U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT

REGION III

Report No. 50-237/79-25; 50-249/79-23

Docket No. 50-237; 50-249 License No. DPR-19; DPR-25

Licensee: Commonwealth Edison Company
Post Office Box 767
Chicago, IL 60690

Facility Name: Dresden Nuclear Power Station, Units 2 and 3

Inspection At: Dresden Site, Morris, IL

Inspection Conducted: September 17, 18 and 24-27, 1979

Inspectors: E. J. Gallagher 11/9/79
for M. J. Oestmann 11/14/79

Approved By: D. W. Hayes, Chief 11/9/79
Engineering Support Section 1

Inspection Summary

Inspection on September 17, 18 and 24-27, 1979 (Report No. 50-237/79-25; 50-249/79-23)

Areas Inspected: Review of cooling lake construction; observation of soil borings on north dike; review of monthly surveillance reports on dike structure; and observation of environmental impact of local private property from apparent leakage of cooling lake. The inspection involved a total of 46 onsite inspector-hours by two NRC inspectors.

Results: No items of noncompliance or deviations were identified.

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DETAILS

Persons Contacted

Commonwealth Edison Company (CECo)

*B. B. Stephenson, Station Superintendent
*B. Shelton, Administrative Assistant Superintendent
*P. Holland, Staff Project Engineer
E. Budziekowski, Support Engineer

Harza Engineering Company

R. Wong, Field Engineer

Other Persons

Mr. and Mrs. C. Novak, Private Property Owners

*Denotes those in attendance at exit meeting.

Functional or Program Areas Inspected

Details of functional or program areas inspected are documented in Section I and II of this report.

Section I

Prepared by E. J. Gallagher

Reviewed by D. W. Hayes, Chief
Engineering Support Section 1

1. Observation of Cooling Lake Dike Structure

An inspection of the Dresden Unit 2 and 3 cooling lake and subsurface drilling was performed during September 24-27, 1979. One purpose of this inspection was to determine if the as constructed dike and foundation meets the original design criteria.

The Final Environmental Statement (FES) (Section 3.4.3) indicates that foundation preparation for the construction of the dikes required that all top soil and granular soils be removed. The material used for the dike construction was required to be silty clay common to the area. Based on a number of borings (later described) taken at the toe of the north dike and through the centerline of the dike there are indications of granular (sand) and permeable material.

The FES also indicated that the material for the dike would be compacted to a density of 95% modified Proctor density according to ASTM D1557. Compaction test records were not available on-site at Dresden. CECo contacted R. W. Hunt Company who performed field testing and inspection of the dike construction. Hunt Company indicated that these records have been discarded after seven years retention. CECo was also attempting to see if S&L retained the field test results.

In any event, the presence of granular material (sand and gravel) in the core and toe of the dike is contrary to original design requirements. The dike was to be clay fill with an impervious core trench keyed into impervious material. Although the core trench does exist, a lease of granular material has been identified below the core which permits seepage.

2. Review of Report by L. Beratan dated April 2, 1973 on Evaluation of Cooling Lake Dike

The above report was written after the failure of the cooling lake dike which ocurred on October 13, 1972. The report evaluates the cooling lake dike design and construction including field test reports and boring logs. This report sites that "many of the borings indicate that there are lenticular deposits of granular soils along the perimeter dike of the cooling lake" and that "the majority of

them occur along the northern dike which follows the bank of the Kankakee River." Borings currently being taken also indicate these granular materials on the north dike. Mr. L. Beratan goes on to say that the foundation preparation for the dikes required that these granular soils be removed before construction of the dike was started. This may not have been the case on the north dike based on current borings.

This report also indicates that a formal surveillance program was in process of being developed. Comments on this program are discussed later.

3. Review of Monthly Surveillance Reports to Determine Whether Adequate Surveillances Have Been Conducted Since 1971.

CECo has instituted a surveillance program for earth dikes and dams as of July 2, 1973. This program was revised to DOS 4450-1 on April 1976 and later revised to current program in DTS 4450-1 April 1979.

The FES (section 5.1.4, item d) required the program to include a detailed inspection at close intervals of the embankment slopes, the toe and ground surface beyond the toe of the dike. In addition, it requires monitoring of local wells near the north and south dikes and inspection of the river bank above and below the water level to determine if there is excessive seepage from the cooling lake. If local wells were not sufficient to monitor ground water level fluctuations, then it was recommended that permanent observation piezometers be installed for that purpose. This surveillance program was to be at monthly intervals.

Based on a comparison of the CECo surveillance program and commitments in the FES, it appears that the current surveillance program is not as comprehensive as what was originally intended. The program does not require the following items:

a. No requirement to monitor local observation wells nor installation of permanent piezometers for measuring groundwater levels.

b. No requirement to observe conditions along the river bank to monitor seepage or if weakening of the bank is occurring.

c. The frequency of surveillance is monthly only between April and October and once during the remaining five months. Recognizing the severe winter months, this time period could still be broader by a few months.

A review of the surveillance reports on file was performed. The number of surveillance reports were not complete. For example, for 1979 a report for April 7, 1979, March 17, 1979 and most recent

August 4, 1979 were the only reports on file. The responsibility for this surveillance has been passed from hand to hand and not retained as should be. The most recent August 4, 1979 report did not indicate any seepage from the river bank although the licensee had been notified of this condition as early as March of 1979.

Based on the above review, improvements such as a more comprehensive program and more thorough documentation of the surveillance need to be instituted.

4. Observe the Construction of Soil Borings on the North Dike by Harza Engineering

Harza Engineering (Chicago) was retained to perform subsurface investigation of soil conditions and groundwater levels. Harza contracted Raimonde Drilling Company to perform the soil borings. The plan was to drill a number of borings parallel to the toe of the dike and between the dike and river bank. After borings parallel to the toe indicated granular material and groundwater approximately two feet below the surface, it was decided to take borings through the centerline of the dike to confirm the material and composition of the dike structure. A number of borings through the dike haVe indicated granular and gravel material with loss of drilling fluid from the casings indicating flow path through the dike.

Seepage from two sources on the river bank were estimated at approximately 0.6 gal/min. Head drop measurement on boring fill #11 where drilling fluid was being lost was estimated to be five inches in four minutes. (Approximately six feet per minute head drop.)

The attached (18) photos are of the Dresden cooling lake, soil boring operations and seepage along the Kankakee river bank.

