THE CLINCH RIVER BREEDER REACTOR PLANT
EROSION AND SEDIMENT CONTROL PLAN REPORT

Introduction

Site preparation activities at the Clinch River Breeder Reactor Plant (CRBRP) site began on September 22, 1982. Authorization to conduct site preparation activities allowed clearing and grubbing, earthwork, construction of temporary facilities and other construction activities to be performed in a manner consistent with NRC requirements, environmental commitments and planned measures for erosion and sediment control. This report is the first semi-annual status report on implementation of the CRBRP erosion and sediment control plan as required by the CRBRP NPDES Permit TN0028801, Part III, Item J. The erosion and sediment control measures implemented by this plan utilizes the best available technology for control of erosion and sediment, as well as, best management practices for control of oil and grease and other pollutants from the construction equipment maintenance areas. These measures are consistent with limiting runoff effluent to 50 mg/l of total suspended solids.

The CRBRP site is located on a peninsula formed by a meander of the Clinch River between river miles 14.5 and 18.6. It is bounded on the north and east by the Department of Energy's Oak Ridge Reservation. There are approximately 1,364 acres within the site's boundaries of which approximately 300 acres (21%) will be disturbed for construction of the CRBRP and related facilities. Of the 300 acres anticipated to be disturbed by the construction activities and susceptible to erosion, to date, approximately 240 acres have been affected.

The terrain of the site is comprised of wooded valleys with ridged contours, consisting of a mixed soil content of clay and silt. The erosion control features are situated in areas which will allow receipt and processing of the greatest amount of rainfall runoff from their respective watersheds during the construction stages.

Implementation

Erosion and sediment control measures implemented since the start of the early site work phase includes the use of hay bales, silt fences, diversion ditches, completion of runoff treatment ponds, grading to allow runoff to flow directly into ponds, seeding and cofferdams. The following paragraphs describe in sequence the measures that are utilized.

Hay bales were placed along the clearing and grubbing limits and upstream of runoff treatment ponds as the site was cleared. The runoff treatment ponds' earth embankments were built and the sand filters installed in accordance with design criteria. Runoff treatment ponds A, B, C, and D were considered functional in December 1982. However, discharge from the ponds were prevented pending issuance of the NPDES permit and completion of pond details such as placing riprap at the discharge pipe outfalls and completing pond contours to assure design capacity. Prior to issuance of the NPDES permit, November through February, a diffuser system was established to disperse the collected runoff in the ponds and prevent a point-source discharge situation.

The diffuser system was implemented by blocking the discharge pipes with inflatable plugs and setting up pumps on the filters of ponds A, B, C and D. The pump intakes were placed in the riser of the pipes so that filtered water could be pumped out to a six-inch diameter, alternating solid and perforated, plastic pipe system. The perforated pipes were located in well vegetated areas so that the pumped water would diffused over a 100 to 200 foot wide area and be absorbed into the ground rather than creating channels of conveyance. A revision of this plan was called for in February due to inadequate absorption. A revised plan was established to promote greater absorption, however, after the State's February 28, 1983 site inspection and their subsequent concurrence to allow direct discharges from the ponds, the plan was never implemented.

Grading has been a major part of erosion and sediment control. Dikes have been built behind spoil area #1, and on the south side of the CB&I laydown area to collect rainfall runoff. Runoff headed toward the downstream side of the pond embankments have been directed to the upstream side so that it is filtered. Fill areas, such as the CB&I laydown area and the T-1 dike area, are sloped so that runoff will flow or can be pumped upstream of ponds for processing. A spring which flows on the downstream side of Pond D embankment, has been redirected to allow flow through the riprapped discharge channel at Pond D. Hay bales and silt fences have been used in conjunction with grading in the lower lying areas and along sloped areas. These control devices are effective in slowing the velocity of runoff to promote increased absorption, settling of sediment and better filtration. Hay bales have been placed along clearing and grubbing limits, especially in areas where runoff temporarily cannot be conveyed to runoff treatment ponds. Locations where hay bales have been particularily effective are: upstream of ponds, downstream of the diffuser systems, downstream of discharge pipes of the ponds, along clearing and grubbing limits of the road and railroad.

Seeding of spoil areas and fill embankments is presently taking place on site. Placement of topsoil is required before seeding of the runoff treatment pond embankments and the areas adjacent to the rip rapped channels on the downstream side of the pond embankments. These areas will be seeded as topsoil placement is completed. A seeding mixture of rye grass is being used for both permanent and temporary vegetation.

