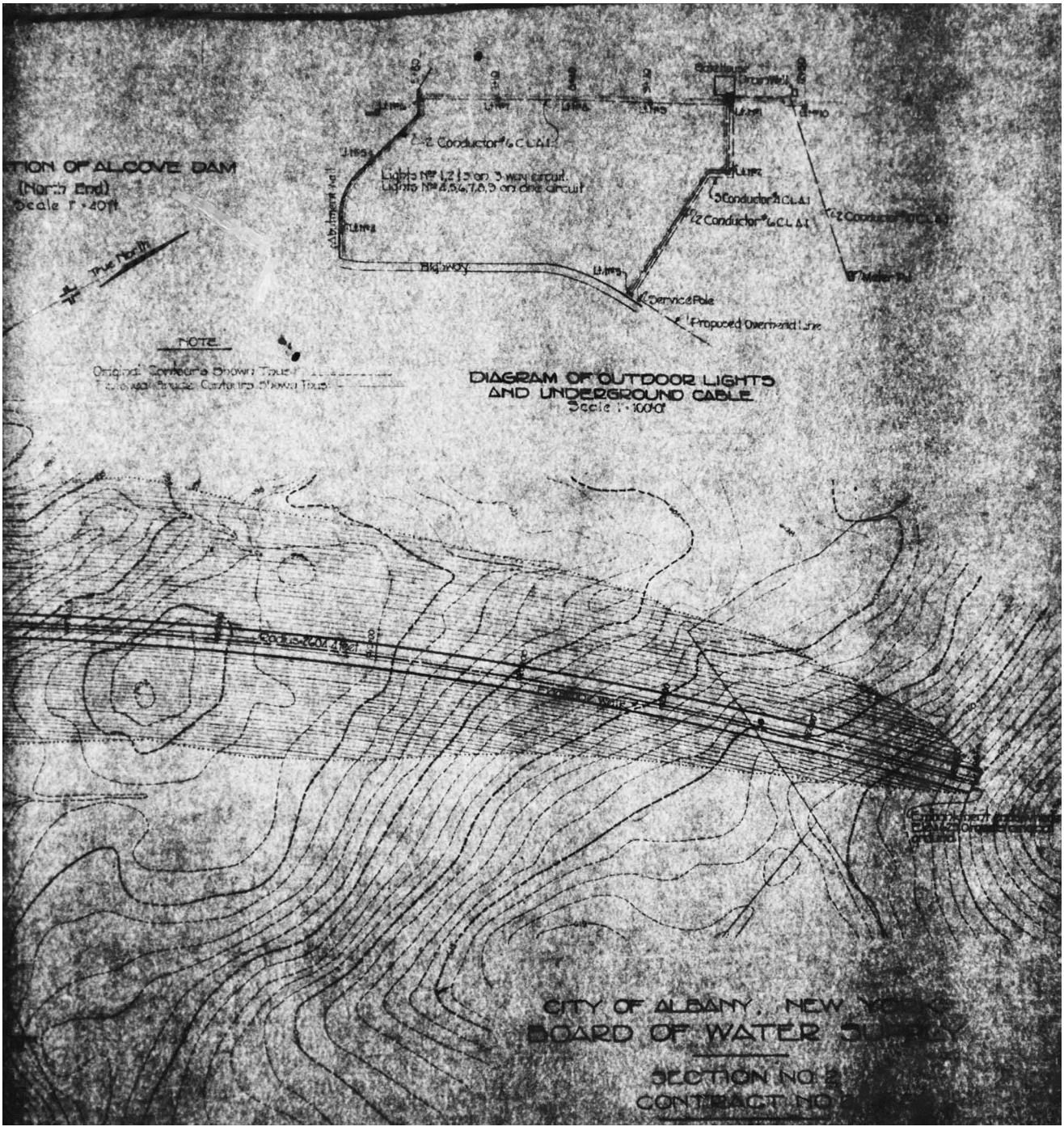
UNCLASSIFIED NL

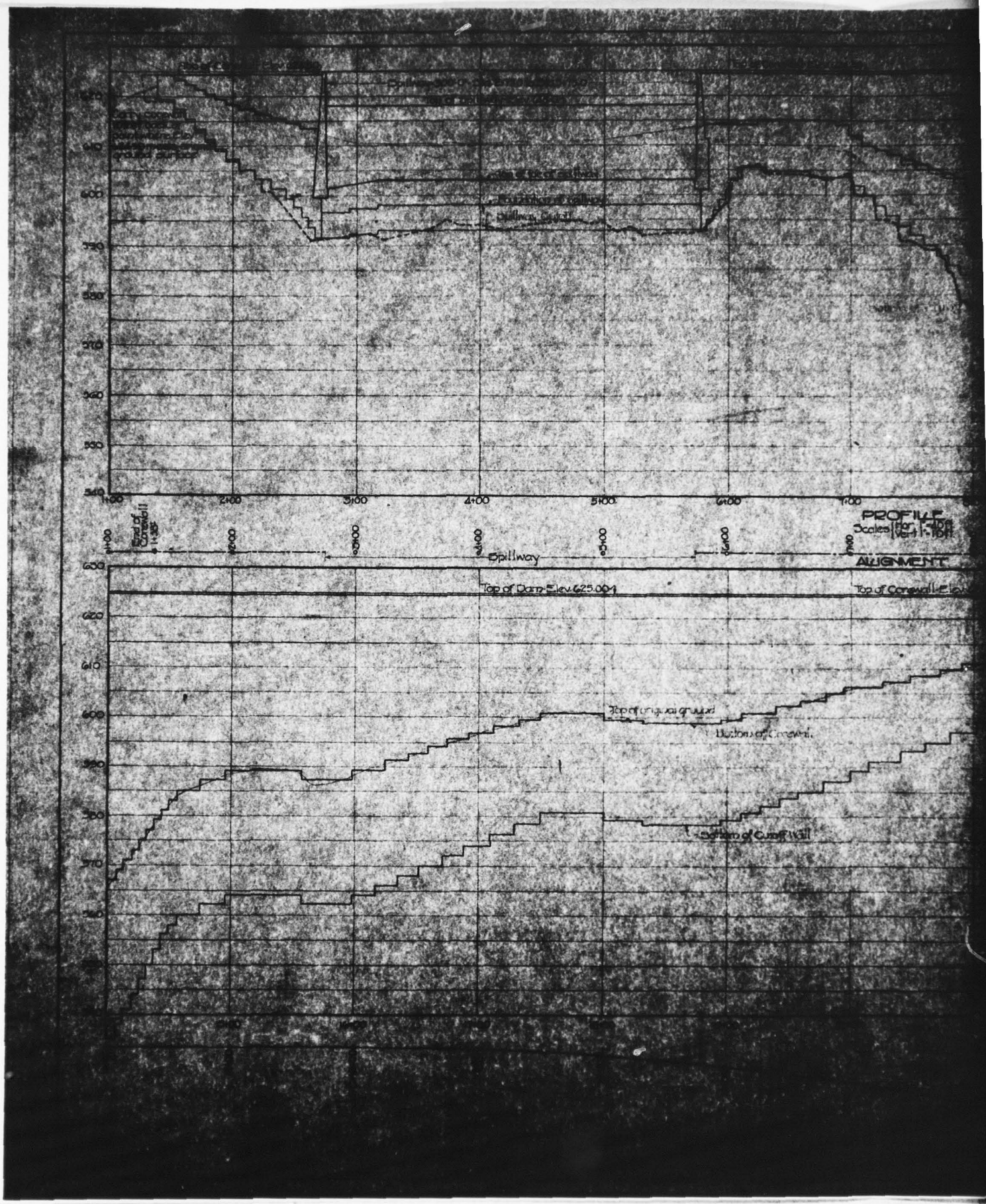
3 OF 3
AD
A069100

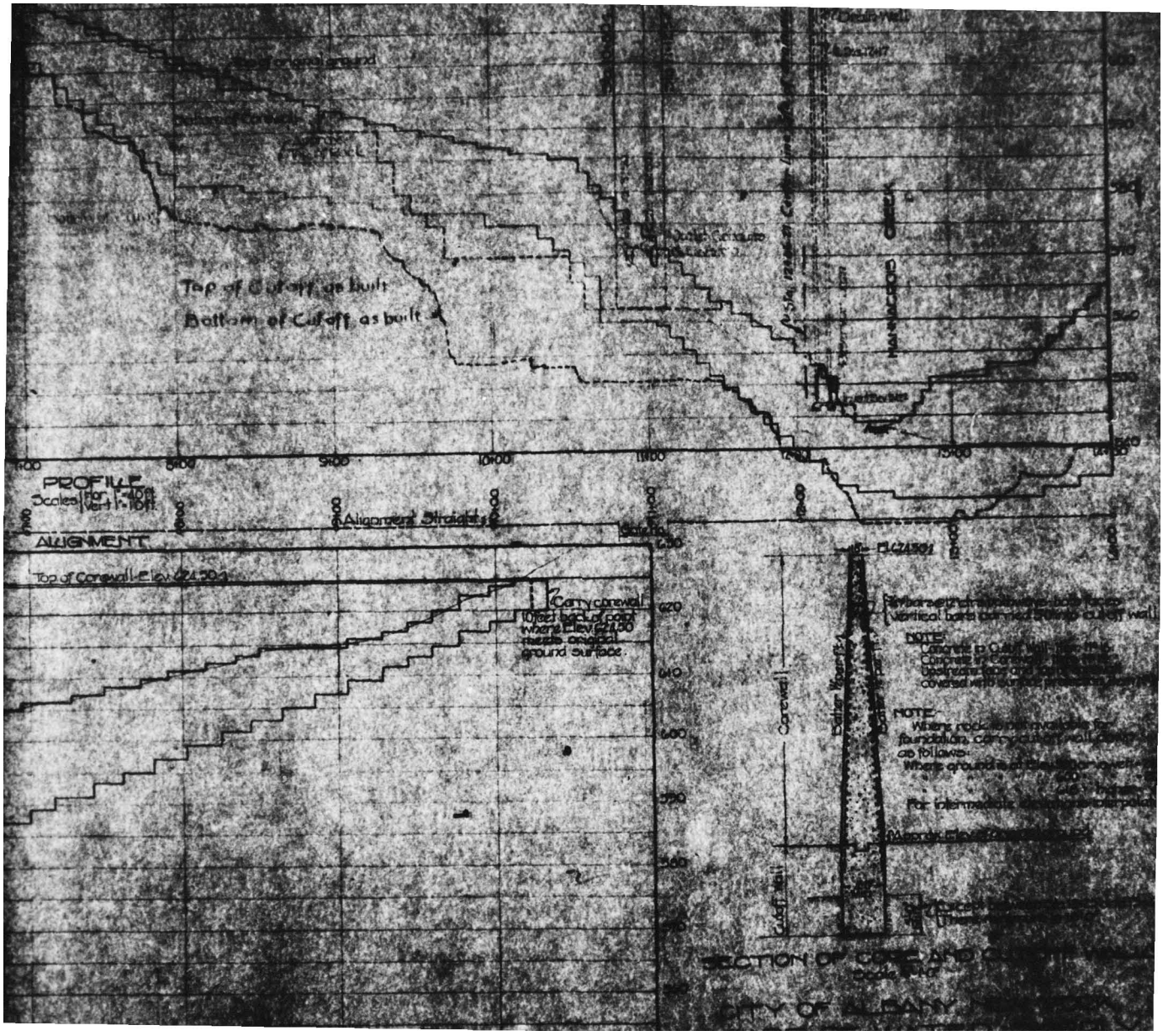


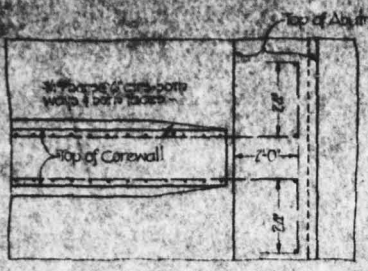
END
DATE
FILMED
7-79
DDC


Operating Stand
Gate House
Outlet of Reservoir Drain
ELEVATION OF
Scale
Gate House
Dam 27 feet wide
Outlet Conduits