Details of the borings are as follows:

Drill rig used:	AR1281 (Raimonde Drilling Company)
Drill bit used:	Fishtail bit (end discharge) and power auger
Soil sample:	Split spoon sampler and undisturbed soil tubes
Boring Locations:	See attached plan of cooling lake, (Figure 1, 1A and 1B)

Boring Log #1 (Parallel to toe of North Dike) September 24, 1979 water level in boring two feet below surface

Sample	Depth (Ft.)	Blows per Ft.	Material Description
1	0-1.5	20	Brown clay
2	2.5-4	8	Sand
3	5-6.5	7	Sand and gravel
4	7.5-9	50 per 3"	Sand and gravel
5	10-11.5	-	Blue shale

Boring #2 (Parallel to toe of North Dike) September 24, 1979 water level two feet from surface

Sample	Depth (Ft.)	Blows per Ft.	Material Description
1	0-1.5	26	Brown clay
2	2.5-4	12	Sand and gravel
3	5-6.5	68	Shale

Boring #3 (Parallel to toe of North Dike) September 24, 1979 water level two feet from surface

Sample	Depth (Ft.)	Blows per Ft.	Material Description
1	0-1.5	13	Brown clay
2	2.5-4	47	Clay silt
3	5-6.5	50 for 6"	Clay silt

Boring #4 (Parallel to toe of North Dike) September 25, 1979 water level 3.5 feet from surface

Sample	Depth (Ft.)	Blows per Ft.	Material Description
1	0-1.5	25	Brown clay
2	2.5-4	14	Sand
3	5-6.5	50 for 3"	Shale
4	7.5-9	-	Gray shale

Boring #5 (Parallel to toe of North Dike September 25, 1979 water level 6.5 feet from surface

Sample	Depth (Ft.)	Blows per Ft.	Material Description
1	0-1.5	42	Brown clay
2	2.5-4	15	Sandy clay
3	5-6.5	8	Sand and gravel
4	7.5-9	11	Sand and gravel
5	10-11.5	50 for 6"	-

Boring #6 (Parallel to toe of North Dike) September 25, 1979 water level five feet from surface

Sample	Depth (ft.)	Blows per Ft.	Material Description
1	0-1.5	13	Sandy clay
2	2.5-4	16	Brown sand (dry)
3	5-6.5	11	Sand and gravel (wet)
4	7.5-9	14	Sand and gravel (wet)
5	10-11.5	31	Sand and gravel (wet)
6	12.5-14	50 for 6"	Gray shale

Borings #7 and #8 (between North Dike and river bank) September 26, 1979
No data available at time of report.

Borings #9, #10 and #11 (Centerline of North Dike) September 27, 1979
No date available at time of report.

NOTE: Boring #11 indicated sand and gravel 29 feet to 34 feet from top of dike - loss of water noted from boring casing on the order of five inches per four minute estimated by Harza Engineering.

5. Review of Licensee Corrective Action

CECo consultants (Harza) are in the process of formulating alternative measures to correct the seepage from the cooling lake. These actions will be reviewed and evaluated during subsequent inspections.

Section II

Prepared by M. J. Oestmann

Reviewed by T. H. Essig, Chief
Environmental and Special
Projects Section

1. Observation of Leakage from Dresden Cooling Lake

The inspector inspected the north dike of the Dresden cooling lake on September 17, 18, 24 and 25, 1979 and observed the seepage of water along the bank of the Kankakee River on Mr. and Mrs. Charles Novak's private property. On September 18, 1979, these private property owners expressed their concern to the inspector of the seepage of water and subsequent erosion of the banks along their river front property. They own 26 lots on the river extending 300 to 400 feet along the river front. The inspector noted that the river bank was peppered with numbers of points of discharges about four feet below ground level. The land along the bank was wet and soggy. Seepage from two sources on the river bank were estimated to be approximately 0.6 gal/min. The inspector also observed a large tree fallen in the river apparently caused by erosion along the bank.

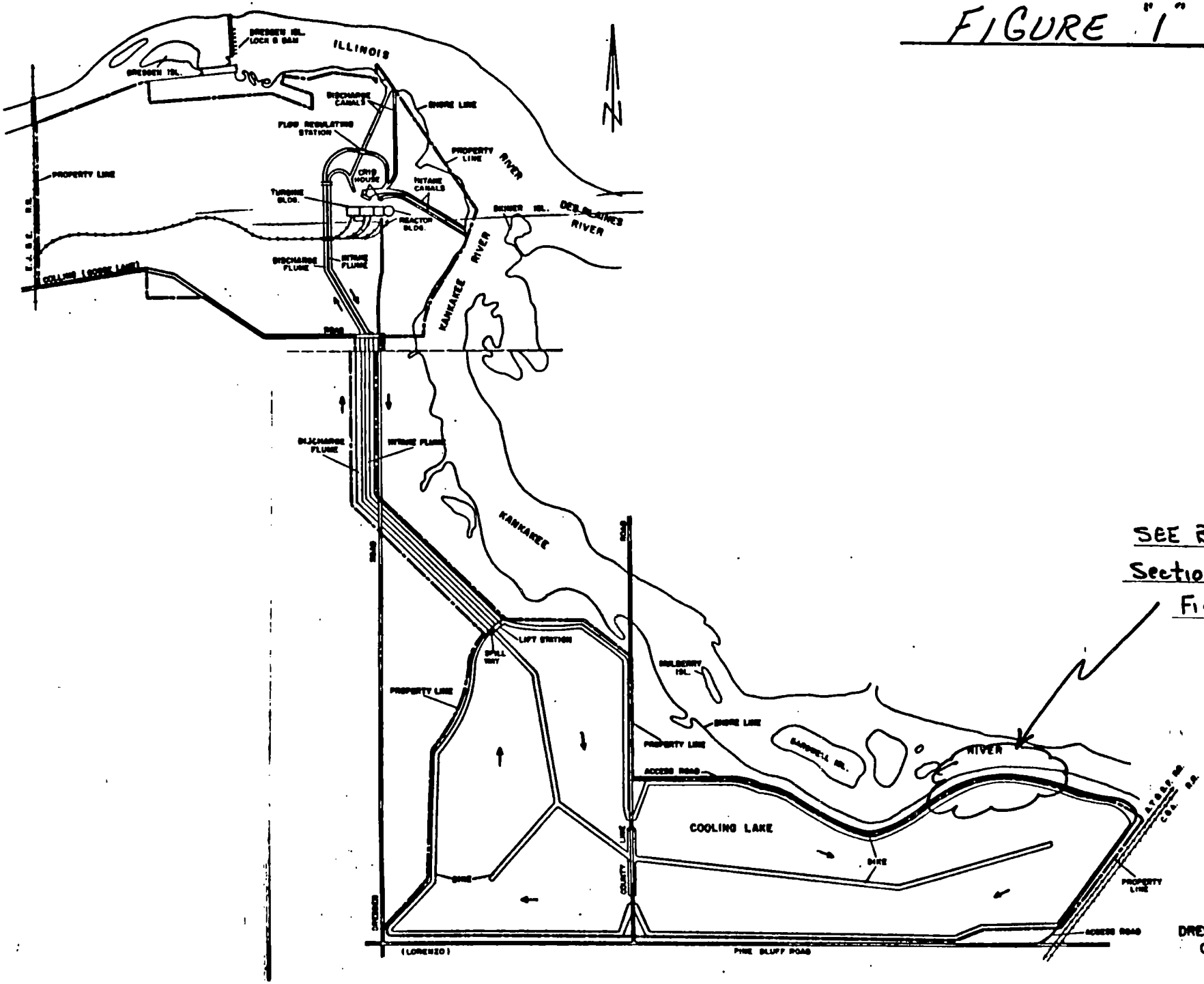
The inspector collected water samples from a local well (15 ft. deep) on the Novak's property and from the Dresden cooling lake. No levels of radioactivity above background were found in the samples. In addition, temperature measurements taken of the well water, the Kankakee River and the seepage from the river bank were at 20°C (68°F). The cooling lake water sample was at 30°C (86°F).