Sequencing of construction activities has also had a beneficial effect on erosion control. Excavation operations were scheduled to follow completion of the runoff treatment ponds. The T-1 dike was installed to contain runoff in areas that could not be conveyed directly to a pond. The area north of the T-1 dike is being gradually filled in with crushed stone, runoff to this is being directed towards Pond B as final plant grade is being obtained. Installation of crushed stone for the on-site portion of the railroad embankment took place in March, while the river elevation was 6 feet below normal water level. When the river rose in April, the embankment was above the water level allowing continuance of work in that area.

Several problems have arisen with efforts to satisfy the NPDES permit requirements. The runoff treatment pond filters have failed to continually process runoff effectively during periods of very intense rainstorms. Retention of inflatable plugs installed in the discharge pipes pending the authorization to discharge became a problem because changes in temperature and water pressure against the plugs caused leakage around the plugs.

Most of the site's runoff has been processed through the sand filters to the 4 foot diameter perforated pipe and discharges approximately 100 feet downstream (the filter systems for each pond differs in distance to discharge outfall). It was observed that water which flows through the sand filters at a low rate discharges with a smaller amount of sediment than water processed at a faster rate. During the rainstorm of April 5, 1983, 4.01" of rain fell and results of the water samples taken revealed a very high concentration of total suspended solids. Temporary measures such as placing hay bales and straw bales to slow runoff entering ponds were taken. Efforts are being made to determine the effectiveness of the filter arrangements in a clean state, and to minimize the sediment loading and turbulent velocity of the runoff prior to it entering the ponds. This is to assure that runoff processed during an intense rainstorm will not exceed effluent limitations of 50 mg/l of total suspended solids. A description of additional measures to aid the sand filter design is included in Attachment # I.

Two cofferdams were constructed in February to allow a 14 foot multiplate culvert at the road station 5 + 35.53 to be installed. The cofferdams allowed work in the Clinch River to continue without disturbing the river on the south side and Grassy Creek on the north. Two pipes allow water to pass from Grassy Creek to the river without disturbing the work area. On April 5, 1983, the cofferdam and access road were partially washed out during a 4 inch rainstorm by a sudden 6 foot rise in the river water level. (The CRBRP Project commitment in the environmental report prohibit work in the river from March to August to prevent the disturbance of fish spawning). As a result of this emergency situation, approval to rebuild the access road and cofferdam was obtained from the EPA, the Army Corps of Engineers, and the Tennessee Division of Water Management to allow road and cofferdams to be rebuilt. Measures such as sealing the cofferdam with a clay cover with crushed stone (to prevent erosion of the clay), construction of the cofferdam to a higher elevation, and placing in a larger pipe to allow equalization of the Grassy Creek and the Clinch River water levels, were taken to mitigate a reoccurence of this event and the necessity for conducting construction activities in the river.

Conclusion

The final design contours of the ponds have not been finished due to the sequencing of the construction activities. In February the pond capacities were calculated from cross sections of the ponds and filters, and they were determined that each pond held a larger capacity than required by the design. As construction activities continue, the pond volumes will decrease to design values. Silt loading in the ponds are presently being monitored by elevation gauges set in the ponds. A sediment marker called for in the designs will be installed in place of the elevation gauges when the ponds are dry enough for access to the area where the markers will be located.

Water quality of the ponds discharges have been monitored since February 1983. See Attachment # II for analytical results. Representative samples were taken once per week per pond and analyzed for pH, total suspended solids and additionally in pond A for oil and grease, by the TVA Singleton Materials Engineering Laboratory. Analytical procedures are in accordance with methods described in Attachment # III.

As previously mentioned, during storms of high intensity the sediment load discharged from the ponds is high, as can be seen by comparison. Flow from the ponds are also monitored. All samples are reported to EPA and the State of Tennessee as required, on discharge monitor reports (DMRs). These reports are submitted to EPA and the State on a quarterly basis.

The ten year, 24 hour design storm (an intensity of 5") has not occurred prior to this report date. Rainfall data, measured daily on the CRBRP site, from October to the present is compiled to weekly values in Attachment #IV.

