REPORT NO. 2

ULTIMATE HEAT SINK SEDIMENTATION MONITORING PROGRAM

Illinois Power Co.
Clinton Power Station
Clinton, Illinois

Prepared
by

Homer L. Chastain & Associates
Decatur, Illinois
October 1980

Ultimate Heat Sink Sedimentation Monitoring Program

Abstract:

Illinois Power Company has established a program to monitor the amount of sediment build-up on the bottom of the Ultimate Heat Sink (UHS) at the Clinton Power Station. This program calls for annual surveys to measure the sediment build-up. The first such survey was made during November 1979. A detailed outline of the procedures used in conducting this program has been outlined in report Number 1. The second annual survey was made during October 1980. Copies of the field notes and calculations for the October 1980 survey are included in the following pages of this report.

Summary of Findings:

Report No. 1 concluded that no significant measurable amount of silt build-up had occurred in the Ultimate Heat Sink from the date of impoundment to November 1979. The data from the October 1980 survey show that an average of approximately 0.2 feet of silt build-up has occurred between November 1979 and October 1980.

The average bottom elevation for the 30 survey locations being monitored was 667.7 feet for both the initial and November 1979 surveys. The average bottom elevation for the October 1980 survey was 667.9 feet. Based on a top of pool elevation of 675.0 feet for the UHS, this

0.2 foot difference constitutes a silt volume equal to 2.7% of the total initial volume of the UHS.

675.0' - 667.7' = 7.3' Ave. Depth
0.2' ÷ 7.3' = 2.7%

HOMER L. CHASTAIN & ASSOCIATES
CONSULTING ENGINEERS
5 North Country Club Road Decatur, Illinois 62521

SUBJECT UHS SILTATION STUDY
CLINTON POWER STATION
PROJECT 2979

DATE 1-20-80 PREP. BY J.L.R. CHKD. BY DS

SHEET 1 OF 1

TABULATION OF BOTTOM OF UHS ELEVATIONS

POINT NO	INITIAL ELEV. FROM AERIALS	ELEV. FROM 11-79 SURVEY	ELEV. FROM 10-80 SURVEY	10-80 ELEV. MINUS INITIAL ELEV.	10-80 ELEV. MINUS 11-79 ELEV.	REMARKS
1	667.5	667.1	666.8	-0.7	-0.3	
2	668.8	668.4	668.2	-0.6	-0.2	
3	669.8	667.5	667.4	-2.4	-0.1	
4	668.3	668.3	668.0	-0.3	-0.3	
5	667.5	667.8	667.4	-0.1	-0.4	
6	670.1	667.9	667.9	-2.2	0	
7	668.0	667.8	667.9	-0.1	+0.1	
8	667.9	667.0	667.1	-0.8	+0.1	
9	668.0	668.0	667.1	-0.9	-0.9	
10	667.6	668.3	668.4	+0.8	+0.1	
11	668.2	668.0	668.4	+0.2	+0.4	
12	667.8	667.6	667.8	0	+0.2	
13	668.2	668.0	668.1	-0.1	+0.1	
14	668.3	667.9	667.9	-0.4	0	
15	668.0	667.9	668.0	0	+0.1	
16	668.8	668.0	668.2	-0.6	+0.2	
17	668.0	668.4	668.9	+0.9	+0.5	
18	665.4	667.5	667.2	+1.8	-0.3	
19	667.0	668.1	668.7	+1.7	+0.6	
20	667.8	667.5	667.8	0	+0.3	
21	668.0	667.4	667.7	-0.3	+0.3	
22	664.8	665.8	665.9	+1.1	+0.1	
23	666.7	667.3	667.6	+0.9	+0.3	
24	667.4	667.9	668.4	+1.0	+0.5	
25	667.5	668.0	668.3	+0.8	+0.3	
26	667.7	668.2	667.9	+0.2	-0.3	
27	667.6	668.0	668.0	+0.4	0	
28	668.4	668.5	668.9	+0.5	+0.4	
29	665.2	664.8	667.1	+1.9	+2.3	
30	667.2	668.3	668.8	+1.6	+0.5	
AVE. ELEV.	667.7	667.7	667.9			

FIELD SURVEY NOTES FOR OCT. 1980 SURVEY

PROJ.
2979

LIHS SILT STUDY
CLINTON

JOB October 2, 1990 Heat Sink

DATE Salt Study PAGE

Water Elev.

				21	
B.M. "SW"				734.22	B.M. "SW"
	4.97	739.19 / 739.19			
			16.11	723.07 / 723.08	
	0.32	723.39 / 723.40			
			15.83	707.56 / 707.57	
	0.43	707.99 / 708.00			
			11.00	696.99 / 697.00	
	4.38	701.37 / 701.38			
Top Water			11.55	689.82 / 689.83	
SH-3			2.51	698.86 / 698.87	Top I.P. @ Screen House Point #3
	11.10	709.96 / 709.97			
			0.48	709.48 / 709.49	
	13.94	723.42 / 723.43			
			0.67	722.73 / 722.74	
	13.78	736.51 / 736.52			
P.T. "A"			1.51	735.00 / 735.01	735.02 PT "A" chiseled "X" on concrete slab

error = .02

SEE P. 9 THIS BOOK

GLW

PARTY CHIEF .....

WEATHER .....

JOB Watkins-Cunningham-Kilgore-Kelley

DATE Oct 2, 1990 PAGE 20

PARTY CHIEF .....

WEATHER .....

JOB

DATE PAGE

PT No	DEPTH	HI	ELEV
1	23.0	689.8	666.8
2	21.6		668.2
3	22.4		667.4
4	21.8		668.0
5	22.4		667.4
6	21.9		667.9
7	21.9		667.9
8	22.7		667.1
9	22.7		667.1
10			
11			
12	22.0		667.8
13	21.7		668.1
14	21.9		667.9
15	21.8		668.0
16	21.6		668.2
17			

PARTY CHIEF

WEATHER

JOB SAMEE CREW

DATE 10-9-80 PAGE 21

TOP OF WATER ELEV = 689.8

GLW

PARTY CHIEF

WEATHER

JOB Oct. 10, 1980 Heat Sink

DATE Silt Study PAGE

Water Elev.

B.M SH-3				698.~~87~~ 86	
	2.70	701.~~57~~ 56			
Top Water			11.69	639.~~88~~ 87	
	11.64	701.~~52~~ 51			
B.M. SH-3			2.65	698.~~87~~ 86	698.~~87~~ 86
			error:	0.00	

PARTY CHIEF

WEATHER

JOB [illegible]

DATE Phelps-Kelley PAGE 22

Oct 10, 1980

B.M 4-3 see page 20 this Book

B.M SH-3

GLW

PARTY CHIEF

WEATHER

JOB Heat Sink Silt Study

DATE Water Depth PAGE

Pt No	Depth	HI	ELEV
17	21.0'	689.9	668.9
18	22.7'		667.2
19	21.2'		668.7
20	22.1'		667.8
21	22.2'		667.7
22	24.0'		665.9
23	22.3'		667.6
24	21.5'		668.4
25	21.6'		668.3
26	22.0'		667.9
27	21.9		668.0
28	21.0'		668.9
29	22.8'		667.1
30	21.1'		668.8
10	21.5'		668.4
11	21.5		668.4

PARTY CHIEF

WEATHER

JOB Same Crew

DATE Oct 19, 1880 PAGE 23

Water Elev = 689.~~88~~ 87

GLW

PARTY CHIEF

WEATHER

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING
ROCK ISLAND, ILLINOIS 61201

REPLY TO
ATTENTION OF:

NCROD-S-070-0X6-1-08220Z

19 NOV 1980

Mr. Jene L. Robinson
Illinois Power Company
500 South 27th Street
Decatur, Illinois 62525

Dear Mr. Robinson:

Inclosed is a Department of the Army permit authorizing work in conjunction with the placement of a revetment mat along the North Fork of Salt Creek near Clinton, Illinois.

Also inclosed is a "Notice of Authorization" which must be posted at the project site.

If any material change in the plans or the work authorized herein is found to be necessary, revised plans must be submitted to this office for the District Engineer's approval before work thereon is begun. A representative of this office will make periodic inspections of the work.

The cooperation you have shown during the processing of your permit is appreciated.

Should you have any questions pertaining to your permit or if we can be of assistance in any of your future projects, please contact our Regulatory Functions Branch by letter, or telephone Mr. Cecil Deitrich, 309/788-6361, extension 213.

