B65 021203 250

December 3, 2002

Earl L. Deskins, KFP 1A-KST

KINGSTON FOSSIL PLANT (KIF) - ANNUAL ASH POND DIKE STABILITY INSPECTION

Attached is the latest dike stability inspection for your plant. The report was prepared by John Albright of our Civil Engineering section and the inspection was performed on October 23, 2002. The report includes recommendations for maintenance. I concur with those recommendations.

If you have questions of comments, please call me at Chattanooga extension 4820, or John Albright at Chattanooga extension 3981.

W. L. Pitt FOR
James G. Adair, Manager
Engineering Design Services
LP 2G-C

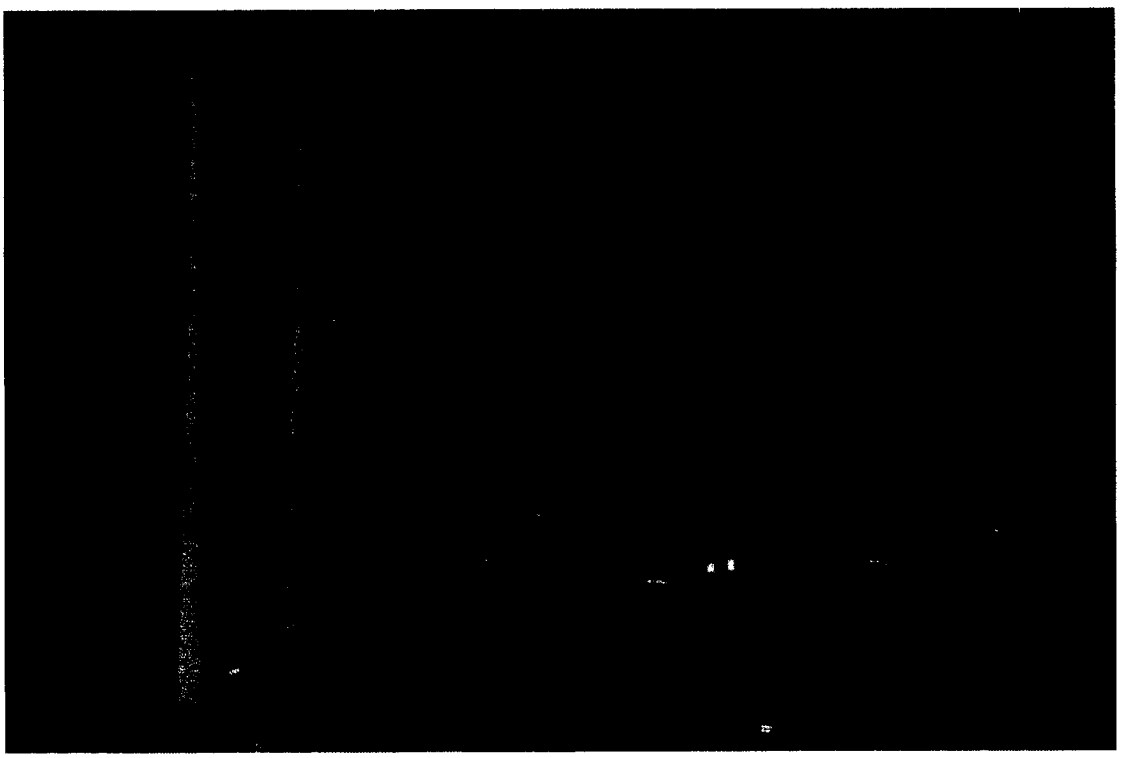
REP:JGA:LMV
Attachment
cc (w/attachment):
L. F. Campbell, KFP 1A-KST
J. H. Catlett, KFP 1A-KST
M. A. Cones, Dam Safety Files, LP 1H-C
M. D. Davis, LP 5E-C
R. E. Johnson, LP 2L-C
G. R. MacDonald, LP 5E-C
B. C. Morris, LP 5E-C
EDMS, EB 5G-C

j:/fossil eng/proj eng/civil/kif ash pond insp cover 2002.doc

TENNESSEE VALLEY AUTHORITY

KINGSTON FOSSIL PLANT

ANNUAL ASH POND DIKE STABILITY INSPECTION



Prepared by: John Albright
Date: October 25, 2002

KINGSTON FOSSIL PLANT
ANNUAL ASH POND DIKE STABILITY INSPECTION—2002

General

The waste disposal areas at Kingston Fossil Plant were inspected for dike structural stability on October 23, 2002. The inspection was performed by John Albright of TVA Engineering Design Services, Civil Engineering, and James T. Settles of Kingston Fossil Plant.

The previous annual inspection was performed on October 24, 2001.

The results of the annual stability inspection are listed below according to location within the ash disposal area.

Active Ash Disposal Area

Plant operations continues to manage this area the same as during the last inspection. Bottom ash is sluiced into a channel southwest of the disposal area where it settles out and is removed by drag line, approximately once a week, to be used for dike construction. Fly ash is sluiced into a channel northwest of the bottom ash channel. Both channels flow northeast into the active ash pond where the fly ash settles out and accumulates. The fly ash is periodically dredged into one of two cells located in the western half of the disposal area. The dikes of these cells are raised using fly ash and bottom ash to provide more capacity for dredged fly ash as needed. Note: the dredge cell dikes were reanalyzed during the summer of 2001 for stability using only fly ash for construction. The factor of safety was acceptable and the dikes above elevation 805 feet may be constructed without bottom ash. See 2002 Pond Inspection Report.

The sluice water flows into the stilling pool through one of two plant constructed spillways. From the stilling pool, the water discharges into the plant intake channel via six standard spillways. At the time of the inspection, five of the six spillways were operating. The western spillway was raised above the level of the other five and was not discharging.

All exterior dike slopes around this area were in sound condition with excellent vegetative cover. No animal activity was observed in the active pond. The vegetation on the eastern side of the pond from the Stilling Pool to Swan Pond Road had not been mowed since the spring. The dikes were in need of mowing as several small trees had grown to a height of 3 to 5 feet (see Photo 1). These dikes are mowed only once a year. No sloughs or seepages were detected. In fact, two areas outside the stilling pool that were active seeps in years past no longer seeped. Those areas are detectable only from the sparse vegetation probably due to the low pH in the soil caused by the seeps. The divider dike between the active pond and the stilling pool had some areas of rill erosion and gullies, but appeared stable otherwise (see Photo 2).