Present construction activities include Pond E. Daily inspections by the construction environmental representative will continue to monitor present and upcoming construction activities. Erosion control measures specified in the CRBRP Erosion and Sediment Control Plan will continually be implemented.

PROPOSED REMEDIAL MEASURES FOR IMPOUNDING POND FILTERS

Extended Filter

General Description: This concept entails adding a supplementary filter layer to the existing filter material to the dimensions and slopes illustrated in Figure A.

Concept Requirements:

Supplementary filter layer shall consist of manufactured sand as permitted for use in masonry mortar, meeting the gradation requirements of ASTM C144. Prior to use, permeability characteristics of this material in the compacted state shall be established by laboratory testing. Test results will be evaluated by Engineer to determine if permeability is compatible with design requirements.

Dewatering shall be performed to expose the toe of the filter and a sufficient distance beyond to permit required work. Accumulated sediment shall be removed from the area adjacent to the lower portions of the filter, at least to an extent which will permit installation of the supplementary filter material. Engineer will inspect existing surface filter layer and provide direction regarding the thickness and extent of contaminated filter material required to be removed. Removed material shall be replaced with manufactured sand meeting the gradation requirements of ASTM C144. This material will be placed in a moist condition and compacted as densely as practical prior to placement of the supplementary filter layer.

The supplementary layer shall be constructed by placing the filter sand in horizontal lifts not exceeding five (5) inches in loose thickness. Each lift shall be compacted with four (4) passes of a hand-operated vibratory plate compactor. Filter material shall be moistened (but not saturated) immediately prior to compaction.

After the material has been placed to the lines shown in Figure A, the final slopes shall be compacted with four (4) passes of a smooth-drum roller (without vibration) pulled up the slopes by a winch or similar device.

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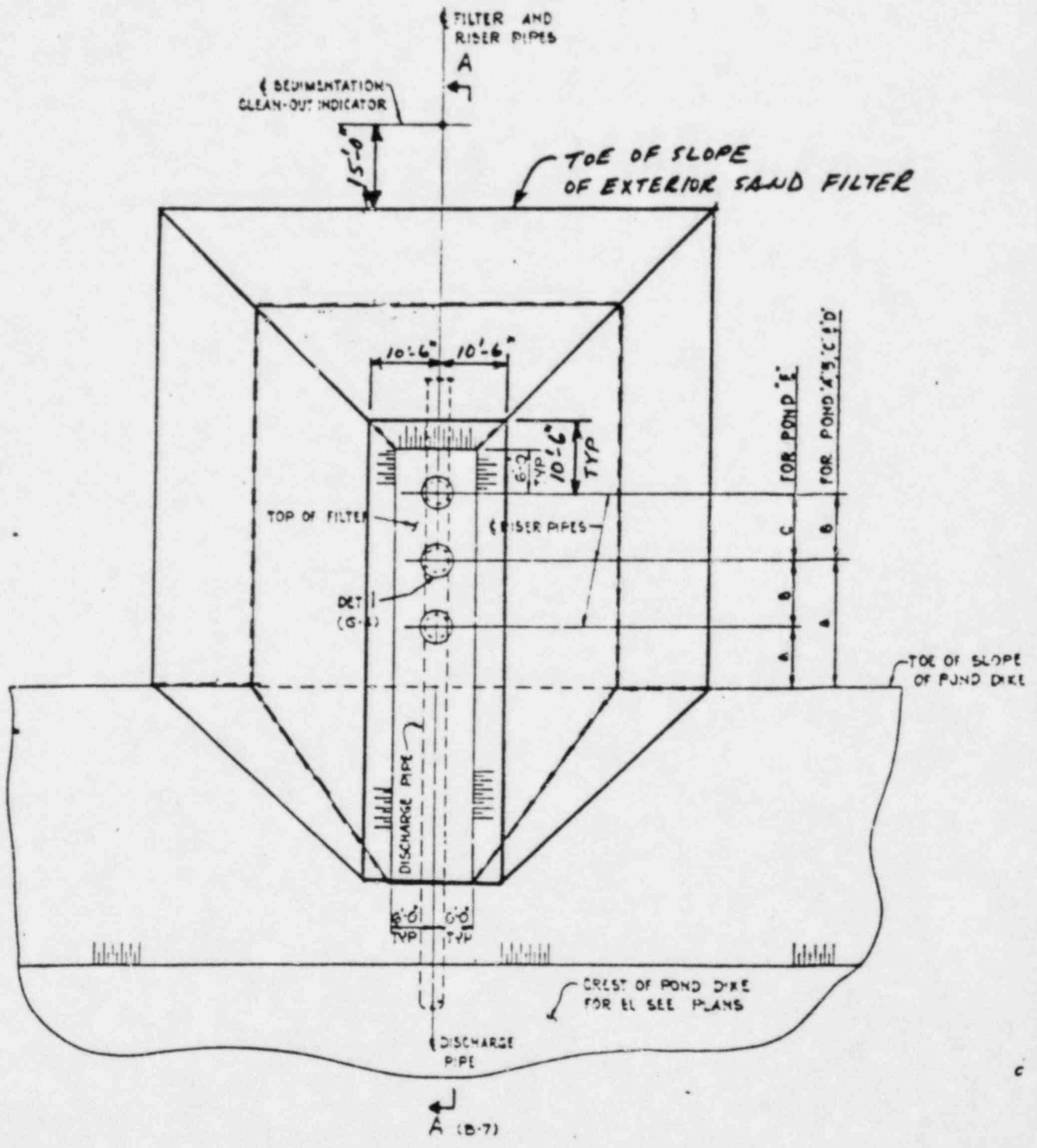


