CORPS OF ENGINEERS
LOUISVILLE DISTRICT

DAILY OHIO RIVER BULLETIN

OHIO RIVER — DATE: 27 SEP 76

							C.S.T.			Condition of Dam
(a)	0	25	PITTSBURGH	16.0	694.0		16.2	-0.2		
D 7.1	6	25	EMSWORTH	10.0	690.1	U	20.0	-0.2		(b) GATES RAISED 6 FEET
	10.0			9.0	680.0	L	10.7	0		
D 9.6	13	27	DASHIELDS	13.4	678.6	U	15.0	0		
	10.0			9.0	673.0	L	9.6	+0.3		
D 12.5	31.7	18	MONTGOMERY	16.0	665.1	U	16.3	+0.1		(b) GATES RAISED 6 FEET
	18.4			9.0	653.6	L	11.6	+0.2		
D 20.5	55	16	NEW CUMBERLAND	12.0	662.5	U	12.6	+0.1		(b) GATES RAISED 6 FEET
	20.5	35		13.5	632.0	L	14.0	+0.4		
D 24.0	84		PIKE ISLAND	12.0	632.0	U	12.5	+0.1		(b) GATES RAISED 6 FEET
	17.2	36		18.2	608.0	L	12.9	+0.2		
D 21.0	126.4		HANNIBAL	12.0	611.0	U	12.3	+0.1		(b) GATES RAISED 4 FEET
	21			12.0	578.0	L	11.9	+0.1		
D 20.0	161.8		WILLOW ISLAND	12.0	590.0	U	12.0	+0.1		(b) GATES RAISED 4 FEET
	20.0			12.0	570.0	L	12.9	-0.3	.03	
D 22.0	204		BELLEVILLE	12.0	570.0	U	12.6	-0.2		(b) GATES RAISED 5 FEET
	22.0	46		12.0	548.0	L	12.2	-0.3		
D 22.0	238		RACINE	12.0	548.0	U	12.1	0		(b) GATES RAISED 3 FEET
	22.0			12.0	526.0	L	12.1	-0.4		
	265	40	PT. PLEASANT	23.0	514.1		21.01	-.15		
D 23.0	279	38	GALLIPOLIS	12.0	520.0	U	12.1	-0.1		(b) ROLLERS RAISED 2 FEET
	23.0	50		12.0	503.5	L	12.5	-1.0	C	
	322	51	ASHLAND	33.5	481.3		34.10	+.02		
D 30.5	341	34	GREENUP	12.0	485.0	U	12.4	-0.1		(b) GATES RAISED 3 FEET
	30.0	54		12.5	472.5	L	13.2	-1.0	C	
	356	50	PORTSMOUTH	14.2	470.0		14.28	-.33		
	408	50	MAYSVILLE	33.5	461.5		33.03	+.06		
D 30.0	436	27	MELDAHL	12.0	473.0	U	12.4	+0.1		(b) GATES RAISED 6.5 FEET
	30.0	51		13.0	443.0	L	13.5	0	FOG	
	471	52	CINCINNATI	26.4	429.5		26.21	-.06		
	483	50	ADDYSTON	28.7	426.3		25.96	-.05		
D 35.0	532	16	MARKLAND	12.0	443.0	U	12.3	-0.2		GATE 1 2 3 4 5 6 7 8 9 10 11 12; OPENING: gate 2 – 1
	35.0	51	WT 7¼	12.0	408.0	L	13.4	+0.9	FOG	TURBINES OPERATING 20 20,4?? (b) 1
D 37.0	607	23	McALPINE	12.0	408.0	U	12.1	-0.1		GATE 1 2 3 4 5 6 7 8 9; OPENING: gate 5 – 1, gate 9 – 2
	37.8	56		9.0	374.0	L	11.2	+1.4	C	TURBINES OPERATING 7 (b) 2
			KOSMOSDALE				10.01	+.48		
	721	16	CANNELTON	9.0	374.0	U	9.1	0		GATE 9FT 1 2 3 4 5 6 7 8 9 10 11 12
D 25.0	25.0	47		10.0	344.0	L	10.6	+0.3	FOG	OPENING 3 2 . . . 0 . . . .
	776	30	NEWBURGH	16.0	344.0	U	10.0	0		GATE 12FT 1 2 3 4 5 6 7 8 9
D 16.0	16.0	38		12.0	330.0	L	13.4	+0.5	LFOG	OPENING 1 . . . . . 2 . .
	792	42	EVANSVILLE	12.6	329.2		13.7	+0.3	C	
	846	19	UNIONTOWN	12.0	330.0	U	12.3	0		GATE 12FT 1 2 3 4 5 6 7 8 9 10
D 18.0	22.0	37		8.0	312.0	L	8.9	+0.5	C	OPENING 2.1 . . . 1 . . . . . 0 1 . .
	877	34	50 — 500P	18.0	301.1	P.S.	18.8	-0.1	FOG	TRAPS / WICKETS (LIN. FT.) / NEEDLES
D 0.1	10.0		400W	9.0	301.0	N.P.	9.8	+0.2		CLOSED / TEMP 76'57'41 / 195
	903	40	51 — 500P	15.4	294.6	P.S.	15.7	+0.2		TRAPS / WICKETS (LIN. FT.) / NEEDLES
D 1.6	8.0		400W	9.0	283.0	N.P.	9.6	-0.1	C	CLOSED / 125
	935	39	PADUCAH	16.7	288.3		15.80	+.15	C	
	939	37	52 — 1248P	18.7	293.3	P.S.	18.6	0		TRAPS / WICKETS (LIN. FT.) / NEEDLES
D 2.3	12.0		700W	9.0	281.0	N.P.	10.2	0	LFOG	165
	962	42	53 — 1248P	16.0	273.1	P.S.	16.6	+0.6		TRAPS / WICKETS (LIN. FT.) / NEEDLES
D 0.0		(d)	680W	–	273.1	L	10.4	-0.6	C	2 / 360
	980	40	CAIRO		270.0		8.7	-1.4		

NOTES

(a) P Total Length, in feet, of Navigable Pass.
W Total Length, in feet, of Movable Weir.

(b) Total discharge area of all gates is equal to number of feet raised (reported above) multiplied by length of one gate.

(c) Lift at locks equals P.S.G. or U.G. minus N.P.G. or L.G. plus "D".

(d) Lower Gage at Dam 53 reads 2.0 with 8 feet depth on lower gate miter sill.

(e) Bankfull Stage.

(1) STATISTICAL INFORMATION

[illegible]	Type of Gate	No.	[illegible]	[illegible]
[illegible]	Drum Lift	13	100 ft	0 ft
[illegible]	Fixed Dam	–	–	–
[illegible]	Drum Lift	10	100 ft	18 ft
[illegible]	Tainter	11	110 ft	21.5 ft
[illegible]	Tainter	9	110 ft	39 ft
[illegible]	Tainter	8	110 ft	30 ft
[illegible]	Tainter	8	110 ft	30 ft
[illegible]	Tainter	8	110 ft	30 ft
[illegible]	Tainter	8	110 ft	30 ft
[illegible]	Roller	8	120 ft	18 ft
[illegible]	Tainter	12	100 ft	37 ft
[illegible]	Tainter	12	100 ft	40 ft
[illegible]	Tainter	9	100 ft	37 ft
[illegible]	Tainter	12	100 ft	40 ft
[illegible]	Tainter	9	110 ft	30 ft
[illegible]	Tainter	10	110 ft	30 ft

COMPLETED REPORT AT 0530 [illegible]

APPENDIX D

Permit Applications from U. S. Army
Corps of Engineers

- Barge facility design sketches
- Pipeline design sketches
- Water Intake design sketches

D

Ship
intake structure Fi

TSC

TRI-STATE SYNFUELS COMPANY

Owen D. Adams
Manager-Project Engineering

October 6, 1981

Oct 9, 1981

Contract 835504	Route	Handle	Copy
V.P.-ATD			
GM Proj. Dev.			
Director	✓		✓
Cost Sched.			✓
Engineering	✓	✓	
Adm Finance			
Procurement			
Mgr. Process			
Subcontract			
Legal			
Sales			
RF			
File			

RECEIVED BY
OCT 9 - 1981
J. K. CLARK, JR.

Mr. John W. Kruse
Fluor Engineers & Constructors, Inc.
Advanced Technology Division
P. O. Box C11944
Santa Ana, California 92711

Re: Tri-State Synfuels Project
Barge Facility
Ref. No. THFI-0046

Dear John:

At our September 15, 1981 meeting in Irvine, John Shipp of Fluor requested examples of the type of information necessary to obtain permits from the U. S. Army Corps of Engineers for the barge facility. The attached information is provided to assist you in the development of the necessary information:

1. Publication EP 1145-2-1 November 1977 - "U. S. Army Corps of Engineers Permit Program, A Guide for Applicants"

2. ENG Form 4345, October 1977 - "Application for a Department of the Army Permit"

3. Public Notice ORLOP-FP 78-IN-121A, Indianapolis Power and Light Company, Patriot Generating Station

4. Public Notice ORLOP-FP 80-IN-149, Southern Indiana Gas and Electric Company, A. B. Brown Generating Station.

OCT 12 '81

Contract 835504	Route	Handle	Copy
Subcontract			
Construction			
Cost Sched.			
[illegible]			✓
Process			
Structural			✓
[illegible]			
[illegible]			
[illegible]			
Electrical			
[illegible]			
File			✓

The drawings associated with the Patriot Generating Station were cited by the Corps as the best example of the type of information which should support permit applications.

At a September 30, 1981 meeting, the Corps advised that they desire all facilities over which they have jurisdiction be permitted simultaneously. This would include the barge facility (Fluor responsibility), pipeline (Tri-State responsibility), water intake (Fluor responsibility) and

conveyors (Fluor responsibility). It is our current interpretation that the permit must be applied for prior to January 1, 1983, and that the permit must also be applied for in conjunction with the project's EIS process.

Please advise if further discussion is necessary.

Sincerely,

ODA:psj
Attachments

xc: W. F. Holland w/attachments

APPLICATION FOR A DEPARTMENT OF THE ARMY PERMIT
For use of this form, see EP 1145-2-1

Form Approved - Office of Mgmt & Budget No. 49-R0420

The Department of the Army permit program is authorized by Section 10 of the River and Harbor Act of 1899, Section 404 of P. L. 92-500 and Section 103 of P. L. 92-532. These laws require permits authorizing structures and work in or affecting navigable waters of the United States, the discharge of dredged or fill material into waters of the United States, and the transportation of dredged material for the purpose of dumping it into ocean waters. Information provided in ENG Form 4345 will be used in evaluating the application for a permit. Information in the application is made a matter of public record through issuance of a public notice. Disclosure of the information requested is voluntary; however, the data requested are necessary in order to communicate with the applicant and to evaluate the permit application. If necessary information is not provided, the permit application cannot be processed nor can a permit be issued.

One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (see sample drawings and checklist) and be submitted to the District Engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned.

1. Application number (To be assigned by Corps)	2. Date Day Mo. Yr.	3. For Corps use only.
4. Name and address of applicant. Telephone no. during business hours A/C ( ) _____ A/C ( ) _____	5. Name, address and title of authorized agent. Telephone no. during business hours A/C ( ) _____ A/C ( ) _____	

6. Describe in detail the proposed activity, its purpose and intended use (private, public, commercial or other) including description of the type of structures, if any to be erected on fills, or pile or floor-supported platforms, the type, composition and quantity of materials to be discharged or dumped and means of conveyance, and the source of discharge or fill material. If additional space is needed, use Block 14.

7. Names, addresses and telephone numbers of adjoining property owners, lessees, etc., whose property also adjoins the waterway.

USE OR DISCLOSURE OF REPORT DATA IS SUBJECT TO THE RESTRICTION ON THE NOTICE PAGE AT THE FRONT OF THIS REPORT

8. Location where proposed activity exists or will occur.

Address:

Street, road or other descriptive location

In or near city or town

County State Zip Code

Tax Assessors Description: (If known)

Map No. Subdiv. No. Lot No.

Sec. Twp. Rge.

Name of waterway at location of the activity.

ORLPD-R

DEPARTMENT OF THE ARMY
LOUISVILLE DISTRICT CORPS OF ENGINEERS
P C BOX 59
LOUISVILLE KENTUCKY 40201

ORLOP-FP
78-IN-121A

29 December 1980

PUBLIC NOTICE

TO WHOM IT MAY CONCERN:

This notice announces an application submitted for a Department of the Army (DA) permit subject to Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act (CWA). This proposal was originally announced in Public Notice No. 78-IN-121, dated 11 July 1978. A public hearing on this proposal was held on 10 August 1978.

APPLICANT: The Indianapolis Power & Light Company
P.O. Box 1595B
Indianapolis, IN 46206

LOCATION: Ohio River, right bank, 516.0 miles below Pittsburgh, Pennsylvania, near Patriot, Switzerland County, Indiana.

PURPOSE: To construct and maintain facilities in connection with a proposed coal fueled electric generating plant. The facilities within the Corps permitting jurisdiction would consist of the following: ice protection dolphins, mooring dolphins, a water intake structure, an equipment unloading slip, a storm drain outfall, a discharge blowdown structure, and material unloading support cells.

DESCRIPTION OF WORK: The applicant has estimated 130,000 cubic yards of excavation and dredging and 145,000 cubic yards of fill would be required for the operation. The breakdown by structure is listed below. Only the quantities below elevation 456.8, the permit jurisdiction limits at this location, are listed.

	Excavated (Cu. Yds.)	Dredged (Cu. Yds.)	Backfill (Cu. Yds.)	Riprap (Cu. Yds.)
Ice Protection Dolphins (7)	—	28,800	42,700	—
Intake Structure & Piping	600	7,900	7,000	900
Equipment Unloading Slip	42,000	14,100	1,000	200
Mooring Dolphins (12)	—	5,960	9,920	—
Storm Drain Outfall	200	200	100	200
Discharge Structure	300	2,200	1,200	800

Barge Unloader Support Cell (4)	—	4,710	9,900	—
Levee Fill (below OHW)	—	—	9,600	13,400
Mooring Cells (32)	—	18,000	30,600	2,600
Equipment Support Cells (5)	—	4,700	10,900	3,900
TOTALS	43,100	86,570	122,920	22,000

All suitable excavated and dredged materials would be used as embankment construction above elevation 456.8. All unsuitable materials would be placed in a contained area as shown on the attached sheet 6 of 10 and covered with topsoil. The maximum riverward projection of any facility into the river would be 370 feet from shore at normal pool. The breakdown by structure is listed below.

	Projection from Shore at Normal Pool in Feet	Elevation Difference from Normal Pool 455.0' MSL in Feet
Ice Protection Dolphins	370	+10.0
Intake Structure & Piping	220	-29.0
Equipment Unloading Slip	20	+4.3
Fleeting Area	340 MAX	+29.8
Storm Drain Outfall	21	+3.0
Discharge Structure	90	-20.0
Limestone Unloading Area	150	+55.0
Coal Unloading Area	170	+55.0

The proposal would require 23 various sized cells as described below. All the cells would be filled with clean granular fill and capped with concrete. The ice protection dolphins would be seven 40-foot diameter steel sheetpile cells on 60-foot centers. The intake structure would consist of four 24-inch pipes each with a 6-foot long, 48-inch diameter perforated inlet pipe as shown on the attached sheet 4 of 10. The equipment unloading slip would be constructed by using steel sheetpiling to erect vertical walls. The two fleeting areas would consist of twenty-two 21- to 26-foot diameter steel sheetpile cells with centerlines between 40 feet and 60 feet from shore. The maximum number of barges moored or docked at any one time would be 61. The storm drain outfall would be a 6-foot pipe. The outfall would open on a 40-foot area which would be protected from erosion by riprap as shown on the attached sheet 7 of 10. The discharge outfall would be a 24-inch pipe, backfilled with sand and gravel.

The backfill would be protected from erosion by riprap as shown on the attached sheet 8 of 10. The material unloading area would be used primarily to unload coal. The unloading area would consist of two 40-foot diameter cells on the inboard side and two 26-foot diameter cells on the outboard side as shown on the attached sheet 9 of 10. The conveyor systems in the unloading area would be covered.

A DA permit, if issued, would be conditioned such that the Federal mooring buoys located at the proposed empty barge fleeting area would be relocated prior to the commencement of any work in the river which could interfere with their use. The relocation would be coordinated with the Louisville District, Corps of Engineers. All navigation interests on the District navigation mailing list will be informed of any impending changes concerning these buoys.

The DA permit, if issued, would include a 10-year maintenance dredging provision to maintain the unloading and fleeting areas. Maintenance dredging would require advance notice which would state where the material would be placed.

A DA permit cannot be issued if any legally required Federal, State or local authorization or certification is denied. A DA permit, if otherwise warranted, will not be issued until a Water Quality Certification or waiver is on file at this office. Certification is the responsibility of the Indiana Stream Pollution Control Board.

The proposed work could have a significant impact on the human environment. Therefore, an Environmental Impact Statement (EIS) has been prepared as required by the National Environmental Policy Act. The final EIS was sent to the U.S. Environmental Protection Agency on 8 December 1980, and notification of this filing was recorded in the Federal Register on 19 December 1980. Copies of the final EIS and the permit application have been placed on file and are available for public review.

Copies of this notice are sent to the appropriate Federal and State Fish and Wildlife Services. Their views and comments are solicitated in accordance with the Fish and Wildlife Coordination Act of 1956. However, there are no known facts that indicate the proposed work would destroy or endanger any known critical habitat of a threatened or endangered species as identified under the Endangered Species Act of 1973. Therefore, unless warranted by later developments, no formal consultation specific to Section 7 of that Act will be initiated with the U.S. Fish and Wildlife Service.

The National Register of Historic Places has been consulted and it has been determined that the "Merit-Tandy Farmstead" is within the project boundary and

ORLOP-PP
Public Notice No. 78-IN-121A

29 December 1980

is currently listed on the Register. This property is discussed in the EIS. The applicant is pursuing mitigative measures with the Advisory Council on Historic Preservation. Any residual impacts on the property will be evaluated and considered in making the final decision. With respect to other sites not currently listed on the Register, if we are made aware, as a result of comments received in response to this notice or by other means, of specific archaeological, scientific, prehistoric, or historical sites or structures which might be affected by the proposed work, the District Engineer will immediately notify the Secretary of the Interior so that we may accomplish necessary investigations pursuant to Section 4 of Public Law 93-291.

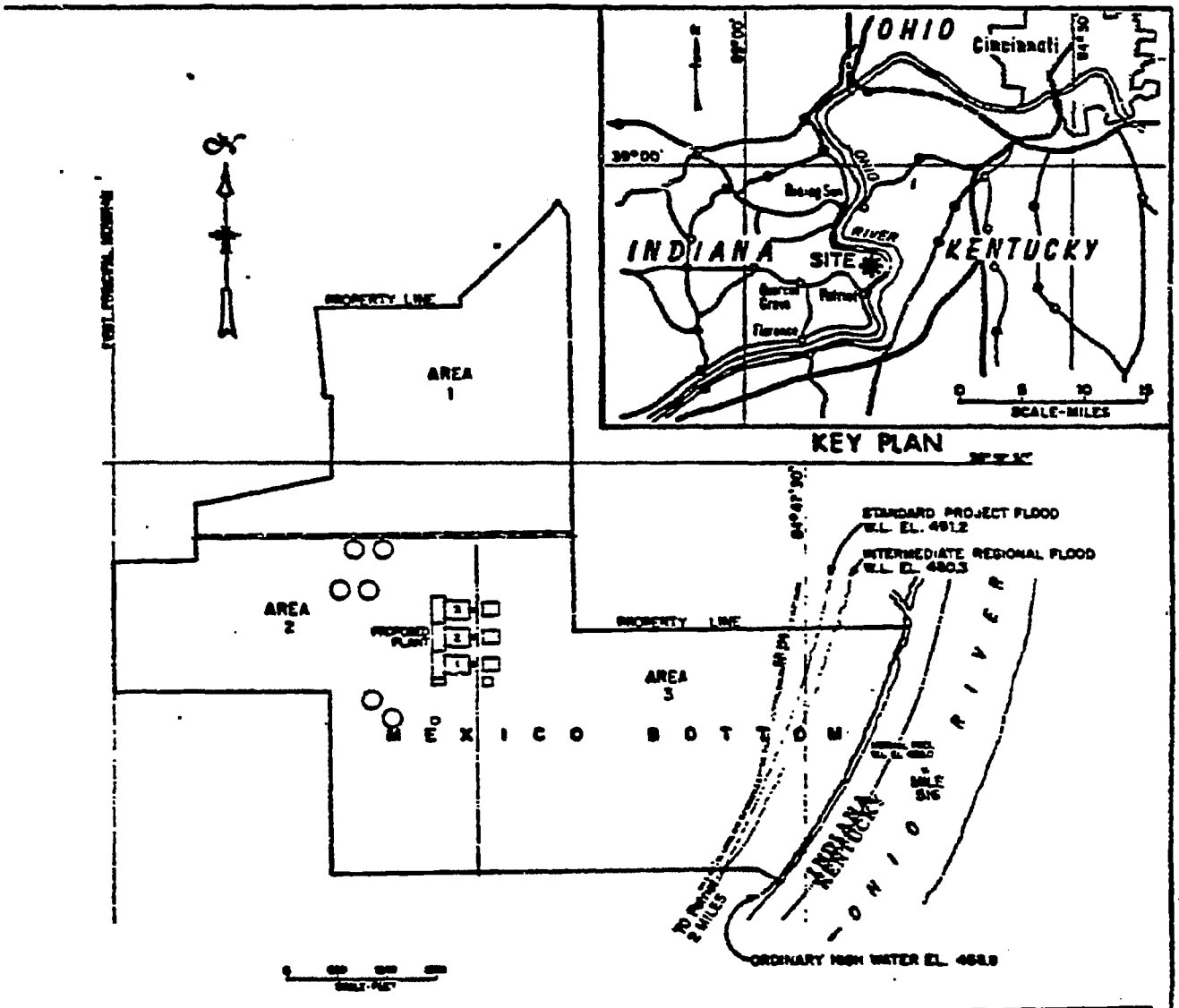
The decision whether to issue a permit will be based on an evaluation of the probable impact of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefits which reasonably may be expected to accrue from the proposal must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered; among those are conservation, economics, aesthetics, general environmental concerns, historic values, fish and wildlife values, flood damage prevention, land use, navigation, recreation, water supply, water quality, energy needs, safety, food production, and in general, the needs and welfare of the people. In addition, the evaluation of the impact of the activity on the public interest will include application of the guidelines promulgated by the Administrator, Environmental Protection Agency, under authority of Section 404(b) of the FWPCA (40 CFR Part 230).