On September 18, 1979, Mr. Novak reported to the inspector that he informed the licensee of the leakage problem on his property for a period of years and in particular in March 1979 when the problem became more severe. The licensee, however, made no mention of this problem in the records reviewed by the inspector pertaining to the monthly surveillances of the cooling lake and dikes.

Although no items of noncompliance or deviations were identified during this inspection, the erosion problem will be examined during a subsequent inspection to ensure that appropriate actions have been taken by the licensee to mitigate the cause of the observed environmental impacts.

Attachments:
1. Figure 1, location of soil borings on north dike
2. Photos (18) of Dresden cooling lake soil borings and seepage
3. Excerpts from final environmental statement, 11/73
4. CECo Dresden lake inspection program (DTS 4450-1 Revision 0, 4/79)

FIGURE "1"



SEE BORING LOCATION
Section thru Dike
FIGURE 1A & 1B

"FIGURE I"

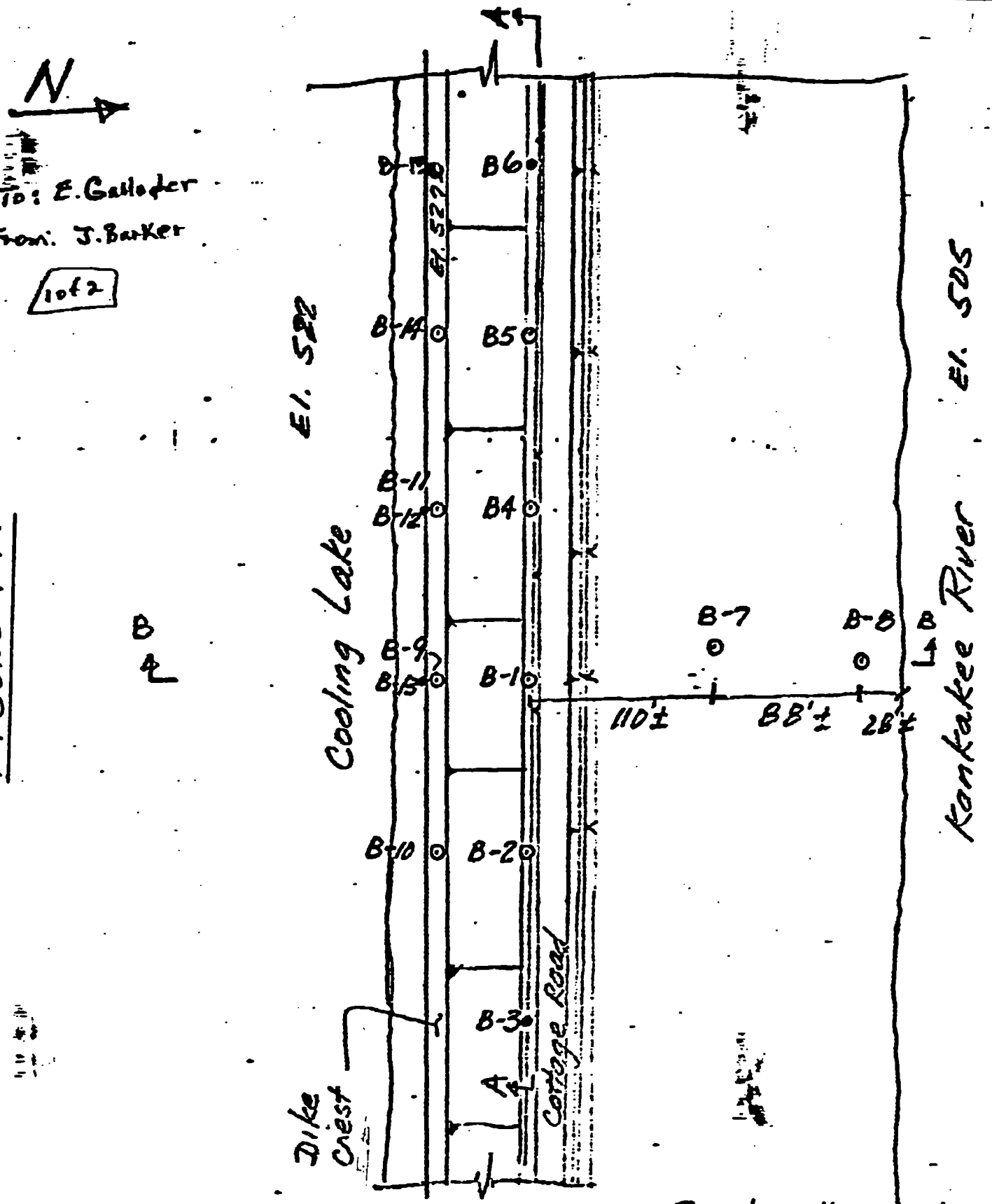
DRESDEN STATION &
COOLING LAKE
1973

HARZA ENGINEERING COMPANY CHICAGO	SUBJECT LOCATION OF BORINGS	PROJECT DRESDEN 1 & 2
		FILE NO.
	COMPUTED ____ CHECKED ____	DATE ____ PAGE ____ OF ____ FILE