All dike roads were in good condition with a good ash or crushed stone surface except for the lower dike road along the east side of the pond (Dike C). The lower road has grown up with vegetation (see Photo 1). Two areas of the lower dike road were rutted and held water making vehicle passage difficult (see Photo 3).

The ash pond discharge spillways are in good condition with no noticeable erosion (see Photos 4 and 5). A recent flow experiment plugged all of the ash pond discharge spillways at their outlets overnight. When the plugs were released, some of the rip-rap at the discharge was washed away and later replaced.

Engineered Redwater Wetland

The engineered wetland along the southeast dike receives seepage that collects in the anoxic limestone drain at the toe of the slope. The wetland appeared to be functioning, at least partially, though the discharged is still pumped to the ash pond. See Photo 6.

Dredge Cells

The top of dike elevation for Cell 2/3 is now elevation 805. The dike for Cell No. 1 is also at elevation 805, but is being raised to El. 810. Cell 2/3 was being dredged into at the time of inspection.

The dike slopes around this area were all stable with some rill erosion in places. Most of the Stage C2 lift has a vegetative cover; recent seeding has sprouted and sparsely covered areas are filling in as in Photo 7. Lift C2 is complete and Lift D1 has been started on Cell 1. Dike slopes with sparse vegetation should continue to be reseeded and mulched until a good vegetative cover is apparent. Plant operations continue to do a commendable job of mowing the slopes. On the North side of the Cell 2/3 dike one of the french drains is flowing heavily and eroding the soil cover over the ash (see Photo 9). In addition, a few small trees are growing in the area and they should be pulled or kept mowed to prevent further growth.

Chemical Treatment Ponds

The chemical treatment ponds are located southwest of the active ash pond. Both ponds were excavated and have no exterior slopes. The internal dike slopes are covered with riprap. These slopes were in good condition.

Coal Yard Drainage Basin

The coal yard drainage basin is located at the southwest corner of the coal pile. This basin was excavated below grade; therefore, there are no exterior dikes. The interior slopes appeared to be in satisfactory condition (see Photo 8). Normal discharge from this basin is pumped into the fly ash discharge ditch and flows to the active ash disposal area. At the time of inspection, water in the pond was at a low level, about 6"

below the first pump start switch and the platform was grounded. The basin was sounded at 5 places and found to have a depth of 2.7 feet average when the water was at elevation 751. This indicates the sediment in the bottom occupies 3.3 feet of the basin's storage capacity. Since it was dredged just over a year ago, we forecast the basin will need to be dredged annually. The bottom of the pond should be no higher than elevation 745. Elevation 745 allows 2 feet of clearance below the pump intakes to prevent the pumps from pumping solids; the elevations indicate the pumps have been pumping solids for some time. In addition, the "V-shaped" pond extensions added during the summer of 2001 to increase the pond storage volume were visually undetectable. TVA drawing 10W225-1 shows the pond and its intended bottom contours.

Actions on Recommendations of Last Inspection

- Lift C3 of the dredge cell dikes has been completed and seeded to protect the slopes from erosion.

Recommendations

- Dredge cell dike slopes with sparse vegetation should continue to be reseeded and mulched until a good vegetative cover is present.
- Cover exposed ash on the berms of Cell 1 with soil and vegetate, approximately 0.6 Ac.
- Remove trees and other growth along the eastern slopes of Dike C. At this point, the trees are small enough to be mowed and mowing at least twice a year is recommended to control the size of the trees. Preventing the trees from getting larger that 1" in diameter at the ground is preferred. Any trees larger than 3" in diameter at the base must be pulled from the dikes, roots and all and the damage repaired.
- Fill should be added and riprap placed to prevent further erosion at a few outlet drains on the northern slope of the dredge cell 2/3 dike, one in particular. See Photo 9. Estimated quantity is 7 cubic yards of rip-rap.
- Plant maintenance should continue to mow grass and vegetation on all dike slopes.
- Plant personnel should continue monitoring the limestone drain area and all exterior dike slopes for seepages, soft wet spots, animal burrowing, sloughing, etc., and notify Fossil Engineering Services of any changes.
- Repair the ruts in the lower dike along the stilling pool and Dike C by filling with soil, compacting it, grading the road to turn water to the outside and covering the repairs with ¾" crushed stone. It is estimated the length of both repairs is 30 feet, requiring about 3 yards of soil to fill the ruts and 12 tons of stone for cover.

- Future flow control of the ash pond discharge should only be done by raising the standpipes. The outlets must not be plugged. Plugging the outlets puts the joints in the concrete pipe under pressure they were not intended to withstand. This pressure could cause the joints to leak and wash out a portion of the dike causing the dike to fail.
- Dredge the Coal Yard Drainage Basin to restore its design contours and protect the pumps from further damage. There is an estimated 2,200 cubic yards of sediment in the original pond and an extra 2,750 cubic yards in the "V" section that needs to be removed as soon as reasonable. See the attached copy of 10W225-1.