Sincerely,

HENRY G. PFIESTER, P.E.
Chief, Operations Division

2 Incl
1. Permit No. 08220Z
2. Notice of Authorization

Copy Furnished:
US Army Corps of Engineers
Peoria Project Office
Foot of Grant Street
Peoria, Illinois 61603 (w/incl 1)

RECEIVED
NOV 24 1980
ENVIRONMENTAL AFFAIRS DEPT.
I. P. C.

Copies Furnished: (Continued)

Mr. Jay C. Henry
Supervisor, Biological Programs
500 South 27th Street
Decatur, Illinois 62525 (w/incl 1)

Mr. David R. Boyce, P.E.
Chief Floodplain Management Engineer
Division of Water Resources
Illinois Department of Transportation
2300 South Dirksen Parkway
Springfield, Illinois 62703

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

NOTICE OF AUTHORIZATION

19 November 1980

A PERMIT TO perform work in conjunction with the placement of a revetment mat along the shoreline of the North Fork of Salt Creek (Clinton Lake) near Clinton, Illinois.

AT Section 22, Township 20 North, Range 3 East in DeWitt County, IL.

HAS BEEN ISSUED TO ILLINOIS POWER COMPANY ON 19 Nov. 1980

ADDRESS OF PERMITTEE 500 South 27th Street, Decatur, Illinois 62525

PERMIT NUMBER NCROD-S-070-0X6-1-0822OZ

PERMIT EXPIRES: 31 December 1983

for the District Engineer

ENG Form 4336
Jul 70

THIS NOTICE MUST BE CONSPICUOUSLY DISPLAYED AT THE SITE OF WORK.

* GPO: 1977 232-98

Application No. NCROD-S-070-0X6-1-08220Z

Name of Applicant Illinois Power Company

Effective Date 19 November 1980

Expiration Date (If applicable) 31 December 1983

DEPARTMENT OF THE ARMY
PERMIT

Referring to written request dated 20 August 1980 for a permit to:

(XX) Perform work in or affecting navigable waters of the United States, upon the recommendation of the Chief of Engineers, pursuant to Section 10 of the Rivers and Harbors Act of March 3, 1899 (33 U.S.C. 403);

(XX) Discharge dredged or fill material into waters of the United States upon the issuance of a permit from the Secretary of the Army acting through the Chief of Engineers pursuant to Section 404 of the Federal Water Pollution Control Act (86 Stat. 816, P.L. 92-500);

( ) Transport dredged material for the purpose of dumping it into ocean waters upon the issuance of a permit from the Secretary of the Army acting through the Chief of Engineers pursuant to Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (86 Stat. 1052, P.L. 92-532);

Illinois Power Company
500 South 27th Street
Decatur, Illinois 62525

is hereby authorized by the Secretary of the Army:
to perform work in conjunction with the placement of a revetment mat. An 800-foot-long by 36-foot-wide section of shoreline will be shaped to a 3:1 slope and covered with a nylon fabriform mat filled with sand-cement mortar 4 inches thick. The area, from elevation 686 to 695 above m.s.l., will require approximately 330 cubic yards of fill material, slightly over half of which will be below the ordinary high water mark,

along the shoreline of the North Fork of Salt Creek (Clinton Lake)
in

at Section 22, Township 20 North, Range 3 East, near Clinton, DeWitt County, Ill.

in accordance with the plans and drawings attached hereto which are incorporated in and made a part of this permit (on drawings: give file number or other definite identification marks.)

Maps No. 08220Z: Proposed revetment mat south of screenhouse at Clinton Power Station, Sheets 1 through 3.

subject to the following conditions:

I. General Conditions:

a. That all activities identified and authorized herein shall be consistent with the terms and conditions of this permit; and that any activities not specifically identified and authorized herein shall constitute a violation of the terms and conditions of this permit which may result in the modification, suspension or revocation of this permit, in whole or in part, as set forth more specifically in General Conditions j or k hereto, and in the institution of such legal proceedings as the United States Government may consider appropriate, whether or not this permit has been previously modified, suspended or revoked in whole or in part.

b. That all activities authorized herein shall, if they involve, during their construction or operation, any discharge of pollutants into waters of the United States or ocean waters, be at all times consistent with applicable water quality standards, effluent limitations and standards of performance, prohibitions, pretreatment standards and management practices established pursuant to the Federal Water Pollution Control Act of 1972 (P.L. 92-500; 86 Stat. 816), the Marine Protection, Research and Sanctuaries Act of 1972 (P.L. 92-532, 86 Stat. 1052), or pursuant to applicable State and local law.

c. That when the activity authorized herein involves a discharge during its construction or operation, of any pollutant (including dredged or fill material), into waters of the United States, the authorized activity shall, if applicable water quality standards are revised or modified during the term of this permit, be modified, if necessary, to conform with such revised or modified water quality standards within 6 months of the effective date of any revision or modification of water quality standards, or as directed by an implementation plan contained in such revised or modified standards, or within such longer period of time as the District Engineer, in consultation with the Regional Administrator of the Environmental Protection Agency, may determine to be reasonable under the circumstances.

d. That the discharge will not destroy a threatened or endangered species as identified under the Endangered Species Act, or endanger the critical habitat of such species.

e. That the permittee agrees to make every reasonable effort to prosecute the construction or operation of the work authorized herein in a manner so as to minimize any adverse impact on fish, wildlife, and natural environmental values.

f. That the permittee agrees that he will prosecute the construction or work authorized herein in a manner so as to minimize any degradation of water quality.

g. That the permittee shall permit the District Engineer or his authorized representative(s) or designee(s) to make periodic inspections at any time deemed necessary in order to assure that the activity being performed under authority of this permit is in accordance with the terms and conditions prescribed herein.

h. That the permittee shall maintain the structure or work authorized herein in good condition and in accordance with the plans and drawings attached hereto.

i. That this permit does not convey any property rights, either in real estate or material, or any exclusive privileges; and that it does not authorize any injury to property or invasion of rights or any infringement of Federal, State, or local laws or regulations nor does it obviate the requirement to obtain State or local assent required by law for the activity authorized herein.