PLAN

FOR ORIENTATION SEE SITE PLANS
(AS LISTED IN TABLE ABOVE (K-5)

Figure A

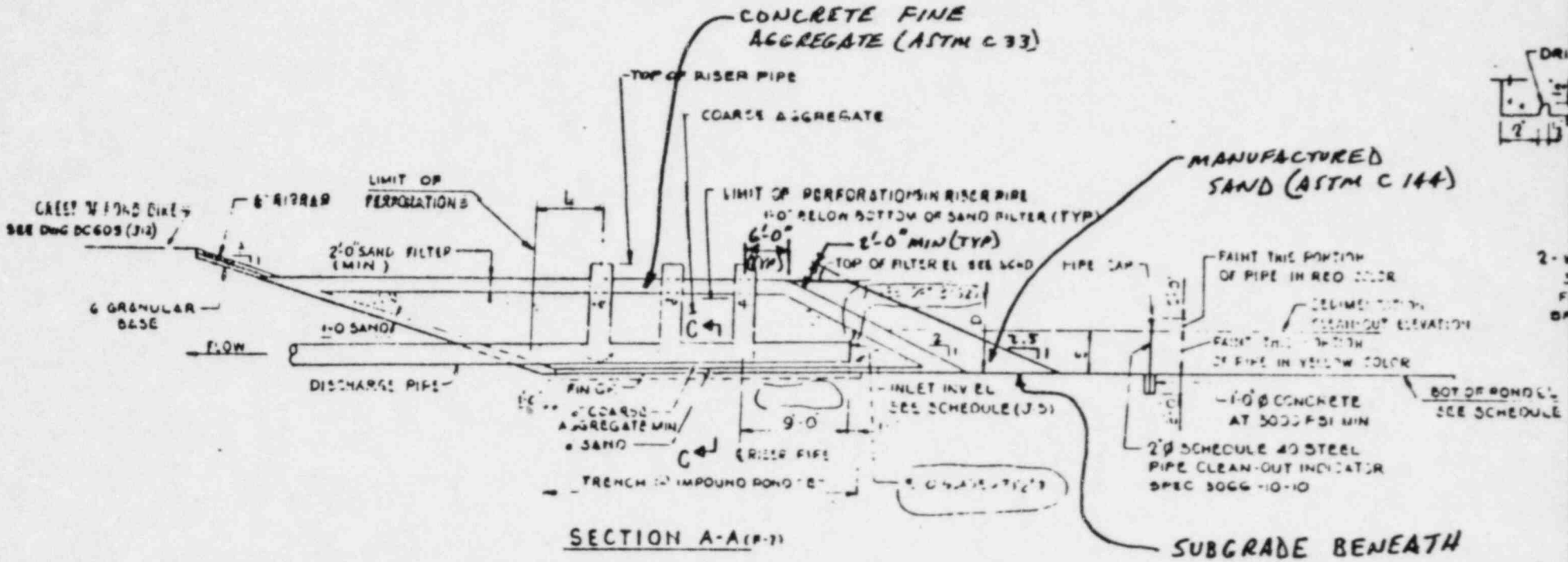
TOP OF RISER PIPE

COARSE AGGREGATE

A (B-7)