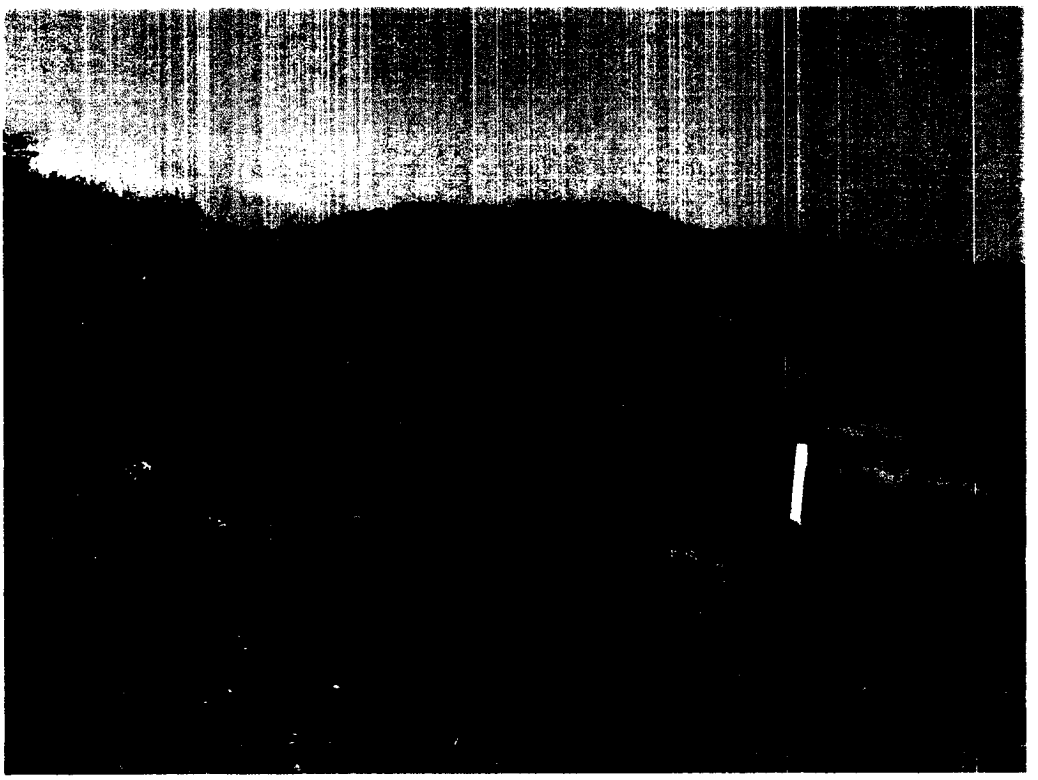


Photo 1 - Dike C and Lower Dike Road

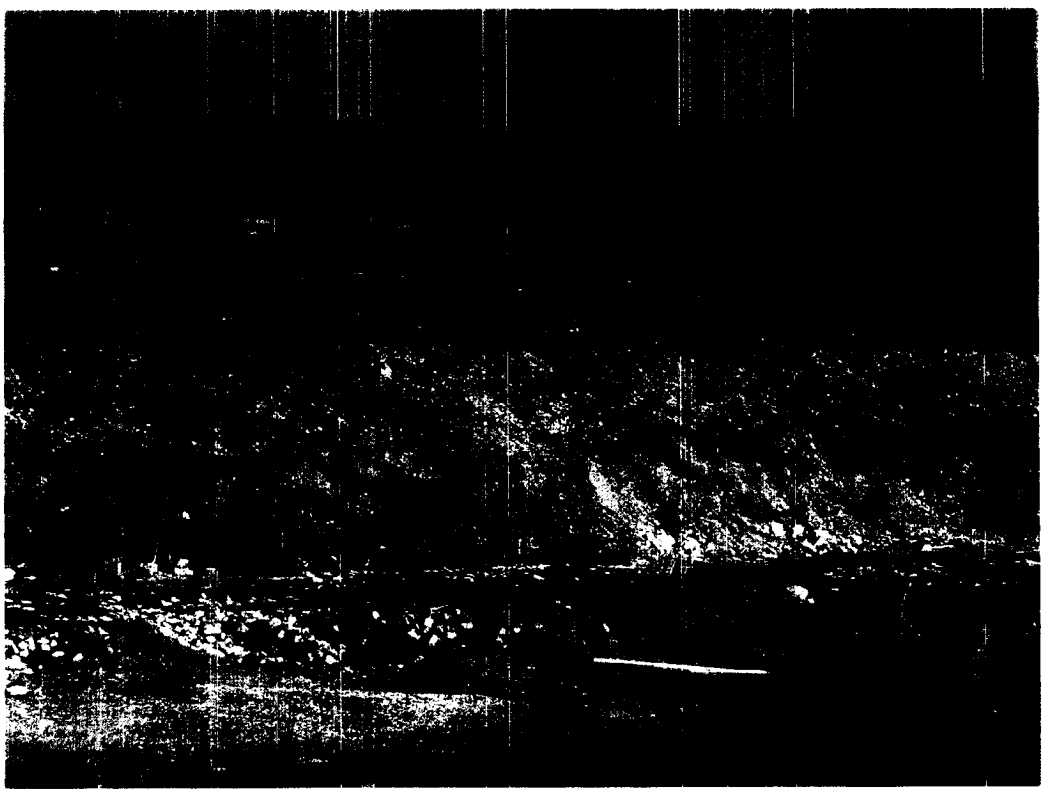


Photo 2 - Stilling Pool Divider Dike

Photo 3 – Wheel Ruts in Dike Road

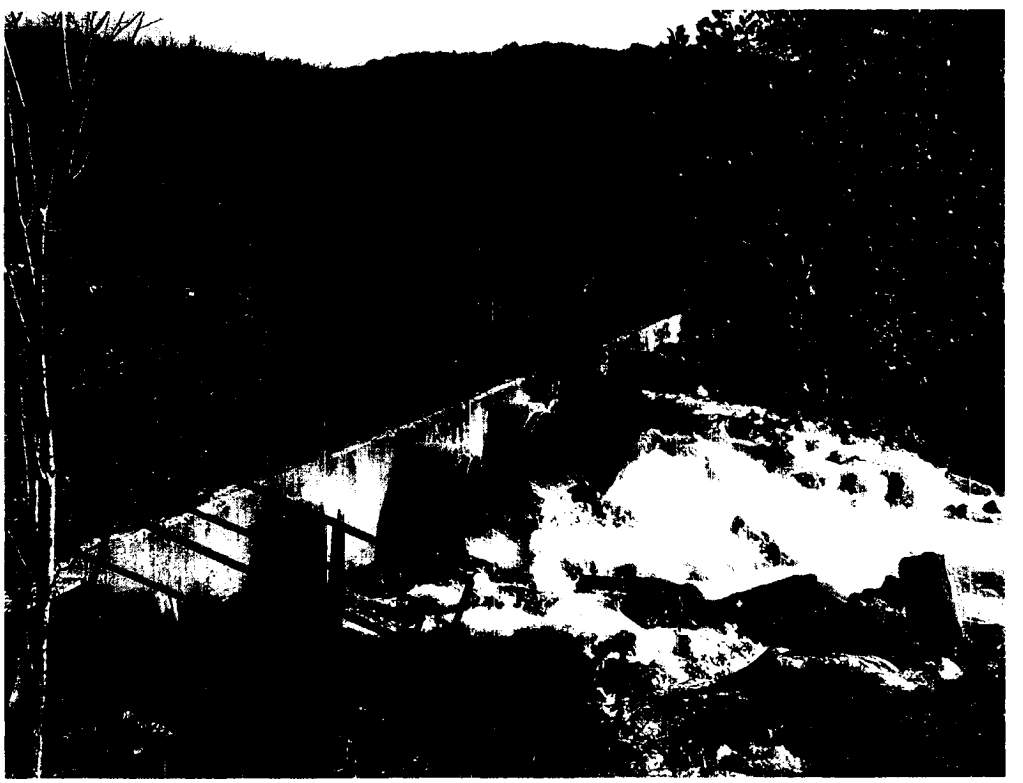


Photo 4 - Ash Pond Spillway Discharge

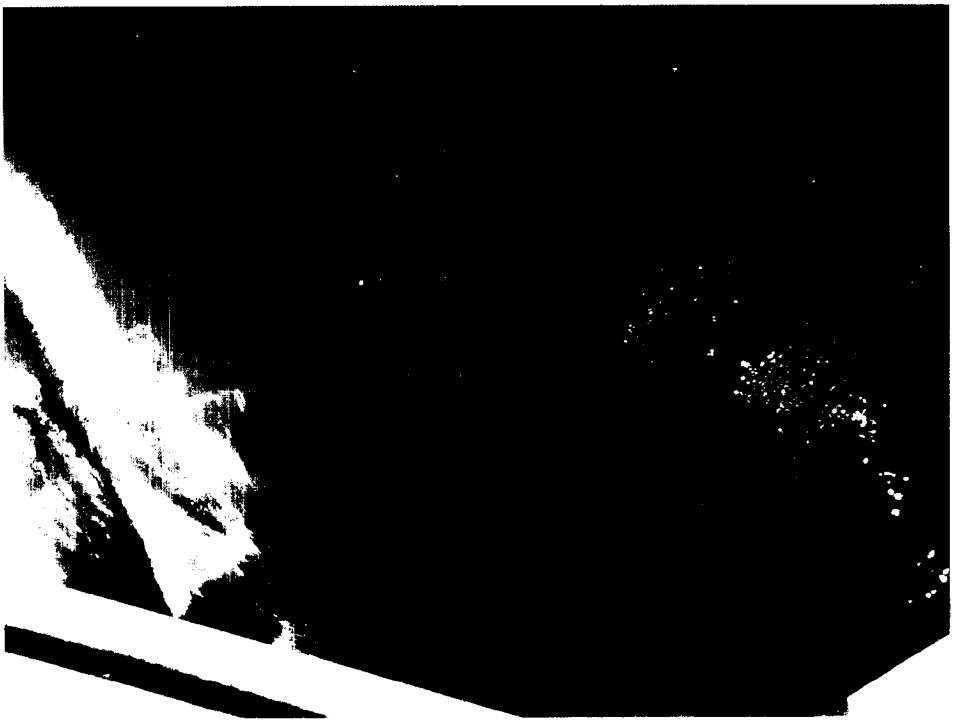


Photo 5 - Ash Pond Spillway Inlet

Photo 6 – Engineered Wetlands