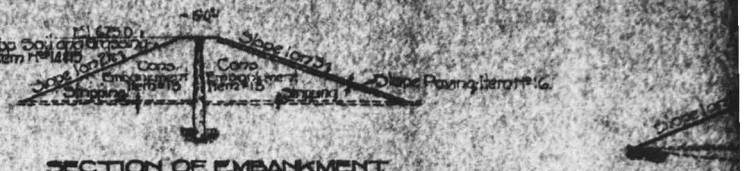

TION OF ALCOVE DAM
(North End)
Scale 1"=40ft.
True North
NOTE
Original Contours Shown Thus:
Proposed Contours Shown Thus:
DIAGRAM OF OUTDOOR LIGHTS
AND UNDERGROUND CABLE
Scale 1"=100ft
2 Conductor #6 C.L.A.I.
Lights Nos 1,2,5 on 3 way circuit.
Lights Nos 4,5,6,7,8,9 on one circuit
3 Conductor #4 C.L.A.I.
2 Conductor #6 C.L.A.I.
Highway
Service Pole
Proposed Overhead Line
Water Pipe
CITY OF ALBANY, NEW YORK
BOARD OF WATER SUPPLY
SECTION NO. 2
CONTRACT NO.


PROFILE
Scales Hor. 1"=100'
Vert. 1"=10'
ALIGNMENT
Spillway
Top of Dam-Elev. 625.00
Top of Cofferdam-Elev.
Top of original ground
Bottom of Cofferdam
Bottom of Cutoff Wall
End of Cofferdam
1+35
1+00
2+00
3+00
4+00
5+00
6+00
7+00
600
620
610
590
580
570
560
550
540

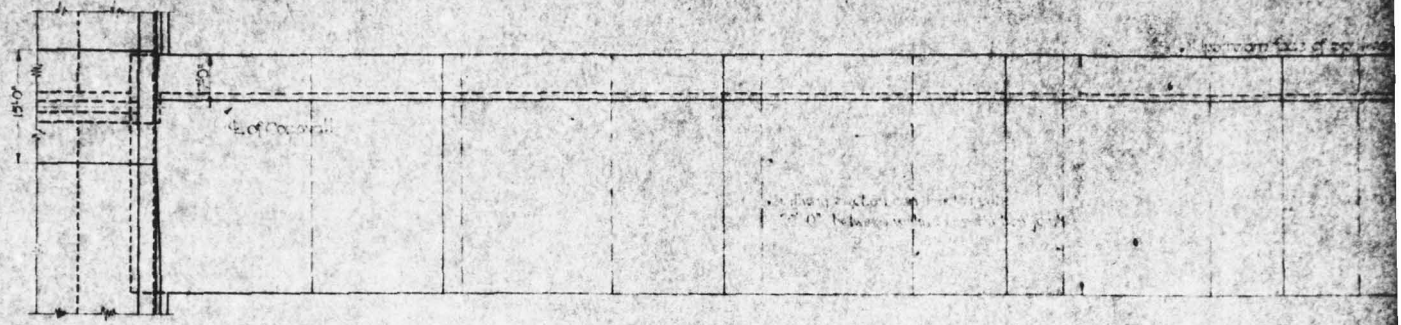

Top of Cutoff as built
Bottom of Cutoff as built
PROFILE
Scales Hor 1"=10ft
Vert 1"=10ft
ALIGNMENT
Top of Corewall Elev 624.30
Carry corewall 10feet below point where Elev is 624.30 towards original ground surface.
Corewall
Cutoff Wall
SECTION OF CORE AND CUTOFF WALL
CITY OF ALBANY



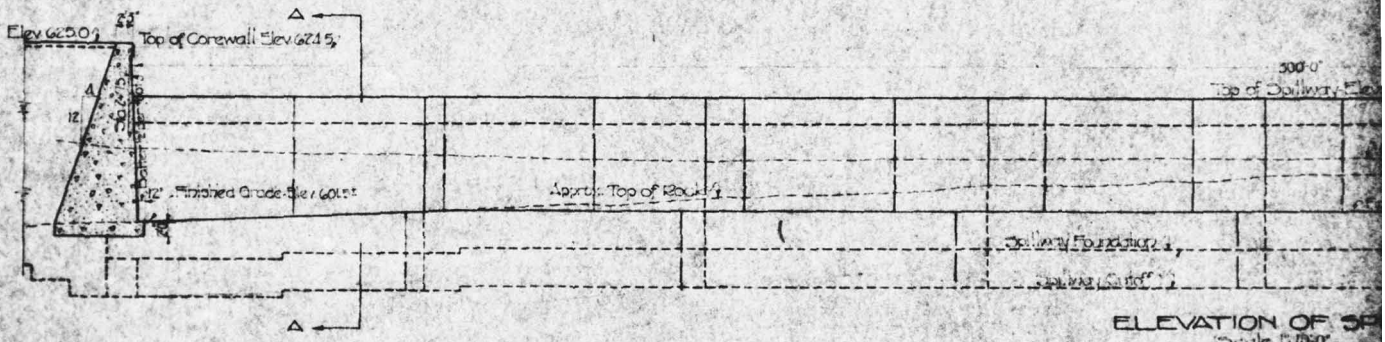
DETAIL SHOWING METHOD OF BENDING COREWALL STEEL INTO ABUTMENT WALLS.
Scale 1/2"=1'-0"



SECTION OF EMBANKMENT AT STATION 18+00.
Scale 1"=30'-0"