To: E. Gallagher
From: J. Barker

1 of 2

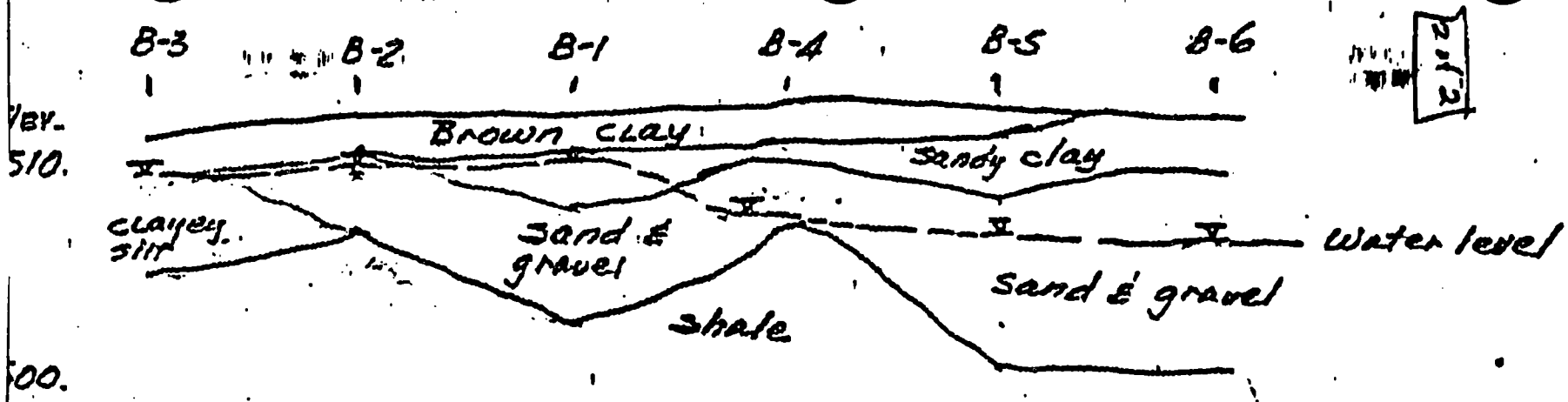
FIGURE 1A



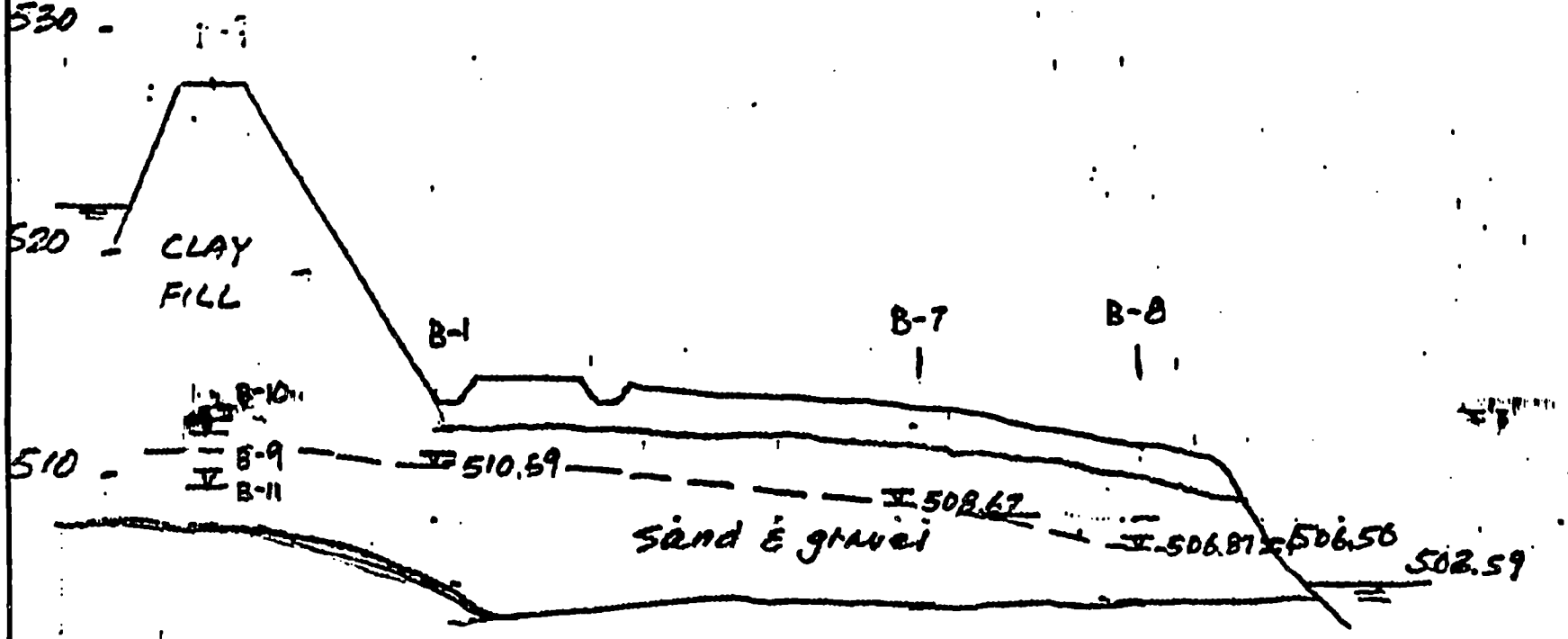
Scale 1" = 100'

Fig I. Boring Location

FIGURE "1, B"



SECTION A-A Scale Vertical 1" = 8'
Horiz. 1" = 100'