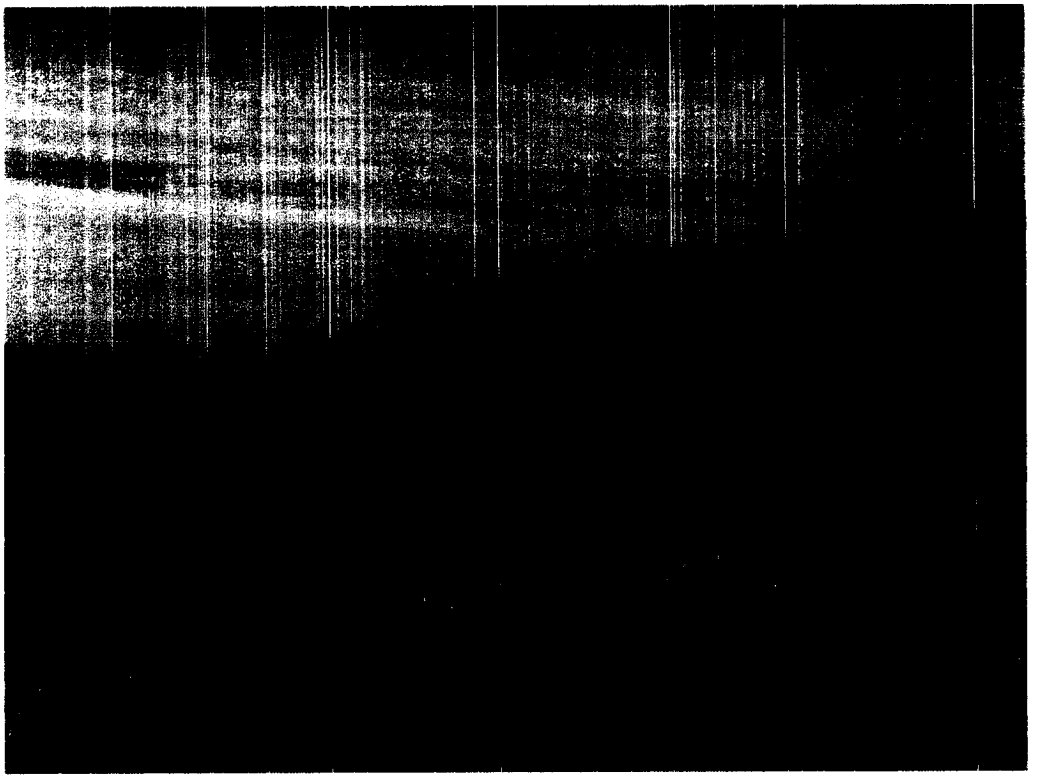


Photo 7 – Exterior Slopes Of Cell 2/3

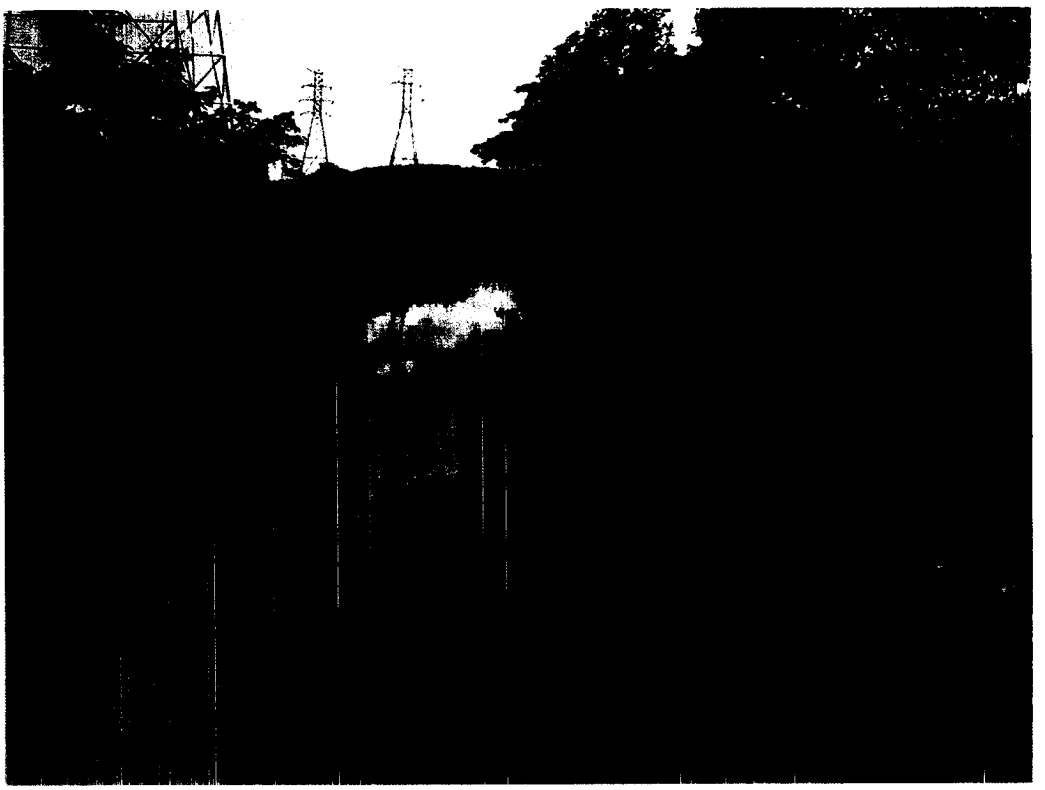
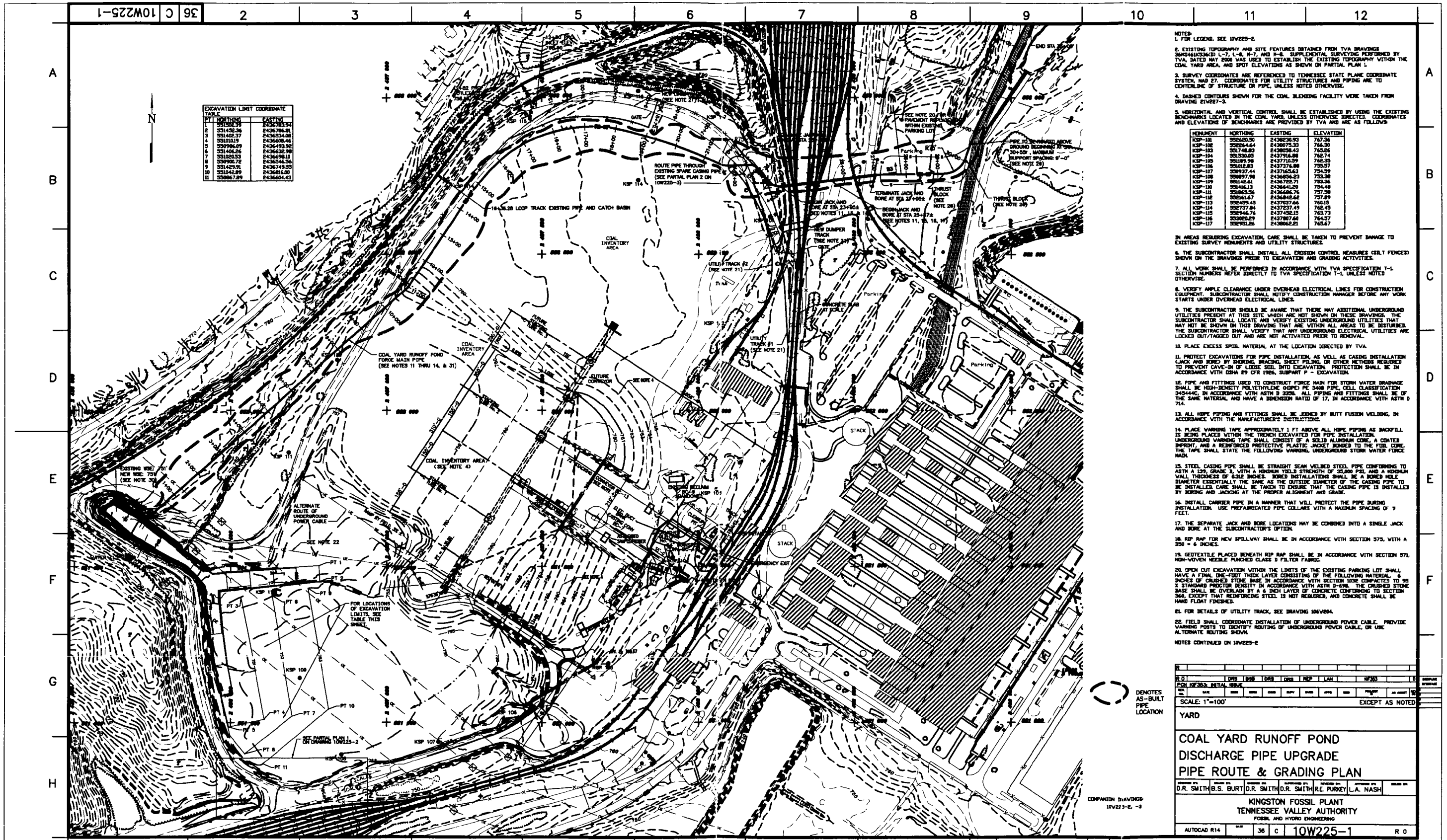


Photo 8 – Coal Yard Drainage Basin

Photo 9 – Cell 2/3 French Drain

Appendix
Drawings and Data to Be Preserved



NOTES:

1. FOR LEGEND, SEE 10V225-2.

2. EXISTING TOPOGRAPHY AND SITE FEATURES OBTAINED FROM TVA DRAWINGS 36A546(CS36/D L-7, L-8, N-7, AND N-8. SUPPLEMENTAL SURVEYING PERFORMED BY TVA, DATED MAY 2000 WAS USED TO ESTABLISH THE EXISTING TOPOGRAPHY WITHIN THE COAL YARD AREA, AND SPOT ELEVATIONS AS SHOWN ON PARTIAL PLAN 1.

3. SURVEY COORDINATES ARE REFERENCED TO TENNESSEE STATE PLANE COORDINATE SYSTEM, NAD 27. COORDINATES FOR UTILITY STRUCTURES AND PIPING ARE TO CENTERLINE OF STRUCTURE OR PIPE, UNLESS NOTED OTHERWISE.

