Civil Engineering and Design Branch Files

J. P. Hillier Stivers, Civil Engineer (Site Development, Highway, and Railroad Design), W3A23 C-K

August 27, 1976

KINGSTON STEAM PLANT - RAISING OF ASH DISPOSAL AREA DIKES - INSTALLATION OF NEW SPILLWAYS - FOUNDATION IMPROVEMENT

On August 23, 1976, Oliver Raine and I at the request of CEB met with General Foreman J. W. Truett and Doyle Cardwell to inspect the installation of new spillways in the existing ash disposal area at Kingston Steam Plant.

Following are the discussion of conditions during the visit and the agreement reached for correcting the present installation and improving the foundation for all installations in the ash area.

The foundation for the pondward portion of the spillways is in light ash. It has not been possible to excavate to firm ground for structure foundations because of water and ash inflow into the excavations. Construction by attempting to firm up the soft ash with earthfill has been unsuccessful, and settlements have occurred on the partially installed structures.

SPILLWAY DESCRIPTION

The inlet of each of the six spillways is composed of a reinforced concrete box with inside dimensions of 4 feet by 4 feet and 2-foot sections of 48-inch reinforced concrete pipe above the box. One section is to be installed initially and additional sections added as needed. The outlet of the box is through a 36-inch reinforced concrete pipe laid horizontal to a reinforced concrete headwall. The boxes are spaced 50 feet on center with the horizontal pipes converging to a spacing of 10 feet on center at the headwall.

STATUS OF CONSTRUCTION

The headwall has been constructed as has been the complete length of horizontal pipes for two of the spillways and their inlet boxes. Approximately 50 percent of the horizontal length of pipe for each of the remaining four spillways has also been installed.

DESCRIBED FOUNDATION CONDITIONS

Headwall

The headwall is founded on firm original ground. The original ground was excavated approximately 2 feet below grade and backfilled with compacted clay.

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Horizontal Pipes and Inlet Boxes

From the headwall to approximately midway of the horizontal pipes the foundation is in natural ground or the original dike. The foundation was excavated approximately 2 feet below grade and backfilled with compacted clay. From midway of the horizontal pipes to and including the inlet boxes the foundation material is light ash which when wet is soft and unstable. The water level in the light ash at the spillways is caused by the fact that the pond is in active use and water is being sluiced into the pond. The ash was excavated approximately 4 feet below grade and backfilled with clay that was tamped in place with backhoe equipment for both the horizontal pipes and the inlet boxes.

Hand probing with a steel rod during our visit indicated a depth of soft ash from 5 feet below grade at the present pipe ends to 8 feet or more at the presently installed inlet boxes.

CONDITION OF HORIZONTAL PIPES

Visual inspection of the horizontal pipes showed settlement of all pipes that were laid on the light ash. Closer inspection of one pipe by crawling through the pipe showed the joints were spreading apart in varying amounts to a maximum of 1-1/2 inches. One section has a 3/8-inch crack completely around the pipe barrel. One section has the end of the barrel broken off to where the "O" ring gasket can be seen.

The other pipes are to be inspected by crawling through the pipes. The joints are to be closed, and the sections that are cracked or broken are to be removed and replaced.

FOUNDATION IMPROVEMENT

All pipes and inlet boxes that are on light ash are to be removed and a firm foundation prepared by placing large stones on the soft ash and compacting with heavy equipment to force the stones down to solid bearing.

It was first considered to remove as much of the light ash as can be removed with equipment for a width of 15 feet each side of the inlet boxes with lateral trenches where the horizontal pipes are. It was decided that it was more practical to excavate the entire width from 15 feet outside the inlet boxes to where the pipes are on solid foundation.

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ROCK PLACING

Initial rock is to weigh from 200 to 400 pounds each with no smaller stones permitted. These rocks are to be forced through the soft material to a firm foundation with heavy equipment. The placing of the 200- to 400-pound stones is to continue to 1 foot below the grade of the pipes and inlet boxes. The top of the large stones is to be choked with smaller stones and surfaced with compacted crushed stone. Instrument observations on the large stone layer and on the crushed stone are to be taken to ensure the rockfill has been compacted to provide a non-settling foundation. Two additional passes of heavy equipment are to be made on the large stone layer and on the crushed stone after surveys indicate no further settlement.