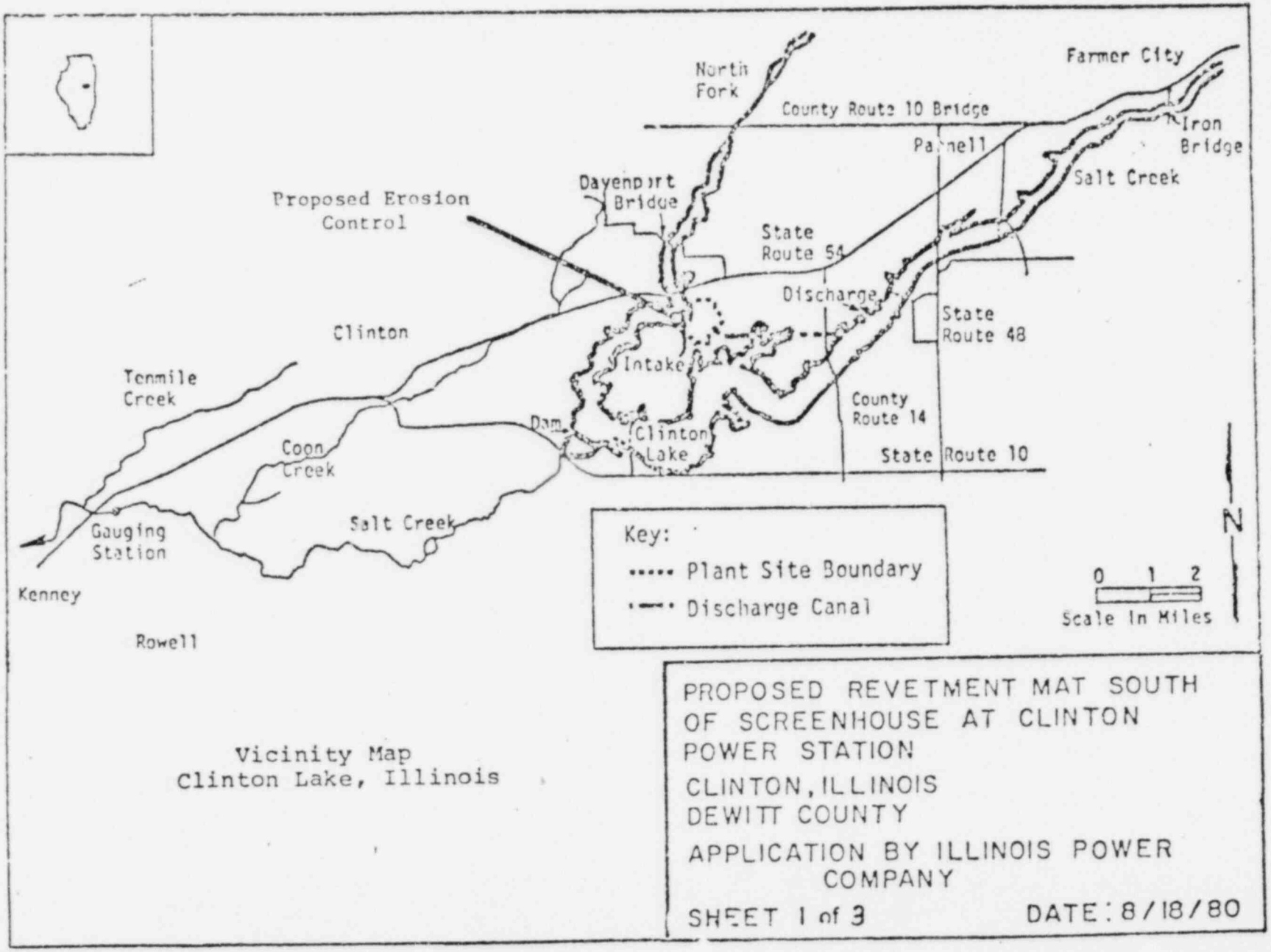
j. That this permit may be summarily suspended, in whole or in part, upon a finding by the District Engineer that immediate suspension of the activity authorized herein would be in the general public interest. Such suspension shall be effective upon receipt by the permittee of a written notice thereof which shall indicate (1) the extent of the suspension, (2) the reasons for this action, and (3) any corrective or preventative measures to be taken by the permittee which are deemed necessary by the District Engineer to abate imminent hazards to the general public interest. The permittee shall take immediate action to comply with the provisions of this notice. Within ten days following receipt of this notice of suspension, the permittee may request a hearing in order to present information relevant to a decision as to whether his permit should be reinstated, modified or revoked. If a hearing is requested, it shall be conducted pursuant to procedures prescribed by the Chief of Engineers. After completion of the hearing, or within a reasonable time after issuance of the suspension notice to the permittee if no hearing is requested, the permit will either be reinstated, modified or revoked.

k. That this permit may be either modified, suspended or revoked in whole or in part if the Secretary of the Army or his authorized representative determines that there has been a violation of any of the terms or conditions of this permit or that such action would otherwise be in the public interest. Any such modification, suspension, or revocation shall become effective 30 days after receipt by the permittee of written notice of such action which shall specify the facts or conduct warranting same unless (1) within the 30-day period the permittee is able to satisfactorily demonstrate that (a) the alleged violation of the terms and the conditions of this permit did not, in fact, occur or (b) the alleged violation was accidental, and the permittee has been operating in compliance with the terms and conditions of the permit and is able to provide satisfactory assurances that future operations shall be in full compliance with the terms and conditions of this permit, or (2) within the aforesaid 30-day period, the permittee requests that a public hearing be held to present oral and written evidence concerning the proposed modification, suspension or revocation. The conduct of this hearing and the procedures for making a final decision either to modify, suspend or revoke this permit in whole or in part shall be pursuant to procedures prescribed by the Chief of Engineers.

l. That in issuing this permit, the Government has relied on the information and data which the permittee has provided in connection with his permit application. If, subsequent to the issuance of this permit, such information and data prove to be false, incomplete or inaccurate, this permit may be modified, suspended or revoked, in whole or in part, and/or the Government may, in addition, institute appropriate legal proceedings.

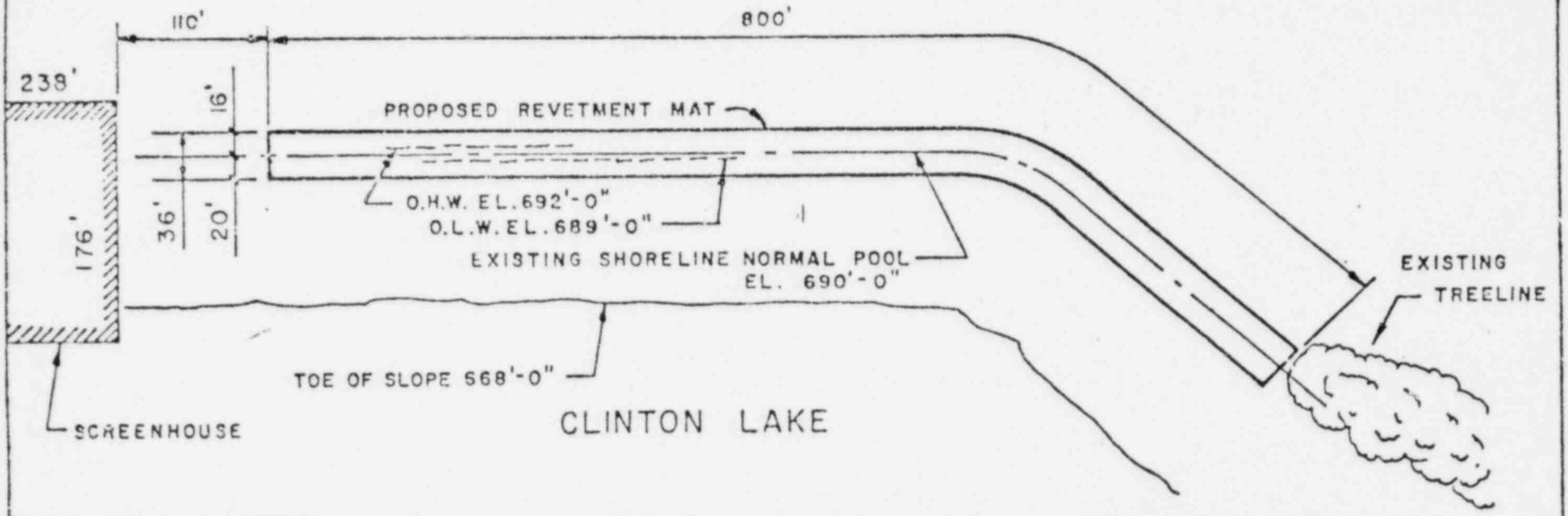
m. That any modification, suspension, or revocation of this permit shall not be the basis for any claim for damages against the United States.

n. That the permittee shall notify the District Engineer at what time the activity authorized herein will be commenced, as far in advance of the time of commencement as the District Engineer may specify, and of any suspension of work, if for a period of more than one week, resumption of work and its completion.



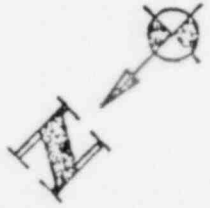
Vicinity Map
Clinton Lake, Illinois

PROPOSED REVETMENT MAT SOUTH OF SCREENHOUSE AT CLINTON POWER STATION
CLINTON, ILLINOIS
DEWITT COUNTY
APPLICATION BY ILLINOIS POWER COMPANY
SHEET 1 of 3 DATE: 8/18/80



NOTES:

1. SLOPES SHALL BE SHAPED TO AN APPROXIMATE 3 to 1 SLOPE USING COMMON CONSTRUCTION EQUIPMENT (DOZER, & FRONT ENDLOADER).
2. APPROXIMATELY 330 CU. YDS. SAND - CEMENT MORTER WILL BE USED IN ALL REVETMENT WORK.
3. DATUM IS N.G.V.D. of 1929
4. PURPOSE IS TO ELIMINATE SOIL EROSION AND PROVIDE SURFACE FOR WAVE ACTION