4. DASHED CONTOURS SHOWN FOR THE COAL BLENDING FACILITY WERE TAKEN FROM DRAWING 21W227-3.

5. HORIZONTAL AND VERTICAL CONTROL SHALL BE ESTABLISHED BY USING THE EXISTING BENCHMARKS LOCATED IN THE COAL YARD UNLESS OTHERWISE DIRECTED. COORDINATES AND ELEVATIONS OF BENCHMARKS ARE PROVIDED BY TVA AND ARE AS FOLLOWS:

MONUMENT	NORTHING	EASTING	ELEVATION
KSP-101	350685.50	2436230.93	767.36
KSP-102	350284.64	2438075.33	766.30
KSP-103	351748.82	2438058.43	763.26
KSP-104	351336.65	2437916.88	762.74
KSP-105	351019.99	2437710.59	762.59
KSP-106	351012.83	2437376.88	735.57
KSP-107	350937.44	2437165.63	734.39
KSP-108	350897.78	2436956.23	733.38
KSP-109	350142.61	2436722.71	733.36
KSP-110	351416.13	2436411.28	734.48
KSP-111	351863.56	2436686.76	737.38
KSP-112	352161.67	2436848.68	737.89
KSP-113	352459.43	2437037.66	764.15
KSP-114	352737.84	2437237.49	762.45
KSP-115	352946.76	2437438.15	763.73
KSP-116	353020.29	2437887.64	764.57
KSP-117	352951.26	2438062.21	765.67

IN AREAS REQUIRING EXCAVATION, CARE SHALL BE TAKEN TO PREVENT DAMAGE TO EXISTING SURVEY MONUMENTS AND UTILITY STRUCTURES.

6. THE SUBCONTRACTOR SHALL INSTALL ALL EROSION CONTROL MEASURES ONLY FENCED SHOWN ON THE DRAWINGS PRIOR TO EXCAVATION AND GRADING ACTIVITIES.

7. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH TVA SPECIFICATION T-1. SECTION NUMBERS REFER DIRECTLY TO TVA SPECIFICATION T-1, UNLESS NOTED OTHERWISE.

8. VERIFY AMPLE CLEARANCE UNDER OVERHEAD ELECTRICAL LINES FOR CONSTRUCTION EQUIPMENT. SUBCONTRACTOR SHALL NOTIFY CONSTRUCTION MANAGER BEFORE ANY WORK STARTS UNDER OVERHEAD ELECTRICAL LINES.

9. THE SUBCONTRACTOR SHOULD BE AWARE THAT THERE MAY ADDITIONAL UNDERGROUND UTILITIES PRESENT AT THIS SITE WHICH ARE NOT SHOWN ON THESE DRAWINGS. THE SUBCONTRACTOR SHALL LOCATE AND VERIFY EXISTING UNDERGROUND UTILITIES THAT MAY NOT BE SHOWN ON THIS DRAWING THAT ARE WITHIN ALL AREAS TO BE DISTURBED. THE SUBCONTRACTOR SHALL VERIFY THAT ANY UNDERGROUND ELECTRICAL UTILITIES ARE LOCKED OUT/TAGGED OUT AND ARE NOT ACTIVATED PRIOR TO REMOVAL.

10. PLACE EXCESS SPOIL MATERIAL AT THE LOCATION DIRECTED BY TVA.

11. PROTECT EXCAVATIONS FOR PIPE INSTALLATION, AS WELL AS CASING INSTALLATION (JACK AND BORE) BY SHORING, BRACING, SHEET PILING, OR OTHER METHODS REQUIRED TO PREVENT CAVE-IN OF LOOSE SOIL INTO EXCAVATION. PROTECTION SHALL BE IN ACCORDANCE WITH OSHA 29 CFR 1926, SUBPART P - EXCAVATION.

12. PIPE AND FITTINGS USED TO CONSTRUCT FORCE MAIN FOR STORM WATER DRAINAGE SHALL BE HIGH-DENSITY POLYETHYLENE (HDPE) PE 3408 PVC, CELL CLASSIFICATION 345444C, IN ACCORDANCE WITH ASTM D 3350. ALL PIPING AND FITTINGS SHALL BE OF THE SAME MATERIAL AND HAVE A DIMENSION RATIO OF 17, IN ACCORDANCE WITH ASTM D 714.

13. ALL HDPE PIPING AND FITTINGS SHALL BE JOINED BY BUTT FUSION WELDING, IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.

14. PLACE WARNING TAPE APPROXIMATELY 1 FT ABOVE ALL HDPE PIPING AS BACKFILL IS BEING PLACED WITHIN THE TRENCH EXCAVATED FOR PIPE INSTALLATION. UNDERGROUND WARNING TAPE SHALL CONSIST OF A SOLID ALUMINUM CORE, A COATED IMPRINT, AND A REINFORCED PROTECTIVE PLASTIC JACKET BONDED TO THE FOIL CORE. THE TAPE SHALL STATE THE FOLLOWING WARNING, UNDERGROUND STORM WATER FORCE MAIN.

15. STEEL CASING PIPE SHALL BE STRAIGHT SEAM WELDED STEEL PIPE CONFORMING TO ASTM A 139, GRADE B, WITH A MINIMUM YIELD STRENGTH OF 35,000 PSI, AND A MINIMUM WALL THICKNESS OF 0.312 INCHES. BORED INSTALLATIONS SHALL BE A BORED HOLE DIAMETER ESSENTIALLY THE SAME AS THE OUTSIDE DIAMETER OF THE CASING PIPE TO BE INSTALLED. CARE SHALL BE TAKEN TO ENSURE THAT THE CASING PIPE IS INSTALLED BY BORING AND JACKING AT THE PROPER ALIGNMENT AND GRADE.

16. INSTALL CARRIER PIPE IN A MANNER THAT WILL PROTECT THE PIPE DURING INSTALLATION. USE PREFABRICATED PIPE COLLARS WITH A MAXIMUM SPACING OF 9 FEET.

17. THE SEPARATE JACK AND BORE LOCATIONS MAY BE COMBINED INTO A SINGLE JACK AND BORE AT THE SUBCONTRACTOR'S OPTION.

18. RIP RAP FOR NEW SPILLWAY SHALL BE IN ACCORDANCE WITH SECTION 373, WITH A D50 = 6 INCHES.

19. GEOTEXTILE PLACED BENEATH RIP RAP SHALL BE IN ACCORDANCE WITH SECTION 571, NON-WOVEN NEEDLE PUNCHED CLASS 3 FILTER FABRIC.