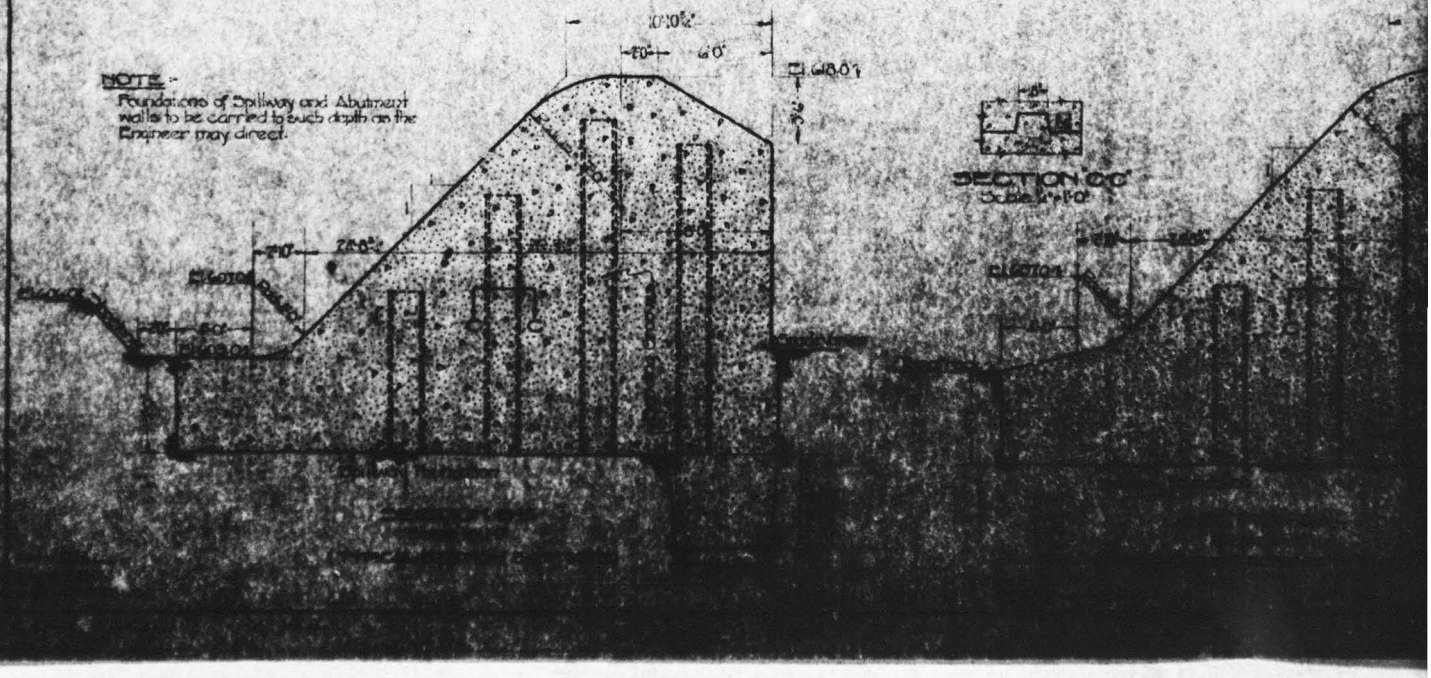


PLAN OF SPILLW
Scale 1"=10'-0"