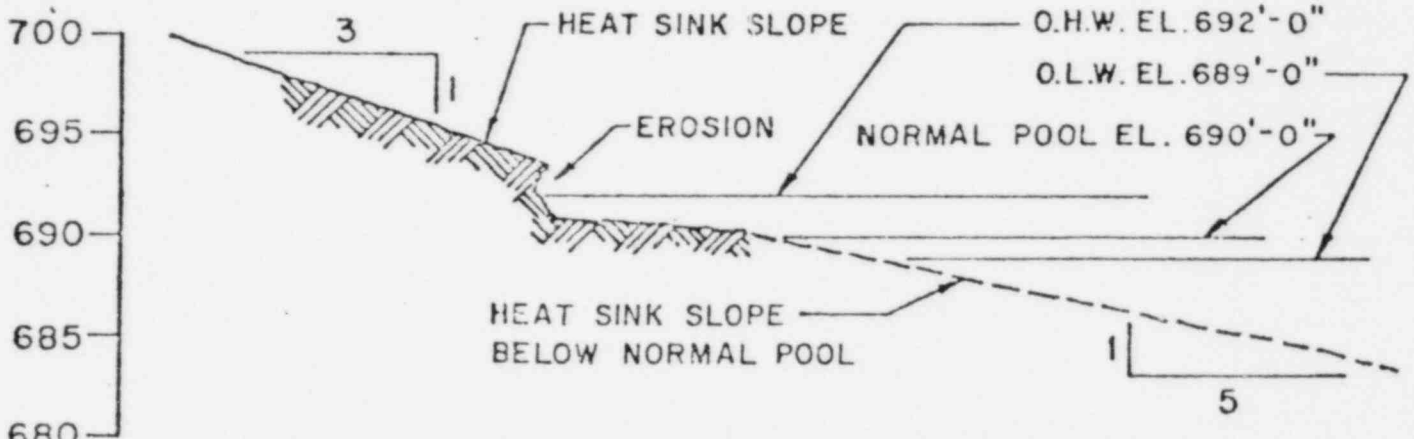


PLAN

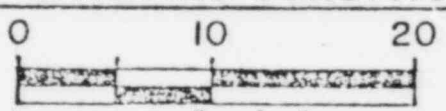
0 40 80 120 240

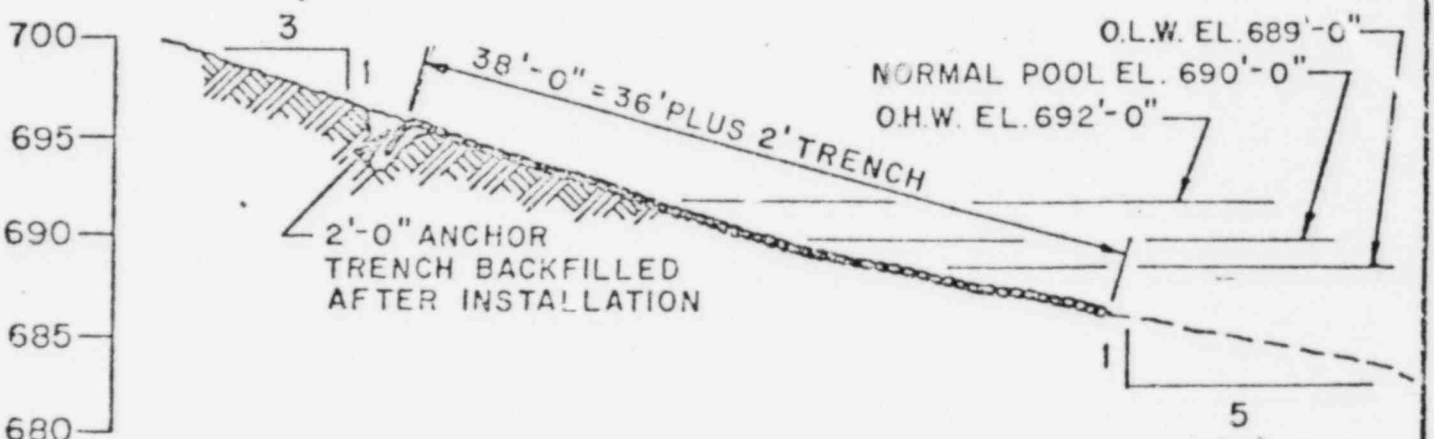
SCALE: 1" = 120'-0"

PROPOSED REVETMENT MAT SOUTH OF SCREENHOUSE AT CLINTON POWER STATION
CLINTON, ILLINOIS
DEWITT COUNTY
APPLICATION BY ILLINOIS POWER COMPANY
SHEET 2 of 3
DATE: 8/18/80

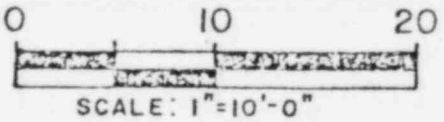


TYPICAL EXISTING CONDITION SECTION





TYPICAL PROPOSED REVETMENT MAT SECTION



PROPOSED REVETMENT MAT SOUTH OF SCREENHOUSE AT CLINTON POWER STATION

CLINTON, ILLINOIS
DEWITT COUNTY

APPLICATION BY ILLINOIS POWER COMPANY

SHEET 3 of 3 DATE: 8/18/80

ILLINOIS EPA
Environmental Protection Agency
2200 Churchill Road, Springfield, Illinois 62706

217/782-2909

Illinois Power Company (DeWitt County)
Shoreline Revetment - Clinton Lake
Log #C-488-80

October 3, 1980

082207

Department of the Army
Rock Island District
Corps of Engineers
Clock Tower Building
Rock Island, Illinois 61201

Gentlemen:

This Agency received the attached on September 29, 1980, from the Illinois Power Company requesting the necessary comments on environmental considerations for the construction of an 800 foot long shoreline revetment, involving the regrading of a Clinton Lake bank segment to a 3:1 slope, and the installation of a fabri-form mat using approximately 330 cubic yards of sand and cement. We offer the following comments.

Based on the information included in this submittal, it is our engineering judgment that the proposed project may be completed without causing water pollution as defined in the Illinois Environmental Protection Act, provided the project is carefully planned and supervised.

These comments are directed at the effect on water quality of the construction procedures involved in the above described project and is not an approval of any discharge resulting from the completed facility, nor an approval of the design of the facility. These comments do not supplant any permit responsibilities of the applicant towards this Agency.

This Agency hereby waives certification under Section 401 of the Clean Water Act (PL 95-217), subject to the applicant's compliance with the following conditions:

1. The applicant shall not cause:

   a. violation of applicable water quality standards of the Illinois Pollution Control Board, Chapter 3, Water Pollution Regulations;

   b. water pollution as defined and prohibited by the Illinois Environmental Protection Act; and

   c. interference with water use practices near public recreation areas or water supply intakes.

2. The applicant shall institute, as appropriate, those construction procedures set forth in EPA #430/9-73-007 entitled, Processes, Procedures and Methods to Control Pollution Resulting from all Construction Activities, dated October, 1973, and any other procedures necessary to prevent water pollution in the stream due to the activity during the project construction period.

3. Any spoil material excavated, dredged or otherwise produced must not be returned to the river or stream but must be deposited in a self-contained area in compliance with all State statutes, regulations and permit requirements with no discharge to the waters of the State unless a permit has been issued by this Agency. Any back filling must be done with clean material and placed in a manner to prevent violation of stream water quality standards.

4. This waiver becomes effective when the Department of the Army, Corps of Engineers, includes the above conditions #1 through 3 as conditions of the requested permit issued pursuant to Section 404 of PL 95-217.

This waiver of certification does not grant immunity from any enforcement action found necessary by this Agency to meet its responsibilities in prevention, abatement, and control of water pollution.

Very truly yours,

Thomas G. McSwiggin
by D. A. Keller

Thomas G. McSwiggin, P.E.
Manager, Permit Section
Division of Water Pollution Control

TGM:BY:mgg4346b/3

Attachment

cc: IEPA, DWPC, Records Unit
DWPC, Field Operations Section, Region 4
IDOT, Division of Water Resources, Springfield
USEPA, Region V
Illinois Power Company

o. That if the activity authorized herein is not started on or before 1st day of October 19 83 (one year from the date of issuance of this permit unless otherwise specified) and is not completed on or before 31st day of December, 19 83, (three years from the date of issuance of this permit unless otherwise specified) this permit, if not previously revoked or specifically extended, shall automatically expire.

p. That this permit does not authorize or approve the construction of particular structures, the authorization or approval of which may require authorization by the Congress or other agencies of the Federal Government.

q. That if and when the permittee desires to abandon the activity authorized herein, unless such abandonment is part of a transfer procedure by which the permittee is transferring his interests herein to a third party pursuant to General Condition t hereof, he must restore the area to a condition satisfactory to the District Engineer.

r. That if the recording of this permit is possible under applicable State or local law, the permittee shall take such action as may be necessary to record this permit with the Register of Deeds or other appropriate official charged with the responsibility for maintaining records of title to and interests in real property.

s. That there shall be no unreasonable interference with navigation by the existence or use of the activity authorized herein.

t. That this permit may not be transferred to a third party without prior written notice to the District Engineer, either by the transferee's written agreement to comply with all terms and conditions of this permit or by the transferee subscribing to this permit in the space provided below and thereby agreeing to comply with all terms and conditions of this permit. In addition, if the permittee transfers the interests authorized herein by conveyance of realty, the deed shall reference this permit and the terms and conditions specified herein and this permit shall be recorded along with the deed with the Register of Deeds or other appropriate official.