20. OPEN CUT EXCAVATION WITHIN THE LIMITS OF THE EXISTING PARKING LOT SHALL HAVE A FINAL ONE-FOOT THICK LAYER CONSISTING OF THE FOLLOWING MATERIAL: 6 INCHES OF CRUSHED STONE BASE IN ACCORDANCE WITH SECTION 1032 COMPACTED TO 95 % STANDARD PROCTOR DENSITY IN ACCORDANCE WITH ASTM D-698. THE CRUSHED STONE BASE SHALL BE OVERLAIN BY A 6 INCH LAYER OF CONCRETE CONFORMING TO SECTION 360, EXCEPT THAT REINFORCING STEEL IS NOT REQUIRED, AND CONCRETE SHALL BE HAND FLOAT FINISHED.

21. FOR DETAILS OF UTILITY TRACK, SEE DRAWING 106V284.

22. FIELD SHALL COORDINATE INSTALLATION OF UNDERGROUND POWER CABLE. PROVIDE WARNING POSTS TO IDENTIFY ROUTING OF UNDERGROUND POWER CABLE, OR USE ALTERNATE ROUTING SHOWN.

NOTES CONTINUED ON 10V225-2

DENOTES AS-BUILT PIPE LOCATION

COMPANION DRAWINGS 10V213-2, -3

R								
R 0	DRS	BSB	DRS	DRS	REP	LAN	WP353	0
PCN WP353 INITIAL ISSUE								

SCALE: 1"=100' EXCEPT AS NOTED

YARD

COAL YARD RUNOFF POND DISCHARGE PIPE UPGRADE PIPE ROUTE & GRADING PLAN

DESIGNED BY	DRAWN BY	RECOMMENDED BY	APPROVED BY	RELEASED BY	APPROVED BY	ISSUED ON
D.R. SMITH	B.S. BURT	D.R. SMITH	D.R. SMITH	R.E. PURKEY	L.A. NASH	

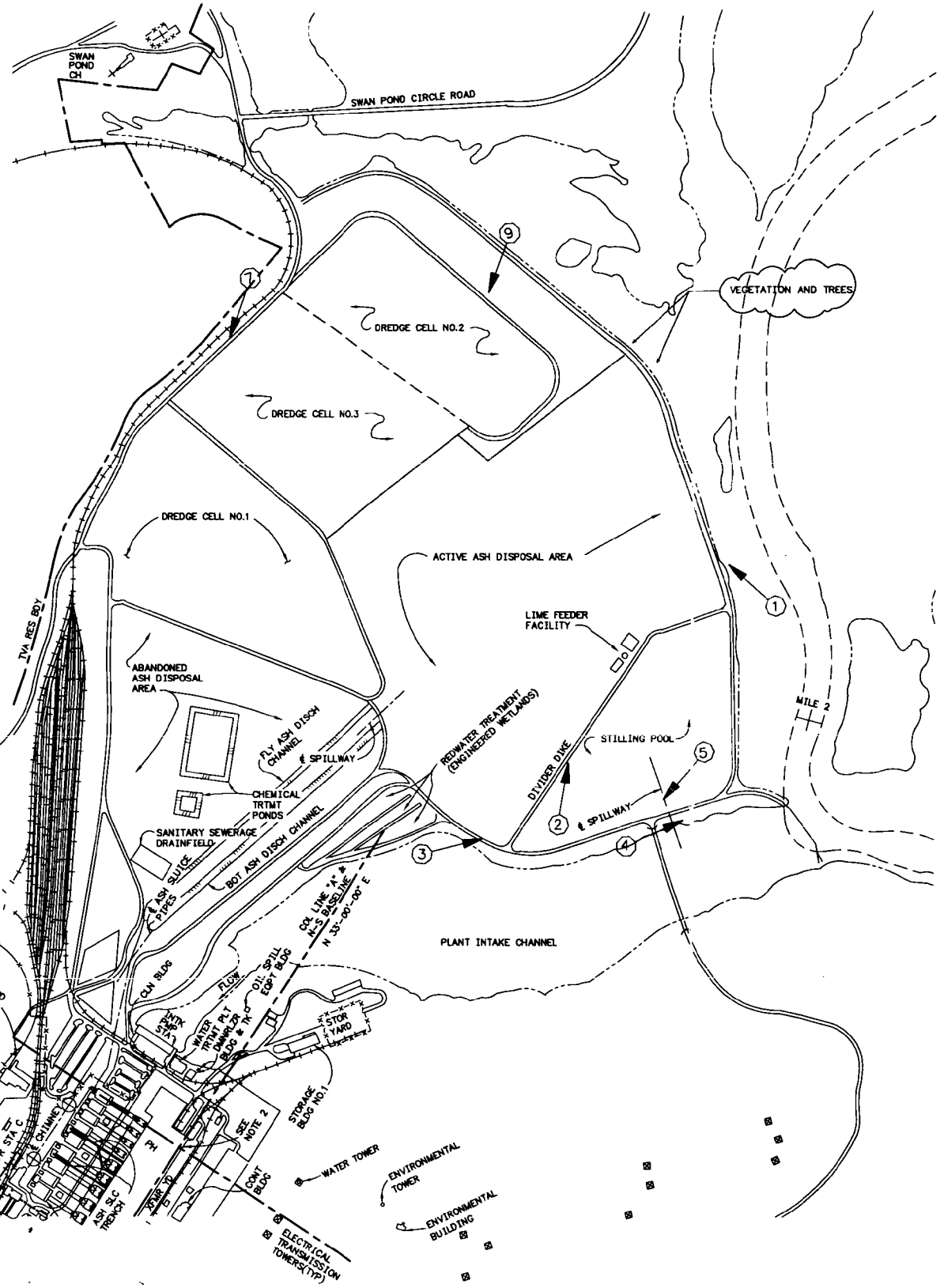
KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

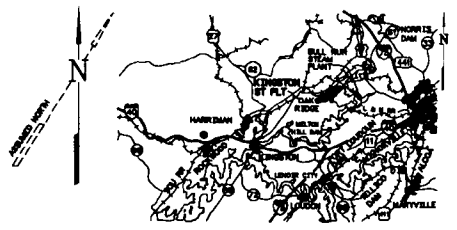
AUTOCAD R14		36	C	10W225-1	R 0

PARSONS | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:1
W_TVA

C.A.D. DRAWING DO NOT ALTER MANUALLY





LOCALITY MAP

NOTES:

1. TOPOGRAPHY TRACED FROM MYLAR PLOTTED FROM APRIL 1974 AERIAL PHOTOGRAPHS AND FROM USGS 7.5 MINUTE QUADRANGLE (HARRIMAN, TN 132-NE AND LENOIR CITY, TN 132-SE) ENLARGED. CONTOUR INTERVAL SHOWN IS 10 FEET.
2. THE TENNESSEE STATE COORDINATES AT THE INTERSECTION OF THE N-S AND E-W BASELINES ARE NORTH 936,804.16 AND EAST 2,436,336.03.
3. FOR PROPOSED AND TEMPORARY FEATURES SEE DWG 10E306-01.