SECTION B-B

HARZA ENGINEERING COMPANY CHICAGO

SUBJECT SECTION THRU DIKE

COMPUTED ____ CHECKED ____

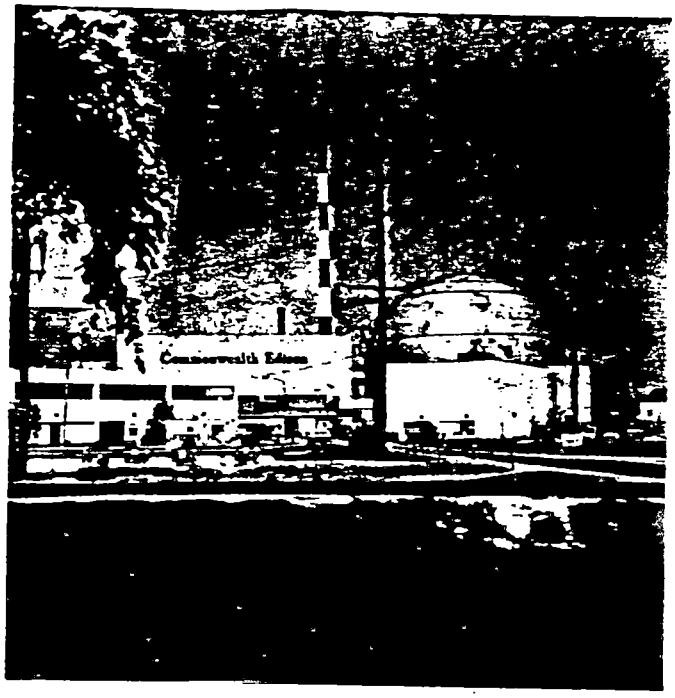
PROJECT DRESDEN I & 2

FILE NO. ____

DATE ____ PAGE ____ OF ____ PAGES

PHOTOS

1. Dresden Station Unit 1
2. Cooling lake looking east along North Dike
3. Cooling lake looking west along North Dike
4. North Dike - boring on toe of Dike
5. Seepage on Kankakee River bank
6. Seepage on Kankakee River bank
7. Seepage on Kankakee River bank
8. Seepage on Kankakee River bank
9. Seepage on Kankakee River bank
10. Measurement of Seepage Along River bank (Harza Engineers)
11. Measurement of seepage along river bank (Harza Engineers)
12. Kankakee River bank
13. Boring at toe of North Dike
14. Boring at toe of North Dike
15. Soil boring #1 granular material above shale
16. Soil boring #1 granular material and blue shale
17. Soil samples from boring #4
18. Soil samples from boring #5



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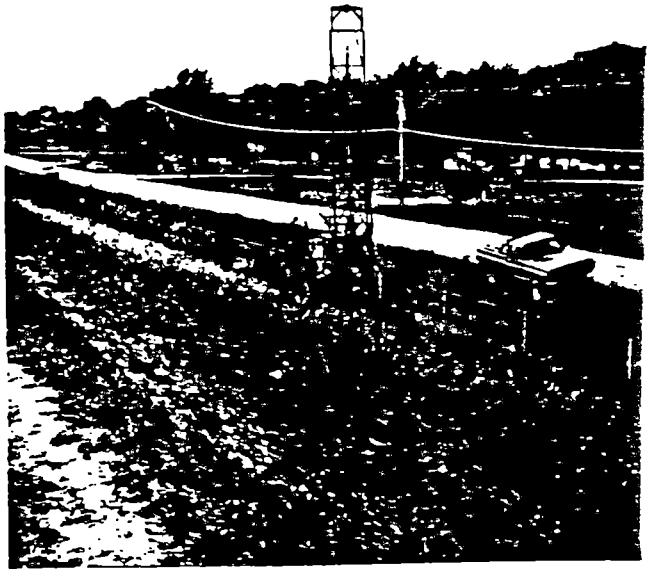

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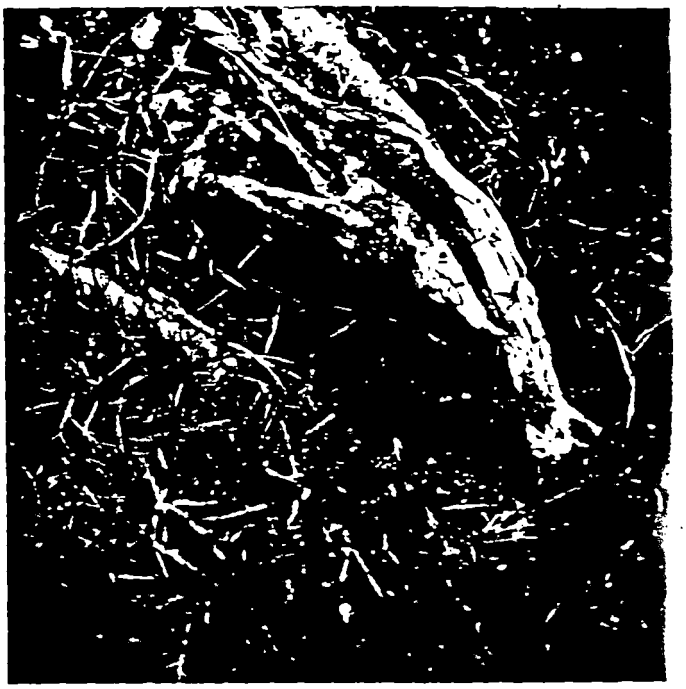

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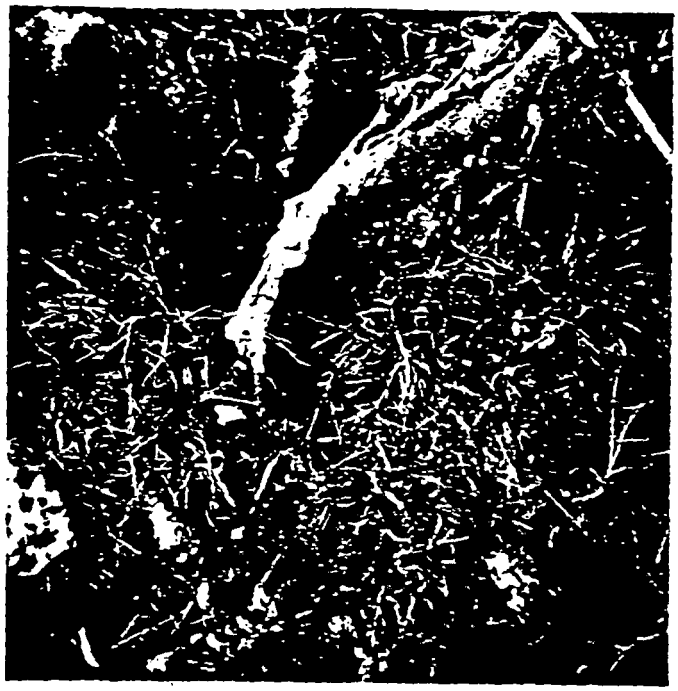