J. F. Miller Stivers

JFMS:RLH
CC: G. L. Buchanan, W3C126 C-K

8/27/76--GLB:MCH
CC: R. G. Domer, W9D224 C-K
Roy H. Dunham, W11A9 C-K
Gene Farmer, E6B39 C-K (4)
B. S. Montgomery, W6D224 C-K
H. H. Mull, E7B24 C-K

Stivers

760929A0476

H. S. Fox, Acting Director of Power Production, 716 EB-C (2)

Roy H. Dunham, Director of Engineering Design, W11A9 C-K

September 28, 1976

KINGSTON STEAM PLANT - ANNUAL ASH DISPOSAL AREA INSPECTION

Attached is a report from J. P. Hillier Stivers to Frank D. Stansberry dated September 27, 1976, of the joint inspection at Kingston Steam Plant which includes a recommendation that another inspection be made as soon as CSB has finished raising the dikes. I concur in this recommendation.

Original Signed By
F. P. Lacy

Roy H. Dunham

GLB:JPHS:BEH
Attachment
CC (Attachment):
G. L. Buchanan, W3C126 C-K (2)
R. G. Domer, W9B224 C-K
MEDS, E4B37 C-K
B. S. Montgomery, 5100 MTB-K
Power Manager's File, 630 PRB-C
E. F. Thomas, 818 PRB-C

Frank D. Stansberry, Head Civil Engineer (Site Development, Highway, Railroad, and Bridge Design), W3A30 C-K

J. P. Hillier Stivers, Civil Engineer (Site Development, Highway, and Railroad Design), W3A23 C-K

September 27, 1976

KINGSTON STEAM PLANT - ANNUAL ASH DISPOSAL AREA INSPECTION

On September 15, 1976, Larry Wall of P PROD, Chattanooga; L. B. Kennedy, Assistant Plant Superintendent; and I inspected the ash disposal areas at Kingston Steam Plant. Our findings were discussed with Monette L. Butler, Plant Superintendent.

The areas were last inspected on September 11, 1975.

On the attached print of drawing 10W420, the different areas are designated.

Change in Dikes Since Last Inspection

At the time of this inspection, CSB was in the process of raising the dikes and installing new spillways in accordance with EN DES drawings and specifications.

All of the original dikes, with the exception of the west dike of the initial area and the south end of dike C, were built with equipment-compacted earth and widened with ash. The west dike of the initial area and the south end of dike C were built and widened with ash.

The outside slopes of dike C, east dike, and the road dike have an excellent cover of vegetation except in the areas where construction has removed the vegetation. The original dikes are in good condition with no visible signs of instability.

Change in Pond Operation Since Last Inspection

There has been no change in operation since last inspection. All ash is sluiced into the initial area. Part of the ash is picked up with a dragline, allowed to drain, then dry hauled to the ash disposal area adjacent to the north dike where the ash is deposited in stages. As each stage reaches the elevation of the top of the north dike, it is covered with earth and seeded.

The ash water carrying light ash that was not picked up by the dragline flows through two plant-constructed spillways and skimmers into the ash disposal area where the rest of the ash settles out. The water then goes into Watts Bar Lake through two standard spillways and skimmers in dike C.

Frank D. Stansberry
September 27, 1976

KINGSTON STEAM PLANT - ANNUAL ASH DISPOSAL AREA INSPECTION

Condition of Spillways, Skimmers, and Outlets

The spillways, skimmers, and outlets of the initial area could not be inspected due to their location in the area with no access.

Visual inspection of the spillways and skimmers in the ash disposal area showed them to be in good condition and operating properly.

The pieces of debris (small tree limbs, etc.) that were caught on the crossmembers of the skimmers, as noted during the last inspection, have been removed.

The outlets of the spillway pipes from the ash disposal area were submerged by Watts Bar Lake and could not be inspected. Visual inspection of the area around the outlets showed no evidence of loss of ash into Watts Bar Lake at this time.