II. Special Conditions: (Here list conditions relating specifically to the proposed structure or work authorized by this permit).

Conditions 1 through 3 listed in the attached letter from the Illinois Environmental Protection Agency, Log #C-488-80 dated 3 October 1980, are considered to be a part of this permit.

The following Special Conditions will be applicable when appropriate:

STRUCTURES IN OR AFFECTING NAVIGABLE WATERS OF THE UNITED STATES:

a. That this permit does not authorize the interference with any existing or proposed Federal project and that the permittee shall not be entitled to compensation for damage or injury to the structures or work authorized herein which may be caused by or result from existing or future operations undertaken by the United States in the public interest.

b. That no attempt shall be made by the permittee to prevent the full and free use by the public of all navigable waters at or adjacent to the activity authorized by this permit.

c. That if the display of lights and signals on any structure or work authorized herein is not otherwise provided for by law, such lights and signals as may be prescribed by the United States Coast Guard shall be installed and maintained by and at the expense of the permittee.

d. That the permittee, upon receipt of a notice of revocation of this permit or upon its expiration before completion of the authorized structure or work, shall, without expense to the United States and in such time and manner as the Secretary of the Army or his authorized representative may direct, restore the waterway to its former conditions. If the permittee fails to comply with the direction of the Secretary of the Army or his authorized representative, the Secretary or his designee may restore the waterway to its former condition, by contract or otherwise, and recover the cost thereof from the permittee.

e. Structures for Small Boats: That permittee hereby recognizes the possibility that the structure permitted herein may be subject to damage by wave wash from passing vessels. The issuance of this permit does not relieve the permittee from taking all proper steps to insure the integrity of the structure permitted herein and the safety of boats moored thereto from damage by wave wash and the permittee shall not hold the United States liable for any such damage.

MAINTENANCE DREDGING:

a. That when the work authorized herein includes periodic maintenance dredging, it may be performed under this permit for 0 years from the date of issuance of this permit (ten years unless otherwise indicated);

b. That the permittee will advise the District Engineer in writing at least two weeks before he intends to undertake any maintenance dredging.

DISCHARGES OF DREDGED OR FILL MATERIAL INTO WATERS OF THE UNITED STATES:

a. That the discharge will be carried out in conformity with the goals and objectives of the EPA Guidelines established pursuant to Section 404(b) of the FWPCA and published in 40 CFR 230;

b. That the discharge will consist of suitable material free from toxic pollutants in other than trace quantities;

c. That the fill created by the discharge will be properly maintained to prevent erosion and other non-point sources of pollution; and

d. That the discharge will not occur in a component of the National Wild and Scenic River System or in a component of a State wild and scenic river system.

DUMPING OF DREDGED MATERIAL INTO OCEAN WATERS:

a. That the dumping will be carried out in conformity with the goals, objectives, and requirements of the EPA criteria established pursuant to Section 102 of the Marine Protection, Research and Sanctuaries Act of 1972, published in 40 CFR 220-228.

b. That the permittee shall place a copy of this permit in a conspicuous place in the vessel to be used for the transportation and/or dumping of the dredged material as authorized herein.

This permit shall become effective on the date of the District Engineer's signature.

Permittee hereby accepts and agrees to comply with the terms and conditions of this permit.

James E. McLeod — November 18, 1980

PERMITTEE — DATE

BY AUTHORITY OF THE SECRETARY OF THE ARMY:

for Thomas J. Pfister — 11-19-80

DATE

F. W. MUELLER, Jr., Colonel
DISTRICT ENGINEER,
U.S. ARMY, CORPS OF ENGINEERS

Transferee hereby agrees to comply with the terms and conditions of this permit.

TRANSFEREE — DATE

Where soil and water meet.

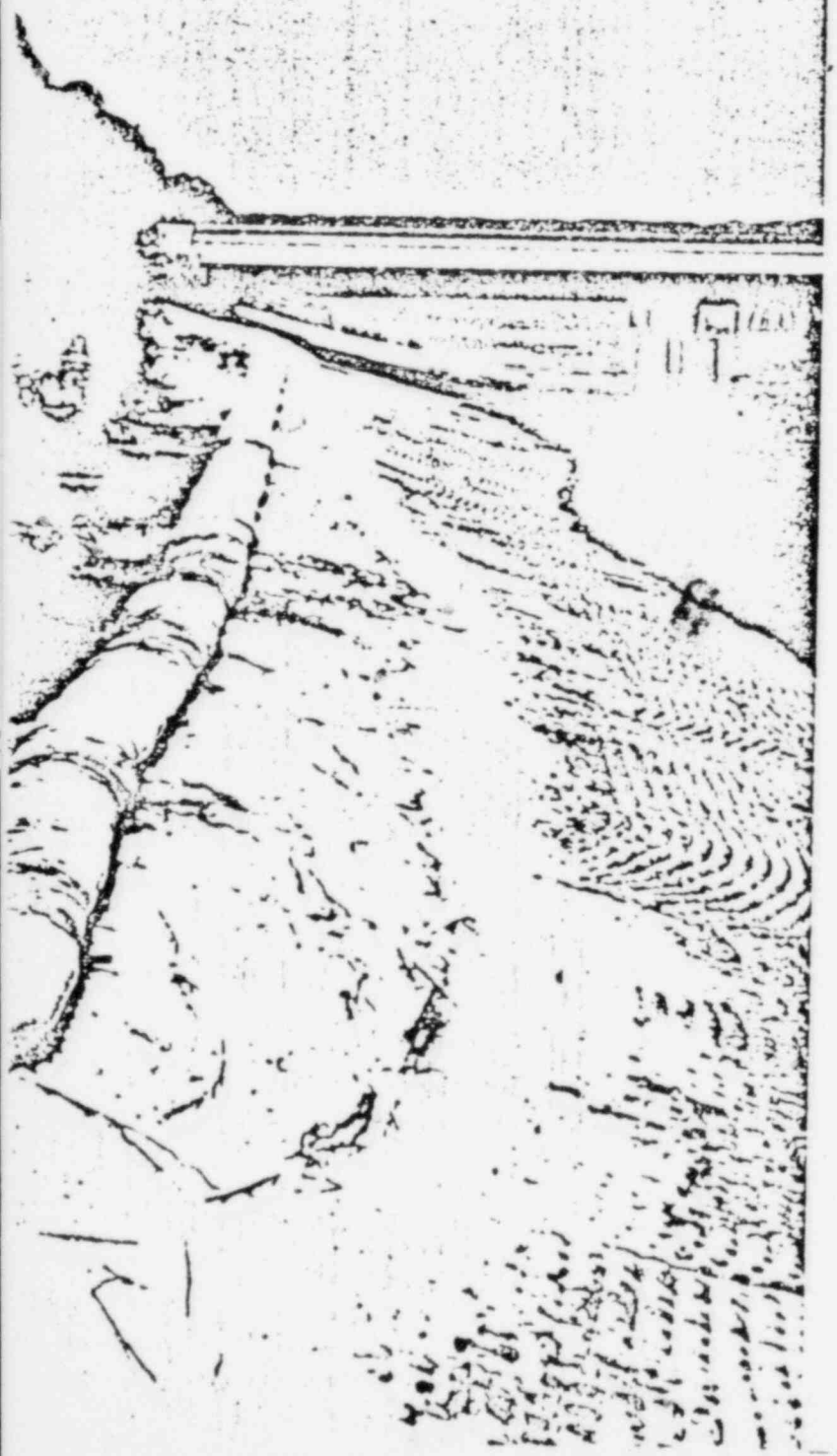
GEORGE D. ELISH
REGIONAL MANAGER

THE PREPAKT CONCRETE CO.
SUBSIDIARY OF
INTRUSION-PREPAKT, INC.