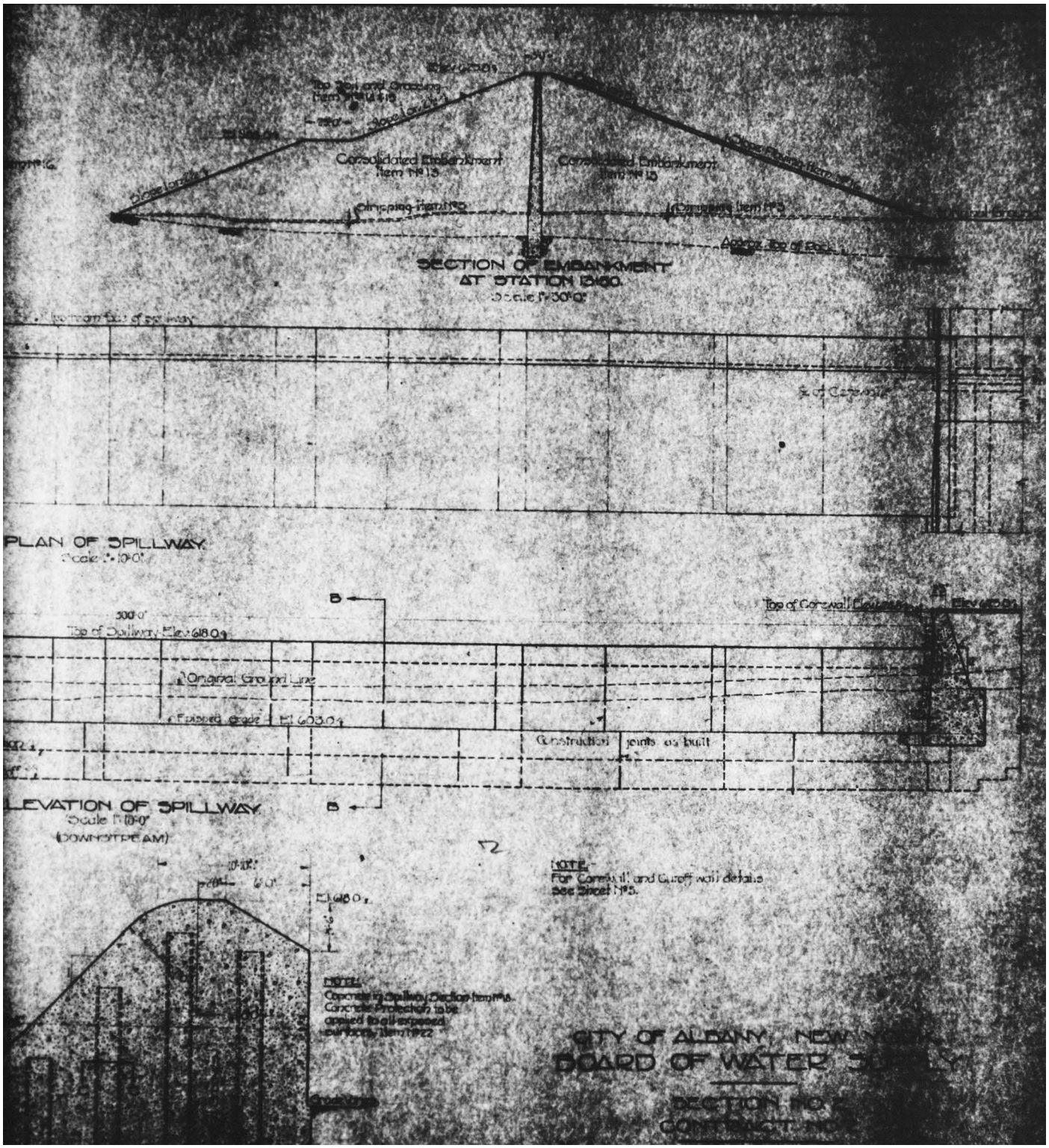


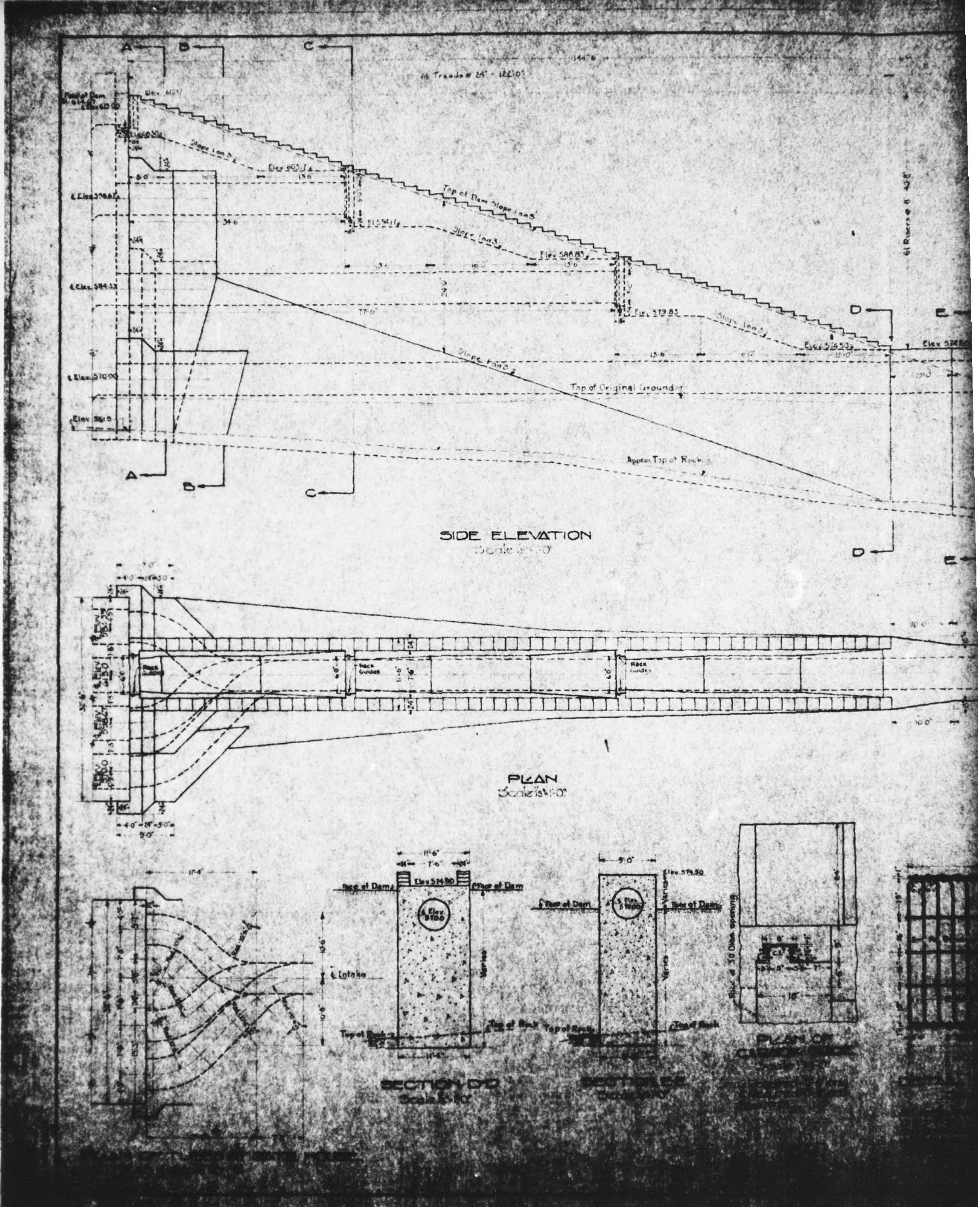
ELEVATION OF SP
Scale 1"=10'-0"
(DOWNSTREAM)