No permit will be granted unless its issuance is found to be in the public interest. Written statements received in this office on or before 28 January 1981 will become a part of the official record, as such will be available for public examination, and will be considered in the determination. Any objections which are received during this period may be forwarded to the applicant for possible resolution before the determination is made whether to issue or deny the requested DA permit.

FOR THE DISTRICT ENGINEER:

Norman Langwell

for KENNETH MATHEWS
Chief, Operations Division



LOCATION MAP
Traced from USGS Rising Sun Quadrangle

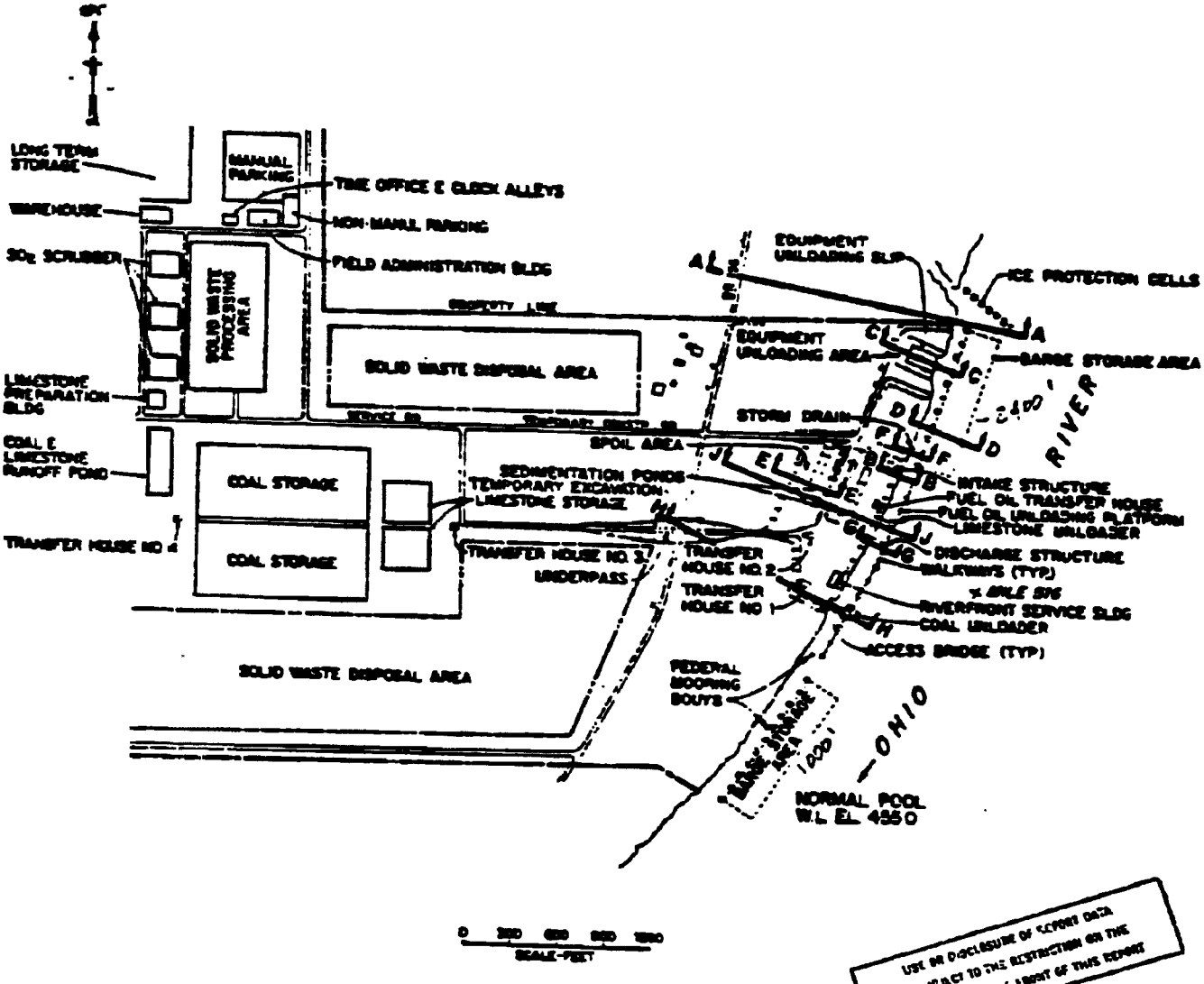
USE OR DISCLOSURE OF REPORT DATA IS SUBJECT TO THE RESTRICTION ON THE NOTICE PAGE AT THE FRONT OF THIS REPORT

NOTE: ALL ELEVATIONS BASED ON OHIO RIVER DATUM

TO CONVERT OHIO RIVER DATUM TO THE USC & GS DATUM OF 1929, SUBTRACT 0.8 FEET

SITE PLAN
PROPOSED PATRIOT GENERATING STATION
AT MILE 516 ON OHIO RIVER
NEAR PATRIOT, SWITZERLAND COUNTY, INDIANA
Application by
INDIANAPOLIS POWER & LIGHT COMPANY

REV. MAY 1980
SHEET 1 OF 10 MAR. 1978



NOTES:

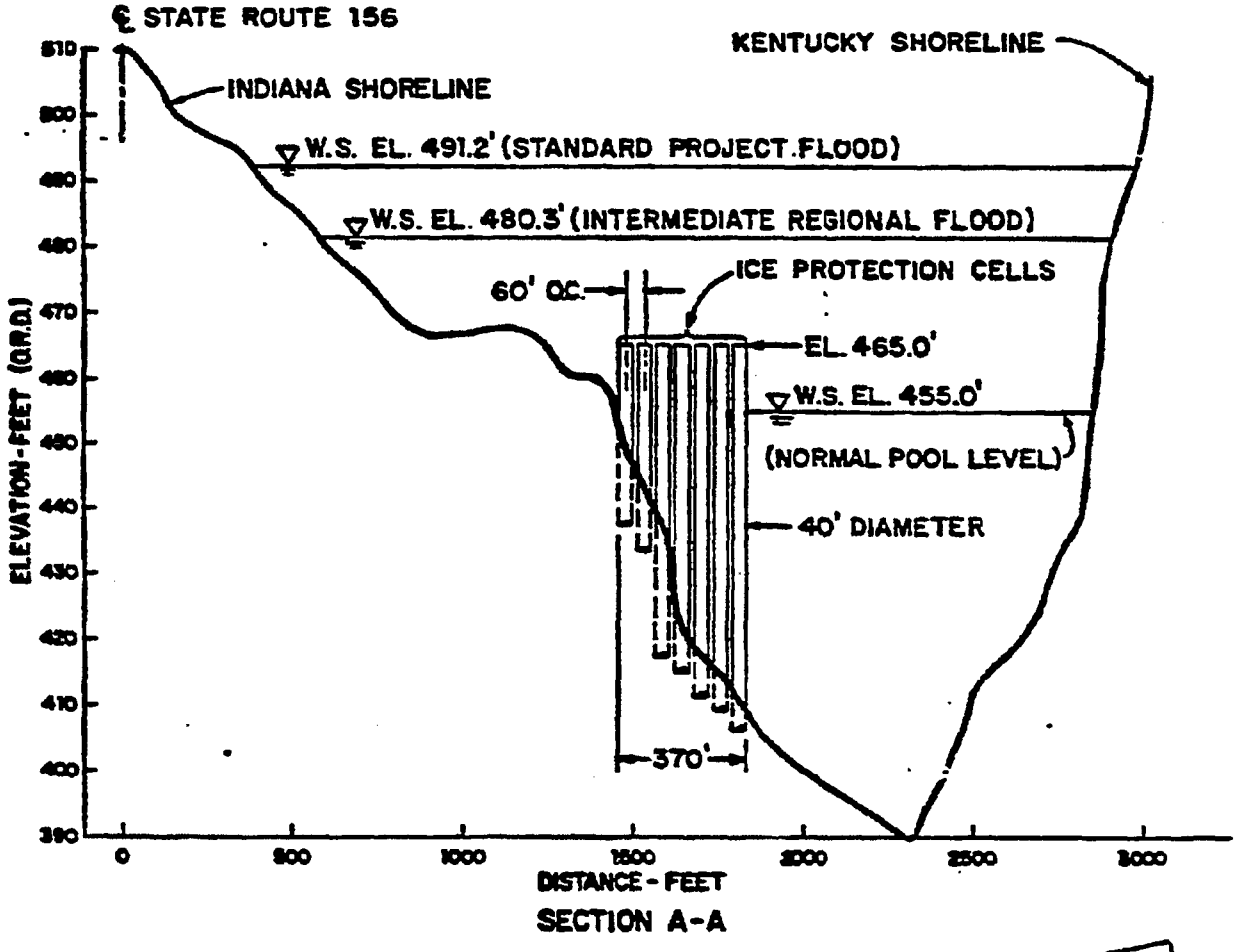
ALL ELEVATIONS BASED ON OHIO RIVER DATUM

FEDERAL MOORING BUOYS TO BE RELOCATED

SPOIL AREA (650'x 275')

AREA 3 PLAN
PROPOSED PATRIOT GENERATING STATION
AT MILE 516 ON OHIO RIVER
NEAR PATRIOT, SWITZERLAND COUNTY, INDIANA
Application by
INDIANAPOLIS POWER & LIGHT COMPANY

REV. MAY. 1980
SHEET 2 OF 10 MAR. 1978



SECTION A-A

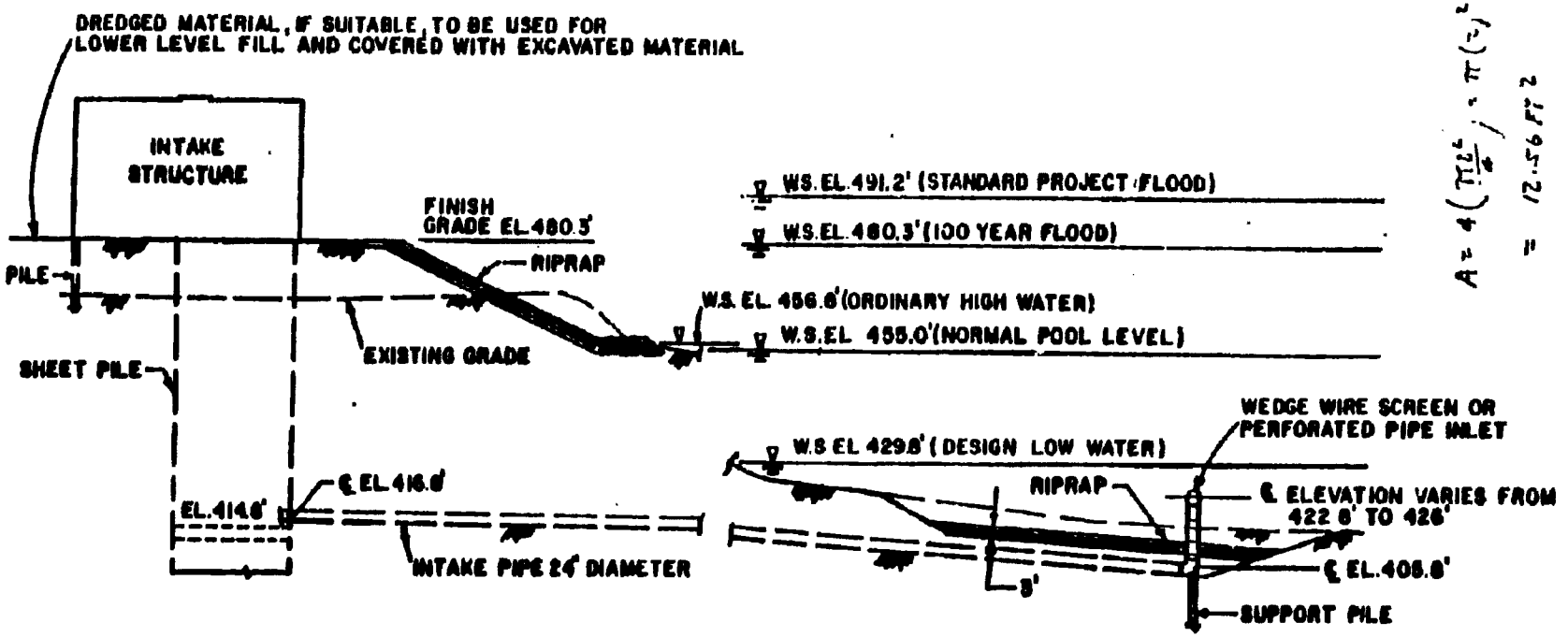
NOTE: ALL ELEVATIONS BASED ON OHIO RIVER DATUM

STEEL SHEET PILE CELLS FILLED WITH CLEAN GRANULAR MATERIAL AND CAPPED WITH CONCRETE

ICE PROTECTION CELLS AND RIVER CROSS SECTION

PROPOSED PATRIOT GENERATING STATION
AT MILE 516 ON OHIO RIVER
NEAR PATRIOT, SWITZERLAND COUNTY, INDIANA
Application by
INDIANAPOLIS POWER & LIGHT COMPANY

REV. MAY 1980
SHEET 3 OF 10 MAR. 1978

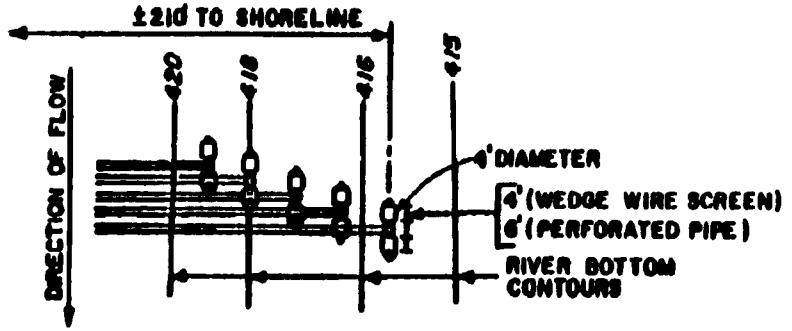


SECTION B - B

0 20 40

SCALE: FEET

NOTE:
ALL ELEVATIONS BASED ON OHIO RIVER DATUM



0 20 40

SCALE: FEET

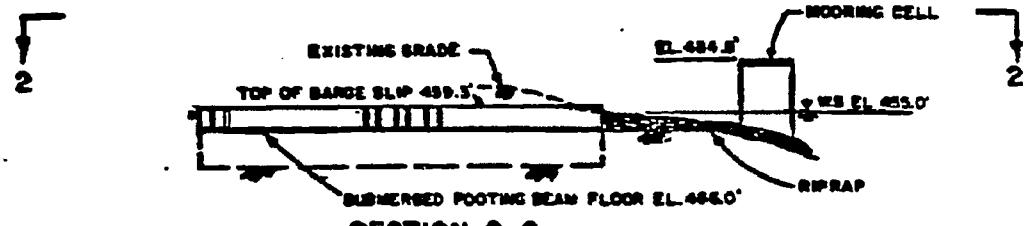
PLAN
INTAKE PIPE CONFIGURATION

USE OR DISCLOSURE OF REPORT DATA IS SUBJECT TO THE RESTRICTION ON THE NOTICE PAGE AT THE FRONT OF THIS REPORT

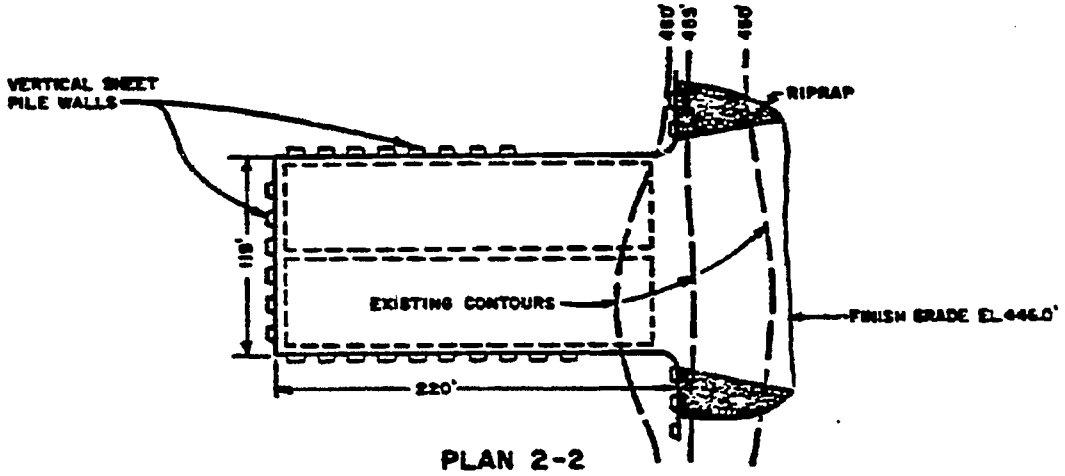
INTAKE STRUCTURE INCLUDING INTAKE PIPING PROPOSED PATRIOT GENERATING STATION

AT MILE 516 ON OHIO RIVER
NEAR PATRIOT, SWITZERLAND COUNTY, INDIANA
Application by
INDIANAPOLIS POWER & LIGHT COMPANY

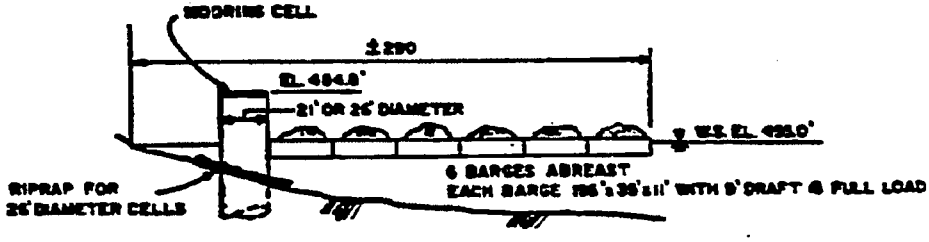
REV. MAY 1980
SHEET 4 OF 10 MAR. 1978



SECTION C-C



PLAN 2-2



SECTION D-D

0 50 100

SCALE: FEET

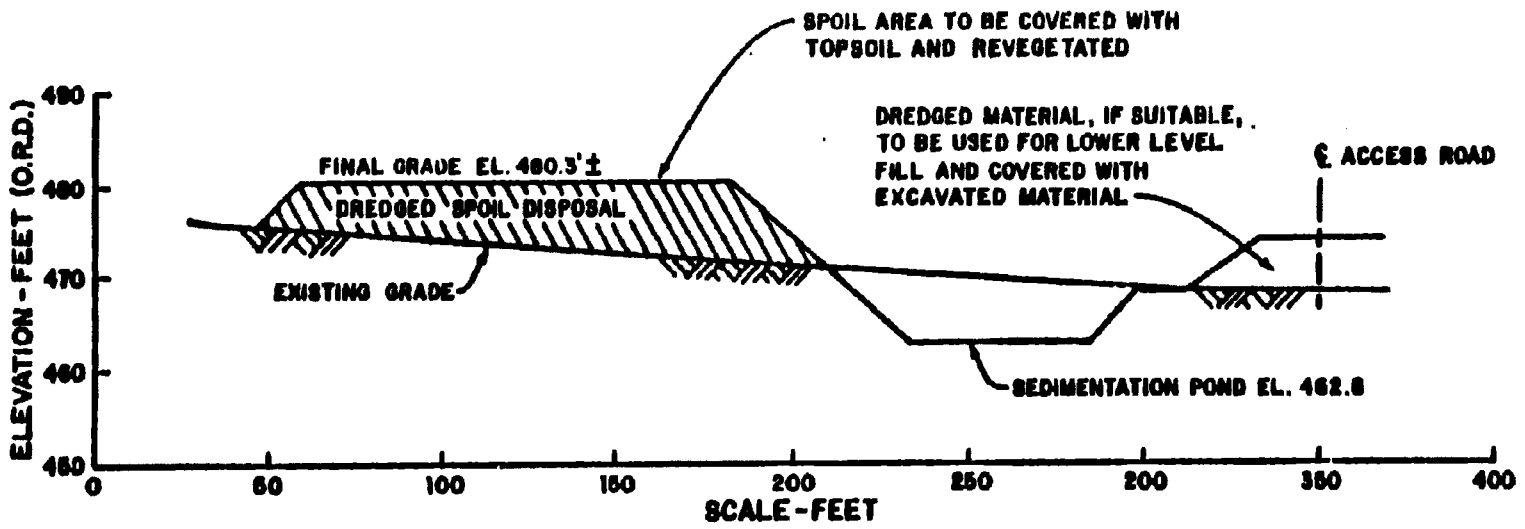
NOTE:
ALL ELEVATIONS BASED ON OHIO RIVER DATUM