9

10

11

12

13

14

15

16

Boring #4

17

18

Boring #5

Attachment 3

Final

environmental statement

related to operation of

DRESDEN NUCLEAR POWER STATION UNITS 2 AND 3

COMMONWEALTH EDISON COMPANY

DOCKET NOS. 50-237 AND 50-249

NOVEMBER 1973

UNITED STATES ATOMIC ENERGY COMMISSION

DIRECTORATE OF LICENSING

NOV 1 9 1973

3 intake. Gate structures in the return canal, intake canal, and river discharge canal are used to regulate the division of flow for recirculation and discharge to the Illinois River.

b. Site Investigation for Cooling Lake[12,13]

Pre-construction investigation consisted of approximately 140 borings made during the initial investigative stage of the project. These borings were made along the alignment of the dikes, the interior of the cooling lake and the canal and lift pump structure. The interior borings were made to define the extent of the borrow areas and the partition dike. Borrow area No. 1 is located in the southeast corner of the cooling lake and area No. 2 in the northwestern corner of the cooling lake (Fig. 3.8). A significant number of the borings were carried down to bedrock. The borings indicated that the bedrock varies over the site from limestone to siltstone and/or sandstone shale. The siltstone and sandstone are the caprock over the limestone formations beneath. The borings indicate that there is significant variation in the elevation of the bedrock formation over the site. This is probably accounted for by the variability of the resistance of the rocks and the erosion forces which have acted on them in their geologic past.

Samples of the foundation material were recovered and unconfined compression tests were run on representative samples of the soil to establish its shearing strength. Many of the borings indicate that there are lenticular deposits of granular soils along the perimeter dike of the cooling lake. The majority of these occur along the northern dikes which follow the bank of the Kankakee River.

Section 3.4.3 c. Dike Construction[12,13]

Foundation preparation for the construction of the dikes required that all top soil, granular soils, and deleterious material be removed before construction of the dikes was started. The material used for construction was required to be silty clay soil which is indigenous to the area. It was determined that the soil removed from the borrow areas varied. Nine prototype soils were used to make the embankment. All of these nine soils were tested in the soils laboratory of R. W. Hunt Company, Engineers, who were responsible for the field control of the compacted dike. The construction specifications required that the soil be deposited in 8-inch loose layers and compacted with suitable compaction equipment so as to attain a minimum compacted density of 95% of modified Proctor density in accordance with ASTM D 1557. Continuous testing of each lift of the compacted embankment material was required during construction. Examination of the QA documentation indicated that this program was carried out.

d. Dike Design[12,13]

The embankment was designed for the licensee by Sargent & Lundy, Inc., Engineers. The design parameters which were used were based upon the unconfined compressive strength of the material used in the embankment construction and the unconfined compressive strength of typical foundation soils. The embankment was proportioned to have a top width of 12 feet

bedrock. All soil boring samples were examined by a qualified soils engineer and profiles plotted in all suspect areas. It was concluded by the Applicant's engineers that nowhere in the dike system was there a potential for the type of failure experienced to repeat itself. To provide an additional measure of certainty, sheet pile cutoff walls were installed and the sheeting driven into the bedrock wherever there was any question of the foundation material being able to perform its intended function. These walls provide additional stability and resistance to seepage, since the only place seepage can now take place is through the interlocks of the sheet piling.

* 5.1.4 (d.) Surveillance Program

A comprehensive formal surveillance program which will provide for routine inspection of the dikes during the life of the plant is in the process of being developed by the Applicant. The program shall include: detailed inspections, at relatively close time intervals, of the embankment slopes, the toe, and the ground surface beyond the toe; and the monitoring of local wells near the north and south dikes and inspection of the river bank above and below water level to determine if there is excess seepage from the lake. The purpose of this program is to identify any anomalies which might develop and to effect a rapid and meaningful repair. The surveillance program shall be included as part of the environmental technical specifications with a monthly surveillance interval.

The Applicant shall, also, at the earliest opportunity, determine by additional investigation, the cause of the 2-foot depression noted in inspection reports of the south dike. Any repairs necessary to insure dike integrity shall be performed. The results of the investigation and proposed action shall be submitted to the Commission for review and approval. The Applicant shall also demonstrate that the 4-in. diameter holes along the south dike are not initial stages of the movement of soil from the dike foundation.

5.2 IMPACTS ON WATER USE

5.2.1 Ground Water

The Station withdraws water only from the Cambrian-Ordovician aquifer at a rate which is small (about 1.5%) compared to other withdrawals in the area.[7] Thus, the Staff concludes that continued use of ground water by the Station will have negligible impact on the water level in the Cambrian-Ordovician aquifer.

Attachment 4

A. PURPOSE

The purpose of this procedure is to visually inspect Dresden Lake and report potential problems that could have adverse effects on the operation of the Station.

B. REFERENCES

1. None.

C. PREREQUISITES

1. Review this procedure prior to Lake inspection.

2. Review the suggested route for inspection on the site map (attached).

3. A G-type Key will be needed for access to the lake.

4. Schedule the use of a vehicle for inspection.

5. Review previous inspection report and note the unusual conditions.

6. Two persons will be required for the lake inspection.

D. PRECAUTIONS

1. None.

E. LIMITATIONS AND ACTIONS

1. None.

F. PROCEDURE

1. The frequency of inspections is once a month during April through October. An inspection will be made only once during the remaining 5 months.

2. The following procedure has been developed to ensure an adequate monthly inspection of the dikes, flumes, and ditches of the Dresden Cooling Lake and associated canals. In addition, this inspection will verify proper drainage of the land surrounding the lake to the government pumping station.

a. Exterior Dikes (visual inspection to look for the following).

(1) Wet areas on the face of the dike.

(2) Wet areas in the immediate area of the base of the dike.

(3) Slumping or falling of dike composition material on the face of the dike.

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(4) Cracks, open pit holes, slumping on the top of the dike.

(5) Condition of rip-rap material and material beneath rip-rap.

b. Interior Dikes (visual inspection to look for the following).

(1) Slumping or falling of dike composition material.

(2) Condition of rip-rap material and material beneath rip-rap.

(3) Cracks, open pit holes, slumping on the top of the dike.

c. Flumes (visual inspection to look for the following).

(1) Slumping or falling of dike composition material.

(2) Wet areas to either side of flumes.

(3) Cracks, open pit holes, slumping in the center flumes.

d. General (visual inspection to look for the following).

(1) Obstruction in the ditches and culverts on the exterior of dike.

(2) Debris on lake and flume surface.