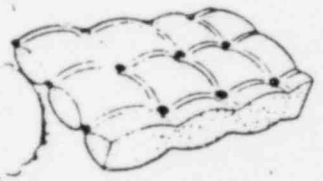
8221 THATCHER ROAD
DOWNERS GROVE, IL 60515
PHONE: 312/964-6100

Fabriform is the solution to erosion problems

2370 @ 6.00/S.Y. Matl
5/10



- ECONOMICAL
- EFFECTIVE
- DURABLE



A double layer form of industrial grade nylon fabric, much like an immense envelope, is shop assembled to fit your topography and delivered to you ready to be filled with pumpable sand/cement mortar to provide economical and reliable slope protection. As easily installed under water as in-the-dry, Fabriform revetments protect the shorelines of rivers and canals, reservoirs, holding basins and drainage channels. Wherever soil and water meet, Fabriform is the adaptable and logical solution to your erosion control problem.

CONSTRUCTION TECHNIQUES, INC.
Cleveland, Ohio 44120

CONTECH

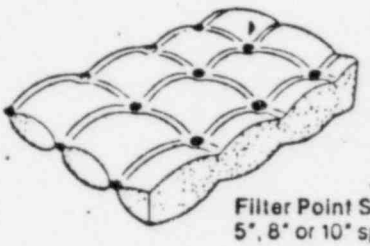
The Fabriform® process

...where s

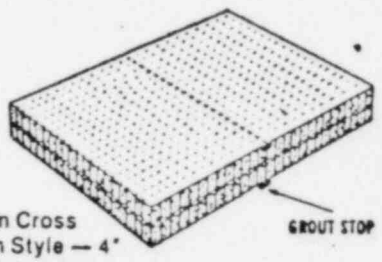
Economical. Fabriform revetments are constructed by injecting mortar into preassembled forms of double layer fabric which has been spread out on the slope to be protected. Under water or in-the-dry, material cost is predictable, labor cost is low, and no dewatering is needed.

For most applications, the two layers of fabric are woven together at spaced filter points. When filled with concrete the textured surface has a cobblestone appearance with filter points functioning to relieve hydrostatic uplift.

Where low permeability and low hydraulic friction are required, the two fabric layers are held in a parallel relationship by a grid of spacer ties on 1" centers to form a revetment of "uniform cross section."



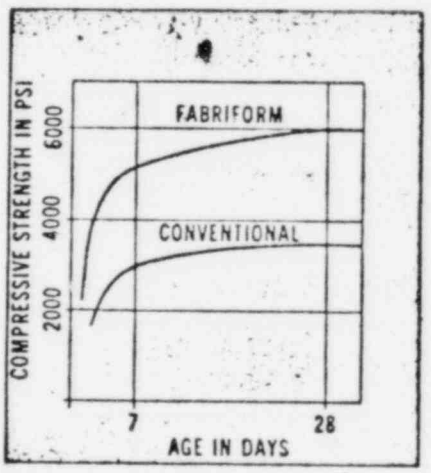
Filter Point Style — 5", 8" or 10" spacing



Uniform Cross Section Style — 4" nominal thickness

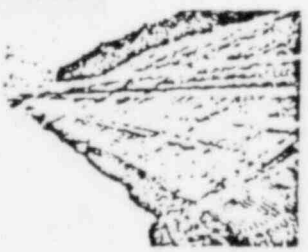
Effective. Fabriform revetments are cast in double layer fabric woven of bulk textured DuPont Cordura® nylon fiber in a warp of tire cord for optimum strength, stability, adhesion, and filtering characteristics.

Controlled bleeding of excess mixing water through the fabric produces all the desirable features of low water/cement ratio mortar — rapid stiffening, durability, high strength, and abrasion resistance. Curves show actual test values from ten widely separated jobs compared with tests on companion specimens cast with identical mortar in conventional molds.

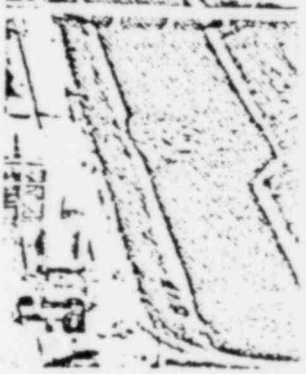


Durable. Fabriform revetments protect the shoreline of Allegheny reservoir above Kinzua dam alongside a highway in southwestern New York. The U.S. Army Corps of Engineers in cooperation with the N.Y. State DOT installed 130,000 ft.² of 8" Filter Point style Fabriform on a 53 ft. embankment sloping 1½ : 1 from 7' above high water to low pool. Much of the revetment was installed at high pool under 20' or more of water. Through more than ten tough winters, with ice up to 24" thick, high winds and wa[illegible]s, weather, and rapidly fluctuating pool levels, slope protection remains fully effective and completely maintenance free.

NOVEMBER 1968 Workmen complete the installation as the pool level recedes to its fall low.



TODAY Fabriform is still protecting the shoreline as effectively as the day it was installed.



a. The discharge canal of VEPCO's nuclear power [illegible] at Surry VA is protected [illegible] 384,250 ft.² of 8" FP Fabri[illegible] revetment.

b. The 1½ : 1 banks of the M[illegible] dam reservoir near Tokyo, Japan are armored against erosion with Fa[illegible]briform ca[illegible] locally woven fabric.

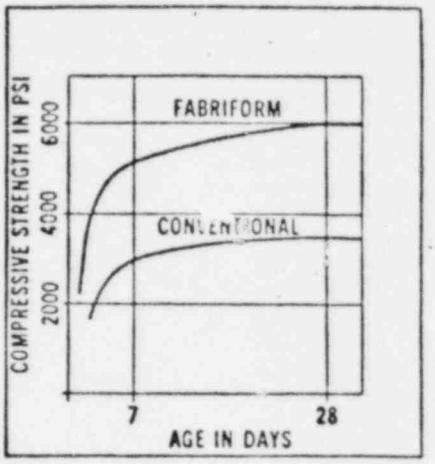
c. Fabriform protects the sar[illegible] shore lines of intake and discharge canals of a foss[illegible] fueled power plant in Flori[illegible]

* U.S. Patent Nos. 3,396,542; 3,396,545 and R.E. 27,460. Other U.S. and foreign patents issued and pending.

TECHNICAL DATA— Performance

COMPRESSIVE STRENGTH

The fabric used in Fabriform construction has been designed to serve as a filter as well as a form. The highly fluid mortar pumped into the fabric forms will typically be mixed at a water/cement ratio in the 0.70 to 0.75 range. Excess mixing water is squeezed through the water permeable fabric causing a pronounced reduction in the water/cement ratio. Curves show actual compressive strength of Fabriform test specimens, averaged from ten widely separated jobs compared with tests on companion specimens cast with identical mortar in conventional molds.



HYDRAULIC FRICTION

Carefully controlled tests conducted in England in 1972 indicated that, for 8" Filter Point revetment, the coefficient of hydraulic friction "n" as used in the Manning Formula varied from 0.023 to 0.030, depending on depth and velocity in a straight reach of trapezoidal channel. A value of 0.025 is suggested for design purposes. The "n" value of UCS revetment has not been determined experimentally. A value of 0.012 is suggested.

DURABILITY OF NYLON

Nylon is immune to attack by mild acids, alkalis, organic solvents, and biological organisms. While the upper layer of nylon fabric may be affected by strong sunlight and by abrasion, the utility of a Fabriform installation will not be impaired as evidenced by 10-year service records. Soil which accumulates in the saddles between nodules in the deeply textured Filter Points will protect these areas. Where appearance is an important consideration, the revetment may be spray coated with dilute colored acrylic emulsion to protect the fabric on the crowns of the nodules against ultraviolet light.

STREAM VELOCITY

Water velocity over 8" Filter Point revetments at an installation in Columbia, Md., based on data from stream gauging stations, was determined to be about 13 ft./sec. An installation near Bedford, Iowa, was designed for a maximum velocity of 20 ft. per second. Documented measurements during flood conditions at this site indicate a maximum flow of 7640 cu. ft./sec. and a velocity estimated to be in the range of 15 to 18 ft./sec.

WAVES AND CURRENTS IN SHIP CHANNELS

Waves and currents generated by the piston effect of large vessels moving through ship channels represents one of the most severe challenges to the Fabriform erosion control system. Values shown here for an installation on the Savannah River were estimated by observers at the site. Wave and current data at the Thames River installation near Chatham, Ontario, are measured values.

Observed Waves & Currents In Ship Channels

Site	H Wave FT	V Current FPS
Savannah R.	5	5
Thames R.	2	24

LAKE WAVES

Actual measured maximum height of lake waves is rarely available and reported observations are often misleading. Values shown here are based on the Molitor formula using measured fetch and assumed maximum wind velocity.