EQUIPMENT UNLOADING SLIP AND BARGE FLEETING AREA

PROPOSED PATRIOT GENERATING STATION

AT MILE 516 ON OHIO RIVER
NEAR PATRIOT, SWITZERLAND COUNTY, INDIANA
Application by
INDIANAPOLIS POWER & LIGHT COMPANY

REV. MAY 1980



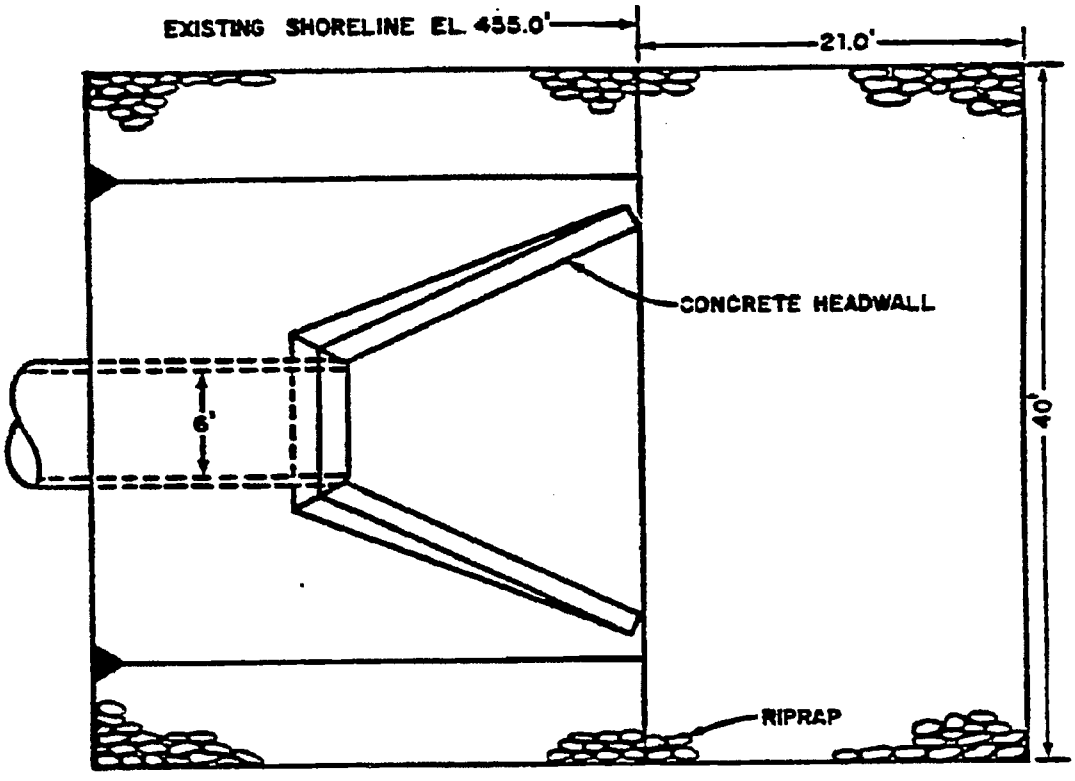
SECTION E-E

NOTE: ALL ELEVATIONS BASED ON OHIO RIVER DATUM

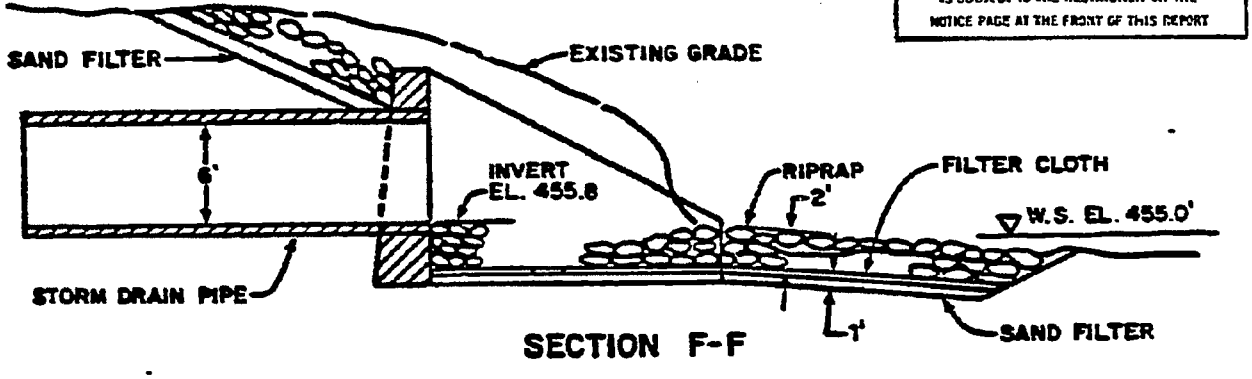
USE OR DISCLOSURE OF REPORT DATA IS SUBJECT TO THE RESTRICTIONS ON THE SERVICE PAGE AT THE FRONT OF THIS REPORT

DREDGED SPOIL DISPOSAL
PROPOSED PATRIOT GENERATING STATION
AT MILE 516 ON OHIO RIVER
NEAR PATRIOT, SWITZERLAND COUNTY, INDIANA
Application by
INDIANAPOLIS POWER & LIGHT COMPANY

REV. 1' 180
SHEET 6 OF 10 [illegible]378



PLAN



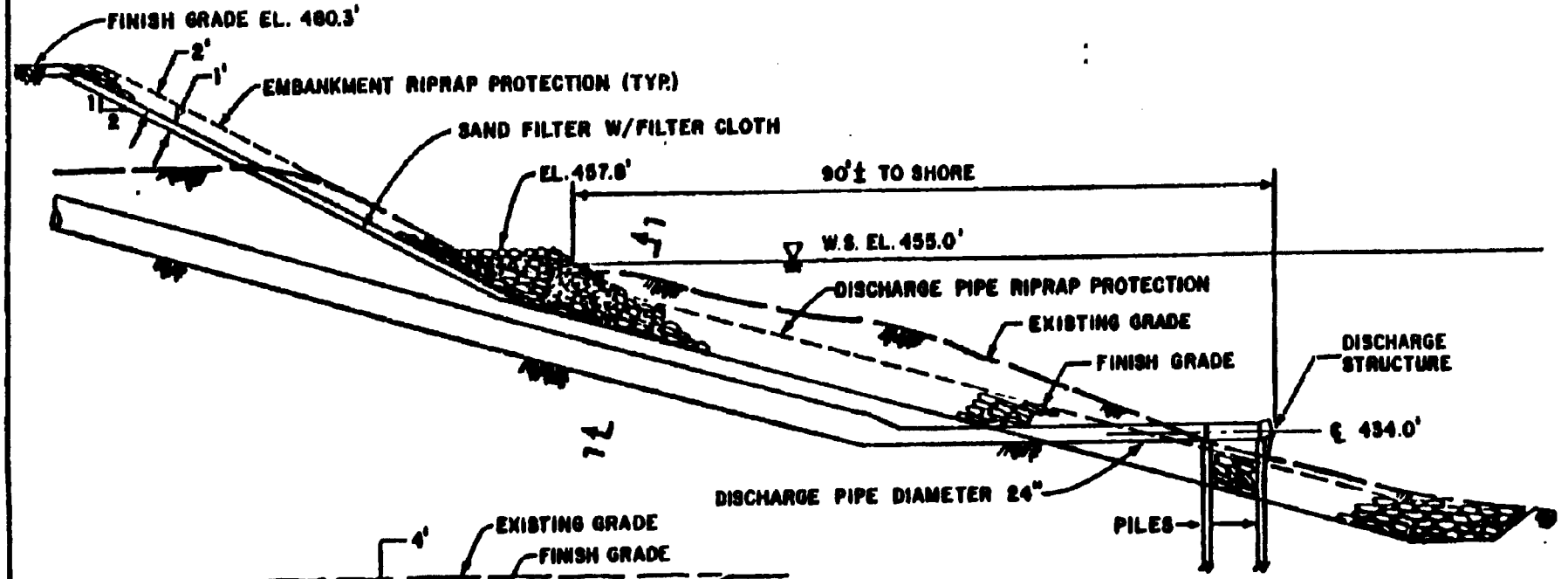
SECTION F-F

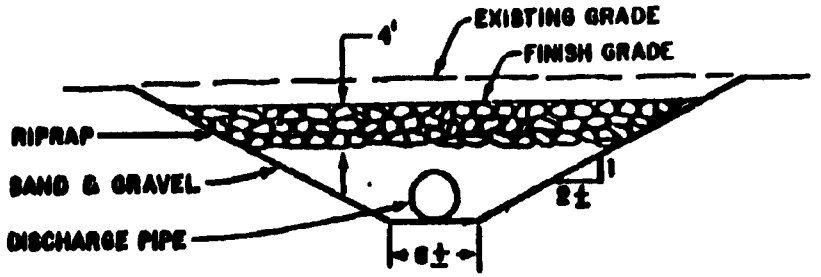
0 10 20
SCALE-FEET

NOTE: ALL ELEVATIONS BASED ON OHIO RIVER DATUM

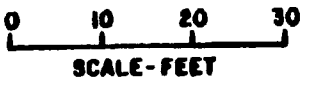
STORM DRAIN OUTFALL
PROPOSED PATRIOT GENERATING STATION
AT MILE 516 ON OHIO RIVER
NEAR PATRIOT, SWITZERLAND COUNTY, INDIANA
Application by
INDIANAPOLIS POWER & LIGHT COMPANY

REV. MAY. 1980
SHEET 7 OF 10 MAR. 1978





SECTION 1-1



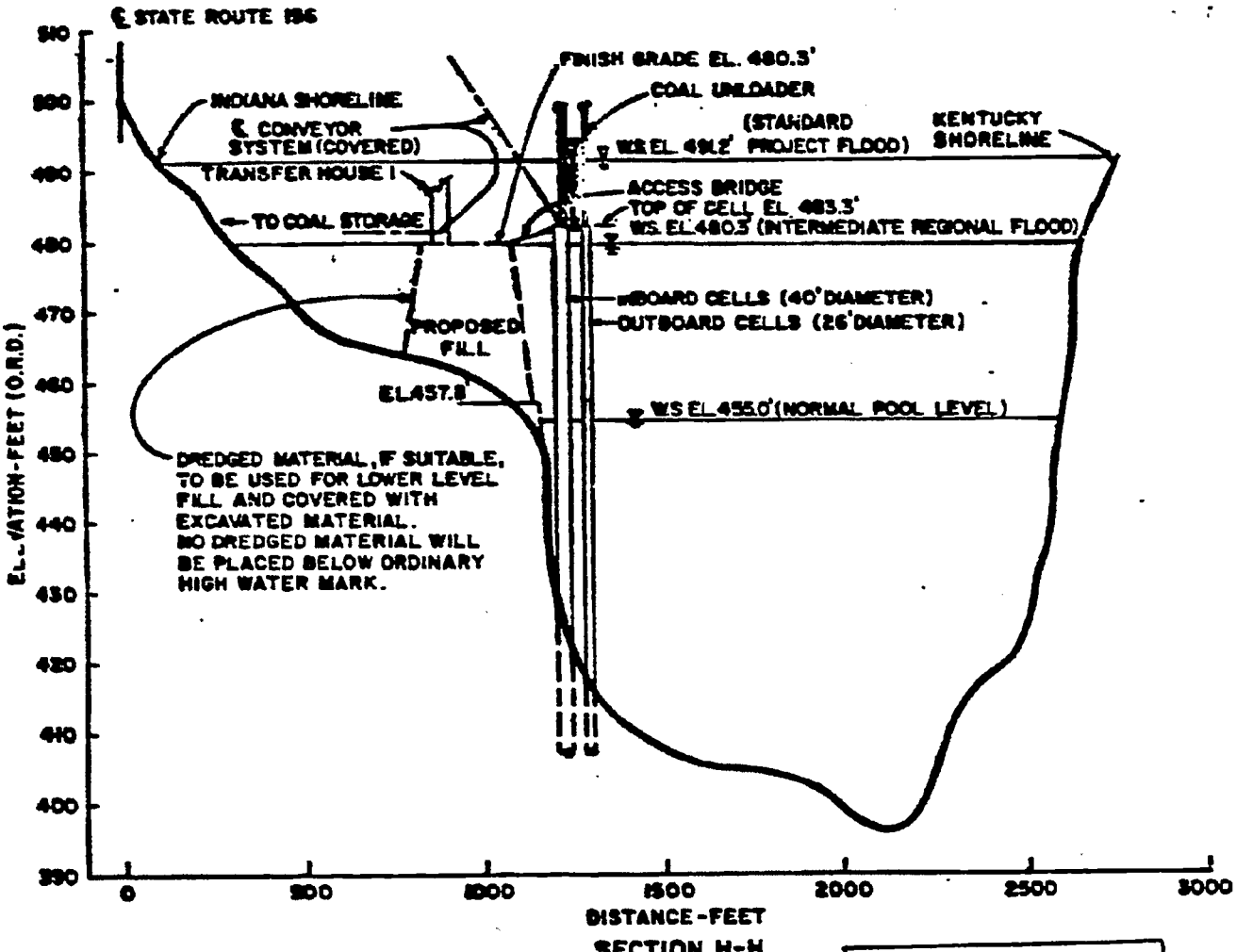
SECTION G-G

NOTE: ALL ELEVATIONS BASED ON OHIO RIVER DATUM

DISCHARGE STRUCTURE AND PIPING
PROPOSED PATRIOT GENERATING STATION

AT MILE 516 ON OHIO RIVER
NEAR PATRIOT, SWITZERLAND COUNTY, INDIANA
Application by
INDIANAPOLIS POWER & LIGHT COMPANY

REV. MAY 1980
SHEET 8 OF 10 [illegible] 1978



SECTION H-H

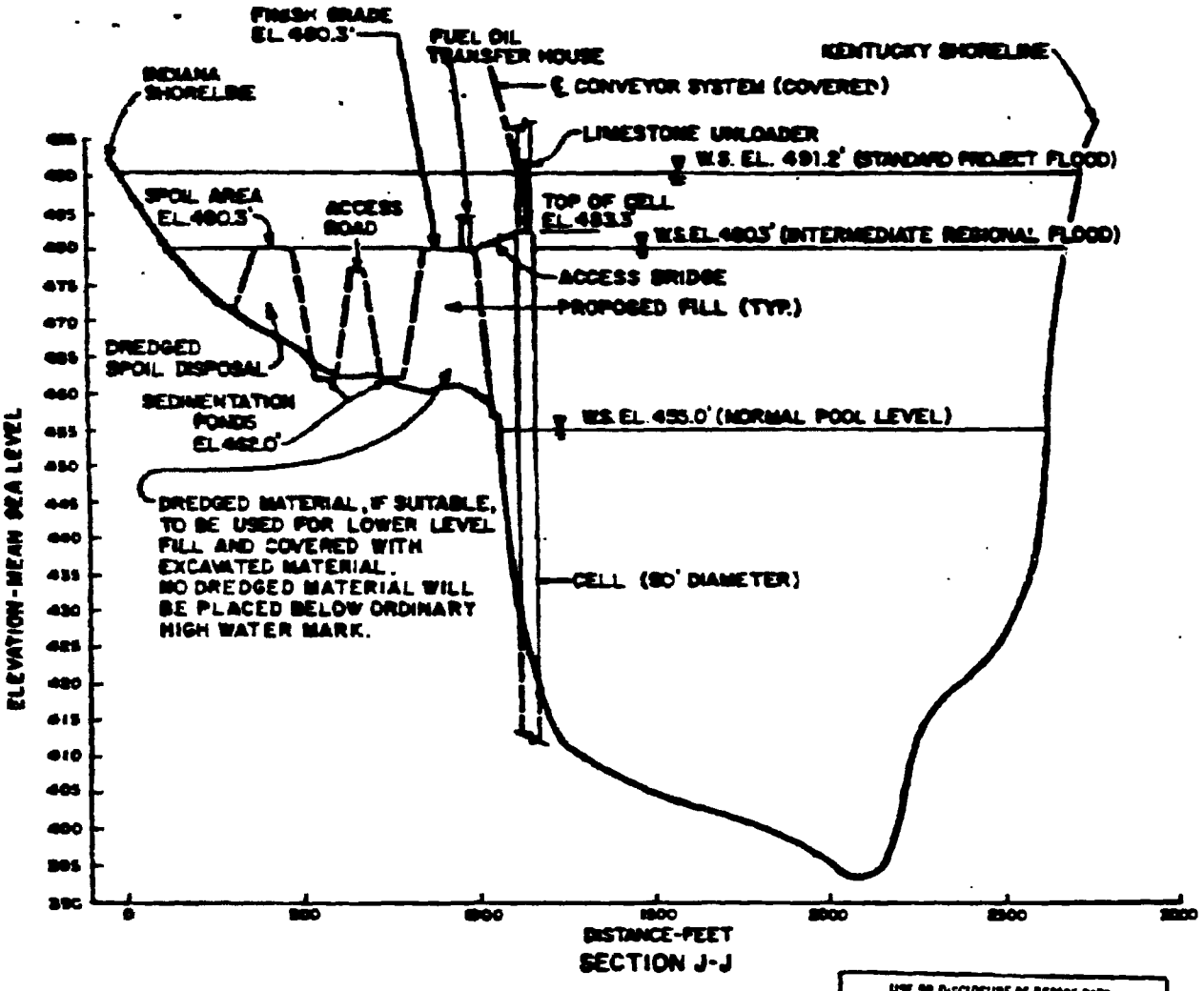
NOTE: ALL ELEVATIONS BASED ON OHIO RIVER DATUM

STEEL SHEET PILE CELLS FILLED WITH CLEAN GRANULAR MATERIAL AND CAPPED WITH CONCRETE

ACCESS BRIDGE: 212' WIDE CONCRETE DECK SUPPORTED BY STEEL OR PRESTRESSED CONCRETE BEAMS. BEAMS SUPPORTED BY CELL, INTERMEDIATE STEEL BENT AND CONCRETE ABUTMENT

COAL BARGE UNLOADING FACILITY
PROPOSED PATRIOT GENERATING STATION
AT MILE 516 ON OHIO RIVER
NEAR PATRIOT, SWITZERLAND COUNTY, INDIANA
Application by
INDIANAPOLIS POWER & LIGHT COMPANY

REV. NOV. 1980
SHEET 9 OF 10 MAR. 1978



SECTION J-J

NOTE ALL ELEVATIONS BASED ON OHIO RIVER DATUM

STEEL SHEET PILE CELL FILLED WITH CLEAN GRANULAR MATERIAL AND CAPPED WITH CONCRETE

ACCESS BRIDGE: 12' WIDE CONCRETE DECK SUPPORTED BY STEEL OR PRESTRESSED CONCRETE BEAMS. BEAMS SUPPORTED BY CELL, INTERMEDIATE STEEL BENT AND CONCRETE ABUTMENT

LIMESTONE UNLOADING FACILITY
PROPOSED PATRIOT GENERATING STATION

AT MILE 516 ON OHIO RIVER
NEAR PATRIOT, SWITZERLAND COUNTY, INDIANA

Application by
INDIANAPOLIS POWER & LIGHT COMPANY

REV. NOV. 1980
SHEET 10 OF 10 SEPT 1980

ORLPD-R

DEPARTMENT OF THE ARMY
LOUISVILLE DISTRICT CORPS OF ENGINEERS
P. O. BOX 59
LOUISVILLE KENTUCKY 40201

ORLOP-FP
80-IN-149

20 March 1981

PUBLIC NOTICE

TO WHOM IT MAY CONCERN:

This notice announces an application submitted for a Department of the Army (DA) permit subject to Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act (CWA).

APPLICANT: Southern Indiana Gas & Electric Company
20-24 Northwest Fourth Street
Evansville, Indiana 47741

LOCATION: Ohio River, right bank, Mile 817, near West Franklin, Posey County, Indiana

PURPOSE: To construct a water intake and barge unloading facility in connection with the expansion of the A. B. Brown Electric Generating Station. This expansion includes Units 2 & 3.

LEAD AGENCY: The Corps has assumed responsibility as lead Federal agency since the Corps is the only Federal agency with an environmental review responsibility for this project under the National Environmental Policy Act. As lead agency, the Corps is responsible for making the decision as to whether the construction of the expanded facility is in the overall public interest. Pursuant to that responsibility, a draft Environmental Impact Statement (EIS) has been prepared as required by the National Environmental Policy Act. The draft EIS was forwarded to the U.S. Environmental Protection Agency for placing official notification in the Federal register. Copies of the draft EIS have also been sent to the following libraries:

Henderson Community College - Henderson, Kentucky
Henderson Public Library - Henderson, Kentucky
Owensboro-Daviess County Public Library - Owensboro, Kentucky
New Harmony Public Library - New Harmony, Indiana
Mount Vernon Public Library - Mount Vernon, Indiana
Evansville Public Library - Evansville, Indiana
Evansville Willard Public Library - Evansville, Indiana
University of Evansville-Main Library - Evansville, Indiana
Indiana State University-Evansville-Main Library - Evansville, Indiana

Copies of the Draft EIS may be obtained by writing to above address, ATTN: ORLPD-R.

ORLOP-FP
80-IM-149

20 March 1981

DESCRIPTION OF WORK: The riverward work consists of installing a water intake structure, six mooring dolphins and an unloading cell to support a clamshell bucket. Attendant features to be constructed above Ordinary High Water would include a pump house, access haul roads, and a target hopper.

The water intake would consist of two 36-inch pipes jacked into place and supported by steel piles, 60-inch diameter intake screens would be attached to the ends. The intakes would have a 28,000 gallon per minute withdrawal capacity. The average intake velocity is 1/2 foot per second. The intake would be 17 feet below normal pool.

The mooring dolphins would be 20 feet diameter cells backfilled with clean gravel and capped with concrete. Two fleets of nine barges each (maximum 3 wide) would be positioned on either side of the unloading cell. The unloading cell would be 40-foot in diameter and would have a crane with clamshell bucket permanently affixed to the top of the cell. The unloading cell and mooring dolphins would require the placement of 22,000 cubic yards of crushed stone as base material. The installation would require 22,000 cubic yards of excavation which would be used as core fill material in the access roads.

The unloading system would have a capacity of 4,000 tons per day. The clamshell which would have a 10 cubic yard bucket, would remove material from the barge to the target hopper located on shore. Trucks would convey material from the target hopper to the plant site. The facility would be used to unload coal, lime, soda ash, and other bulk commodities necessary for the construction and operation of the plant. Outloading from shore to barge is not anticipated.

A DA permit cannot be issued if any legally required Federal, State or local authorization or certification is denied. A DA permit, if otherwise warranted, will not be issued until a Water Quality Certification or waiver is on file at this office. Certification is the responsibility of Indiana Stream Pollution Control Board.

Copies of this notice are sent to the appropriate Federal and State Fish and Wildlife Services. Their views and comments are solicited in accordance with the Fish and Wildlife Coordination Act (amended 1958) and the Endangered Species Act of 1973, as amended by the Endangered Species Amendment Act of 1978. However, there are no known facts that indicate the proposed work would destroy or endanger any known critical habitat of a threatened or endangered species listed or proposed. Therefore, unless warranted by later developments, no formal consultation specific to Section 7 of the 1973 Act, as amended, will be initiated with the U.S. Fish and Wildlife Service.

Any person may request, in writing, within the comment period specified in this notice, that a public hearing be held to consider this application. A request for a public hearing must state the specific interest which might be damaged by issuance of the DA permit.

ORLOP-FP
80-IN-149

20 March 1981

The National Register of Historic Places has been consulted and it has been determined that there are no properties currently listed on the Register which would be directly affected by the work. If we are made aware, as a result of comments received in response to this notice or by other means, of specific archaeological, scientific, prehistorical, or historical sites or structures which might be affected by the proposed work, the District Engineer will immediately notify the Secretary of the Interior so that he may accomplish the necessary surveys, investigations and recovery activities pursuant to Section 4 of Public Law 93-291.

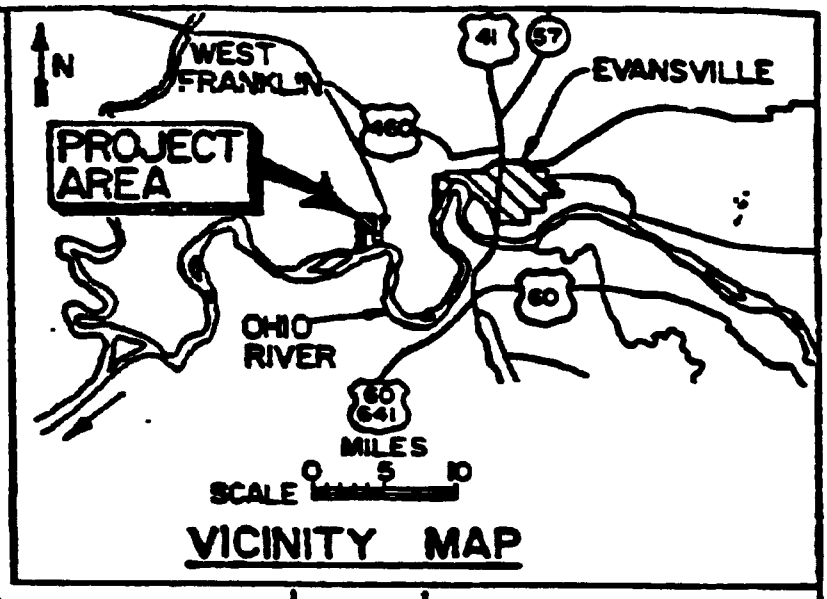
The decision whether to issue a permit will be based on an evaluation of the probable impact of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefits which reasonably may be expected to accrue from the activity must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered; among those are conservation, economic impact, aesthetic values, general environmental concerns, historic values, fish and wildlife values, flood damage prevention, land use, navigation, recreation, water supply, water quality, energy needs, safety, food production, and in general, the needs and welfare of the people. In addition, the evaluation of the impact of the activity on the public interest will include application of the guidelines (40 CFR Part 230) promulgated by the Administrator, Environmental Protection Agency, under authority of Section 404(b) of the CWA.