(3) Damage to exterior fence.

(4) Blockage in culvert beneath intake and discharge canal.

(5) Basin and operation of Goose Lake Pumping Station.

(6) Seepage in the area of the lift station and spillway.

(7) Burrow holes or the burrowing of animals into either the dikes or the immediate area of the dikes.

(8) Dumping of miscellaneous materials on any Commonwealth Edison property.

e. Should any of the above mentioned items occur, it is necessary that there be an immediate investigation to determine the cause and the necessary corrective action to be taken. The corrective action taken will depend on the nature of the circumstances surrounding the problem, but in some instances corrective action would have to be performed immediately because dike failure could result.

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f. After inspection, write a brief report summarizing the condition of the lake and surrounding areas. Also mark up a copy of print M-1A showing the location of any problem areas or unusual conditions.

g. Route the report to:

(1) Superintendent

(2) Assistant Superintendent

(3) Operating Engineer

(4) Technical Staff Supervisor

G. CHECKLISTS

1. Site maps, attached.

H. TECHNICAL SPECIFICATION REFERENCES

1. None.

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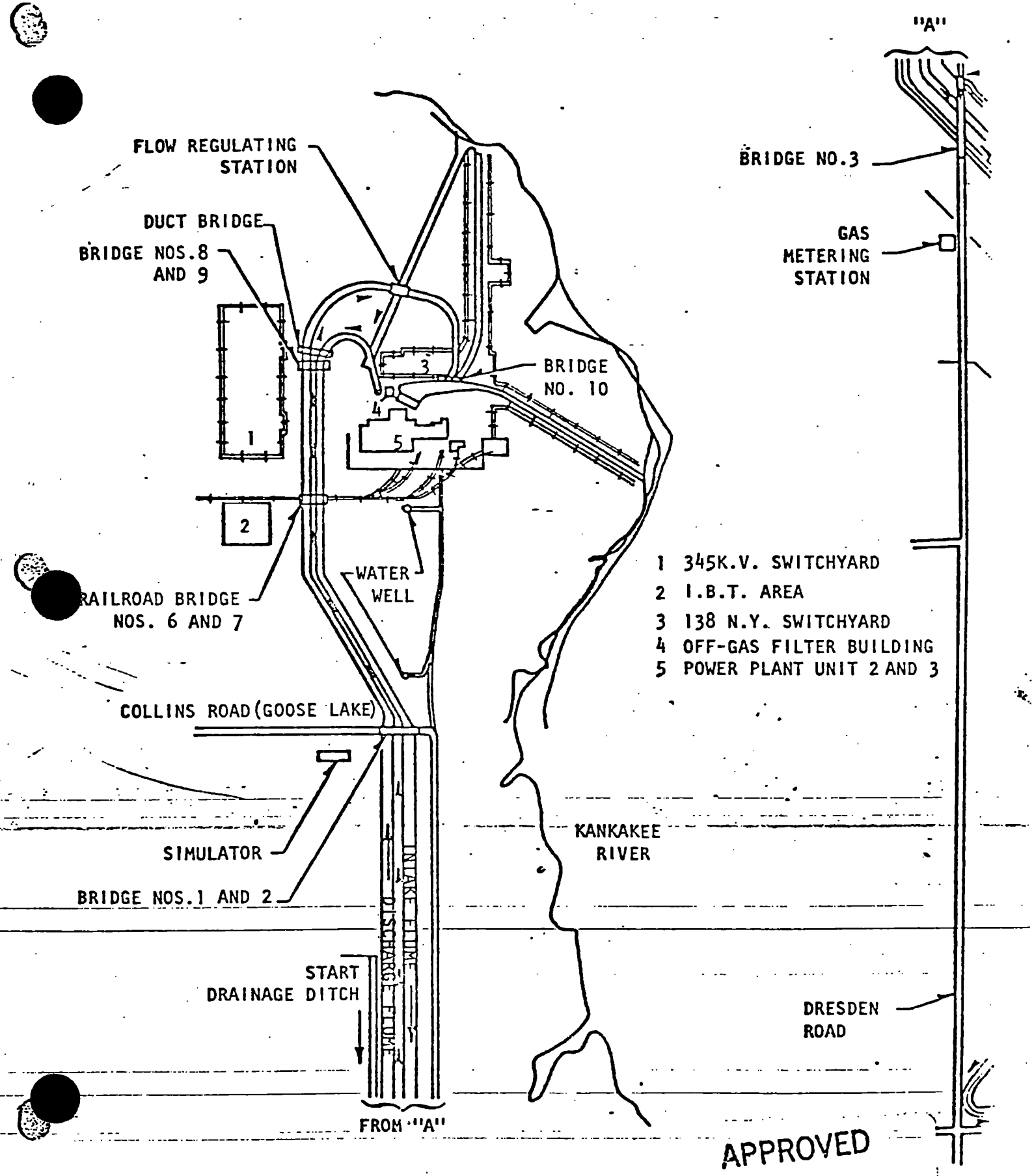
D.O.S.R.