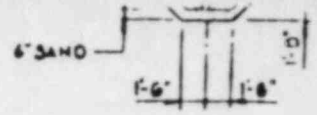
PLAN

FOR ORIENTATION SEE SITE PLANS
(AS LISTED IN TABLE ABOVE (K-5)



SECTION A-A (B-7)

SUBGRADE BENEATH FILTER MATERIAL COMPACTED TO 95% std PROCTOR DENSITY



SECTION C-C

FOR POND "E" ONLY
SCALE 3/8"=1'-0"

IMPOUNDING POND FILTER

NTS

	REVISION		REVISION

ADDITIONAL UPSTREAM CONTROL MEASURES TO AID SAND FILTER DESIGN

As discussed in the joint meeting between Project Office, SWEC and BRI personnel on Thursday, April 21, 1983, additional control measures will be implemented upstream of the sand filters to aid in the removal of suspended solids from rainfall runoff.

The scheme consists of a sloped bench as shown in Figure B, to collect runoff from the upstream slopes and convey it to the far end of the pond across from the filter. The bench will have a slight pitch so that the runoff will flow freely but not at a high velocity. Stone or riprap will be placed on the bench to slow the runoff. The water will enter the pond area from one direction minimizing the turbulence in the pond. The opening to the pond will be located so that the runoff will have a longer distance to travel before it reaches the sand filter; allowing more time for settling of the suspended solids.

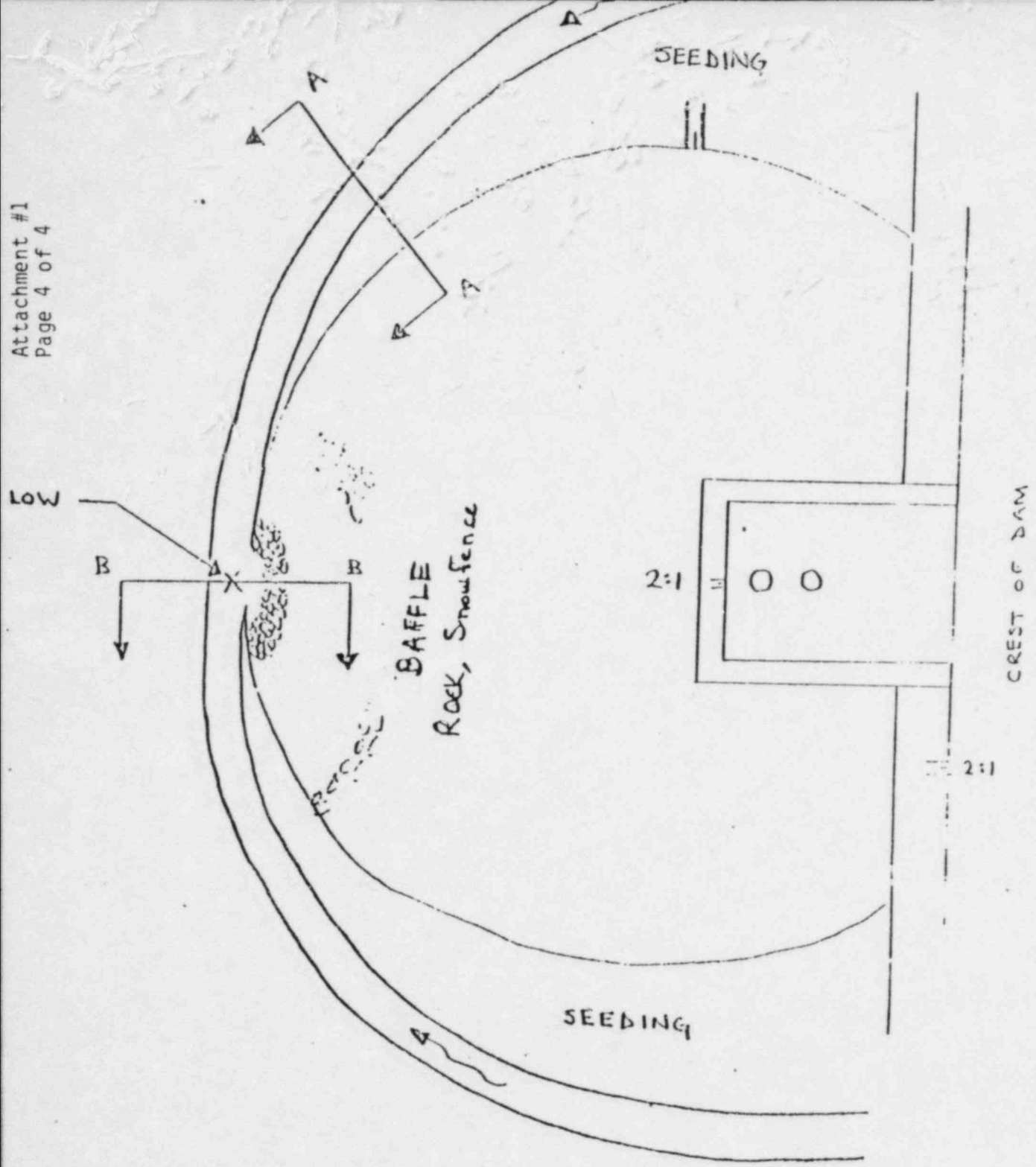
A rock berm will be placed in front of the opening of the bench to dissipate the velocity and spread the flow into the pond. Additional baffles will be placed in the pond area, as required, to prevent channeling and to slow the velocity of the runoff.