No permit will be granted unless its issuance is found to be in the public interest. Written statements received in this office on or before 20 April 1981 will become a part of the official record and will be considered in the determination. Any objections which are received during this period may be forwarded to the applicant for possible resolution before the determination is made whether to issue or deny the requested DA permit. All information pertaining to this application is available for public examination. Address all comments or inquiries to the above address, ATTN: ORLOP-FP, or call Mr. D. Hawkins (502) 582-5607.

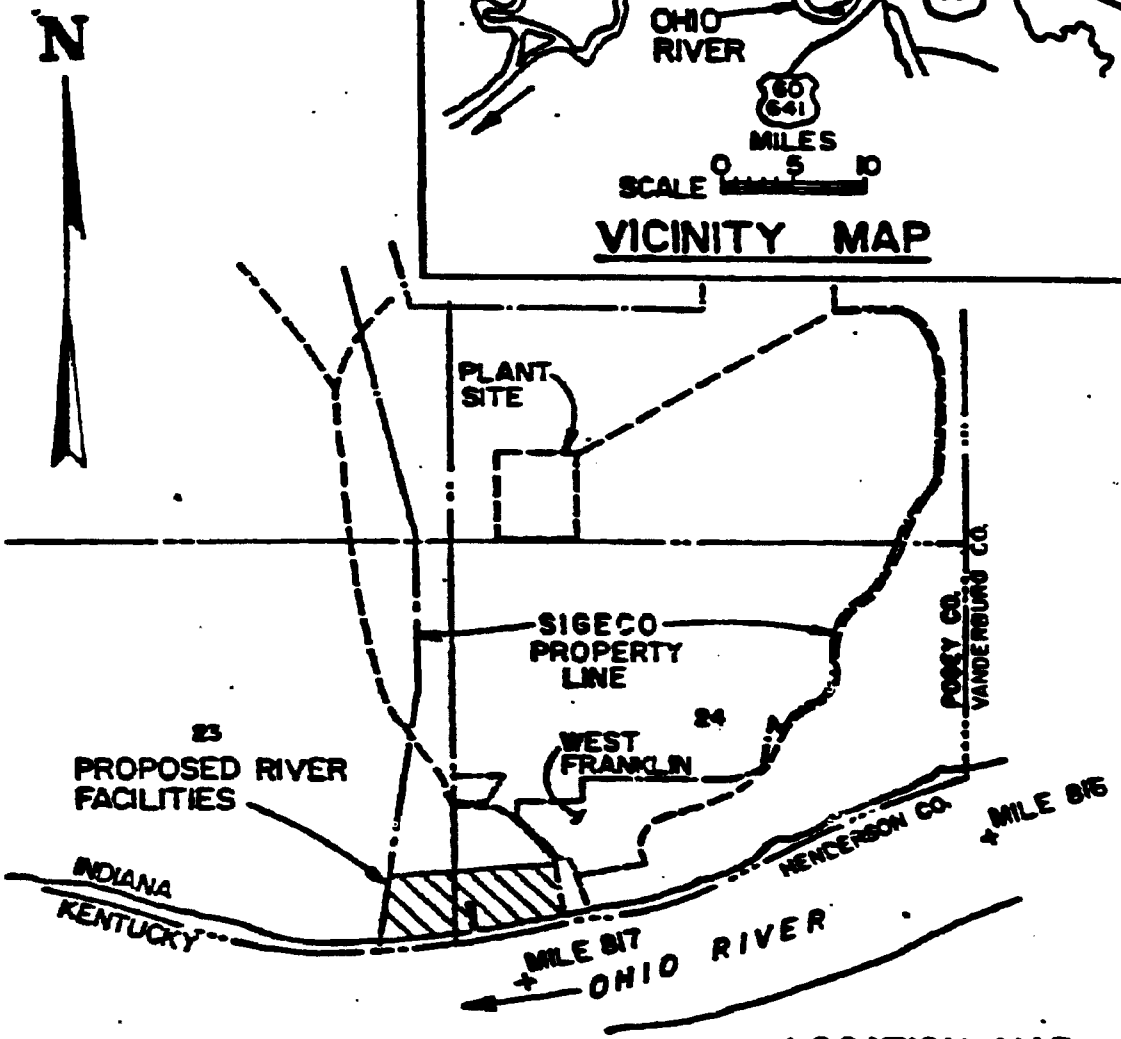
FOR THE DISTRICT ENGINEER:

KENNETH MATHEWS
Chief, Operations Division

USE OR DISCLOSURE OF REPORT DATA IS SUBJECT TO THE RESTRICTION ON THE NOTICE PAGE AT THE FRONT OF THIS REPORT



VICINITY MAP

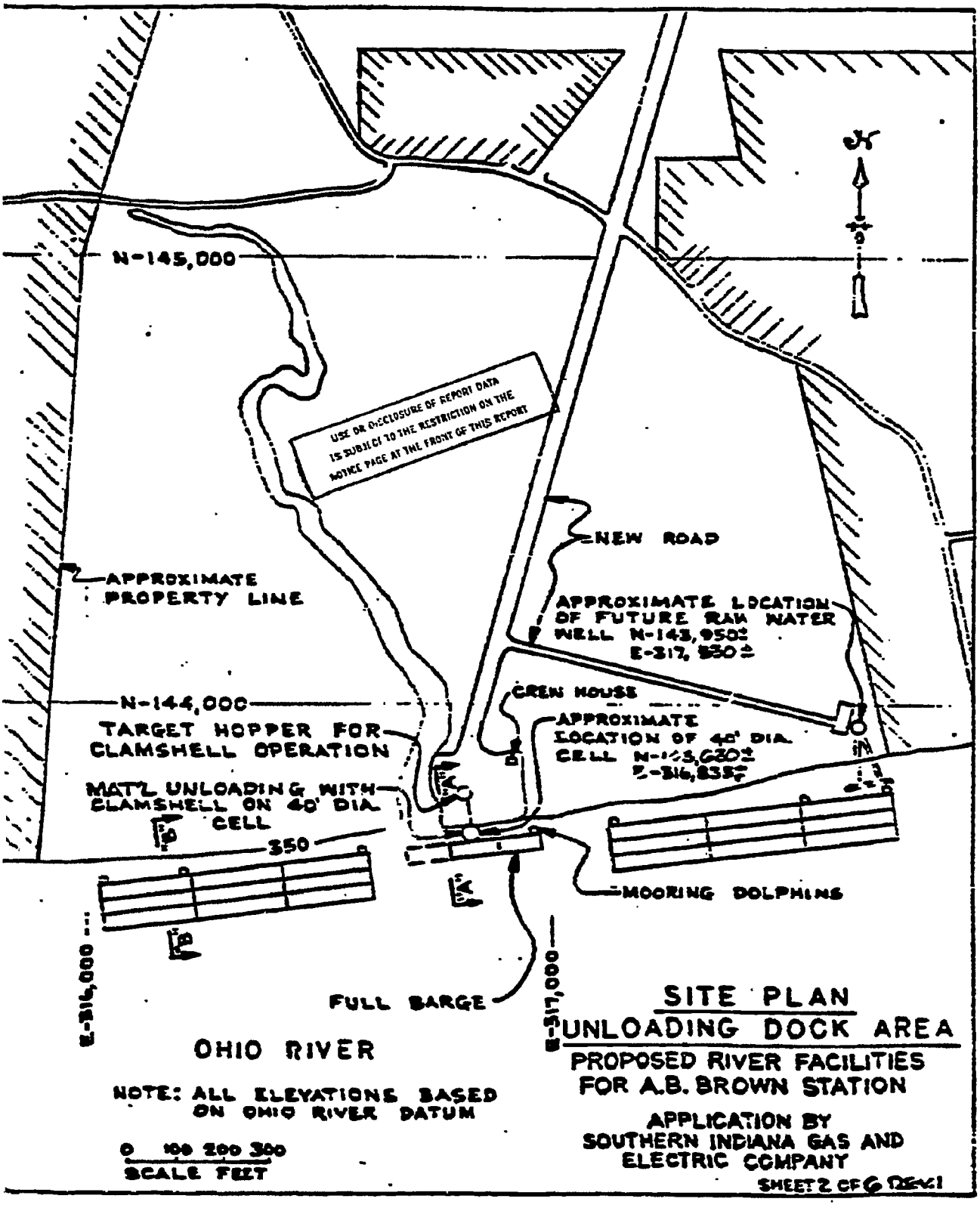


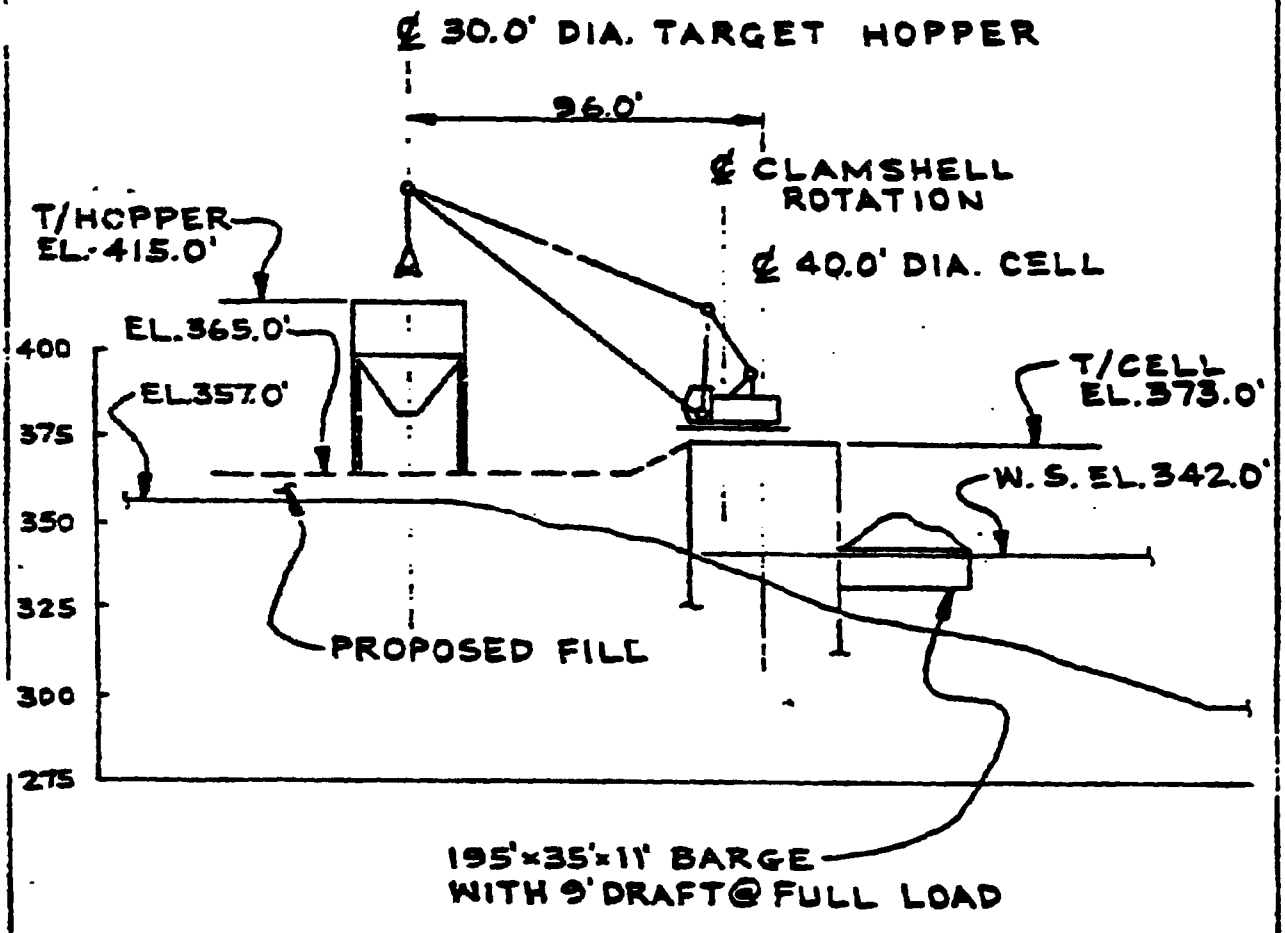
LOCATION MAP

PROPOSED RIVER FACILITIES FOR A.B. BROWN STATION

APPLICATION BY SOUTHERN INDIANA GAS AND ELECTRIC COMPANY

SHEET 1 OF 6


N-145,000
USE OR DISCLOSURE OF REPORT DATA IS SUBJECT TO THE RESTRICTION ON THE NOTICE PAGE AT THE FRONT OF THIS REPORT
NEW ROAD
APPROXIMATE PROPERTY LINE
APPROXIMATE LOCATION OF FUTURE RAW WATER WELL N-143,950± E-317,350±
N-144,000
CREW HOUSE
TARGET HOPPER FOR CLAMSHELL OPERATION
APPROXIMATE LOCATION OF 40' DIA. CELL N-145,620± E-316,835±
MAT'L UNLOADING WITH CLAMSHELL ON 40' DIA. CELL
350
MOORING DOLPHINS
E-316,000
E-317,000
FULL BARGE
OHIO RIVER
NOTE: ALL ELEVATIONS BASED ON OHIO RIVER DATUM
0 100 200 300
SCALE FEET
SITE PLAN
UNLOADING DOCK AREA
PROPOSED RIVER FACILITIES FOR A.B. BROWN STATION
APPLICATION BY SOUTHERN INDIANA GAS AND ELECTRIC COMPANY
SHEET 2 OF 6 REV. 1



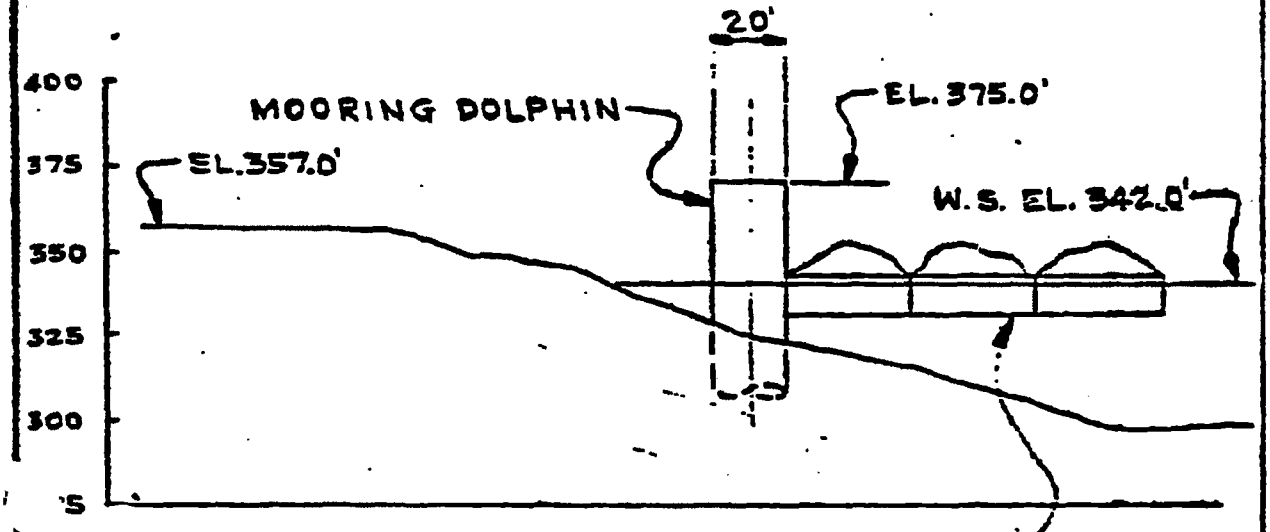
SECTION "A-A"

NOTE: ALL ELEVATIONS BASED ON OHIO RIVER DATUM

BARGE UNLOADING FACILITIES

PROPOSED RIVER FACILITIES
FOR A.B. BROWN STATION

APPLICATION BY
SOUTHERN INDIANA GAS AND
ELECTRIC COMPANY



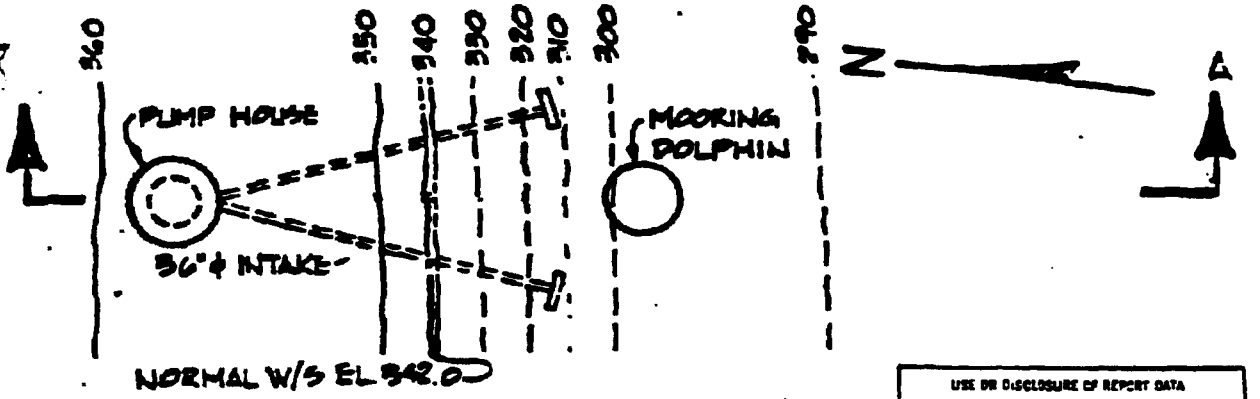
SECTION "B-B"

NOTE: ALL ELEVATIONS BASED ON OHIO RIVER DATUM

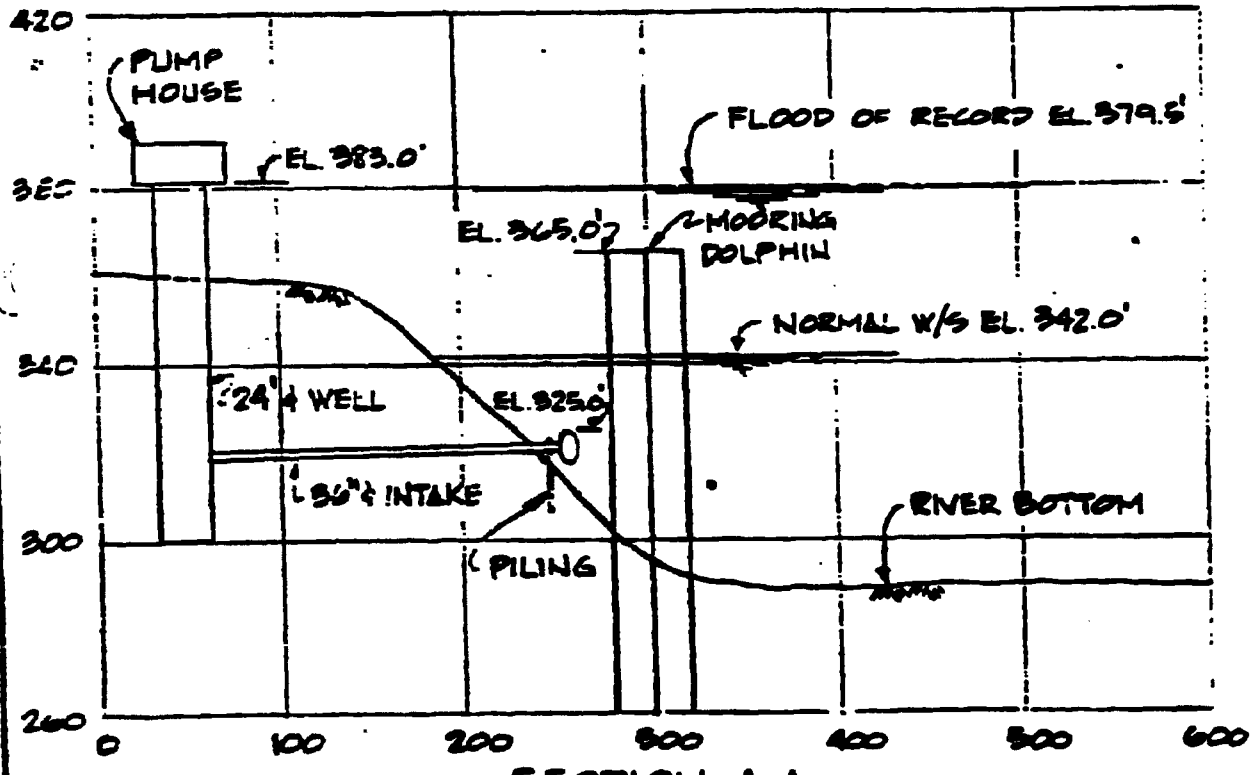
BARGE FLEETING AREA

PROPOSED RIVER FACILITIES FOR A.B. BROWN STATION

APPLICATION BY SOUTHERN INDIANA GAS AND ELECTRIC COMPANY



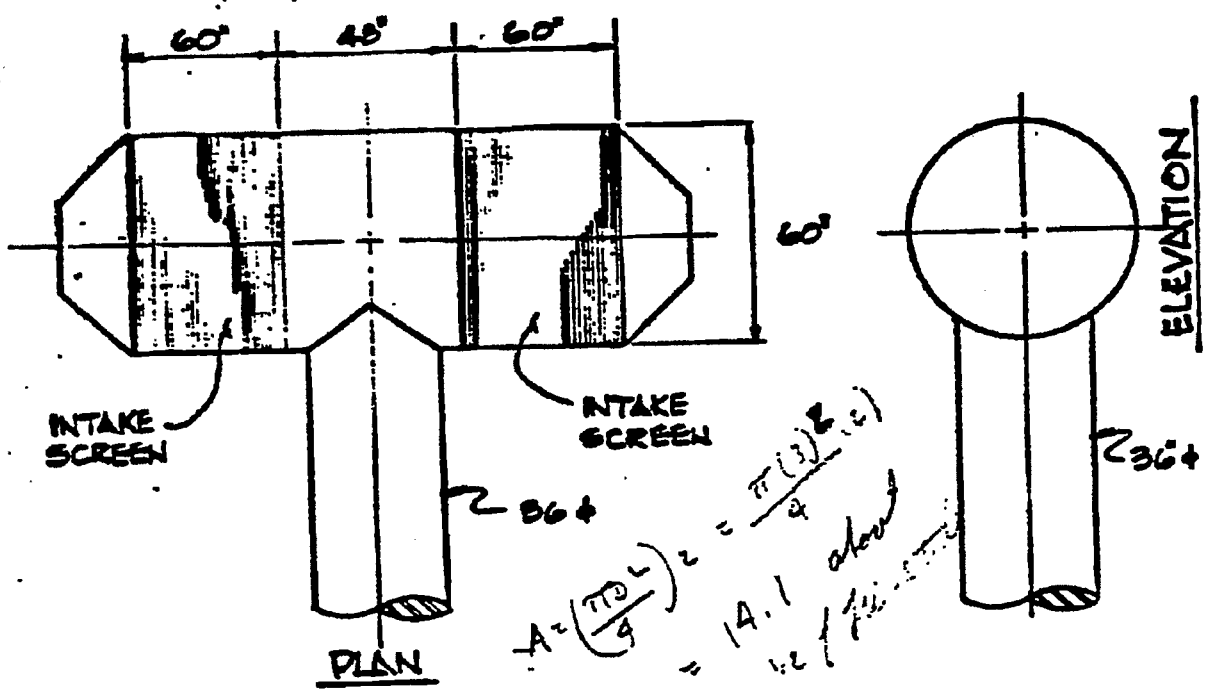
PLAN



SECTION A-A

SCALE
HORIZONTAL 1"=100'
VERTICAL 1"=40'

PLAN AND SECTION OF RIVER INTAKE
PROPOSED RIVER FACILITIES FOR A.B. BROWN STATION APPLICATION BY SOUTHERN INDIANA GAS AND ELECTRIC CO.
SHEET 5 OF 6



SCALE ¼"=1'-0"

NOTES

1. CAPACITY 14,000 G.P.M.@ LESS THAN 0.95 FT/SEC. AVERAGE THROUGH SLOT VELOCITY, 28,000 G.P.M. FOR EMERGENCY CONDITIONS DURING SHUTDOWN OF SECOND LATERAL
2. 62.5% SCREEN OPEN AREA
3. HYDROSTATIC COLLAPSE STENGTH IN EXCESS OF 10 FT OF WATER
4. MATERIAL AISI GRADE 304 STAINLESS STEEL
5. JOHNSON INTAKE SCREEN No. 125 (0.125") SLOT
6. PIPE AND SCREENS TO BE SUPPORTED BY DRIVEN PILES, DEPENDING UPON GEOLOGICAL EXPLORATION

RIVER INTAKE DETAILS

PROPOSED RIVER FACILITIES FOR A.B. BROWN STATION

APPLICATION BY SOUTHERN INDIANA GAS AND ELECTRIC CO.