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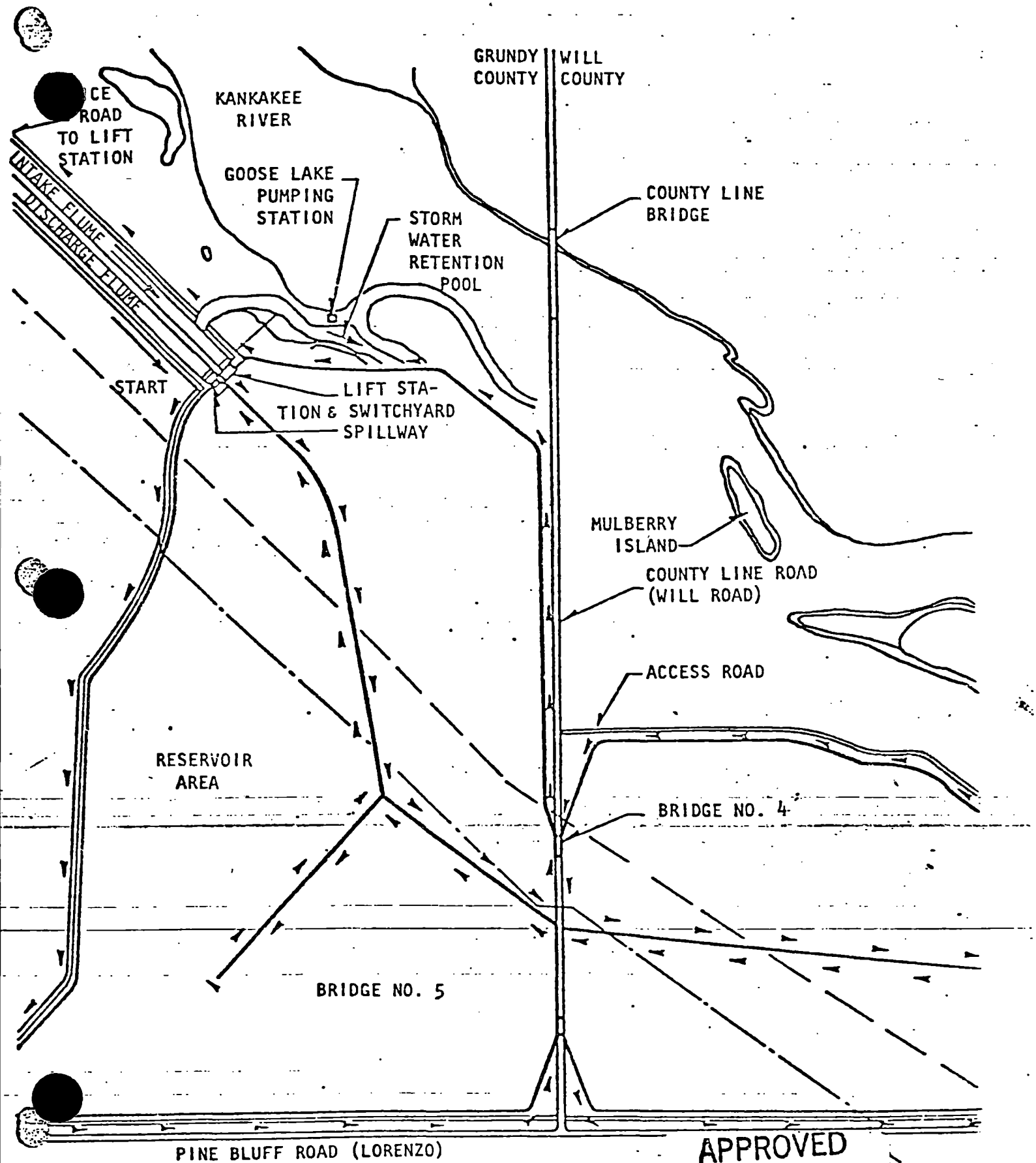

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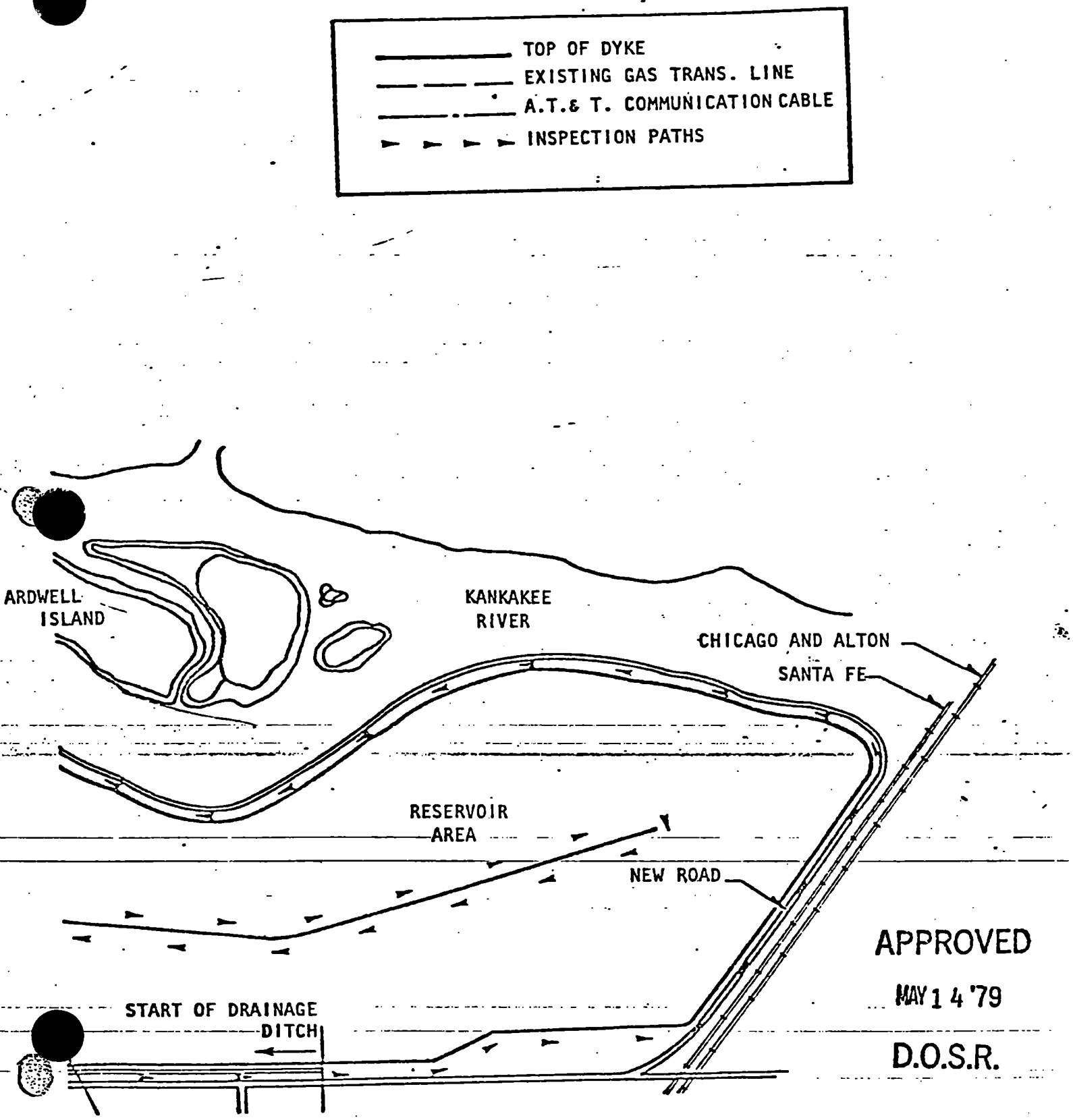

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D.O.S.R.

Figure 1. ROUTE FOR MONTHLY LAKE, DIKES AND FLUMES INSPECTION