Estimated Max. Wave On Lakes

Site	V_w Wind MPH	F Fetch MI.	$^*H$ Wave FT.
Champlain	45	15	4
Alleghany	25	4	3

$$^*H = 0.17\sqrt{V_w F} + 2.5\sqrt[4]{F}$$

EFFECT ON pH OF SURROUNDING WATER

Laboratory tests have demonstrated that cement lost through fabric will average about ¼% of cement content with a maximum of ½%, equivalent to about 3000 gm of cement per cu. m. of mortar pumped. Tests have likewise demonstrated that the addition of 50 gms of cement to a cubic meter of mortar will raise the pH value about 1.0, well within the normal range of pH variation in potable water—typically 7.0 to 9.5. From these facts it may be demonstrated that raise in pH will be limited to no more than 1.0 provided that:

1. In stagnant water—total volume is at least 60 times the volume of concrete pumped.
2. In moving water—the rate of concrete injection in cu. yds/hr. does not exceed the rate of water flow in cu. yds./min.

See other side for additional information.

Fabriform takes the risk out of revetments

Economy for the client

- Fabriform can be placed on steep slopes to give more useable land with less slope to protect.
- No filter underlayment necessary on most soils. Fabriform has filtering capability built in.
- No need to revet an entire slope just because rocks roll down hill. Protect only the area subject to erosion.

Economy for the contractor

- The big risk on any job is the cost of labor. Material cost is a known factor. On a typical Fabriform job, material represents about 80% of cost. Labor, equipment, and field overhead together account for only about 20%.
- Production rate is very high. A 5 or 6 man crew will average about 5000 ft.^{2} per shift on routine jobs.
- Mobilization cost is low — a pick-up truck, a grout pump with some hose, and a small portable sewing machine and you're ready to go to work.

For: Case histories
Technical data
Fabric ordering information
Detailed field instructions

Call or write:

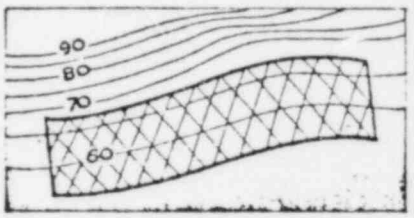
CONTECH

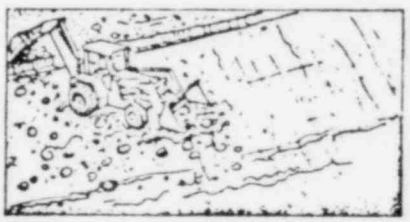
CONSTRUCTION TECHNIQUES, INC.

11900 Shaker Boulevard • Cleveland, Ohio 44120
Phone: 216-623-0679 • Telex 98-5674

Six steps to a fast and easy installation

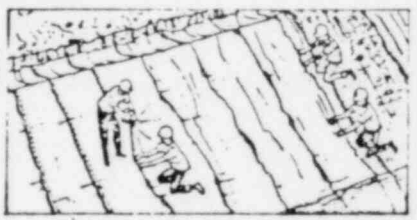
1 Determine from Topographic data the area of fabric required. Contech will submit fabric assembly drawings for your approval.

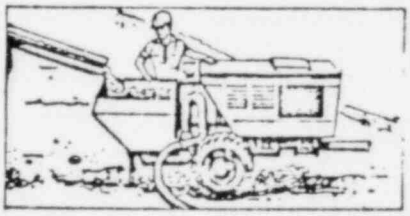




2 Rough grade the surface to be protected. An anchor trench is usually required at the crown of the slope.

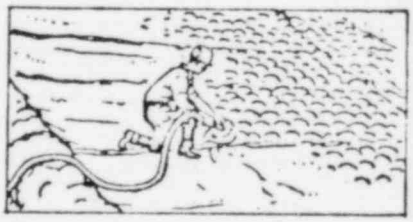
3 Join the fabric panels in the field with a portable sewing machine. These panels will range up to 5000 ft.^{2} each.





4 Pump transit mixed sand/cement mortar into the fabric. Pumping capacity should be 10 to 12 cu. yds. per hour.

5 Fill the fabric in the anchor trench first. Use a piece of burlap around the 1½" insert pipe to make a pressure tight seal.



6 Complete filling the fabric by working up from the slope toward the crown. Lateral flow is controlled by grout stops. Backfill the trench and the job is done.

TECHNICAL MEMORANDUM — INSTALLATION

Ordering Fabric

1. Fabric panels are assembled to order in accordance with shop drawings prepared by the installer. Prepare a sketch of each different panel size that will be required. Instructions for preparation of fabric shop drawings are available on request. Alternatively, Contech will prepare shop drawings at nominal cost from topographic data furnished.
2. In making a preliminary estimate of the quantity of fabric required, allow 20% for fabric assembly contraction which occurs as a result of filling with mortar and for surface irregularities.
3. A firm quotation for assembled fabric will be submitted upon receipt of shop drawings.
4. A minimum fabric inventory of 500,000 sq. ft. is normally maintained. Normal production is 25,000 sq. ft. per day with delivery to start ten days from receipt of assembly drawings.

Slope Preparation

1. For the sake of appearance, revetments should be placed over relatively smooth surfaces. Minor irregularities are tolerable for the Filter Point configuration, since their effect on appearance will be obscured by the deeply textured surface of the mat.
2. The upper anchor trench is most conveniently placed at the crown of the slope.
3. Place fabric immediately following grading and slope preparation.
4. If backfilling is necessary, use compacted granular material. If silt content is over 20%, place a spun-bonded filter cloth underlayment.

Fabric Placement

1. Position fabric loosely along the bank before grout injection. Stake fabric at predetermined locations to allow for fabric contraction. Do not approximate fabric locations. Measure dimensions on the bank and stake at about 20-ft. centers. Seams should be generally perpendicular to the shoreline for best appearance.
2. Fabric panels are joined in the field with a bag closer (portable sewing machine). Lay out the first panel and fold back the leading edge. Invert the adjacent abutting panel. Join the top layers of fabric. Join the bottom layers of fabric. Fold the joined panels back on the bank with the seams down.
3. To avoid field sewing as much as possible, prepare fabric assembly sketches in such detail that the great majority of the sewing can be done prior to delivery.
4. Provide each job with a small quantity of uncut, unassembled fabric for special field tailoring.

Mortar Preparation

1. Very fluid sand-cement mortar is used in all Fabriform revetment work. Air content of 5 to 8% will improve pumpability of the fluid mortar and freeze/thaw resistance of hardened mortar. Use a retarding admixture in hot weather. Substitution of pozzolanic quality fly ash for up to 35% of the cement is particularly recommended as an aid to pumpability.
2. Excess mixing water expelled through the permeable Fabriform fabric will reduce the volume of 27 cu. ft. of wet mortar to about 23-1/2 cu. ft. of hardened mortar as illustrated by the following typical mixes.

Range of Quantities — In Pounds Per Cu. Yd.

Material	As Delivered	In Place
Cement	700 - 900	800 - 1000
Sand	2200 - 1800	2500 - 2000
Water	520 - 630	400 - 500

3. Mortar consistency should be in the 9-11 second range through the 3/4" orifice of the standard flow cone described in Corps of Engineers Specification CRD-C 79.

Mortar Pumping

1. Insert the injection pipe through a small slit cut in the upper layer of fabric. Wrap a piece of burlap around the insert to act as a packer. Use care to avoid grout spillage.
2. First pump the upper edge of the mat which has been placed in the anchor trench, followed by injection into the lower edge, working back up the slope. Avoid over pressuring of the fabric.
3. In flowing water, pump the upstream edge of the mat first. Maximum allowable water velocity using routine installation procedures, is about 3 ft. per second.
4. Do not walk on the mat for about one hour after pumping or when footprints will leave indentations.
5. Remove burlap from insert holes and smooth mortar by hand.
6. Clean up mortar spilled by hand. Do not wash down mat with a water hose.
7. A typical crew consists of a foreman, pump operator, and three or four laborers. A diver may be necessary for injecting mortar under water. Pumping rate will vary depending on site conditions. On large jobs, placement rates up to 6,000 sq. ft. per 8 hour shift are regularly achieved.