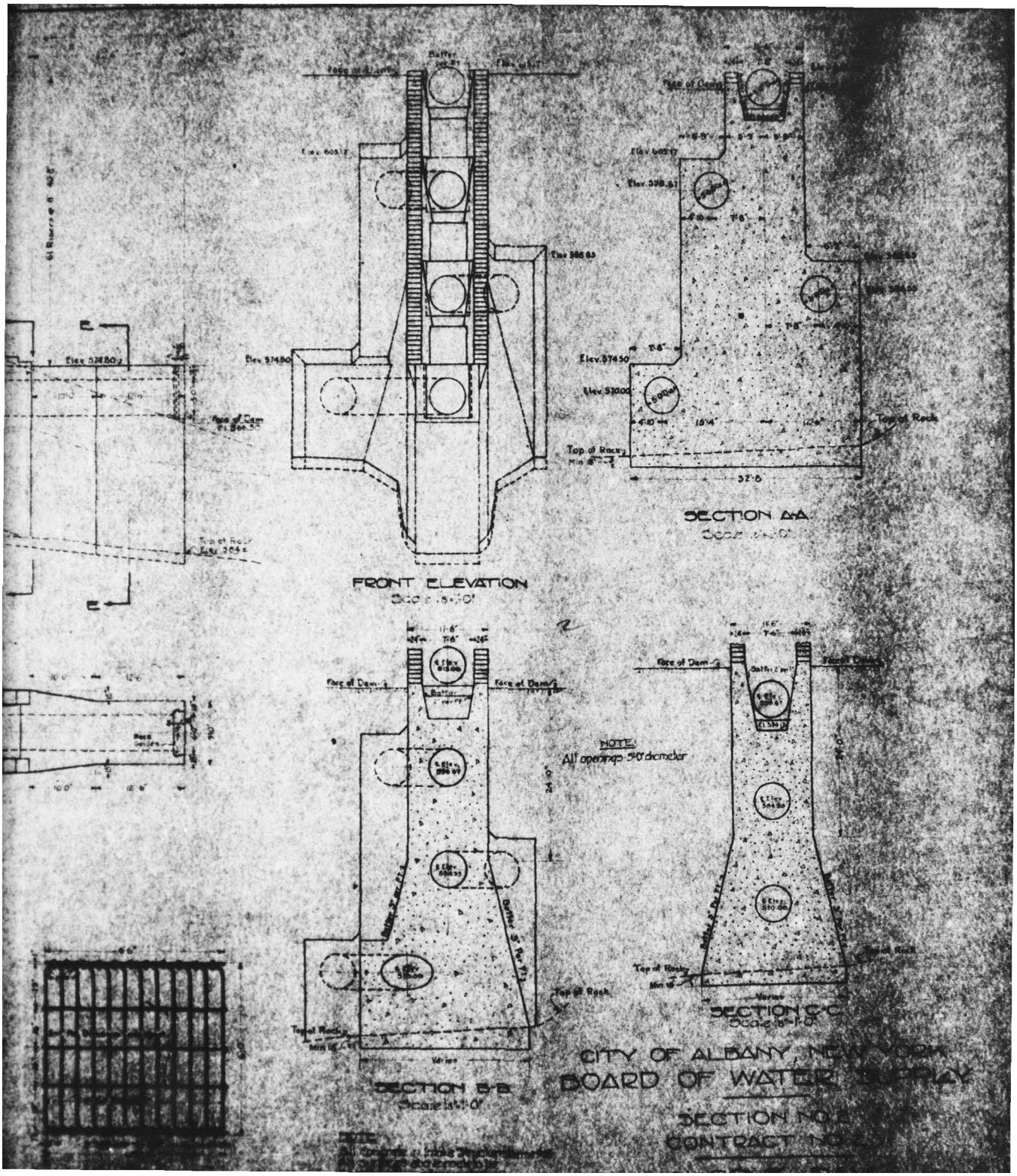
NOTE:-
Foundations of Spillway and Abutment walls to be carried to such depth as the Engineer may direct.