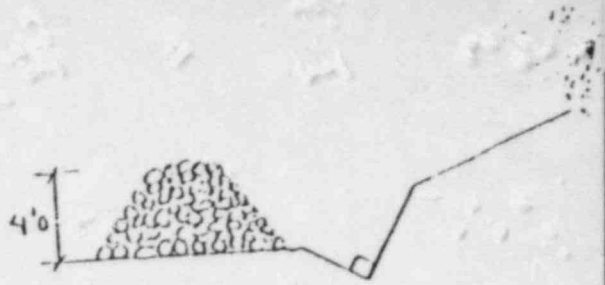
The slopes upstream and downstream of the bench will be seeded and mulched to minimize erosion of the slopes. All on-site areas will continue to be graded and seeded to minimize erosion and the high sediment load to the ponds.

All of these measures will be optimized for impounding Ponds A, B, C, and D, and their unique contours. Pond conditions and filter discharges will continue to be monitored closely.

An additional two feet of fine filter sand will be placed and compacted along the existing side slopes of the sand filters to improve the filters' filtering capacity.

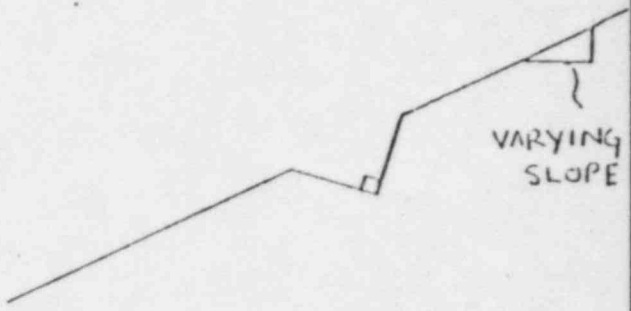
(See sketch on page 4)





ROCK BERM

SECTION B-B



SECTION A-A

POND AREA BENCH

NOT TO SCALE

Figure B

Water Samples - Analytical Test Results*

	pH	Oil & Grease (mg/l)	Total Suspended Solids (mg/l)
February 2, 1983			
Pond A	6.84	0.0062	195
Pond D	6.85	-	113
March 3, 1983			
Pond A	6.90	0.010	5
Pond B	7.18	-	3
Pond C	7.40	-	3
March 7, 1983			
Pond A	7.00	0.008	1
Pond B	7.27	-	1
Pond C	7.40	-	3
Pond D	7.40	-	5
March 18, 1983			
Pond A	6.72	0.04	6
Pond B	6.92	-	3
Pond C	6.52	-	9
March 22, 1983			
Pond A	6.80	0.05	34
Pond B	6.72	-	8
Pond C	7.00	-	1
Pond D	6.95	-	15
April 1, 1983			
Pond A	7.10	0.06	5
Pond B	7.00	-	5
Pond D	7.18	-	3
April 5, 1983			
Pond A 10:30 a.m.	6.93	0.13	222
2:30 p.m.	7.25	0.05	750
Pond B 10:30 a.m.	7.25	-	140
2:30 p.m.	7.48	-	3198
Pond C 10:30 a.m.	7.15	-	4870
2:30 p.m.	7.28	-	8436
Pond D 10:30 a.m.	7.20	-	1994
2:30 p.m.	7.30	-	3803