Equipment

1. Pumping capacity should be about 12 cu. yds. per hour. Equipment which has been successfully used includes the Thomsen Model 4.5, Mayco Model C-30, Moyno No. 6 frame or larger, or similar equipment. Use minimum 2 in. pipe or hose from the pump to a wye fitting and two 1-1/2 in. hoses from the wye to the fabric.
2. For field sewing, Sac-Up machines are suggested, either the electric model BB or the air operated model BBZ. Machines take 1/4 lb. spools of No. 138 BST white nylon thread.

GUIDE SPECIFICATIONS

I. GENERAL

The surfaces to be protected shall be prepared and graded to such an extent that they are normally stable in the absence of erosive forces. A fabric envelope in a mat configuration shall be positioned over these surfaces and filled with a pumpable sand/cement grout in such a way as to form a stable mat of suitable weight and configuration.

The Contractor shall furnish records of past successful experience in performing this type of work. The Contractor shall save the Owner harmless from liability of any kind arising from the use of any patent or unpatented invention in the performance of this work.

II. MATERIALS

A. Grout shall consist of a mixture of portland cement, fine aggregate, and water so proportioned and mixed as to provide a pumpable slurry. Pozzolan and grout fluidifier conforming to these specifications may be used at the option of the Contractor. The mix shall exhibit a compressive strength of 2000 psi at 28 days when made and tested in accordance with ASTM C-31 and C-39.

B. Fabric forming material shall consist of multiple panels of double-layer, open selvage fabric joined in a mat configuration. The two fabric layers shall each be no lighter than 20 x 20 count/inch, 840 denier tire cord nylon, of which at least 50% by weight shall be bulked continuous multifilament tire cord nylon.

1. Filter Point fabric (designated as FP on drawings) shall consist of multiple panels of double-layer fabric woven together on spaced centers in such a manner as to provide Filter Points for the relief of hydrostatic uplift pressure. Filter Points shall be spaced as indicated on drawing.
2. Uniform Cross Section fabric (designated as UCS on drawings) shall consist of multiple panels of double-layer fabric joined together by interwoven ties of a uniform length spaced on 1" centers. Hydrostatic uplift relief, where required, shall be provided by sewing together the two fabric layers at locations and in the manner indicated on the drawings.
3. Individual mill width panels shall be cut to suitable length and the two layers of fabric separately joined edge to edge by means of nylon thread. The tensile strength of stitched joints shall be not less than 100 lbs. per inch.
4. Fabric porosity is essential for the successful execution of this work. At the direction of the engineer, the Contractor shall demonstrate the suitability of fabric design by injecting the proposed grout into 6" diameter sleeves under a pressure of 10 to 15 psi which shall be maintained by means of air pressure or a standpipe for 10 minutes. The sleeves shall be constructed of the same fabric used in the individual layers of fabric. 6" x 12" test cylinders shall be cut from each specimen and tested in accordance with ASTM C-39.

The average compressive strength of the FABRIFORM test cylinders shall be at least 20% higher at seven days than that of companion test cylinders made in accordance with ASTM C-31, and not less than 2500 psi at 28 days.

III. PLACEMENT OF GROUT IN MAT FABRIC

Prior to grout injection, the fabric shall be positioned at its design location. Grout shall be introduced into the space between the layers of fabric. Where convenient, adjacent fabric panels shall be joined, before grout injection, by field sewing the two layers of fabric separately, edge to edge, except that with the approval of the Engineer or where called for by plans, adjacent panels may be lapped a minimum of two feet. In no case will simple butt joints be permitted.

FABRIC DESCRIPTION

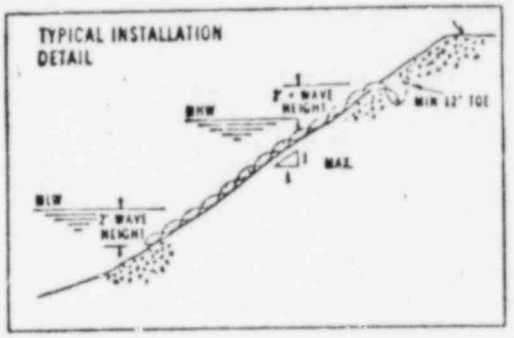
	FF	UCS	Fiber
Warp—Top & Bottom, Ends/in.	22	22	850 den. Nylon 66
Fill—Top & Bottom, Picks/in.	22	22	965 den. Cordura
Drop Stitches	—	—	1300 den. Nylon 66
Approx. Wt oz./yd.^{2}	11.7	22.2	
Ship Wt. lbs./1000 ft.^{2}	82	157	
Ship Vol. ft.^{3}/1000 ft.^{2}	5.2	12.1	

FABRIC TEST DATA

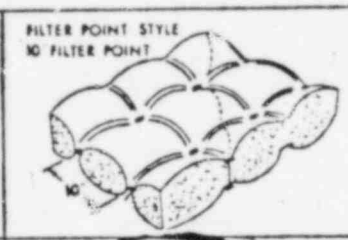
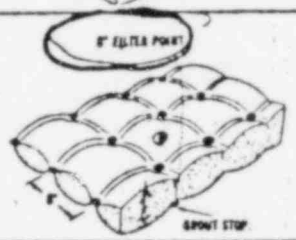
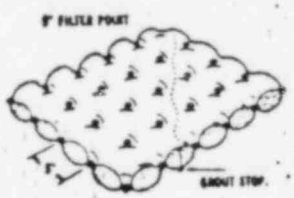
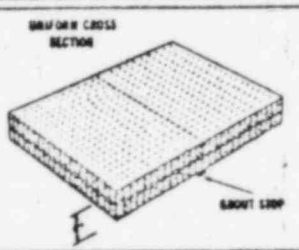
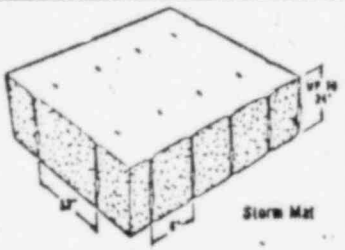
Tensile Strength—Warp & Fill	Min. 200#/in.	ASTM D-1682-75
Porosity	Min. 100 Ft.^{3}/Min.	ASTM D-737-75

TECHNICAL DATA
Installation

FABRIFORM is a double-layer fabric woven of textured nylon in a tough, multifilament warp for optimum strength, stability, adhesion, and filtering characteristics. After being placed on the slope to be protected, either under water or in-the-dry, this fabric envelope is filled by pumping into it a highly fluid sand/cement mortar. The upper edge of the revetment is usually placed in an anchor trench to prevent undermining by groundwater run-off. It should extend from a point well below minimum low water to a point above maximum anticipated wave run-up.



Available Fabriform Fabric Styles

Typical Mortar Volume and Weight per Square Foot (may vary with field conditions)		
Fresh Mortar	0.55 ft³	 **10" Filter Point** Where unusually severe abrasion is anticipated or where additional weight is required, 10" Filter Point fabric may be specified.
Hardened Mortar Weight	0.50 ft³	
Max Thickness	70 lbs	
Average Thickness	8.0 in	
	6.0 in	
Fresh Mortar	0.38 ft³	 **8" Filter Point** The majority of all Fabriform installations to date have been made with 8" Filter Point fabric. As sketches illustrate, the pattern of filter points is oriented at about 30° to the shoreline to present an attractive checkerboard appearance. The cobbled surface of Filter Point revetments provides excellent attenuation of hydraulic energy.
Hardened Mortar Weight	0.30 ft³	
Max Thickness	41 lbs	
Average Thickness	5.0 in	
	3.5 in	
Fresh Mortar	0.25 ft³	 **5" Filter Point** For low velocity flows or for light wave action characteristic of small recreational ponds, 5" Filter Point fabric provides reliable protection at minimum cost.
Hardened Mortar Weight	0.20 ft³	
Max Thickness	26 lbs	
Average Thickness	3.3 in	
	2.2 in	
Fresh Mortar	0.40 ft³	 **Uniform Cross Section** Used where low permeability and low hydraulic friction is required. Filter Points may be installed for relief of uplift pressure.
Hardened Mortar Weight	0.33 ft³	
Max Thickness	44 lbs	
Average Thickness	4.0 in	
	3.8 in	
Fresh Mortar	Varies	 **Storm Mat** StorMats protecting shorelines, withstood typhoons from the East China Sea. Custom assembled up to 24" thick, they may be of varying thickness or tapered configuration suitable for use as pipeline saddles.
Hardened Mortar Weight	Varies	
Max Thickness	Varies	
Average Thickness	24 in.	
Fresh Mortar		
Hardened Mortar Weight		
Max Thickness		
Average Thickness		

See other side for additional information.