Action on Recommendation of Last Inspection

The debris has been removed from the crossmembers of the skimmers in the ash disposal area.

Recommendations

We have no recommendations for corrective work as a result of this inspection.

We recommend that KN DES be notified as soon as CSB has finished raising the dikes and another inspection be made at that time.

J. P. Hillier Stivers

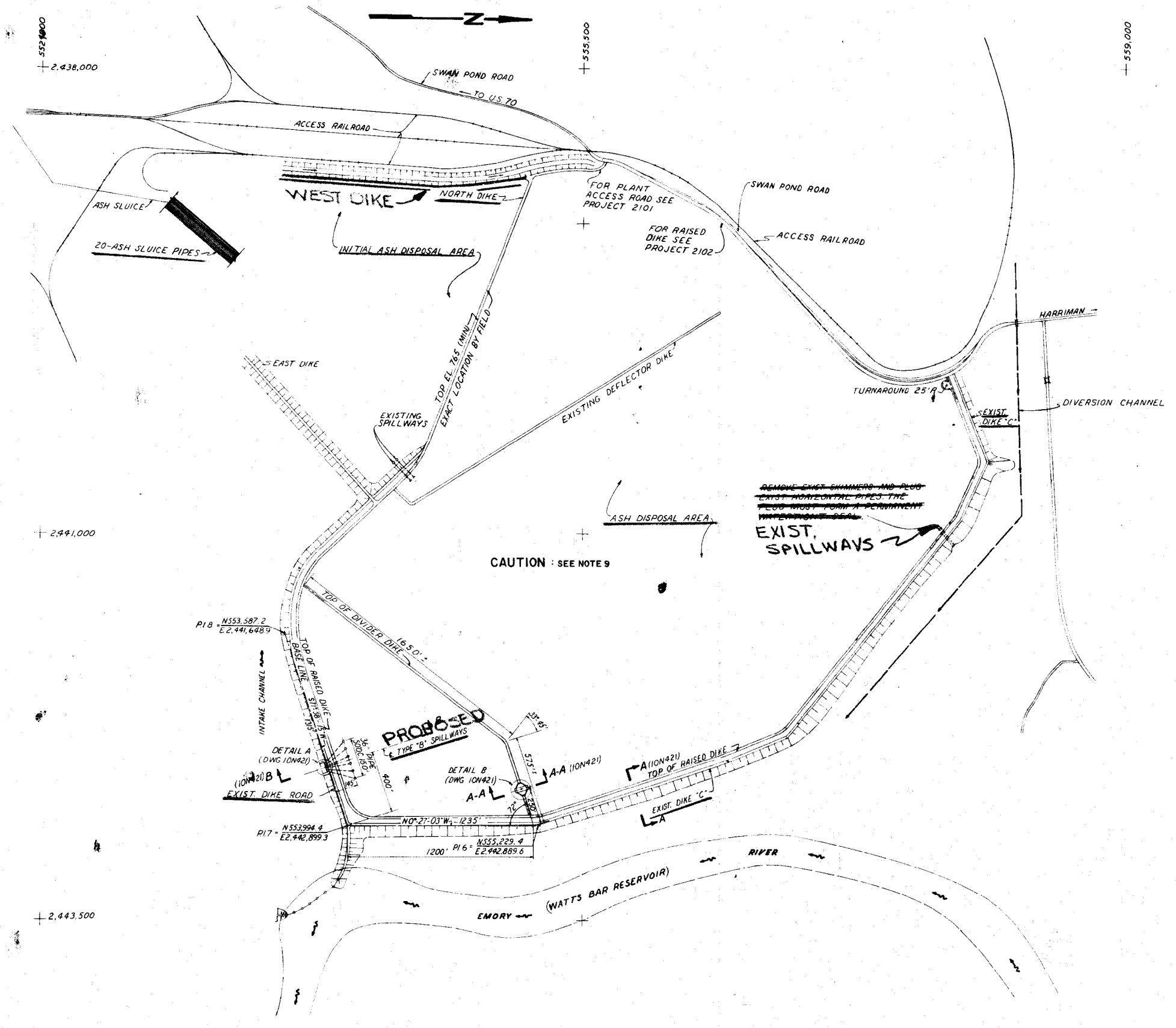
JPHS:BIH
Attachment

Concur: Original Signed By
F. D. Stansberry
Frank D. Stansberry

Original Signed By
G. L. Buchanan
G. L. Buchanan

9/27/76--FDS:BIH
CC: G. L. Buchanan, W3C126 C-K
(Attachment)