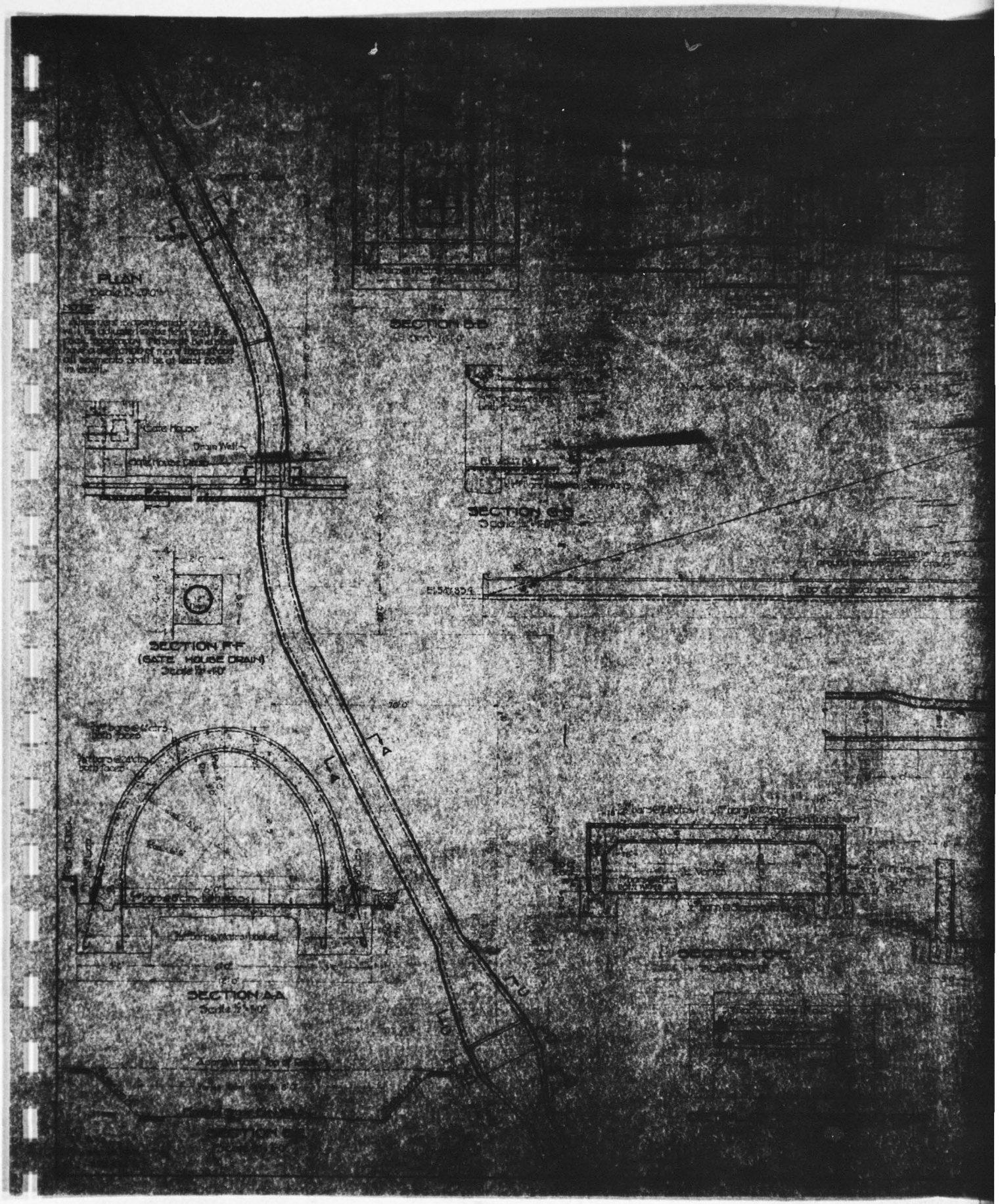


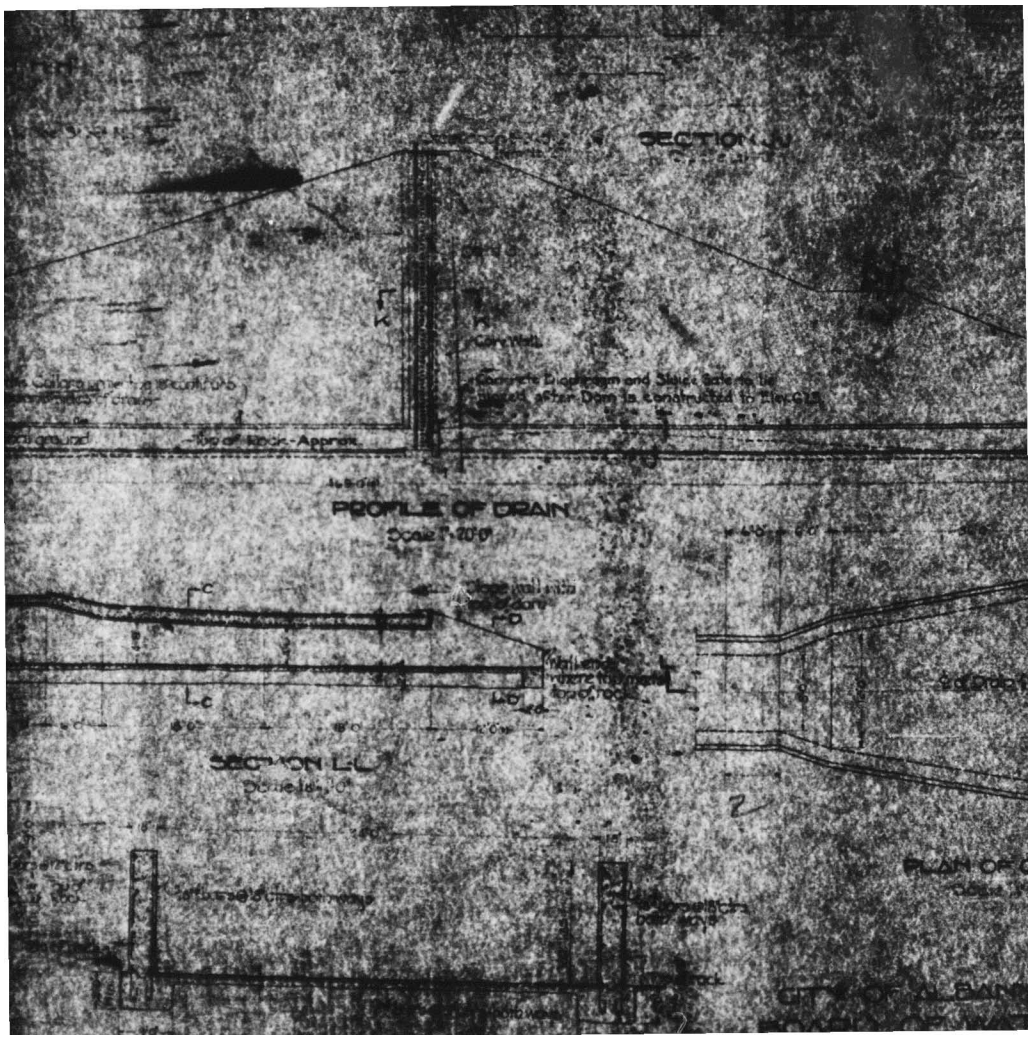
SECTION CC
Scale 1"=10'-0"

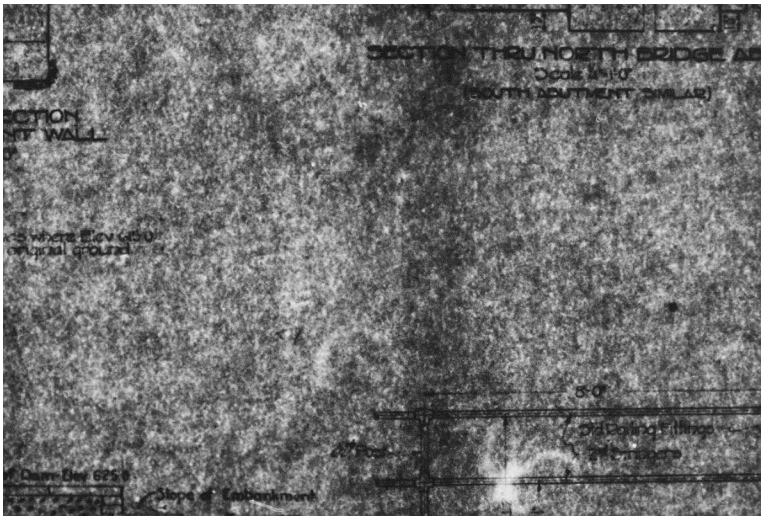

Consolidated Embankment
Item No 13
Consolidated Embankment
Item No 13
Clearing Item No 2
Clearing Item No 2
Approx Toe of Rock
SECTION OF EMBANKMENT
AT STATION 13+60.
Scale 1"=30'-0"
PLAN OF SPILLWAY.
Scale 1"=10'-0"
300'-0"
Toe of Spillway, Elev 618.0
Original Ground Line
Finished Grade
Construction joints as built
ELEVATION OF SPILLWAY.
Scale 1"=10'-0"
(DOWNSTREAM)
NOTE:
For Cofferdam and Cutoff wall details
see Sheet No 5.
NOTE:
Concrete Protection table
CITY OF ALBANY, NEW
BOARD OF WATER


61 Treads @ 24" = 122'-0"
Top of Dam Slope 1 on 3
Slope 1 on 3
Elev. 588.83
Elev. 579.83
Elev. 576.50
Elev. 584.33
Elev. 570.00
Elev. 561.5
Top of Original Ground
Approx. Top of Rock
61 Risers @ 8" = 40'-8"
SIDE ELEVATION
Rack Guides
PLAN
Face of Dam
Elev 574.80
Elev. 574.50
Top of Rock
Intake
Varies
SECTION D-D


FRONT ELEVATION
SECTION A-A
SECTION B-B
SECTION C-C
NOTE:
All openings 5'-0" diameter
CITY OF ALBANY, NEW YORK
BOARD OF WATER SUPPLY
SECTION NO.
CONTRACT NO.