APPENDIX E

Ranney Water System - Preliminary Design Criteria and Budget Cost Estimates

THE RANNEY COMPANY
DIVISION OF Layne-NEW YORK COMPANY, INC.
2 NORTH STATE STREET · P. O. BOX 72 · WESTERVILLE, OHIO 43081 · (614) 882-3104

May 12, 1982

Fluor Engineers and Constructors, Inc.
Advanced Technology Division
Post Office Box C11944
Santa Ana, California 92711

Attention: Mr. W. Jack Buckamier
Senior Contracts Engineer

REFERENCE: PRELIMINARY REPORT
DETAILED PUMP TESTING
FLUOR CONTRACT NO. 835504-O-K004

Gentlemen:

The test pumping procedures at Site 6 have been completed and some preliminary observations presented herein. The survey area tested indicated a very good potential for ground water development and Site 6, in particular, indicated a higher yield under test conditions than most sites along the Ohio River.

In order to develop the preliminary design for a Collector well system in the study area to produce long term reliable yields of 12,000 or 18,000 gallons per minute (gpm), the yield determinations were based on anticipated minimum conditions of low river stage, water temperature and took into account the effect that well interference would have in the system. Utilizing minimum condition values is critical to ensure that the minimum yield requirements can be satisfied at all times.

Under test conditions, the yield from a Collector well at Site 6 would approximate 6,000 gpm. However, under minimum conditions, this yield would be reduced somewhat. The anticipated yields from Collector wells located at the other sites can only be approximated at this time, and are estimated to be slightly less than 6,000 gpm. These yields will be more closely determined following test pumping at each site as construction plans progress.

Based upon these determinations, it appears that a yield of 12,000 gpm can be developed from a system of three Ranney Collector wells. Correspondingly, it appears that a yield of 18,000 gpm can be obtained from a series of five Collector wells. As further testing at the individual sites is accomplished, there exists a possibility that each of these systems can be reduced by one Collector

well, as results dictate. For the purpose of system cost comparison, three and five Collector wells should be used and prospective sites (in order of preference) would be: Sites 6, 2, 5, 1 and 4.

The estimated cost to design and construct a system to produce 18,056 gpm consisting of five Ranney Collector wells is about $6,200,000.00, and for a system to produce 12,000 gpm from three Ranney Collector wells, is about $3,720,000.00. Detailed test pumping at prospective Collector sites is estimated to cost $65,000.00 per site.

In our previous correspondence of December 18, 1981, we outlined the preliminary design for an intake to produce 18,056 gpm. From present indications, there appears to be sufficient river water depth in the vicinity of Site 3 to retain that site as the tentative Intake location. The estimated cost to design and construct a Ranney Surface Water Intake to produce up to 18,500 gpm is about $2,200,000.00.

Please find attached copies of the water quality analyses from the samples collected during the recent test pumping procedures. More detailed comments pertaining to these analyses and the anticipated water quality from a Collector well system will be provided in the final report. It is anticipated, from past experiences, that the water produced from a Collector well system can be of a more consistent temperature and quality, potentially resulting in a more simplified water treatment design.

Should you have any questions in this regard, please do not hesitate to contact us. We hope that the information supplied is sufficient for your project planning at this point. More detailed determinations will be included in the final report.

Thank you for this opportunity to be of service.

Very truly yours,

THE RANNEY COMPANY

Henry C. Hunt

Henry C. Hunt

HCH/blw

Enclosures

18,056 : 6,200,000 + 5(65,000) = 6,525,000

12,000 : 3,720,000 + 3(65,000) = 3,915,000

TOTAL PROJECT COST = 1.2 TIMES CONSTRUCTION COST

AQUA ASSOCIATES INC.
Analytical Chemistry and Bacteriology
1275 Bloomfield Avenue
Building 1
P.O. Box 1251
Fairfield, N.J. 07006
(201) 227-0422

N.J. DEP. CERTIFIED LABORATORY #07066

ANALYSIS REPORT:

Date 5/5/82
Laboratory No. 81592W
Date Sampled 4/27/82
Location Tri State Synfuels Henderson, Kentucky
Source Pumping well after 74 hours pumping

The Ranney Co.
P.O. Box 72
Westerville, Ohio 43081

Attn: Henry Hunt

pH	7.1 Units	Total Hardness, $CaCO_3$	360 mg/l
Color	0 Units	Calcium Hardness $CaCO_3$	244 mg/l
Turbidity	10 Units	Magnesium Hardness $CaCO_3$	116 mg/l
Conductivity	642 Micromhos/cm.	Iron, as Fe	0.56 mg/l
		Manganese, as Mn	<0.01 mg/l
Total Dissolved Solids	513.6 mg/l	Copper, as Cu	0.16 mg/l
Total Alkalinity, $CaCO_3$	324 mg/l	Silica, as SiO_2	11.3 mg/l
Carbonate Alkalinity $CaCO_3$	0 mg/l	Nitrate, as N	0.9 mg/l
Bicarbonate Alkalinity $CaCO_3$	324 mg/l	Saturation Index	+0.12
Hydroxide Alkalinity $CaCO_3$	0 mg/l		
Chloride, as Cl	6 mg/l		
Sulfate, as SO_4	54 mg/l		
Fluoride as F	0.22 mg/l		
Phosphate, as PO_4	0.21 mg/l		

Andrew Pappachen Director

AQUA ASSOCIATES INC.
Analytical Chemistry and Bacteriology
1275 Bloomfield Avenue
Building 1
P.O. Box 1251
Fairfield, N.J. 07006
(201) 227-0422

N.J. DEP. CERTIFIED LABORATORY #07065

ANALYSIS REPORT:

Date 5/6/82
Laboratory No. 81611W
Date Sampled 4/24/82
Location Tri State Synfuels
Henderson, Kentucky
Source Pumping Well @ 1 Hour

The Ranney Co.
P.O. Box 72
Westerville, Ohio 43081

Attn: Henry Hunt

pH	7.3 Units	Total Hardness, $CaCO_3$	298 mg/l
Color	0 Units	Calcium Hardness $CaCO_3$	170 mg/l
Turbidity	11 Units	Magnesium Hardness $CaCO_3$	128 mg/l
Conductivity	640 Micromhos/cm.	Iron, as Fe	1.24 mg/l
Total Dissolved Solids	512 mg/l	Manganese, as Mn	<0.01 mg/l
Total Alkalinity, $CaCO_3$	164 mg/l	Copper, as Cu	0.2 mg/l
Carbonate Alkalinity $CaCO_3$	0 mg/l	Silica, as SiO_2	8.4 mg/l
Bicarbonate Alkalinity $CaCO_3$	164 mg/l	Nitrate, as N	2.3 mg/l
Hydroxide Alkalinity $CaCO_3$	0 mg/l		
Chloride, as Cl	12 mg/l		
Sulfate, as SO_4	44 mg/l		
Fluoride as F	0.15 mg/l		
Phosphate, as PO_4	0.26 mg/l		

Director

AQUA ASSOCIATES INC.
Analytical Chemistry and Bacteriology
1275 Bloomfield Avenue
Building 1
P.O. Box 1251
Fairfield, N.J. 07006
(201) 227-0422

N.J. DEP. CERTIFIED LABORATORY #07066

ANALYSIS REPORT:

Date 5/6/82
Laboratory No. 81594A
Date Sampled 4/24/82
Location Tri State Synfuels
Henderson, Kentucky
Source Ohio River @ 1 hour

The Ranney Co.
P.O. Box 72
Westerville, Ohio 43081

Attn: Henry Hunt

pH	7.3 Units	Total Hardness, $CaCO_3$	150 mg/l
Color	35 Units	Calcium Hardness $CaCO_3$	80 mg/l
Turbidity	54 Units	Magnesium Hardness $CaCO_3$	70 mg/l
Conductivity	331 Micromhos/cm.	Iron, as Fe	0.12 mg/l
Total Dissolved Solids	265 mg/l	Manganese, as Mn	0.3 mg/l
Total Alkalinity, $CaCO_3$	120 mg/l	Copper, as Cu	0.19 mg/l
Carbonate Alkalinity $CaCO_3$	0 mg/l	Silica, as SiO_2	6.3 mg/l
Bicarbonate Alkalinity $CaCO_3$	120 mg/l	Nitrate, as N	3.4 mg/l
Hydroxide Alkalinity $CaCO_3$	0 mg/l		
Chloride, as Cl	22 mg/l		
Sulfate, as SO_4	65 mg/l		
Fluoride as F	0.05 mg/l		
Phosphate, as PO_4	0.26 mg/l		

Andrew Pappachen Director

Andrew Pappachen M.S. (Chemistry) M.S. (Civil Engineering)

THE RANNEY COMPANY

DIVISION OF Layne-NEW YORK COMPANY, INC.

2 NORTH STATE STREET · P. O. BOX 72 · WESTERVILLE, OHIO 43081 · (614) 882-3104

December 18, 1981

Fluor Engineers and Constructors, Inc. (ATD)
Post Office Box C11944
Santa Ana, California 92711

Attention: Mr. John Shipp

REFERENCE: RANNEY HYDROGEOLOGICAL SURVEY AT GENEVA, KENTUCKY
FLUOR CONTRACT NO. 835504-0-K004

Dear Mr. Shipp:

As per your request we have provided some preliminary design criteria and budget cost estimates for the proposed Collector well system and Surface Water Intake at the proposed Tri-State Synfuels site near Geneva, Kentucky. We have also enclosed general plan and section view sketches of typical Collector well and Intake designs that could be utilized at this site.

The preliminary design criteria that were utilized in developing the budget costs are based upon initial field observations made during the test drilling phase. As further testing (test pumping, aquifer analysis) is conducted at each prospective site, final design criteria can be determined and more firm cost estimates prepared. The budget costs for a Collector well system are based on the preliminary data obtained in the vicinity of Test Well No. 6, where the first program of test pumping is being conducted. The preliminary design and budget costs for the Surface Water Intake were prepared based upon location of the Intake Structure in the vicinity of Test Well No. 3.

SURFACE WATER INTAKE

The Surface Water Intake, located in the vicinity of TW-3, should fundamentally consist of a concrete caisson located on shore with two intake lines extending out to fixed screen assemblies, located approximately 200 feet offshore, as shown in Attachment A.

The caisson will be 24-feet inside diameter, constructed of reinforced concrete with a bottom sealing plug, a top floor slab and an intermediate, valve control floor. The approximate elevations of the top floor slab and caisson bottom are 380.0 and 297.0 feet, M.S.L., respectively. The caisson structure will be located within 100 feet inland from the Ohio River at normal pool stage.

The intake lines will be 30-inches in diameter and will extend from the caisson approximately 300-feet out to the river screen assemblies. The screens will be mounted on piling supports at a center-line elevation of about 313.0 feet, M.S.L.

The estimated cost to design and construct a raw water intake, as described above, to produce 18,056 gpm is about $2,200,000.00.

COLLECTOR WELL SYSTEM

From our preliminary indications, it appears that the desired quantity of water can be obtained from a system consisting of three Ranney Collector wells. As further testing is analyzed, it may indicate that this quantity of water can be developed from two Collector wells or that four Collectors may be required.

A Collector well to produce approximately 6,020 gallons per minute, located in the vicinity of TW-6, should fundamentally consist of a concrete caisson with lateral screens radiating out from near the bottom of the caisson at elevations to be further determined following testing procedures.

The caisson will be 16-feet inside diameter, constructed of reinforced concrete with a bottom sealing plug, a top floor slab and an intermediate valve control floor. The top floor slab will be at approximate elevation 380.0 feet, M.S.L.; about 4 feet above the reported 100 year flood elevation. The elevations of the caisson bottom and of the lateral screens will be determined following testing. It is estimated that approximately 1,070 lineal feet of 16-inch diameter carbon-steel lateral screen will be required to produce 6,020 gpm under current design criteria.

The estimated cost to design and construct a system to produce 18,056 gpm consisting of three Ranney Collector wells similar in design to that described above is about $4,800,000.00.

It is anticipated that water produced from a Collector well system will be more constant in temperature and quality and of a somewhat better quality; requiring less treatment than that produced from a River Intake, which is subject to seasonal fluctuations in temperature and slugs of contaminated water or water of varying quality.

These budget prices are based upon the preliminary designs outlined and do not include pumps, mechanical piping, pump houses, site access roads, temporary electrical service for construction equipment and any applicable State and Local Taxes. As further testing procedures are completed, adjustments to the above designs and cost estimates will be made as warranted.

As we discussed, preliminary findings at the site of TW-6 have indicated that several additional observation wells beyond the original scope, will be required to facilitate proper analysis of the site. The installation of these additional wells have extended our time schedule for the study.

Our current scheduling for completion of the detailed test pumping at the site of TW-6 is as follows:

a. Installation of observation wells and test pumping procedures to be completed by January 22, 1982.

b. Test analysis and presentation of rough draft of hydrogeological sur-

vey report - February 15, 1982.

A copy of a laboratory analysis of a water sample obtained at the site of TW-6 will be forwarded to you as received by our office. More representative water samples will be obtained and analyzed during the test pumping procedures and will be included in the rough draft report. This information should be available within the next week.

Should you have any questions regarding this information, please let us know. We regret having to extend the time of completion for the test pumping procedures, however, we feel that the additional work will be necessary for proper evaluation. Please let us know if there is any further information you may require ahead of this schedule.

Thank you for your patience in this matter.

Very truly yours,

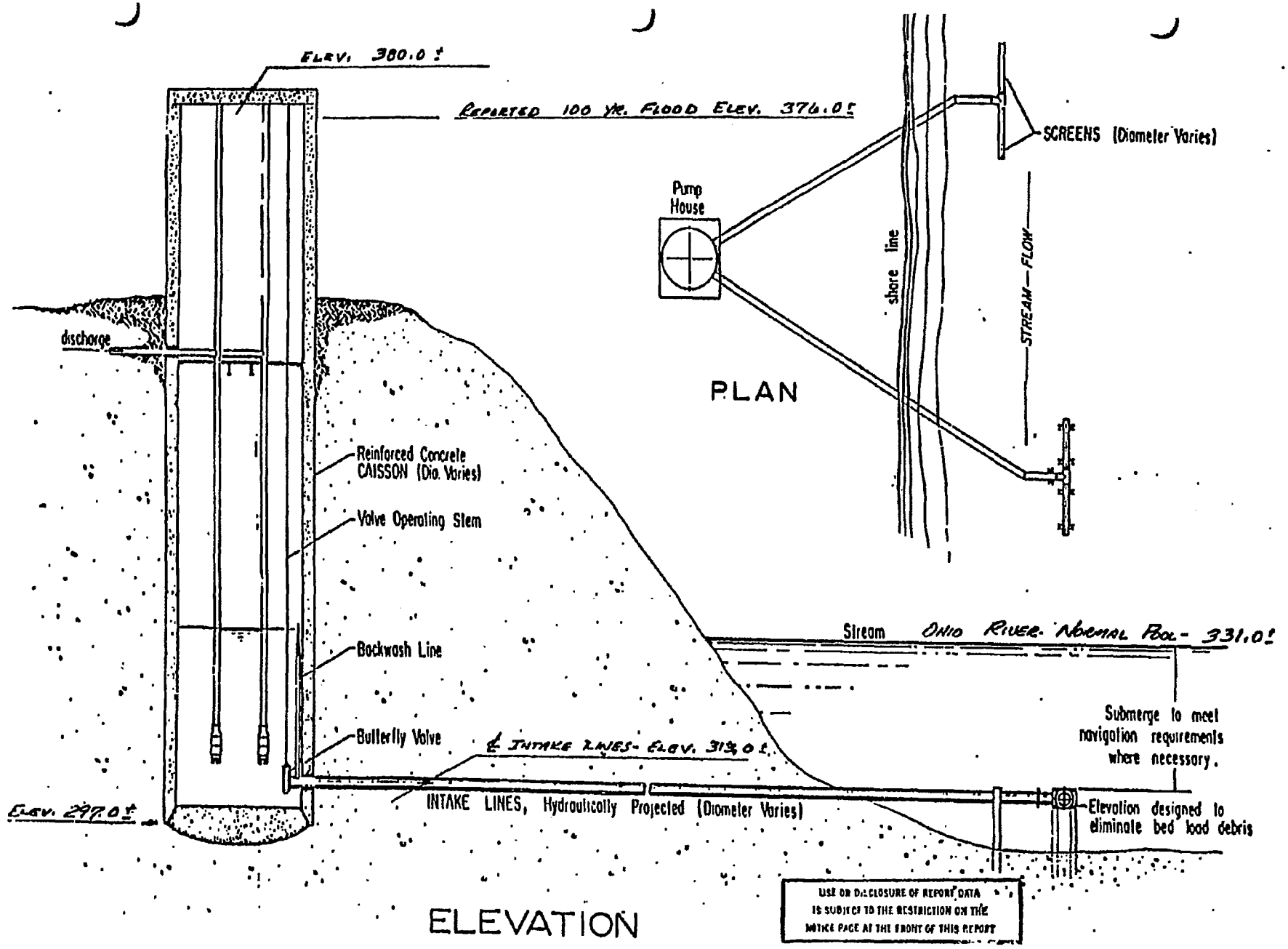
THE RANNEY COMPANY

Henry C Hunt

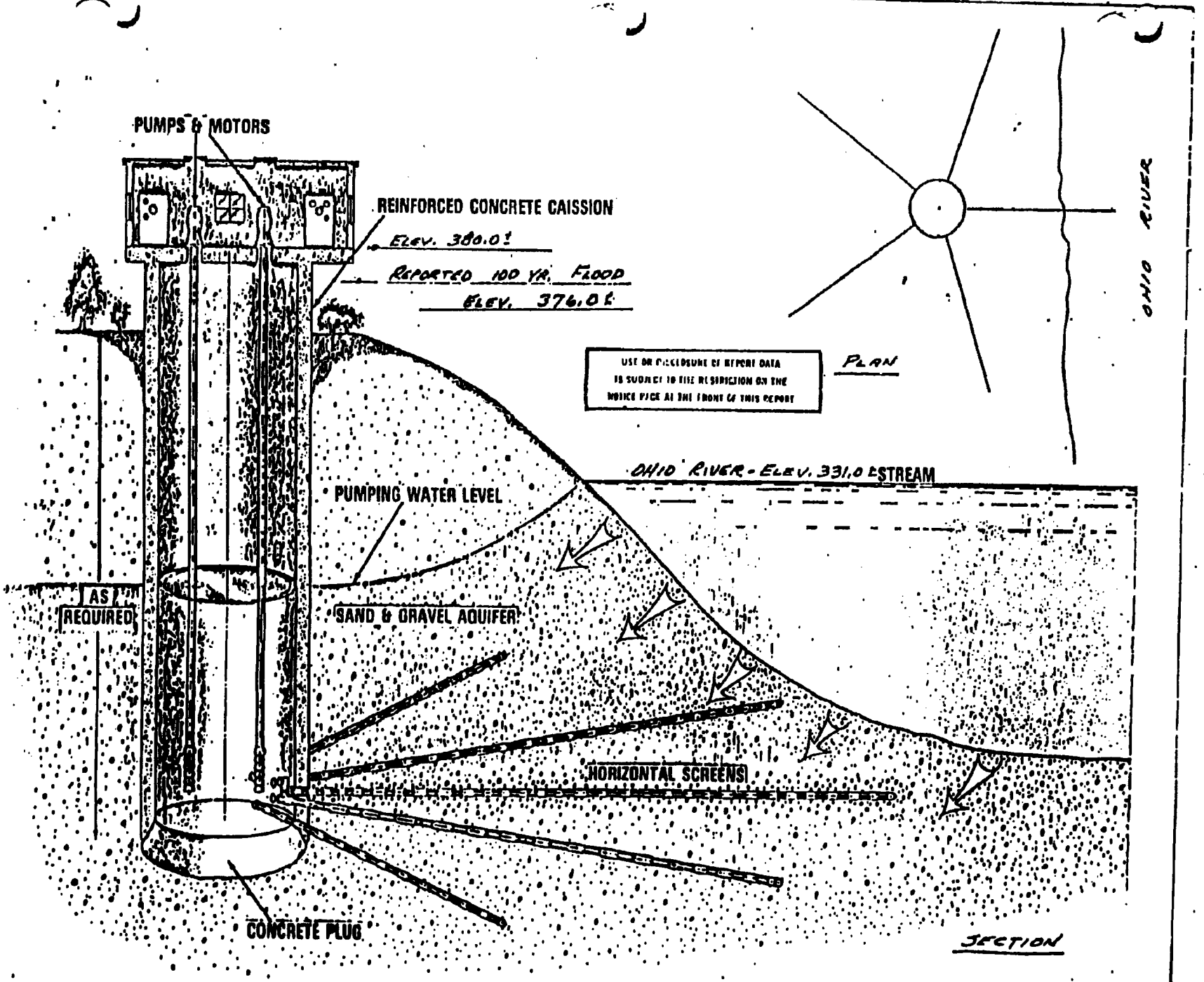
Henry C. Hunt

HCH/blw

Enclosure



RANNEY RAW WATER INTAKE



RANNEY COLLECTOR WELL (TYPICAL)

THE RANNEY COMPANY
Westerville Ohio

WELL LOG

Client: FLUOR CORPORATION JOB NO. RLM-5493

Location: GENEVA, KENTUCKY Well No. SITE 6 - 12" P.W.