9/27/76--GLB:BCH
CC (Attachment):
R. G. Domer, W9D224 C-K
Roy H. Dunham, W11A9 C-K
MEDS, E4B37 C-K
B. S. Montgomery, 5100 MIB-K



NOTES:

1. SOIL EXPLORATION AND LABORATORY TESTING IS RECORDED IN MEMORANDUM REPORT FROM GENE FARMER TO G.L. BUCHANAN, DATED NOVEMBER 3, 1975.
2. CIRCULAR-ARC STABILITY ANALYSIS SAFETY FACTORS FOR THE NEW DIKES BASED UPON AN EVALUATION OF THE SOILS INVESTIGATION REPORT ARE AS FOLLOWS:
   A. INITIAL CONSTRUCTION, EXTERIOR SLOPE: SAFETY FACTOR = 2.6
   B. INITIAL CONSTRUCTION, INTERIOR SLOPE: SAFETY FACTOR = 1.9
   C. OPERATING CONDITION WITH ASH AND WATER TO EL. 761, EXTERIOR SLOPE: SAFETY FACTOR = 2.7
   D. OPERATING CONDITION WITH ASH AND WATER TO EL. 761, INTERIOR SLOPE: SAFETY FACTOR = 1.6
3. ALL WORK TO BE IN ACCORDANCE WITH T-1 SPECIFICATIONS UNLESS NOTED.
4. ALL DIKE CONSTRUCTION SHALL BE IN ACCORDANCE WITH GENERAL CONSTRUCTION SPECIFICATION NO. G-9 FOR ROLLED EARTHFILL FOR DAMS AND POWER PLANTS. FILL COMPACTION SHALL BE AT LEAST 95% OF STANDARD MAXIMUM DENSITY AND FILL MOISTURE CONTENT SHALL BE WITHIN 2% OF OPTIMUM MOISTURE CONTENT, AS DETERMINED BY THE CENTRAL SOILS LABORATORY.
5. FOUNDATION PREPARATION FOR EARTH EMBANKMENTS SHALL CONSIST OF REMOVING ORGANIC TOPSOIL, TO A DEPTH THAT WILL REMOVE ALL ROOTS AND ALL PERVIOUS MATERIAL, (RIPRAP, GRAVEL, CRUSHED STONE, COARSE ASH, ETC.), AND EXCAVATION SHALL CONTINUE TO A DEPTH THAT WILL SUPPORT HEAVY EARTH MOVING EQUIPMENT WITHOUT RUTTING INTO THE GROUND AND WITHOUT HEAVING THE GROUND SO AS TO REDUCE ITS STABILITY.
6. PIPE BACKFILL SHALL CONSIST OF IMPERVIOUS SOIL, FREE OF DEBRIS, WITH NO HARD LUMPS OR CLODS LARGER THAN 3" IN DIAMETER. COMPACTION SHALL BE BY HAND-HELD COMPACTORS TO A MINIMUM OF 1' ABOVE THE TOP OF THE PIPE. THE SOIL SHALL BE PLACED IN 6" LAYERS AND COMPACTED TO AT LEAST 95% OF STANDARD MAXIMUM DENSITY AS ESTABLISHED BY THE CENTRAL SOILS LABORATORY. BACKFILL MOISTURE SHALL BE CONTROLLED TO OBTAIN THE MAXIMUM PRACTICABLE DENSITY. THE BACKFILL SHALL BE PLACED SO AS TO MAINTAIN THE SAME ELEVATION ON BOTH SIDES OF THE PIPE.