PLAN
Gate House
Drain Well
SECTION F-F
(GATE HOUSE DRAIN)
SECTION A-A
SECTION B-B
SECTION C-C


PROFILE OF DRAIN
Scale 1"=20'-0"
SECTION L-C
Scale 1/8"=1'-0"


SECTION THRU NORTH BRIDGE AB
Scale 1/4"=1'-0"
(SOUTH ABUTMENT SIMILAR)
6'-0"
Slope of Embankment

APPENDIX F

VISUAL CHECK LIST

CHECK LIST
VISUAL INSPECTION
PHASE I

NAME DAM Alcove Dam COUNTY Albany STATE New York ID# NY 93

TYPE OF DAM Earthfill HAZARD CATEGORY High

DATE(s) INSPECTION June 15, 1978 WEATHER clear, cool, windy TEMPERATURE 65°

POOL ELEVATION AT TIME OF INSPECTION 617.2 M.S.L. TAILWATER AT TIME OF INSPECTION None M.S.L.

INSPECTION PERSONNEL:

R. Jeffrey Kimball, P.E.
Steve Cowan - Deputy Comm. - ADW &WS
Steve Alexander, P.E. - Smith & Mahoney
James T. Hockensmith
Dave Bruno - Comm. - ADW & WS

James T. Hockensmith RECORDER

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None noted	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None noted	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Minor amounts of erosion on downstream slope. Tree covered on downstream below berm.	
VERTICAL AND HORIZONTAL ALINEMENT OF THE CREST	No settlement or misalignment noted.	
RIPRAP FAILURES	None noted throughout entire embankment except for some missing near spillway wing walls.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Appears to be good and stable	
ANY NOTICEABLE SEEPAGE	No seepage noted. A damp area near end of berm on south abutment.	
STAFF GAGE AND RECORDER	Pool level continuously recorded.	
DRAINS	None	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	N/A	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	N/A	
DRAINS	N/A	
WATER PASSAGES	N/A	
FOUNDATION	N/A	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	N/A	
STRUCTURAL CRACKING	N/A	
VERTICAL AND HORIZONTAL ALIGNMENT	N/A	
MONOLITH JOINTS	N/A	
CONSTRUCTION JOINTS	N/A	
STAFF GAGE OF RECORDER:	N/A	

OUTLET WORKS - Water Supply

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Four - 5' diameter intakes which flow into two water supply line - unobserved pipes. Valves operative.	
INTAKE STRUCTURE	Control tower with four 5 foot diameter intakes at different levels.	
OUTLET STRUCTURE	Discharge into water supply system.	
OUTLET CHANNEL	None	
EMERGENCY GATE	Lowest gate can act as emergency blowoff.	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	300' long ogee spillway in good condition. V. Minor spalling of gunite	
APPROACH CHANNEL	None	
DISCHARGE CHANNEL	300' wide converging into 120' wide rock bottom channel with concrete walls.	
BRIDGE AND PIERS	One highway bridge which should not have a restricting effect.	

GATED SPILLWAY - Emergency Drain

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	4'x4' concrete conduit can be used to drain reservoir - reportedly not opened since construction.	
APPROACH CHANNEL	Sluice gate operated through manhole	
DISCHARGE CHANNEL	Fairly narrow and partially tree covered immediately downstream.	
BRIDGE AND PIERS	One highway bridge downstream which will have to restricting effect.	
GATES AND OPERATION EQUIPMENT	Sluice gate	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Fairly narrow and partially tree covered immediately downstream	
SLOPES	Gently rolling - stable	
APPROXIMATE NO. OF HOMES AND POPULATION	75 homes and 300 people within 3 miles	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Gently rolling and stable	
SEDIMENTATION	Minor	

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None known	
OBSERVATION WELLS	8 observation wells installed on downstream berm in 1975. Wells read twice weekly.	
WEIRS	None	
PIEZOMETERS	None	
OTHER	None	

APPENDIX G

ENGINEERING DATA CHECK LIST

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Alcove Dam

ID# NY 93

ITEM	REMARKS	
AS-BUILT DRAWINGS	Unknown	
REGIONAL VICINITY MAP	Construction Drawings	Owner
CONSTRUCTION HISTORY	Unknown	
TYPICAL SECTIONS OF DAM	Construction Drawings	Owner
OUTLETS - PLAN	Construction Drawings	Owner
- DETAILS		
- CONSTRAINTS	Unknown	
- DISCHANCE RATINGS		
RAINFALL/RESERVOIR RECORDS	Unknown	

ITEM	REMARKS	
DESIGN REPORTS	Pre-construction	Owner and Smith & Mahoney
GEOLOGY REPORTS	Unknown	
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY	Reports	Owner and Smith & Mahoney
SEEPAGE STUDIES	Unknown	
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Construction Drawings Design Report Unknown	Owner and Smith & Mahoney
POST-CONSTRUCTION SURVEYS OF DAM	Inspections and soils reports	Owner and Smith & Mahoney
BORROW SOURCES	Unknown	

ITEM	REMARKS	
MONITORING SYSTEMS	Construction Drawings for Monitors	Owner and Smith & Mahoney
MODIFICATIONS	None	
HIGH POOL RECORDS	Strip Chart	Owner
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Several reports on spillway, monitors, etc.	Owner and Smith & Mahoney
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None	
MAINTENANCE OPERATION RECORDS	Unknown	

REMARKS		
SPILLWAY PLAN SECTIONS DETAILS	Construction Drawings	Owner
OPERATING EQUIPMENT PLANS & DETAILS	Construction Drawings	Owner

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Gentle slopes and wooded - 32.5 square miles

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 618.0 feet - 37,000 acre-feet

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 625.0'- 47,600 ac-ft.

ELEVATION MAXIMUM DESIGN POOL: 624.18 feet

ELEVATION TOP DAM: 625.0 feet

CREST:

a.	Elevation	618.0 feet
b.	Type	Concrete ogee
c.	Width	Ogee section 2' weir - see drawings
d.	Length	300 feet
e.	Location Spillover	Right abutment
f.	Number and Type of Gates	None

OUTLET WORKS:

a.	Type	Two - 42" steel pipes
b.	Location	Center of embankment
c.	Entrance inverts	568.25 feet
d.	Exit inverts	548.00 feet
e.	Emergency draindown facilities	4 foot tunnel - operability of gates unknown

HYDROMETEOROLOGICAL GAGES:

a.	Type	Rain gage - near by
b.	Location	
c.	Records	

MAXIMUM NON-DAMAGING DISCHARGE 2,400 cfs 1936