Date December 4, 1981

Well Dia. 12" Total Depth 120 ft. Drill Method Cable-Tool

Screen: From 87.5' To 117.5' Casing Steel From +3.0 To 87.5

Elevation: Top of Casing Ground Approx. 320.0 feet, M.S.L.

(Log in feet from ground level) Static 12 feet ± From Ground

FROM	TO	MATERIAL	REMARKS
0	23.0	Brown CLAY.	
23.0	38.0	Medium-firm gray CLAY (plastic).	
38.0	48.0	Fine-coarse gray SAND, 25% fine GRAVEL - 3/8 inch	
		maximum diameter.	Heavy gray Silt.
48.0	58.0	Fine-medium gray SAND, scattered fine GRAVEL.	Heavy gray Silt.
58.0	62.0	Fine-medium gray SAND. 10% birdseye and fine	
		GRAVEL, 3/8"maximum diameter.	Medium gray Silt.
62.0	66.0	Fine-coarse brownish gray SAND, 25% fine-medium	
		GRAVEL, 1/2" maximum diameter.	Medium gray Silt.
66.0	80.0	Fine-coarse brownish gray SAND, 40% fine-medium	
		GRAVEL, 3/4" maximum diameter.	Light-medium gray Silt.
80.0	87.0	Fine-coarse brownish gray SAND, 50% fine-coarse	
		GRAVEL, 5% 2" diameter GRAVEL, 5" COBBLE at 80 feet.	Light-medium gray Silt.
87.0	88.5	Fine-coarse greenish-gray SAND, 25% fine-medium	
		GRAVEL, cemented clayballs 2 - 4" diameter.	
		Bailed tight.	Medium gray Silt.
88.5	91.0	Fine-coarse brownish gray SAND, 15% fine-medium	
		GRAVEL.	Light Silt.
91.0	105.0	Fine-coarse brownish gray SAND, 30% fine-medium	
		GRAVEL. 1" diameter	Light gray Silt.

THE RANNEY COMPANY
Westerville Ohio

WELL LOG

Client: FLUOR CORPORATION JOB NO. RLM-5493
Location: GENEVA, KENTUCKY Well No. SITE 6 - 12" P.W.
Date December 4, 1981
Well Dia. Total Depth Drill Method
Screen: From To Casing From To
Elevation: Top of Casing Ground
(Log in feet from ground level) Static From

FROM	TO	MATERIAL	REMARKS
105.6	106.0	Fine-coarse brownish gray SAND, 50% fine-coarse	
		GRAVEL 2 - 3" diameter with small cobbles.	Light gray Silt.
106.0	108.5	Stiff gray CLAY and GRAVEL mixed. Drilled out.	
108.5	114.0	Fine-coarse whitish light-gray SAND, 30% fine-medium	
		GRAVEL.	Heavy gray Silt.
114.0	118.0	Fine-coarse brownish-gray SAND, 40% fine-medium	
		GRAVEL.	Medium gray Silt.
118.0	119.0	Coal - (Drilled open hole).	Black Water
119.0	120.0	Firm gray CLAY - hole stopped.	

THE RANNEY COMPANY
Westerville Ohio

WELL LOG

Client FLUOR CORPORATION - GENEVA, KENTUCKY JOB NO. RLM-5493

Location: 75 ft. upstream from P.W. 12 in. Well No. Site 6, P-1

Date November 18, 1981

Well Dia. 6" Total Depth 112 ft. Drill Method Cable Tool

Screen: PVC From 107.0 To 112.0 Casing Steel From 0 To 108.0

Elevation: Top of Casing 3 ft. above ground Ground Approx. 320.0 feet, M.S.L.

(Log in feet from ground level) Static 11.83 feet From Ground

FROM	TO	MATERIAL	REMARKS
0	22.0	Firm brown clay	
22.0	38.0	Plastic medium grey clay	
38.0	48.0	Fine - medium grey sand	Medium-heavy silt
		30% fine-medium gravel (Silt % not accurate (due to	soft clay in pipe)
48.0	62.0	Fine - medium grey sand - trace of gravel, medium grey	silt
62.0	68.0	Fine - coarse grey sand, 25% fine	
		Medium gravel 1/2" dia.	Medium grey silt
68.0	80.0	Fine - coarse grey sand, 40% fine	
		Medium gravel 1" dia.	Medium grey silt
80.0	95.0	Fine - coarse grey sand, 40% fine	
		Coarse gravel, scattered 3" dia. rock	Light grey silt
95.0	100.0	Fine - coarse light greenish-grey sand	Very light silt
		30% fine-medium gravel to 1" dia., scattered 3" dia.	rock
100.0	104.0	Fine - coarse light grey sand	
		10% fine gravel 3/8" dia.	Light silt
104.0	107.5	Fine - coarse grey sand, 50% fine	
		Coarse gravel 2 1/2" dia.	
107.5	108.5	Rock - Pipe stopped - Drilled 1 ft. out of pipe	
108.5	112.0	Fine - medium grey sand, 10% fine gravel,	Light silt
		Hole stopped.	

*****

*Extra samples taken each 5 ft. from 80'-110' for sieve analysis

THE RANNEY COMPANY
DIVISION OF Layne-NEW YORK COMPANY, INC.
2 NORTH STATE STREET · P. O. BOX 72 · WESTERVILLE, OHIO 43081 · (614) 882-3104

Received 9 Nov 81

November 3, 1981

Fluor Engineers and Constructors, Inc.
Advanced Technology Division
Post Office Box C11944
Santa Ana, California 92711

Attention: Mr. W. Jack Buckamier
Sr. Contracts Engineer

RE: PRELIMINARY REPORT
HYDROGEOLOGICAL SURVEY
FLUOR CONTRACT NO. 835504-O-K003

Gentlemen:

Please find enclosed general location plans and data pertaining to the preliminary phases of the geophysical evaluation and exploratory test hole drilling for the above-referenced contract. The preliminary geophysical evaluation phase has been completed, and at this time, four of the six test/sampling holes have been completed. The test study area extends approximately 25,000 feet downstream along the Ohio River bank (to approximate river mile 811.5) from the upstream property line of the Henderson County Riverport Authority.

The geophysical evaluation consisted of a field survey conducted by a Ranney geophysical crew along the banks of the Ohio River near Geneva, Kentucky, as shown in Figure 1. At each of the resistivity stations, subsurface information was obtained by the surface electrical resistivity method. Electrical resistivity soundings were made to depths up to 200 feet at 29 stations shown on Figure 1, and denoted alphabetically (A-Z) and numerically (1-3) for future reference. Prospective sites for the location of the exploratory test holes were selected on the basis of the results of these electrical resistivity soundings. Detailed procedures and results of this evaluation are included in Appendix A of this report.

The exploratory test/sampling holes are currently being installed at locations selected during the geophysical evaluation. At the time of this writing, four of the six exploratory test holes have been completed and are located as shown on Figure 2. The fifth test hole is currently being drilled and it is anticipated that the sixth test hole will be completed by November 6th. The depths of these test wells, denoted as TW-1 through 4, are 131, 126, 102 and 115 feet, respectively, and confirm the presence of relatively clean sand and gravel deposits. Detailed well log descriptions of each test hole are included in Appendix B of this report.

Results of the geophysical evaluation and initial exploratory test holes have indicated that Ranney Collector wells are indeed a feasible approach in providing a water supply for the proposed synfuels facility at Geneva. Determinations of anticipated yields that can be obtained from the study area and the number of Ranney Collectors that will be required to produce the necessary quantity of water cannot be made until sufficient test pumping has been accomplished. As previously discussed, test pumping procedures will be required at each Ranney Collector well site to determine the anticipated yield and to develop design criteria.

Data obtained during the geophysical evaluation indicated that the subsurface materials in the study area along the downstream section, river mile 810 to 811.5, were more favorable for the development of a ground water supply than those materials upstream to the Riverport; i.e. to the north and east of Geneva. Geologic data obtained during the installation of TW-1 and TW-2 supported these determinations, and on this basis it was decided to concentrate our immediate efforts and exploration in the downstream portion of the study area. The upstream portion of the study area exhibits some potential for ground water development, but limitations on available land preclude development of the full supply from this area alone. The upstream area can be further tested if needed.

The results of test drilling have indicated that the downstream portion of the study area probably has adequate room to locate the required number of Ranney Collector wells, using proper well spacing as well as more promising sands and gravels and saturated thickness of the aquifer. 1500' ±

Based upon the results of the geophysical evaluation and the exploratory test drilling, there appears to be adequate sand and gravel deposits which are hydraulically connected with the Ohio River to develop the required ground water supply. It is recommended that each prospective Ranney Collector site be test pumped in order to determine anticipated well yield and develop final design criteria. Continue issued 6 Nov 81

Following the completion of TW-5 and TW-6, the additional geologic information will be evaluated and final selections of test pumping sites will be made. Any additional comments will be offered at that time as pertain to the system feasibility and the selection of test pumping sites.

Should you have any questions regarding this report, please do not hesitate to contact us.

Thank you for this opportunity to be of service.

Respectfully submitted,

THE RANNEY COMPANY

Henry C Hunt

Henry C. Hunt

HCH/blw

APPENDIX F

Rough order of magnitude estimate of installed and operating costs of raw water treatment system versus ground water treatment system.

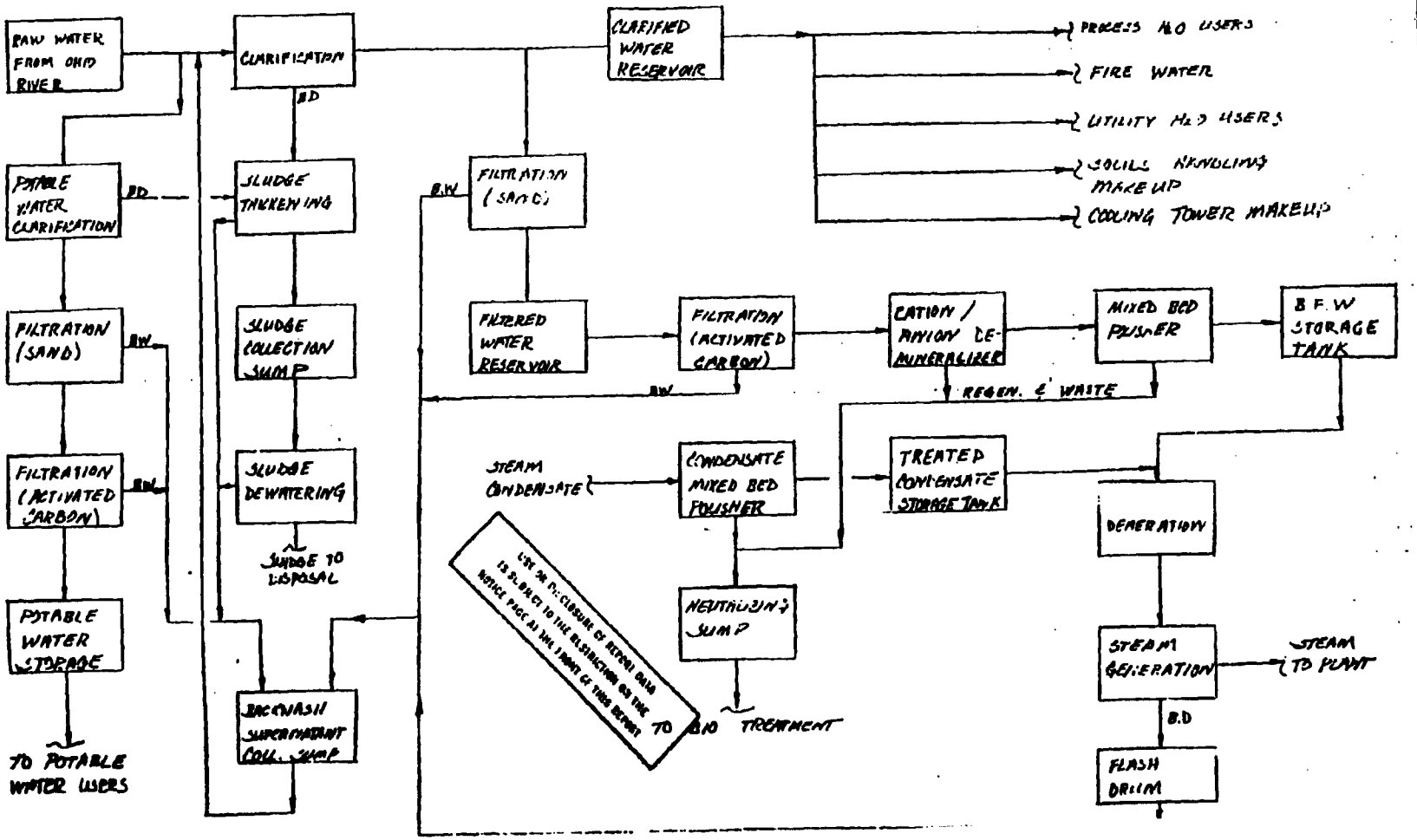
APPENDIX F

Table of Contents

FLUOR

CONT. NO. 65524
BY MKM CHK'D
SHEET NO.

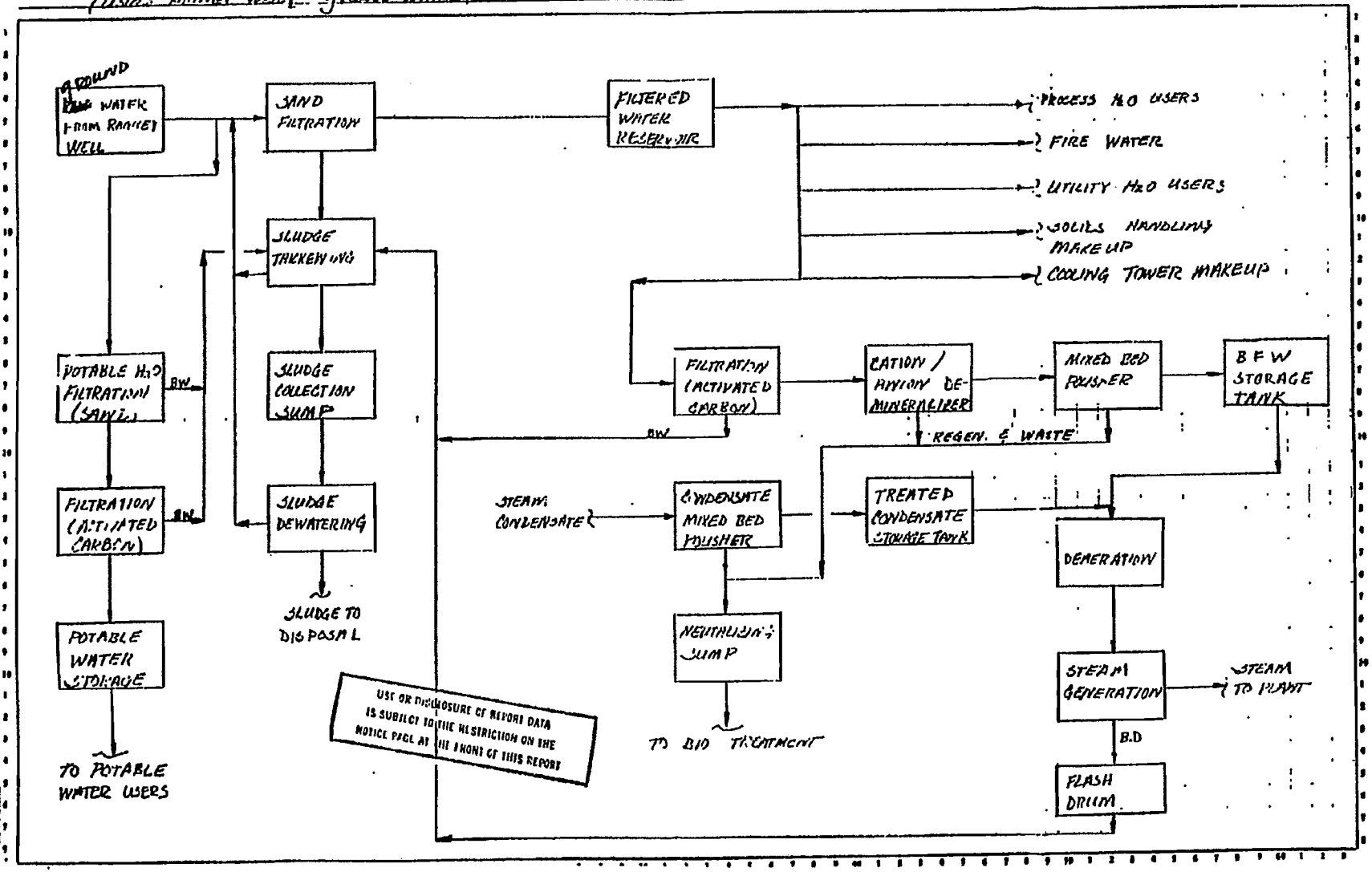
TRI-STATE WATER MANAGEMENT PLANT FLOW DIAGRAM
(USING LOTAKE CREEK AS RAW WATER)



FLUOR

CONT. NO. 1324
BY MEM CHK'D
SHEET NO.

TC STATE WATER MANAGEMENT BLOCK FLOW DIAGRAM
(USING RANNEY WELL – GROUND WATER)



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FLUOR

CALCULATIONS and SKETCHES

DATE 5-6-82
CONT. NO. 835504
BY MKM CHK'D
SHEET NO. 1 /40

RANNEY WELL WATER SYSTEM VS INTAKE STRUCTURE ROM COST ESTIMATE

UNIT LISTS

UNITS	UNITS INCLUDED WITH: RANNEY WELL — FROM WELL	INTAKE STRUCTURE — FROM OHIO R
RAW WATER		✓
POTABLE H2O CLARIFIER	✓	✓
SAND FILTER (POTABLE)	✓	✓
A.C. FILTER (POTABLE)	✓	✓
POTABLE H_2O STORAGE		✓
RAW WATER CLARIFIER	✓	✓ *
SAND FILTER	✓	✓
SLUDGE THICKENER	✓	✓
SLUDGE COLLECTION SUMP	✓	✓
SLUDGE DEWATERING		✓
BACKWASH SUPERNATANT COLLECTION SUMP		✓
CLARIFIED H2O RESERVOIR	✓	✓ *
FILTERED H2O RESERVOIR	✓	✓
A.C. FILTER	✓	✓
DEMINERALIZER	✓	✓
MIXED BED POLISHER	✓	✓
BFW STORAGE TANK	✓	✓
CONDENSATE MIXED BED POLISHER	✓	✓
TREATED COND. STORAGE TANK	✓	✓
NEUTRALIZING SUMP	✓	✓
STEAM GENERATOR	✓	✓

* UNIT SIZES DIFFER BETWEEN THE TWO SYSTEMS

THOSE UNITS THAT ARE INCLUDED IN BOTH SYSTEMS WILL NOT BE INCLUDED IN THE COST ESTIMATE

FLUOR

CALCULATIONS and SKETCHES

DATE 5-6-82
CONT. NO. 835504
BY MKM CHK'D
SHEET NO. 2/AD

RANNEY WELL WATER SYSTEM VS INTAKE STRUCTURE ROM COST ESTIMATE

UNITS TO BE INCLUDED IN COST ESTIMATE

COST INFORMATION IS NEEDED FOR:

- RANNEY WELL
- INTAKE STRUCTURE
- RAW WATER CLARIFIER
- SAND FILTER (DIFF. SIZES)
- BACK WASH SUPERNATANT COLLECTION SUMP
- CLARIFIED WATER RESERVOIR
- FILTERED WATER RESERVOIR
- POTABLE WATER CLARIFIER

COST INFO FOR UNITS IS REQUIRED FOR TWO FLOW RATES:

- 19,000 GPM - RAW WATER REQUIRED
- 11,000 GPM - " " " "

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FLUOR

CALCULATIONS and SKETCHES

DATE 5-6-82
CONT. NO. 83.5504
BY MKM CHK'D
SHEET NO. 3/10

RANNEY WELL WATER SYSTEM VS
INTAKE STRUCTURE ROM COST ESTIMATE

EQUIPMENT
COST INFORMATION: 19000 GPM

CLARIFIERS

ASSUMPTIONS (FROM R. BEARDSLEY)
- 5 CLARIFIER UNITS
- DIAMETER = 80 ft PER UNIT
- HEIGHT = 10 ft W/ 2 ft FREEBOARD
- RISE RATE = 0.75 GPM/ft^2
  (MAX W/ 4 UNITS OPERATING = 0.99 GPM/ft^2)

THESE ARE CONVENTION UNITS
400 ACCOUNT COST = $480,000/UNIT

TOTAL COST = $2,400,000

FILTERS – GRANULAR MEDIA

ASSUME – (R. BEARDSLEY)
- FOR RANNEY WELL SYSTEM, 12 UNITS
- DIAMETER = 12 ft
- AUTOMATIC BACKWASH UNITS
- 400 ACCOUNT COST = 94,400 PER UNIT