7. THE DIVIDER DIKE SHALL BE CONSTRUCTED OF BOTTOM ASH. PLACEMENT OF THE UNDERWATER ASH FILL SHALL BE BY END DUMPING ALONG THE LENGTH OF THE DIKE. THE TOP SURFACE OF THE UNDERWATER DIKE JUST ABOVE THE WATER SHALL BE THOROUGHLY COMPACTED AND SCARIFIED BEFORE PLACING THE OVERLAYING ASH FILL. BOTTOM ASH FOR THAT PORTION OF THE DIVIDER DIKE ABOVE WATER SHALL BE PLACED IN NOT MORE THAN 9-INCH LAYERS, AND SHALL BE WELL COMPACTED WITH RUBBER TIRED HAULING EQUIPMENT.
8. CUT SLOPES ADJACENT TO EXISTING OR PROPOSED DIKES SHALL NOT BE EXCAVATED STEEPER THAN 3:1 AND TOP OF CUT SHALL BE A MINIMUM OF 20' FROM THE TOE OF ANY DIKE.
9. WHEN CONNECTING THE NEW DIKE TO THE OLD DIKE, EXTREME CARE SHALL BE USED TO INSURE AN IMPERVIOUS AND STABLE CONNECTION. THE EXISTING DIKES SHALL BE STRIPPED OF ALL VEGETATION, RIPRAP, GRAVEL, CRUSHED STONE, COARSE ASH AND OTHER PERVIOUS MATERIAL BEHIND, AND SCARIFIED TO A MINIMUM DEPTH OF 6" AND COMPACTED SO AS TO FORM A BOND WITH THE NEW FILL. THE UTMOST CAUTION SHALL BE USED IN BENCHING THE EXISTING DIKE SLOPES SO AS NOT TO CREATE AN UNSTABLE CONDITION. SMALL BENCHES OF MINIMUM DEPTH SHALL BE USED.
10. GRASSING: CUT AND FILL SLOPES, AND DISTURBED AREAS SHALL BE SEEDED WITH TYPE 6E MIXTURE (SPRING SEEDING) OR TYPE 8 (FALL SEEDING). IF COVER IS NEEDED PRIOR TO SEEDING DATES USE TYPE 9 FOR WINTER SEEDING AND TYPE 10A FOR SUMMER SEEDING. ALL AREAS ARE TO BE SEEDED, FERTILIZED, AND MULCHED IN ACCORDANCE WITH SECTIONS 180 AND 182.
11. RIPRAP IS TO BE PLACED AT THE LOCATIONS AS SHOWN. AT LEAST 50% OF THE RIPRAP SHALL CONSIST OF STONE OF A WEIGHT EQUAL TO OR GREATER THAN 150 LBS., AND IN ACCORDANCE WITH SECTION 830.
12. FILTER BLANKET SHALL BE 6" THICK AND IN ACCORDANCE WITH SECTION 836.
13. SUMMARY OF QUANTITIES - SEE DWG 2102H101

SCALE : 1" = 300'

COMPANION DRAWING: 10N421, N422, N423
HWY PROJECT 2102

INSPECTED AND APPROVED FOR ISSUE
P.M. Montgomery

PRINTS REQD-R OR or PROJ

	DWG SIZE F	H
ME		
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REV NO.	ECN NO.	DATE	DSGN	DRWN	CHKD	SUPV	CNGR	INSP	SUBM	RECM	APPR
DSGN D.R. GALLOWAY							INSP S.D. STONE JR for				
DRWN J.R.C. 5-20-76											
CHKD D.R. GALLOWAY							ENGINEER S.B. Logan				
SUPV J.P.H. STEVENS											

ASH POND DIKE

PLAN-RAISING ASH DISPOSAL AREA DIKE

KINGSTON STEAM PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED	RECOMMENDED	APPROVED
Robert J. Bowman	R.D. Bowman	G.B. Dexter

KNOXVILLE 5-20-76 | 36 | C | 10N420 RO

RECORD DRAWING AS CONSTRUCTED

TVA-00005770