PHOTO TAKEN AT THIS LOCATION IN THIS DIRECTION.

TOPOGRAPHY TRACED BY M.P. TORMON 1/30/1991

R										
R		RWA	TMJ	RWA	VWD	VWD	RGJ	WDH		
ELECTRONICALLY RESTORED DRAWING										
REV. NO.	DATE	DESN	DRWN	CHKD	SUPV	SUPD	APPD	ISSD	PROJECT ID	AS CONST

SCALE: NONE EXCEPT AS NOTED

YARD

ASH DISPOSAL AREA
2003 ANNUAL INSPECTION

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14	DATE 04/28/81	36	C	API01	R

TASK COMPLETED BY: | T-V NO.

PLOT FACTOR:4800 W-TVA

C.A.D. DRAWING DO NOT ALTER MANUALLY

Albright, John G.

From: Daniel R Smith [Daniel.R.Smith@parsons.com]
Sent: Tuesday, October 29, 2002 2:52 PM
To: Albright, John
Subject: FW: Pump settings for KIF Coal Yard Runoff

FYI

Hope this helps

Dan

-----Original Message-----
From: Smith, Daniel R
Sent: Wednesday, September 13, 2000 8:21 AM
To: 'cwrice5@tva.gov'
Cc: 'cmminghini@tva.gov'; Brooks, Richard L.
Subject: Pump settings for KIF Coal Yard Runoff

Sorry its taken me so long to respond, but I've taken a look at this within the last few days. I've added a pretty lengthy explaniation below to show how I've arrived at the recommended elevations for pump start and pump lag. I recommend that pump start at elevation 751.5, and pump lag at 752.5. I computed approximate removal times for this scenario, and the worst case is 2 days. I think this is reasonable, but would like Cheri to review this and concur, or provide her recommendation. Pump alarm elevation is really anybodys guess, and perhaps Harold should be consulted. I am not really sure what he wants to be notified for. Very intense storms will fill up the pond pretty fast, and on that basis an alarm could be set at a lower elevation (754), in order to warn someone that the pond is getting pretty high. After the spillway is built, water should spill at about 756. If the alarm is set at 756, water should already be spilling, but would tell someone that this is going on, in case someone wanted to go out there and inspect it. Pump shutoff should be set at elevation 750.5.

A detailed explaination is below for how I evaluated removal time based on pump start and pump lag. An alternative pump start and lag could be pump start el 751.5 and pump lag at 752. I am concerned that wave action could cause rapid pump lag start/stop, and for this reason, its probably better to have pump shut off one-half foot lower than pump start.

Call me if you have any questions.

Cheri, I recommend that the SK-01 be revised to show excavation matching the revised elevations contained herein. I'll try to get this to you by the end of September, unless you need it sooner.

Dan

After responding with Harold Catlett, I found out that the bottom of the pond is going to be excavated to 745. After adding 4 ft for barge draft (w/pumps attached), and allowing an additional 2 ft to keep the pump intakes off the bottom, and allowing for sedimentation, the nominal elevation of the pond will be at 751, essentially the same as now. I not sure what exactly caused the problems with the pumps earlier, but it may be a good idea to install some type of rock check dam out in the yard in an attempt to filter out some of the sediment before it settles in the area where the pumps will be. The site should also frequently measure the bottom elevation of the pond and remove sediment (especially after larger rainfall events), before accumulated sediment gets too high.

Anyway, the calc we did assume a wse of 745, instead of 751. The storage volume we assumed (based on the excavation shown on SK-01 is about 4.5 ac-ft. Therefore, I assumed a wse of 751, and assumed that the 4.5 ac-ft will be excavated between els 751-753. The total storage available should still be 45.38 ac-ft to impound enough water for the 100 yr storm event.

I looked at 2 scenarios -

1) Pump start 751.5 and pump lag at 752.
2) Pump start 751.5 and pump lag at 752.5.

The latter (case 2) I think is better, because I think with 1/2 foot between pump start and lag, wave action could cause both pumps to start, or cause the second pump to start/stop rapidly, and we don't want this to happen. Pump cycling should not exceed 15 starts per hour (4 min cycle), and this should not be a problem based on the analysis I did.

These calcs are simplified and are approximate.

Our calc determined a single pump operating point of 1410 gpm, and dual pump operating point of 1700 gpm. Because there is 6 ft less static head (we assumed wse at 745), I recomputed operating points of 1480 gpm and 1750 gpm respectively.

Using the pump start and lag for case 2, I did some rough estimations of removal time based on probable 1 inch and 1.5 inch storms (frequent storms), to see how long it would take one pump or combinations of pumps to remove accumulated runoff. The drainage area is 100 ac, and CN = 90, therefore I roughly calculated a volume for a 1 inch storm (w/o initial abstraction of 0.5 in) = 7.5 ac-ft and a 1 inch storm (w/ initial abstraction of 0.5 in) = 3.75 ac-ft. This roughly correlates to the revised storage volume between 751 and 752.5 (6.28 ac-ft). I also looked at a 1.5 inch storm (with and without abstraction). A 1.5 inch storm event will produce 11.25 ac-ft of runoff (w/o abstraction) and 7.5 ac-ft w/ abstraction).

For case 2, the time to de-water is summarized below.

For a very small storm that produces 1/2 foot runoff (wse = 751.5), it would take one pump 6.5 hrs to remove this. If the storm produces enough runoff to raise the elevation to about 752.5, and the second pump would not cut on, it would take one pump 1 day (24 hrs) to remove this volume.

If a 1.5 inch storm produced 11.25 ac-ft of runoff, depending on storm intensity it would take one pump 2 days to empty this volume, or 2 pumps 1.5 days.

Based on storm frequencies we looked at, I think this a pretty good removal time.