FOR RANNEY WELL SYS, H_2O TO FILTER ≅ 19000 GPM
FOR INTAKE STRUCT., ONLY BFW MAKEUP IS FILTERED,
FLOWRATE ≅ 5814 GPM

$$\frac{\text{INTAKE}}{\text{RANNEY}} = \frac{5814}{19000} = 0.3$$

FLUOR

CALCULATIONS and SKETCHES

DATE 5-6-82
CONT. NO. 83551A
BY MKM CHK'D
SHEET NO. 4/40

RAMNEY WELL WATER SYSTEM VS
INTAKE STRUCTURE ROM COST ESTIMATE

EQUIPMENT COST INFORMATION – 19,000 GPM P.2
FILTERS CONT. P.2

IF RAMNEY WELL SYSTEM REQUIRES 12 FILTER UNITS, INTAKE STRUCTURE WOULD REQUIRE ≈ 4 UNITS

COST, RAMNEY WELL (12 UNITS) = $1,132,800

INTAKE STRUCTURE (4 UNITS) = $377,600

BACKWASH SUPERNATANT COLLECTION SUMP

CONCRETE STRUCTURE, FLOWRATE = 391 GPM

VOLUME (1 DAY STORAGE) = 75,300 ft³
12 ft DEEP, SURFACE AREA = 6275 ft²
COST = $150,000 (FROM M. NORMAN – COST & SCHEDULING)

CLARIFIED WATER RESERVOIR

WANT 7 DAY STORAGE CAPACITY
FLOWRATE ≈ 19 000 GPM $\left(\frac{1440 \text{ min}}{\text{day}} \times \frac{\text{ft}^3}{7.481 \text{ GAL}}\right)$

VOLUME = $\left(19000 \frac{\text{GAL}}{\text{min}} \times 1440 \frac{\text{min}}{\text{day}} \times \frac{\text{ft}^3}{7.481 \text{ GAL}}\right) \times 7 \text{ days}$

= 3,657,265 ft³/day × 7 days

= 25,600,800 ft³

ASSUME POND DEPTH = 12 ft

SURFACE AREA = 2,133,400 ft²

FLUOR

CALCULATIONS and SKETCHES

DATE 5-6-7-

CONT. NO. 7-2224

BY MRM CHK'D

SHEET NO. 5/45

RANNEY WELL WATER SYSTEM VS INTAKE STRUCTURE POM COST ESTIMATE

EQUIPMENT COST INFORMATION - 19000 GPM p. 3

TO PRICE PONDS :

FROM MIKE NORMAN CHIEF COST & SCHED. ENG. IN JAN 1980 $ AT 60 % EFFICIENCY OF LABOR

$$\left(\frac{\text{SURFACE AREA}}{1{,}840{,}000\ ft^2}\right)^{0.65} \times \$\ 6{,}583{,}000 = \text{MATERIAL}$$

$$\left(\frac{\text{SURFACE AREA}}{1840{,}000\ ft^2}\right)^{0.65} \times \$\ 8{,}760{,}000 = \text{LABOR}$$

CLARIFIED WATER RESERVOIR COSTS

$$\text{MATERIAL} \left(\frac{2133{,}400\ ft^2}{1{,}840{,}000\ ft^2}\right)^{0.65} \times \$6583000 = \$\ 7{,}247{,}500$$

TOTAL COST, LABOR = $ 9,644,300

NOTE : FOR STRUCTURES REQUIRING ALOT OF CIVIL WORK (IE CONCRETE STRUCTURES), LABOR COSTS ARE HIGHER THAN MATERIAL COSTS

FLUOR

CALCULATIONS and SKETCHES

DATE 5-6-82
CONT. NO. 835504
BY MKM CHK'D
SHEET NO. 6/A2

RANNEY WELL WATER SYSTEM VS INTAKE STRUCTURE ROM COST ESTIMATE

EQUIPMENT COST INFORMATION - 19000 GPM P.4
FILTERED WATER RESERVOIR

7 DAY STORAGE CAPACITY

FOR RANNEY WELL SYSTEM
FLOW RATE ≅ 19 000 GPM
VOLUME REQ'D = 25,600,800 ft3

FOR INTAKE STUCTURE SYSTEM
FLOW RATE = 5814 GPM
VOLUME REQ'D = 7,833,862 ft3

ASSUME POND DEPTHS = 12 ft

SURFACE AREA, RANNEY WELL = 2,133,400 ft2

SURFACE AREA, INTAKE STRUCT = 652,800 ft2

MATERIAL COST, RANNEY =

(REFER TO P4 5) $\left(\frac{2{,}133{,}400\ ft^2}{1{,}840{,}000\ ft^2}\right)^{0.65} \times 6583000 =$ $7,247,500

LABOR COST, RANNEY = $9,641,300

MATERIAL COST, INTAKE = $3,356,700

LABOR COST, INTAKE = $4,166,700

FLUOR

CALCULATIONS and SKETCHES

DATE 5-7-82
CONT. NO. 23503
BY MKM CHK'D
SHEET NO. 7/43

RANNEY WELL WATER SYSTEM VS
INTAKE STRUCTURE ROM COST ESTIMATE

EQUIPMENT COST INFORMATION - 19000 GPM P.E
POTABLE WATER CLARIFIER

USING SAME ASSUMPTIONS FROM R. BEARDSLEY
(REFER TO PG 3)

1 UNIT WITH RISE RATE = 0.75GPM/ft^2
DIAMETER = 80ft^3

FLOW RATE / CLARIFIER = 3770 GPM

POTABLE WATER FLOWRATE = 121 GPM

FROM M. NORMAN (COST & SCALE)

TO REDUCE SIZE OF UNIT

$$\text{Cost}^{*} = \left(\frac{121\ \text{GPM}}{3770\ \text{GPM}}\right)^{0.65} \times \$\ 420{,}000$$

$$= \$\ 51{,}240$$

* NOTE: WHEN CAPACITY FACTOR IS BELOW 0.5, THIS METHOD OF PRICING IS NOT VERY ACCURATE

FLUOR

CALCULATIONS and SKETCHES

DATE 7-6-82
CONT. NO. 8200-54
BY [illegible] CHK'D
SHEET NO. 8/12

RANNEY WELL WATER SYSTEM VS INTAKE STRUCTURE ROM COST ESTIMATE

EQUIPMENT COST INFORMATION : 11 000 GPM

CLARIFIERS - SAME ASSUMPTIONS AS FOR CASE USING 19000GPM

$$\text{CAPACITY FACTOR} = \frac{11000}{19000} = (0.6)$$

FROM COST & SCHEDULING (MIKE NORMAN)

- IF NUMBER OF UNITS IS REDUCED FOR SMALLER FLOWRATE :

$$\left(\text{COST}_{11000\,GPM}\right) = \left(\frac{11000}{19000}\right)^{0.9} \left(\text{COST}_{19000\,GPM}\right)$$

- IF SIZE OF UNITS IS REDUCED:

$$\left(\text{COST}_{11000\,GPM}\right) = \left(\frac{11000}{19000}\right)^{0.65} \left(\text{COST}_{19000\,GPM}\right)$$

FOR 19000 CASE, IT WAS ASSUMED THAT 3 CLARIFIERS WOULD BE USED. THESE ARE CONVENTIONAL UNITS SO ASSUME THAT FEWER OF THE SAME CLARIFIERS WILL BE USED FOR THE CASE OF 11,000 GPM

$$\therefore \text{COST}_{11,000\,GPM} = (0.6)^{0.9}\,(2,400,000)$$

TOTAL COST = $1,515,500

FILTERS - USING SAME ASSUMPTIONS

$$\text{COST}_{11,000\,GPM} = (0.6)^{0.9}\,(1,132,800)$$

RANNEY WELL

TOTAL COST = $715,300

FLUOR

CALCULATIONS and SKETCHES

DATE 5-6-82
CONT. NO. 82554
BY IRM CHK'D
SHEET NO. 9/45

RANNEY WELL WATER SYSTEM VS INTAKE STRUCTURE ROM COST ESTIMATE

EQUIPMENT COST INFORMATION - 11000 GPM p.2

FILTERS CONT P.2

$\text{COST}_{11{,}000}$ (RANNEY WELL) = $715,300

$\text{COST}_{11000\,GPM}$ (INTAKE STRUC) = $(0.6)^{0.9}$ (377,600)

= $238,400

BACKWASH SUPERNATANT COLL. SUMP

FLOWRATE IN = 385 GPM

VOLUME (1 DAY STORAGE) = 74,100 ft^3

COST = $ 150,000 (FROM M. NORMAN - COST & SCHEDULING)

CLARIFIED WATER RESERVOIR

FLOWRATE = 10554 GPM

FOR 7 DAY STORAGE CAPACITY, 12 ft DEPTH

VOLUME = 1,223,600 ft3

SURFACE AREA = 1,185,050 ft2

FILTERED WATER RESERVOIR

RANNEY WELL FLOWRATE = 10,554 GPM

INTAKE STRUCTURE FLOWRATE = 2,744 GPM

7 DAY STORAGE CAPACITY, 12 ft DEPTH

FLUOR

CALCULATIONS and SKETCHES

DATE 5-6-82
CONT. NO. 835504
BY MKM CHK'D
SHEET NO. 10/40

RANNEY WELL WATER SYSTEM VS INTAKE STRUCTURE ROM COST ESTIMATE

EQUIPMENT COST INFORMATION - 11000 APM. P. 3
FILTERED WATER RESERVOIR CONT P. 2

VOLUME, RANNEY WELL = 14,220,605 ft³

VOLUME, INTAKE STRUCTURE = 3,697,305 ft³

SURFACE AREA, RANNEY WELL = 1,185,050 ft²

SURFACE AREA, INTAKE STRUCTURE = 308,100 ft²

CLARIFIED WATER RES. - COST

(REFER PG 5)

MATERIALS = $ 4,945,600
LABOR = $ 6,581,100

FILTERED WATER RESERVOIR - COST

RANNEY WELL, MATERIALS = $ 4,945,600
LABOR = $ 6,581,100

INTAKE STRUCTURE, MATERIALS = $ 2,060,400
LABOR = $ 2,741,700

FLUOR

CALCULATIONS and SKETCHES

DATE 5-7-82
CONT. NO. 83504
BY MKM CHK'D
SHEET NO. 11/45

RAMNEY WELL WATER SYSTEM VS INTAKE STRUCTURE ROM COST ESTIMATE

EQUIPMENT COST INFORMATION - 11000 GPM p. 4
POTABLE WATER CLARIFIER

REFER TO P.G 7

FLOWRATE = 31 GPM

COST = $ 21,200

FLUOR

CALCULATIONS and SKETCHES

DATE 5-10-1-

CONT. NO. [illegible]

BY [illegible] CHK'D

SHEET NO. 12/40

RANNEY WELL WATER SYSTEM VS INTAKE STRUCTURE ROM COST ESTIMATE

LABOR COSTS - 19000 GPM

CLARIFIERS (RAW WATER)

(GENERAL FACTOR FROM Y. M. KIM)

TOTAL LABOR COSTS = 2/3 EQUIPMENT COSTS

LABOR = 2/3 (2,400,000) = $1,600,000

FILTERS

LABOR COST = 2/3 EQUIPMENT COST

LABOR, RANNEY WELL = 2/3 (1,132,800)

= $755,200

LABOR, INTAKE = 2/3 (377,600) = $251,700

POTABLE WATER CLARIFIER

LABOR COST = 2/3 EQUIPMENT COST

LABOR = 2/3 (51,340) = $34,200

CLARIFIED & FILTERED WATER RESERVOIRS

LABOR COSTS WERE DETERMINED WITH EQUIPMENT COSTS.

FLUOR

CALCULATIONS and SKETCHES

DATE 5-10-82
CONT. NO. 83553-A
BY MKM CHK'D
SHEET NO. 13/41

RANNEY WELL WATER SYSTEM VS INTAKE STRUCTURE ROM COST ESTIMATE

LABOR COSTS - 11,000 GPM

CLARIFIER

LABOR = 2/3 (1,515,500) = #1,010,300

FILTERS

LABOR, RANNEY = 2/3 (715300) = #476,900

LABOR, INTAKE = 2/3 (238,400) = #158,900

POTABLE WATER CLARIFIER

LABOR = 2/3 (21200) = #14,100

CLARIFIED & FILTERED WATER RESERVOIR

LABOR COSTS HAVE BEEN FIGURED ALONG WITH EQUIPMENT COSTS.

FLUOR

CALCULATIONS and SKETCHES

DATE 5-10-82
CONT. NO. 935504
BY [illegible] CHK'D
SHEET NO. 1 of 3

RANNEY WELL WATER VS INTAKE STRUCTURE
KDM COST ESTIMATE

POWER COST COMPARISON

POWER CONSUMPTION CONSIDERATIONS

INTAKE STRUCTURE	RANNEY WELL
PUMPING TO CLARIFIER	PUMPING TO SAND FILTER
PUMPING TO CLAR. H_2O RES	PUMPING TO FILTERED WATER
PUMPING TO SAND FILTER	
PUMP TO: PROCESS H_2O	PUMP TO: BFW MAKEUP
FIRE WATER	
UTILITY H_2O	
SOLIDS HANDLING	
COOLING TOWER	
FROM BACKWASH COLLECTION SUMP	

PROCESS MANUAL - VOL 5 HYDRAULIC DATA
SOURCE OF PRESSURE DROP INFOMATION
USED IN FOLLOWING CALCULATIONS

FLUOR

CALCULATIONS and SKETCHES

DATE 5-10-82
CONT. NO. 835504
BY [illegible] CHK'D
SHEET NO. 15/-2

RAMNEY WELL WATER SYSTEM IG INTAKE STRUCTURE ROM COST ESTIMATE

POWER COST – 19000 GPM

HYDRAULIC HP – RIVER TO POND

$$HHP = \frac{GPM \times \Delta P, PSI}{1714}$$

FLOWRATE = 19000 GPM
ASSUME: 4 PUMPS, WITH 70% EFFICIENCY
11500' FROM RIVER TO POND
24 INCH DIAMETER PIPE

$$\Delta P = \left(\frac{1.1}{100 ft\ PIPE}\right) 11500 ft = 127\ PSI$$

$$HHP\ PER\ PUMP = \frac{\left(\frac{19000}{4}\right)(127)}{1714} = 352\ HP$$

$$BRAKE\ HP/PUMP = \frac{352}{.7} = 503\ HP$$

TOTAL BRAKE HP = 2012

$$TOTAL\ KW = (2012\ HP)\left(\frac{0.74570\ KW}{HP}\right)$$

$$= 1500\ KW$$

∴ PUMPING TO CLARIFIER = PUMPING TO SAND FILTER
BOTH REQUIRE 1500 KW

FLUOR

CALCULATIONS and SKETCHES

DATE 5-10-82
CONT. NO. 835504
BY MKM CHK'D
SHEET NO. 16/20

RANNEY WELL WATER SYSTEM VS INTAKE STRUCTURE ROM COST ESTIMATE

POWER COSTS - 19000 GPM p.2

HYDRAULIC HP - PUMPING TO CLARIFIED H2O RES
PUMPING TO FILTERED H2O RES

19000 GPM
100 ft LINE - ASSUME
ΔP IN LINE = $\left(\frac{1.1}{100 ft} \times 100 ft\right) = 1.1$ PSI

LOSS IN VALUE = 15 PSI

$$HHP = \frac{19000\ (16.1)}{1714} = 178$$

BRAKE HP = 255

KW = 190

HYDRAULIC HP - PUMPING TO SAND FILTER, INTAKE

FLOWRATE = 5814 GPM
100 ft LINE, 24" - ASSUME

ΔP, LINE = $\left(\frac{0.09}{100 ft}\right) 100 ft = 0.09$ PSI

ΔP FROM VALVE = 15 PSI

$$HHP = \frac{(5814 \times 15.09)}{1714} = 51$$

BRAKE HP = 73

KW = 55

FLUOR

CALCULATIONS and SKETCHES

DATE 5-10-82
CONT. NO. 83504
BY MPM CHK'D
SHEET NO. 17/40

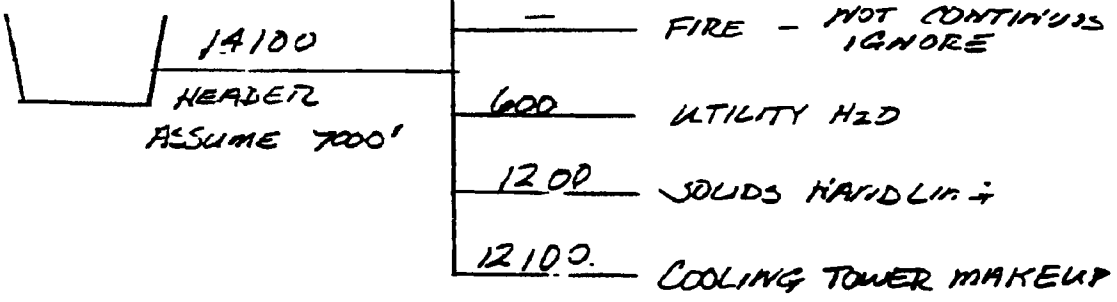
DANNEY WELL WATER SYSTEM V6 INTAKE STRUCTURE ROM COST ESTIMATE

POWER COSTS - 19000 GPM P.3

HYD. HP - PUMPING TO:

INTAKE SYSTEM - PROCESS H2O USERS
FIRE WATER
UTILITY H2O
SOLIDS HANDLING
COOLING TOWER MAKEUP

NOTE: FITTING LOSSES FROM Y. KIM



IN LINE - HEADER

FLOWRATE = 14100 GPM

Assume 7000' OF 24" LINE

$$\Delta P = \left(\frac{0.64}{100\,ft} \times 7000\,ft\right) = 45\,PSI$$

$$HHP = \frac{(14100 \times 45)}{1714} = 369$$

BRAKE HP = 526

KW = 393

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FLUOR

CALCULATIONS and SKETCHES

DATE 5-10-82
CONT. NO. 83504
BY MRM CHK'D
SHEET NO. 18/A1

RAMNEY WELL WATER SYSTEM VS INTAKE STRUCTURE ROM COST ESTIMATE

POWER COSTS - 19000 GPM P.4

PROCESS H_2O USERS

ASSUME 4" PIPE, 7000' LONG

$$HHP = \frac{200\left(1.2\left(\frac{7000}{100}\right) + 50\right)}{1714} = 16$$

BRAKE HP = 22

KW = 17

UTILITY H_2O USERS

ASSUME 8" PIPE, 28000'

$$HHP = \frac{600\left(1.2\left(\frac{7000}{100}\right) + 200\right)}{1714} = 99$$

BRAKE HP = 142

KW = 106

SOLIDS HANDLING

ASSUME 8" PIPE, 3000'

$$HHP = \frac{1200\left(0.75\left(\frac{3000}{100}\right) + 20\right)}{1714} = 30$$

BRAKE HP = 43

KW = 32

FLUOR

CALCULATIONS and SKETCHES

DATE 5-12-82
CONT. NO. 835504
BY PAKM CHK'D
SHEET NO. A/4

RAWNEY WELL WATER SYSTEM VS INTAKE STRUCTURE ROM COST ESTIMATE

POWER COSTS - 19000 GPM P.S

COOLING TOWERS

ASSUME 10", 2000'

$$KHP = \frac{12100\left(1.0\left(\frac{2000}{100}\right)+5\right)}{1714} = 494$$

BRAKE HP = 706

KW = 526

FOR RAWNEY WELL SYSTEM

SAME AS INTAKE EXCEPT FOR THE ADDITION OF RFW MAKEUP

RFW MAKEUP

FLOWRATE = 5814

ASSUME 12", 7000'

$$KHP = \frac{5814\left(2.8\left(\frac{7000}{100}\right)+20\right)}{1714} = 733$$

BRAKE HP = 1045

KW = 780

FLUOR

CALCULATIONS and SKETCHES

DATE 5-10-82
CONT. NO. 835534
BY MKM CHK'D
SHEET NO. 20/42

RANNEY WELL WATER SYSTEM VS INTAKE STRUCTURE ROM COST ESTIMATE

POWER COSTS - 19000 GPM, P.6
MAIN HEADER

FLOWRATE = 19900

$$KHP = \frac{19900/45)}{1714} = .523$$

BRAKE HP - 747

KW = 557

KHP FOR PUMPING FROM BACKWASH COLLECTION SUMP

FLOWRATE = 148
ASSUME 8" PIPE, 5000' LONG

$$KHP = \frac{148\left(0.65\left(\frac{5000'}{100}\right)+50\right)}{1714} = 7$$

BRAKE HP = 10

KW = 8

FLUOR

CALCULATIONS and SKETCHES

DATE 5-10-82
CONT. NO. 835504
BY MKM CHK'D
SHEET NO. 21/40

RANNEY WELL WATER SYSTEM VS INTAKE STRUCTURE ROM COST ESTIMATE

SUMMARY – POWER CONSUMPTION – 19000 GPM

FOR COMPARISON UNITS ONLY

INTAKE STRUCTURE	KW REQ'D	COST, $
PUMPING TO CLARIFIER	1500	660,000
PUMPING TO CLAR. H2O RES.	190	83,600
PUMPING TO SAND FILTER	55	24,200
PUMP TO: PROCESS WATER USERS	17	7,480
FIREWATER	0	-
UTILITY WATER USERS	106	46,640
SOLIDS HANDLING	32	14,080
COOLING TOWER	526	231,440
MAIN HEATER	396	175,120
BACKWASH COLLECTION SUMP	K	3,520
TOTAL	2,832	1,246,080

RANNEY WELL SYSTEM	KW REQ'D	COST, $
PUMPING TO SAND FILTER	1500	660,000
PUMPING TO FILTERED H2O RES.	190	83,600
PUMP TO: PROCESS H2O USERS	17	7,480
FIRE WATER	0	0
UTILITY WATER USERS	106	46,640
SOLIDS HANDLING	32	14,080
COOLING TOWER	526	231,440
RFW MAKEUP	780	343,200
MAIN HEATERS	557	245,080
TOTAL	3708	$1,631,520

FLUOR

CALCULATIONS and SKETCHES

DATE 5-11-22
CONT. NO. 155034
BY W.S.V. CHK'D
SHEET NO. 22/45

RANNEY WELL WATER SYSTEM VS INTAKE STRUCTURE ROM COST ESTIMATE

SUMMARY – POWER CONSUMPTION, 19000 GPM CONT.