	pH	Oil & Grease (mg/l)	Total Suspended Solids (mg/l)
April 6, 1983			
Pond A	7.40	0.10	261
Pond B	7.40	-	116
Pond C	7.30	-	151
Pond D	7.38	-	164
April 14, 1983			
Pond A	6.48	0.13	12
Pond B	6.76	-	2
Pond C	6.84	-	2
Pond D	7.09	-	6
April 22, 1983			
Pond A	7.07	0.17	2
Pond B	7.16	-	6
Pond C	7.26	-	6
April 28, 1983			
Pond A	7.04	0.70	3
Pond B	6.88	-	1
Pond C	7.28	-	0.2

*Results reflect actual effluent concentrations being released through discharge pipes.

Analytical Procedures

Analytical procedures are in accordance with the following analytical methods. Oil and grease analyses are performed in accordance with ASTM D-2778 and pH determinations are made by using ASTM D-1293. The method for total suspended solids is described below.

SUSPENDED SEDIMENT ANALYSIS

After trying a number of various methods, the Tennessee Valley Authority has found the filter paper method of making a total sediment concentration analysis to be the most satisfactory. The procedure is as follows:

a. Preparation of Samples--Suspended sediment samples are delivered to the laboratory in pint milk bottles. Each bottle is wiped clean of all mud and dirt and the bottle cap removed. The pint bottle of water and sediment is weighed on a balance which is accurate to 1 g. This weight is recorded as the gross sample weight.

b. Preparation of Filter Papers--For separation of sediment from the water in the sample, fluted filter papers grade 513, 18.5 cm in diameter are used. A filter paper is placed in each permanently numbered flat tin tare.

Left partly uncovered, each tare is placed on a metal shelf in an electric drying oven where they are allowed to remain for 1-1/2 h at a constant temperature of 110°C. The cans are then removed, closed, and placed in a desiccator where they are allowed to cool for 1-1/2 h. Then each can, with the enclosed filter paper, is weighed on a balance which is accurate to 0.0001 g. The resulting weight is recorded as the filter weight tare.

c. Separation of Sediment by Filtration--The samples are placed on a bench in front of a filtering rack holding glass funnels, and the cans are placed on a shelf above and behind the rack. Each filter paper is then removed from its can, placed in an 8-oz. ribbed glass funnel, and unfolded. The suspended sediment sample is poured into the funnel. The silt adhering to the inside of the sample bottle is loosened with a glass rod and is washed with distilled water into the filter paper by means of a wash bottle. The empty bottles

are weighed in the same manner as were the sample-filled bottles and recorded as tare weights.

d. Drying and Weighing Papers and Sediment--After all the water has run through the filter, the filter is covered with a cloth and allowed a air dry for 16 h. The papers are then folded and returned to their respective cans. The cans, partly uncovered, are placed in an oven where they remain for 1-1/2 h at 110°C. They are then removed to a desiccator and cooled for 30 min. The cans and papers containing the silt are weighed on the analytical balance and the results recorded as gross filter weights.

e. Calcuating and Reporting Results--On the worksheet, the net sample weights and net filter weights are obtained by subtraction. To calculate the concentration of sediment in parts per million, the net filter weight (sediment weight) is divided by the net sample weight and the decimal point moved six places to the right.

Attachment #IV

WEEKLY RAINFALL FOR CRBRP SITE

Week Of -	Rainfall (inches)
October 2nd	0.00
3 - 9	.56
10 - 16	.95
17 - 23	.00
24 - 30	.00
Nov. 31 - 6	2.31
7 - 13	.69
14 - 20	1.69
21 - 27	1.17
Dec. 28 - 4	3.50
5 - 11	.82
12 - 18	1.93
19 - 25	.72
Jan. 26 - 1	.74
2 - 8	.40
9 - 15	.64
16 - 22	.44
23 - 29	.01
Feb. 30 - 5	2.39
6 - 12	1.93
13 - 19	.67
20 - 26	.00
March 27 - 5	.00
6 - 12	1.02
13 - 19	.09
20 - 26	1.00
April 27 - 2	.97
3 - 9	5.30
10 - 16	.43
17 - 23	.39
24 - 30	1.00