TO GET PRICE OF POWER USAGE:

$$KW \times \frac{8000\ hr}{yr} \times \$0.055/KW\cdot hr = \text{ANNUAL COST FOR POWER CONSUMPTION}$$

FOR INTAKE STRUCTURE

$$\text{COST, POWER} = (2832\ KW)\left(8000\ \frac{hr}{yr}\right)(0.055)$$

$$= \$1,246,080$$

FOR RANNEY WELL SYSTEM

$$\text{COST, POWER} = (3708\ KW)\left(8000\ \frac{hr}{yr}\right)\left(\$0.055/KW\cdot hr\right)$$

$$= \$1,631,520$$

FLUOR

CALCULATIONS and SKETCHES

DATE 5-10-82
CONT. NO. 8351-34
BY MKM CHK'D
SHEET NO. 23(4)

RAMNEY WELL WATER SYSTEM VS INTAKE STRUCTURE ROM COST ESTIMATE

POWER COST - 11000 GPM

ALL POWER REQUIREMENT CALCS USE THE SAME ASSUMPTIONS AS FOR THE 19000 GPM CASE (PP 15-21)

NHP - RIVER TO POND

FLOWRATE = 11000 GPM

$$NHP = \frac{11000\ (127)}{1714} = 815$$

BRAKE HP = 1164

KW = 868

NHP - PUMPING TO CLARIFIED H2O RES
PUMPING TO FILTERED H2O RES (RAMNEY)

$$NHP = \frac{11000\left(1.1\left(\frac{100}{100}\right)+15\right)}{1714} = 103$$

BRAKE HP = 148

KW = 110

FLUOR

CALCULATIONS and SKETCHES

DATE 5-10-82
CONT. NO. 835504
BY MKM CHK'D
SHEET NO. 24/45

RANNEY WELL WATER SYSTEM VS INTAKE STRUCTURE ROM COST ESTIMATE

POWER COSTS - 11000 GPM PZ

HHP - PUMPING TO SAND FILTER, INTAKE

FLOWRATE = 2755 GPM

$$HHP = \frac{2755\ (15.09)}{1714} = 24$$

BRAKE HP = 35

KW = 26

HHP - PUMPING TO:

INTAKE STRUCTURE — 7799

200	PROCESS H_2O USERS
0	FIREWATER
400	UTILITY H_2O
627	SOLIDS HANDLING
6572	COOLING TOWER MAKEUP

HEADER

$$HHP = \frac{7799\ (45)}{1714} = 205$$

BRAKE HP = 293

KW = 218

FLUOR

CALCULATIONS and SKETCHES

DATE 5-10-82
CONT. NO. 8353-4
BY IAKM CHK'D
SHEET NO. 23/A3

RANNEY WELL WATER SYSTEM VS INTAKE STRUCTURE R&M COST ESTIMATE

POWER COSTS - 11000 GPM p. 3

PROCESS H_2O USERS

HHP = 16

BRAKE HP = 22

KW = 17

UTILITY H_2O USERS

$$HHP = \frac{700\left(1.2\left(\frac{7000}{100}\right)+200\right)}{1714} = 66$$

BRAKE HP = 95

KW = 71

SOLIDS HANDLING

$$HHP = \frac{627\left(0.75\left(\frac{3000}{100}\right)+20\right)}{1714} = 16$$

BRAKE HP = 22

KW = 17

FLUOR

CALCULATIONS and SKETCHES

DATE 5-10-82
CONT. NO. 83514
BY W.K.M. CHK'D
SHEET NO. 26/29

RANNEY WELL WATER SYSTEM VS INTAKE STRUCTURE P.O.M. COST ESTIMATE

POWER COSTS - 11000 GPM P4

COOLING TOWER MAKEUP

$$HHP = \frac{6572\left(1.0\left(\frac{2000}{100}\right)+50\right)}{1714} = 268$$

BRAKE HP = 383

KW = 286

FOR RANNEY WELL WATER SYSTEM

SAME AS INTAKE EXCEPT FOR THE ADDITION OF BFW MAKEUP

BFW MAKEUP

$$HHP = \frac{2744\left(2.8\left(\frac{7000}{100}\right)+20\right)}{1714} = 346$$

BRAKE HP = 494

KW = 368

MAIN HEATER

$$HHP = \frac{10554(45)}{1714} = 277$$

BRAKE HP = 396

KW = 295

FLUOR

CALCULATIONS and SKETCHES

DATE 5-10-92
CONT. NO. 83552
BY VAKM CHK'D
SHEET NO. 20/42

RANNEY WELL WATER SYSTEM VS INTAKE STRUCTURE ROM COST ESTIMATE

POWER COSTS - 11000 GPM PS
HHP FOR PUMPING FROM BACKWASH COLLECTION SUMP

FLOWRATE = 385 GPM

$$HHP = \frac{385\left(0.65\left(\frac{5000}{100}\right)+50\right)}{1714} = 19$$

BRAKE HP = 26

KW = 20

FLUOR

CALCULATIONS and SKETCHES

DATE 5-10-82
CONT. NO. 235504
BY W.S.M. CHK'D
SHEET NO. 28(4)

RANNEY WELL WATER SYSTEM VS INTAKE STRUCTURE ROM COST ESTIMATE

SUMMARY - POWER CONSUMPTION, 11000 GPM

INTAKE STRUCTURE	KW REQ'D	COST, $
PUMPING TO CLARIFIER	868	381,920
PUMPING TO CLAR. H2O RES	110	48,400
PUMPING TO SAND FILTER	26	11,440
PUMP TO: PROCESS H2O USERS	17	7,480
FIRE WATER	0	0
UTILITY WATER USERS	71	31,240
SOLIDS HANDLING	17	7,480
COOLING TOWER	286	125,840
MAIN HEADER	218	95,920
BACKWASH COLL. SUMP	20	8,800
TOTAL	1633	718,520

RANNEY WELL WATER SYSTEM	KW REQ'D	COST, $
PUMPING TO SAND FILTER	868	381,920
PUMPING TO FILTERED H2O RES	110	48,400
PUMP TO: PROCESS H2O USERS	17	7,480
FIREWATER	0	0
UTILITY WATER USERS	71	31,240
SOLIDS HANDLING	17	7,480
COOLING TOWER	286	125,840
BFW MAKEUP	368	161,920
MAIN HEADER	295	129,800
TOTAL	2032	894,080

FLUOR

CALCULATIONS and SKETCHES

DATE 5-11-82
CONT. NO. 83559
BY MEM CHK'D
SHEET NO. 29(4)

RANNEY WELL WATER SYSTEM VS INTAKE STRUCTURE ROM COST ESTIMATE.

CHEMICALS - 19000 GPM

CLARIFIER - RAW WATER

POLYELECTROLYTE IS ADDED AT RATE OF 0.5 ppm

$= \frac{0.5 \text{ lb PE}}{10^6 \text{ lb H}_2\text{O}}$ (VOL 43 2.5.0 pg)

FOR 19000 GPM WATER:

$\left(19000 \frac{\text{gal}}{\text{min}}\right)\left(\frac{1 \text{ ft}^3}{7.481 \text{ gal}}\right)\left(62.4 \frac{\text{lb}}{\text{ft}^3}\right) = 152{,}481 \frac{\text{lb}}{\text{min}} \text{ H}_2\text{O}$

P.E. REQUIRED $= \left(\frac{0.5 \text{ lb PE}}{10^6 \text{ lb H}_2\text{O}}\right)\left(152{,}481 \frac{\text{lb H}_2\text{O}}{\text{min}}\right)$

$= 0.08 \frac{\text{lb}}{\text{min}}$ $\left(4.8 \frac{\text{lb}}{\text{hr}}\right)$

FOR $\left(\frac{8000 \text{ hr}}{\text{yr}}\right)$ = BASIS OF TRI-STATE

ANNUAL POLYELECTROLYTE REQ'L = 38,040 lb

FLUOR

CALCULATIONS and SKETCHES

DATE 5-11-82
CONT. NO. 63557
BY MKM CHK'D
SHEET NO. 30/A

RAMNEY WELL WATER SYSTEM VS
INTAKE STRUCTURE ROM COST ESTIMATE

CHEMICAL COSTS - 19000 GPM P.2
CHEMICALS, CLARIFIER CONT. P.2 19000 GPM

CHLORINE USED IN CLARIFIER:

$\frac{2 \text{ lb Chlorine}}{10^6 \text{ lb } H_2O}$ (Vol 43 2.5.0 P. 6)

ANNUAL AMOUNT CHLORINE REQ'L =

$\left(\frac{2 \text{ lb } Cl_2}{10^6 \text{ lb } H_2O}\right)\left(\frac{158421 \text{ lb } H_2O}{\text{min}}\right)\left(\frac{60 \text{ min}}{1 \text{ hr}}\right)\left(\frac{8000 \text{ hr}}{\text{yr}}\right)$

$= 1,521,420 \text{ lb } Cl_2/\text{yr}$

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CLARIFIER - POTABLE WATER

(121 GPM) = 60,560 lb/hr H_2O

PE REQ'D = $\left(\frac{0.5 \text{ lb PE}}{10^6 \text{ lb } H_2O}\right)\left(60560 \frac{\text{lb } H_2O}{\text{hr}}\right)\left(8000 \frac{\text{hr}}{\text{yr}}\right) = 242 \text{ lb/yr}$

ANNUAL AMT Cl_2 = $\left(\frac{2 \text{ lb } Cl}{10^6 \text{ lb } H_2O}\right)\left(60560 \frac{\text{lb } H_2O}{\text{hr}}\right)\left(8000 \frac{\text{hr}}{\text{yr}}\right)$

$= 9,690 \text{ lb } Cl_2/\text{yr}$

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FLUOR

CALCULATIONS and SKETCHES

DATE 5-11-82
CONT. NO. 23554
BY W.R.I. CHK'D
SHEET NO. 2 (4)

RANNEY WELL WATER SYSTEM VS INTAKE STRUCTURE ROM COST ESTIMATE

CHEMICAL COSTS - 19000 GPM PS

FROM PREVIOUS WATER ANALYSIS
RANNEY WELL TDS = 451 ppm
OHIO RIVER WATER TDS = 252 ppm

IN BFW TREATMENT UNIT, MORE REGENERATION OF ION EXCHANGERS WILL BE REQUIRED THUS REQUIRING MORE REGENERATION CHEMICALS

ASSUME BFW CHEM, RANNEY = $\frac{451}{252}$ CHEM, INTAKE

FOR 19000 GPM, REGENERATION CHEMICALS (NaOH, H_2SO_4) WERE DETERMINED FOR THE SCHEME USING A RANNEY WELL SYSTEM. (REFER TO TRI-STATE FILE # 215.4R-44 BOOK 3)

RANNEY WELL BFW = 5814 GPM

H_2SO_4 REQ'D = 2423 lb/day IN CATION EX.
NaOH REQ'D = 2156 lb/day IN ANION EX

H_2SO_4 REQ'D = 420 lb/day IN MIXED BED POLISHER
NaOH REQ'D = 420 lb/day " "

∴ TOTAL REGENERATING CHEMICALS FOR BFW - RANNEY

$$H_2SO_4 = (2843 \text{ lb/day} \times \frac{1 \text{ day}}{24 \text{ hr}})(\frac{8000 \text{ hr}}{\text{yr}}) = 947,700 \text{ lb/yr}$$

$$NaOH = (2576 \times \frac{1}{24})(8000) = 858,700 \text{ lb/yr}$$

FLUOR

CALCULATIONS and SKETCHES

DATE 5-11-82
CONT. NO. 125504
BY MKO CHK'D
SHEET NO. 2/10

RANNEY WELL WATER SYSTEM VS INTAKE STRUCTURE ROM COST ESTIMATE

CHEMICAL COSTS – 19000 GPM @ pH 4

FOR INTAKE STRUCTURE

$$H_2SO_4 = \left(\frac{268}{451}\right)\left(947700 \frac{lb}{yr}\right) = 563{,}100 \ lb/yr$$

$$NaOH = \left(\frac{268}{451}\right)\left(858700 \frac{lb}{yr}\right) = 510{,}200 \ lb/yr$$

FLUOR

CALCULATIONS and SKETCHES

DATE 5-11-82
CONT. NO. 435534
BY MKM CHK'D
SHEET NO. 33/-

RANNEY WELL WATER SYSTEM VS INTAKE STRUCTURE ROM COST ESTIMATE

CHEMICALS - 11 000 GPM

CLARIFIER - RAW WATER

$$\left(11000 \frac{gal}{min}\right)\left(\frac{1 ft^3}{7.481 gal}\right)\left(62.4 \frac{lb}{ft^3}\right)\left(60 \frac{min}{hr}\right) = 5,505,144 \frac{lb}{hr}$$

$$\text{PE REQUIRED} = \left(\frac{0.5 lb\ P.E}{10^6 lb\ H_2O}\right)\left(5,505,144 \frac{lb}{hr}\right)\left(8000 \frac{hr}{yr}\right)$$
$$= 22,021 lb/yr$$

CHLORINE, RAW WATER TRTMT

$$\left(\frac{20 lb\ Cl_2}{10^6 lb\ H_2O}\right)\left(5505143 \frac{lb\ H_2O}{hr}\right)\left(8000 \frac{hr}{yr}\right)$$

CHLORINE REQ'L = 880,800 lb/yr

CLARIFIER - POTABLE WATER

$$\left(32 \frac{gal}{min}\right) = 16,020 lb/hr$$

USE OR DISCLOSURE OF REPORT DATA IS SUBJECT TO THE RESTRICTION ON THE NOTICE PAGE AT THE FRONT OF THIS REPORT

$$\text{ANNUAL AMT, PE} = \left(16020 \frac{lb}{hr}\right)\left(8000 \frac{hr}{yr}\right)\left(\frac{0.5 lb\ PE}{10^6 lb\ H_2O}\right) = 64 lb/yr$$

$$\text{ANNUAL AMT, } Cl_2 = \left(16020 \frac{lb}{hr}\right)\left(8000 \frac{hr}{yr}\right)\left(\frac{20 lb\ Cl_2}{10^6 lb\ H_2O}\right) = 2,563 lb/yr$$

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FLUOR

CALCULATIONS and SKETCHES

DATE 5-11-82
CONT. NO. 83554
BY MKM CHK'D
SHEET NO. 3A/4)

RANNEY WELL WATER SYSTEM VS INTAKE STRUCTURE ROM COST ESTIMATE

CHEMICAL COSTS - 11000 GPM p. 2

USING CAPACITY FACTOR $\left(\frac{11000}{17000}\right) = 0.6$

RANNEY WELL

$H_2SO_4 = 947{,}700\,(0.6) = 568{,}600$ #/yr

$NaOH = 858{,}700\,(0.6) = 497{,}100$ #/yr

INTAKE STRUCTURE

$H_2SO_4 = 563{,}100\,(0.6) = 326{,}000$ #/yr

$NaOH = 510{,}200\,(0.6) = 295{,}400$ #/yr

BULK CHEMICAL COSTS - FROM GERALD ALEXANDER
PERMUTIT CO.
(213) 790-7555

H_2SO_4 - 3¢/lb
$NaOH$ = 15¢/lb
Cl... = 7.5¢/lb
F.E. = $1.75/lb

FLUOR

CALCULATIONS and SKETCHES

DATE 5-11-82
CONT. NO. 83504
BY W.K.M CHK'D
SHEET NO. 25/40

RANNEY WELL WATER SYSTEM VS INTAKE STRUCTURE ROM COST ESTIMATE

CHEMICAL COSTS - SUMMARY

19080 GPM -

RANNEY WELL,

H_2SO_4 = (947,700 lb/yr)($0.03/lb) = $28,400/yr

NaOH = (858,700 lb/yr)($0.15/lb) = $128,800/yr

P.E. = 0

CHLORINE = (1,521,420 + 9690) lb/yr ($.075/lb) = $114,800

INTAKE STRUCTURE

H_2SO_4 = (563,100 lb/yr)($0.03/lb) = $16,890

NaOH = (510,200 lb/yr)($0.15/lb) = $76,530

PE = (38,940 + 242) lb/yr ($1.75/lb) = $66,990

CHLORINE = (1,531,110) lb/yr ($.075/lb) = $114,833

FLUOR

CALCULATIONS and SKETCHES

DATE 5-11-82
CONT. NO. 83554
BY MKM CHK'D
SHEET NO. 36/40

RAYNEY WELL WATER SYSTEM VS INTAKE STRUCTURE ROM COST ESTIMATE

ANNUAL CHEMICAL COSTS - SUMMARY

11 000 GPM

RAYNEY WELL

H_2SO_4 = (548 600 lb/yr)($0.03/lb) = $16,460

NaOH = (497,100 lb/yr)($0.15/lb) = $74,570

P.E. = 0

CHLORINE = (880,800 + 2,560) lb/yr ($0.075/lb) = $66,250

INTAKE STRUCTURE

H_2SO_4 = (326 000 lb/yr)($0.03/lb) = $9,780

NaOH = (295 400 lb/yr)($0.15/lb) = $44,310

P.E. = (22021 + 64) lb/yr ($1.75/lb) = $38,650

CHLORINE = (883360) lb/yr ($0.075/lb) = $66,250

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FLUOR
CALCULATIONS and SKETCHES

DATE 5-11-82
CONT. NO. 23554
BY BLM CHK'D
SHEET NO. 27/40

RANNEY WELL WATER SYSTEM VS INTAKE STRUCTURE RAW COST ESTIMATE

COST ESTIMATE - INTAKE STRUCTURE - 19000 GPM

UNIT	EQUIPMENT COST, $	LABOR COST, $	POWER COST, $	CHEMICAL COST, $
INTAKE STRUCTURE	COST DATA PROVIDED SEPARATELY			
POTABLE H2O CLARIFIER	51,340	34,200		
RAW WATER CLARIFIER	2,400,000	1,600,000	660,000	181820
CLARIFIED WATER RES	1,247,500	9,644,300	83,600	
SAND FILTER	377,600	251,700	24,200	
FILTERED WATER RES.	3,356,700	4,466,700	474,760	
BACKWASH SUPERNATANT COLLECTION SUMP	150,000	100,000	3,520	
BFW TREATMENT	+			93,420
TOTAL, $	13,583,140	16,096,900	1,246,080	275,240

TOTAL OVERALL COST, INTAKE STRUCTURE = $ 31,201,360
(19000 GPM RAW WATER)

USE OR DISCLOSURE OF REPORT DATA IS SUBJECT TO THE RESTRICTION ON THE NOTICE PAGE AT THE FRONT OF THIS REPORT

FORM E-030 REV. 4/69
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FLUOR
CALCULATIONS and SKETCHES
DATE 5-11-82
CONT. NO. 6235-04
BY KKM CHK'D
SHEET NO. 2 & (2)

RANNEY WELL WATER SYSTEM VS INTAKE STRUCTURE ROM COST ESTIMATE

COST ESTIMATE - RANNEY WELL SYS, 19000 GPM

UNIT	EQUIPMENT COST, $	LABOR COST $	POWER COST, $	CHEMICAL COST, $
RANNEY WELL Struct.				
SAND FILTER	1,132,800	755,200	660,000	114,830
FILTERED H_2O RESERVOIR	7,247,500	9,644,300	971,520	
BFW TREATMENT				157,200
TOTAL, $	8,380,300	10,399,500	1,631,520	272,030

TOTAL OVERALL COST, RANNEY WELL (17000 GPM) = $ 20,683,350

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FLUOR
CALCULATIONS and SKETCHES
DATE 5-11-82
CONT. NO. 22553-2
BY RRM CHK'D
SHEET NO. 39 (2)

RANNEY WELL WATER SYSTEM VS INTAKE STRUCTURE R&M COST ESTIMATE

COST ESTIMATE - INTAKE STRUCTURE, 11000 GPM

UNIT	EQUIPMENT COST, $	LABOR COST, $	POWER COST, $	CHEMICAL COST, $
INTAKE STRUCTURE				
POTABLE H_2O CLARIFIER	21,200	14,100		
RAW H_2O CLARIFIER	1,515,500	1,010,300	381,920	104,900
CLARIFIED H_2O RESERVOIR	4,945,600	6,581,100	48,400	
SAND FILTER	238,400	158,900	11,440	
FILTERED H_2O RESERVOIR	2,060,400	2,741,700	267,960	
BACKWASH SUPERNATANT COLLECTION SUMP	150,000	100,000	8800	
BFN TREATMENT				54,090
TOTAL, $	8,931,100	10,606,100	718,520	158,990

TOTAL OVERALL COST, INTAKE STRUCTURE = $20,414,710
(11000 GPM RAW WATER)

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COST ESTIMATE - RANNEY WELL SYS, 11000 GPM

UNIT	EQUIPMENT COST, $	LABOR COST, $	POWER COST, $	CHEMICAL COST, $
RANNEY WELL, ...				
SAND FILTER	715,300	476,900	381,920	66250
FILTERED H_2O RESERVOIR	4,945,600	6,581,100	512,160	
BFW TREATMENT				91037
TOTAL, $	5,660,900	7,058,000	894,080	157,280

TOTAL OVERALL COST, RANNEY WELL (11000 GPM RAW WATER) = $13,770,260

RANNEY WELL WATER SYSTEM VS INTAKE STRUCTURE ROM COST ESTIMATE

FLUOR
CALCULATIONS and SKETCHES

DATE 3-11-82
CONT. NO. 835??4
BY YAKIN CHK'D
SHEET NO. 4/4

STRUCTURAL ENGINEERING STUDY

RANNEY WATER SYSTEM VERSUS INTAKE STRUCTURE

1.0 GENERAL

This study will provide a comparison of a Ranney Water System versus an alternate surface water intake structure.

2.0 WORK DEFINITION

2.1 The Ranney Water System shall be one of the following:

2.1.1 Radial Collectors: Horizontal screens radiate from a central caisson collecting water from the surrounding strata, utilizing either induced infiltration or ground water storage as the source of supply.

2.1.2 Raw Water Intakes: The onshore pumping station and caisson is gravity fed through one or more intake lines which are supplied by one or more intake screens located in the surface water source.

2.1.3 Infiltration Galleries: Permeable horizontal or inclined conduits are constructed below the water table in an area where the permeablility of the natural soil is sufficient to transmit this quantity of water to the gallery under the existing head conditions.

The optimum Ranney Water System will be selected and an estimated construction cost provided as part of the Ranney Hydrogeological Survey, Fluor Inquire NO. k003-0-835504-7JB.

2.2 Alternate surface water intake structures to be evaluated by Fluor shall be the following:

2.2.1 Onsbore pump-house with deep shaft and tunnel under river to intake structure projecting up thru the river bottom to a velocity cap.

2.2.2 Onsbore pump-house with shallow shaft and tunnel through the side of the river bank, and above the river bottom, with intake screens.

2.2.3 Above water trestle and pump platform with submerged pumps suspended in the river.

The optimum alternate surface water intake structure will be selected and a cost comparison made with the optimum Ranney Water System. Final recommendation will be based on total cost of the raw water.

STRUCTURAL ENGINEERING STUDY (Continued)

3.0 DELIVERABLE TO TRI-STATE

A formal report that contains the following:

3.1 Capital cost estimates.

3.2 Operating cost estimates

3.3 General descriptions of proposed intake structure.

4.0 SCHEDULE

It is estimated that the proposed work will be completed as follows:

4.1 Ranney Water System: 3 months after award of contract (NO. k003-0-835504-7JB).

4.2 Alternate Surface water intake structures: 4 months after authorization to proceed.