PN-ABF-021

Pakistan
Water and Power Development Authority

Lakhra Coal Mine and Power Generation Feasibility Study

Power Plant Feasibility

Volume VII

January 1986

Sponsored by

United States Agency for International Development

Prepared by

Gilbert/Commonwealth International, Inc.

PN-ABE-021

LAKHRA COAL MINE AND POWER GENERATION FEASIBILITY STUDY

POWER PLANT FEASIBILITY

VOLUME VII

Submitted to

U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

and

PAKISTAN WATER AND POWER DEVELOPMENT AUTHORITY

By

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Jackson, Michigan 49201

R-2748

January, 1986

LAHKRA POWER FEASIBILITY STUDY

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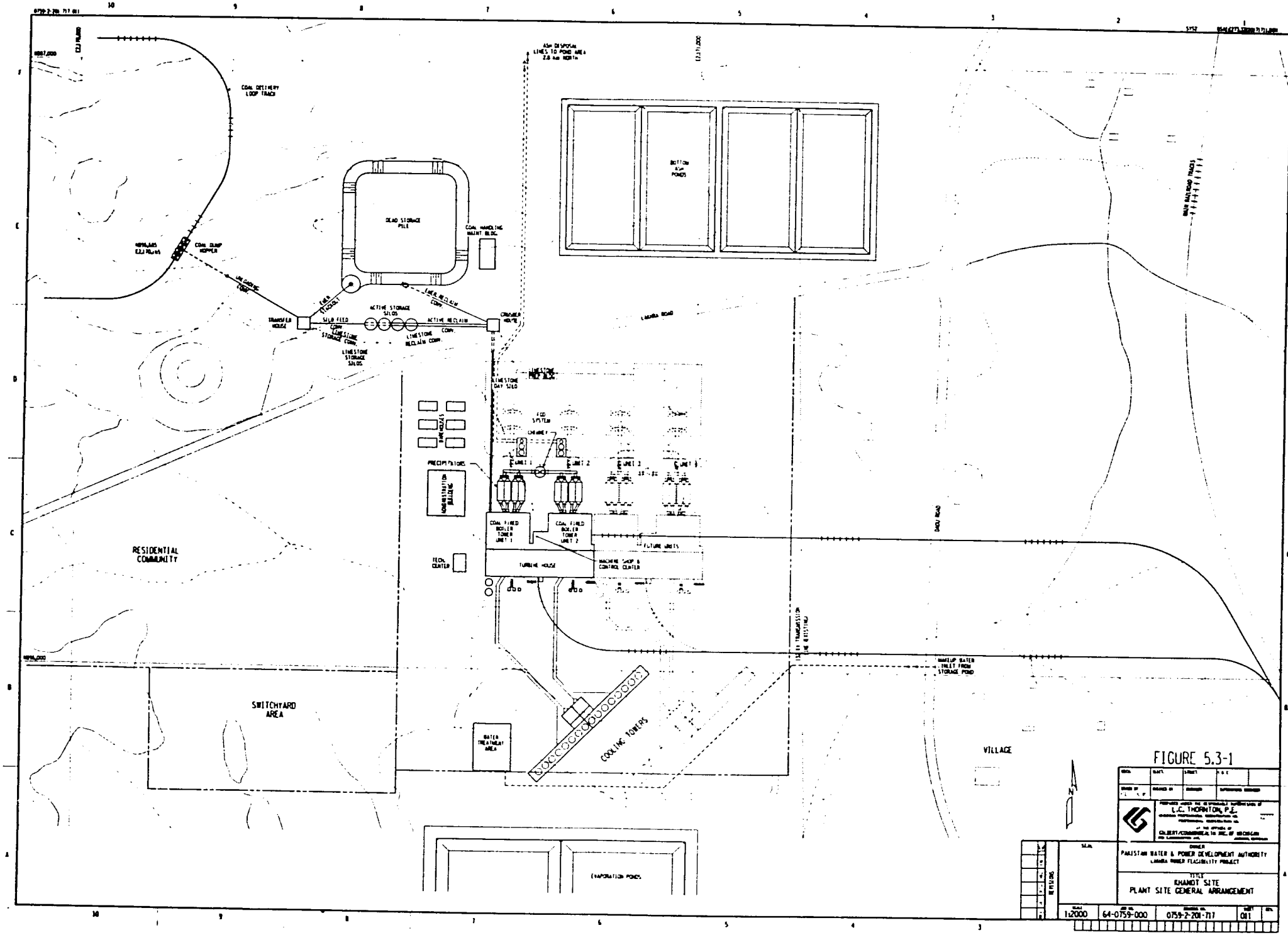


FIGURE 5.3-1

L.C. THORNTON, P.E.

PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY
LAHORA POWER FEASIBILITY PROJECT

TITLE
KHANOT SITE
PLANT SITE GENERAL ARRANGEMENT

SCALE	JOB NO.	DRAWING NO.	SHT	REV.
1:2000	64-0759-000	0759-2-201-717	001	

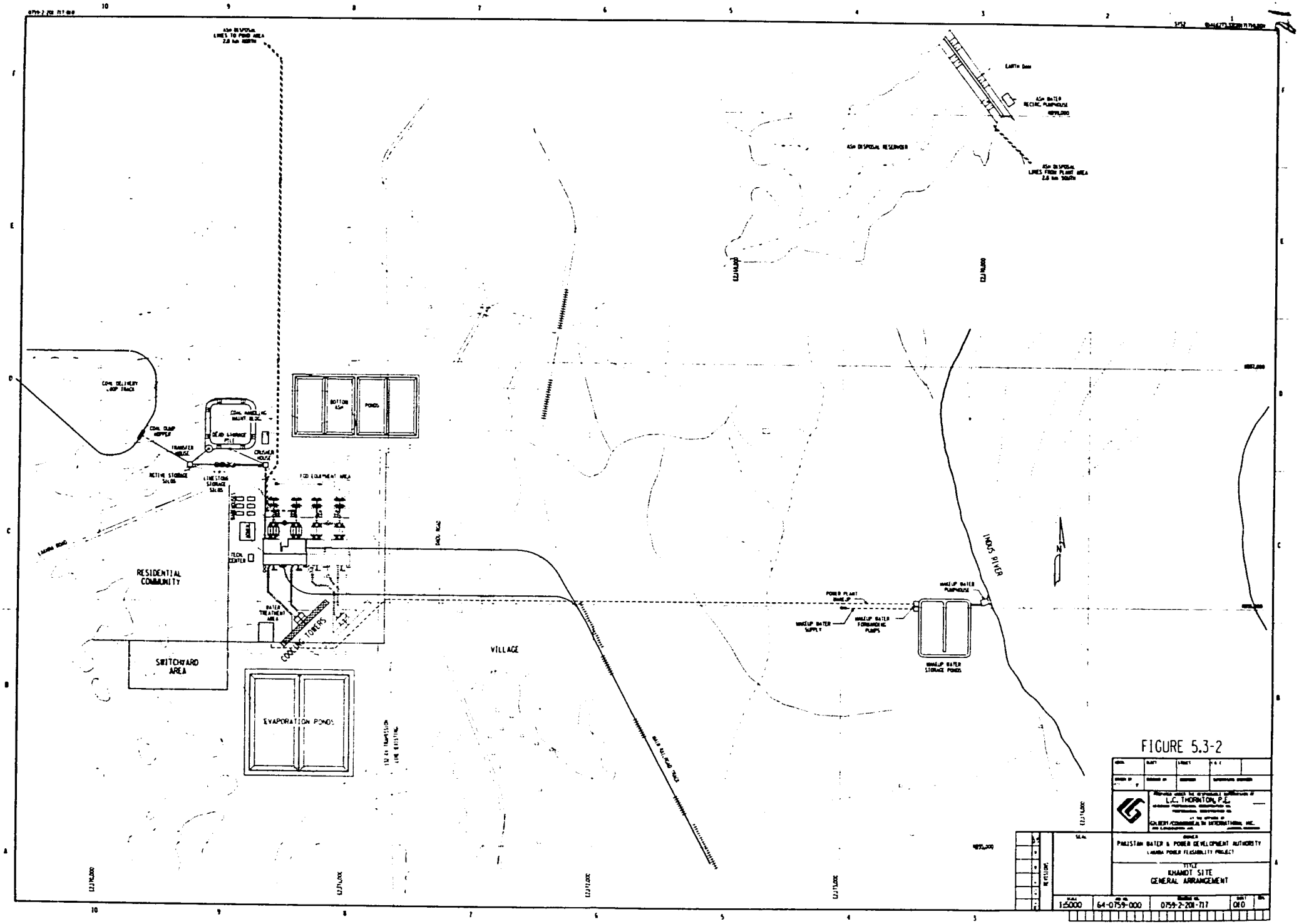


FIGURE 5.3-2

L.C. THORNTON, P.E.

PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY

KHANDT SITE
GENERAL ARRANGEMENT

1:5000 | 64-0759-000 | 0759-2-201-717 | 010

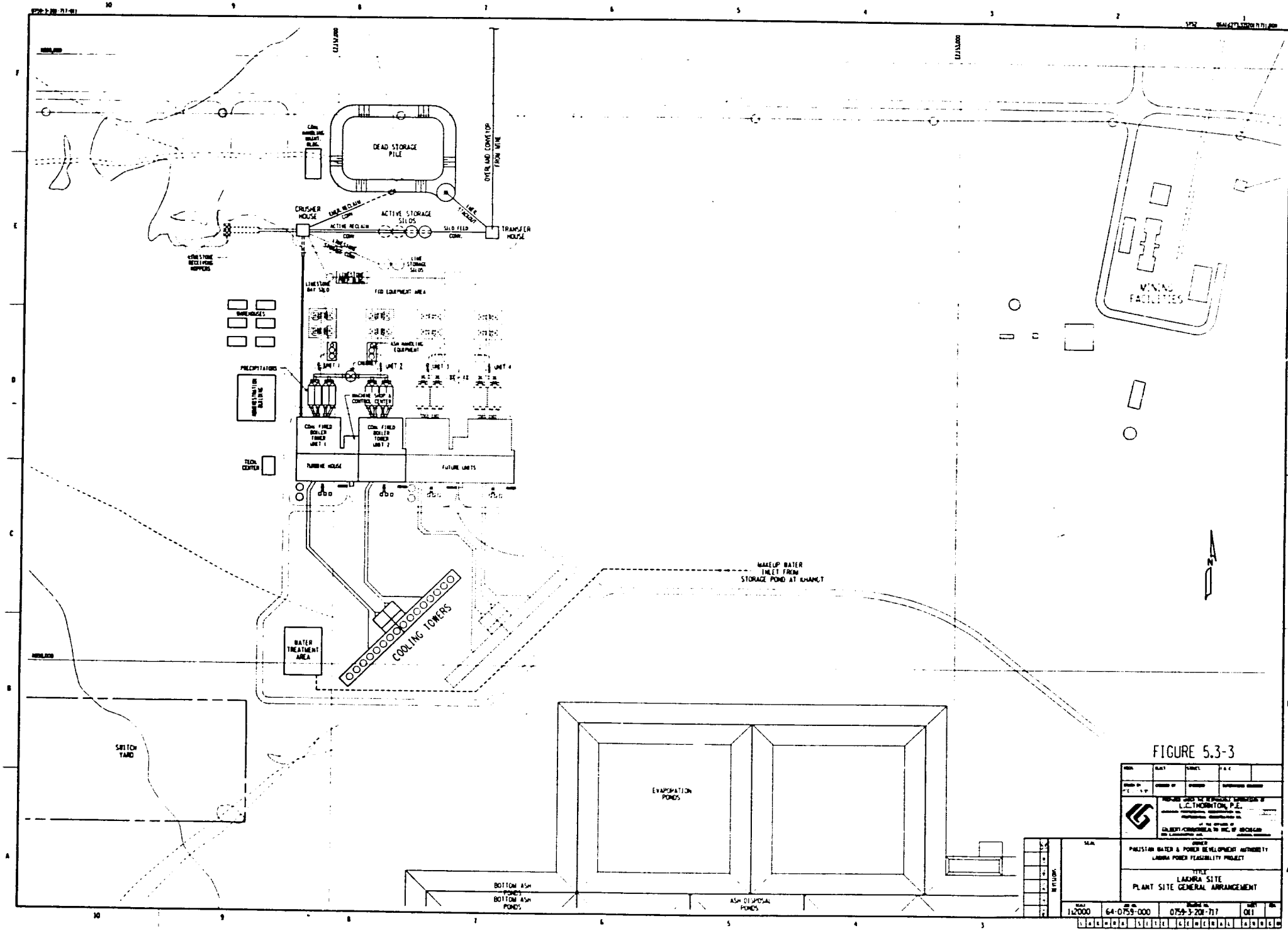


FIGURE 5.3-3

L.C. THORNTON, P.E.

OWNER
PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY
LAKHRA POWER FEASIBILITY PROJECT

TITLE
LAKHRA SITE
PLANT SITE GENERAL ARRANGEMENT

SCALE	JOB NO.	DRAWING NO.	SHEET	REV.
1:2000	64-0759-000	0759-3-201-717	011	

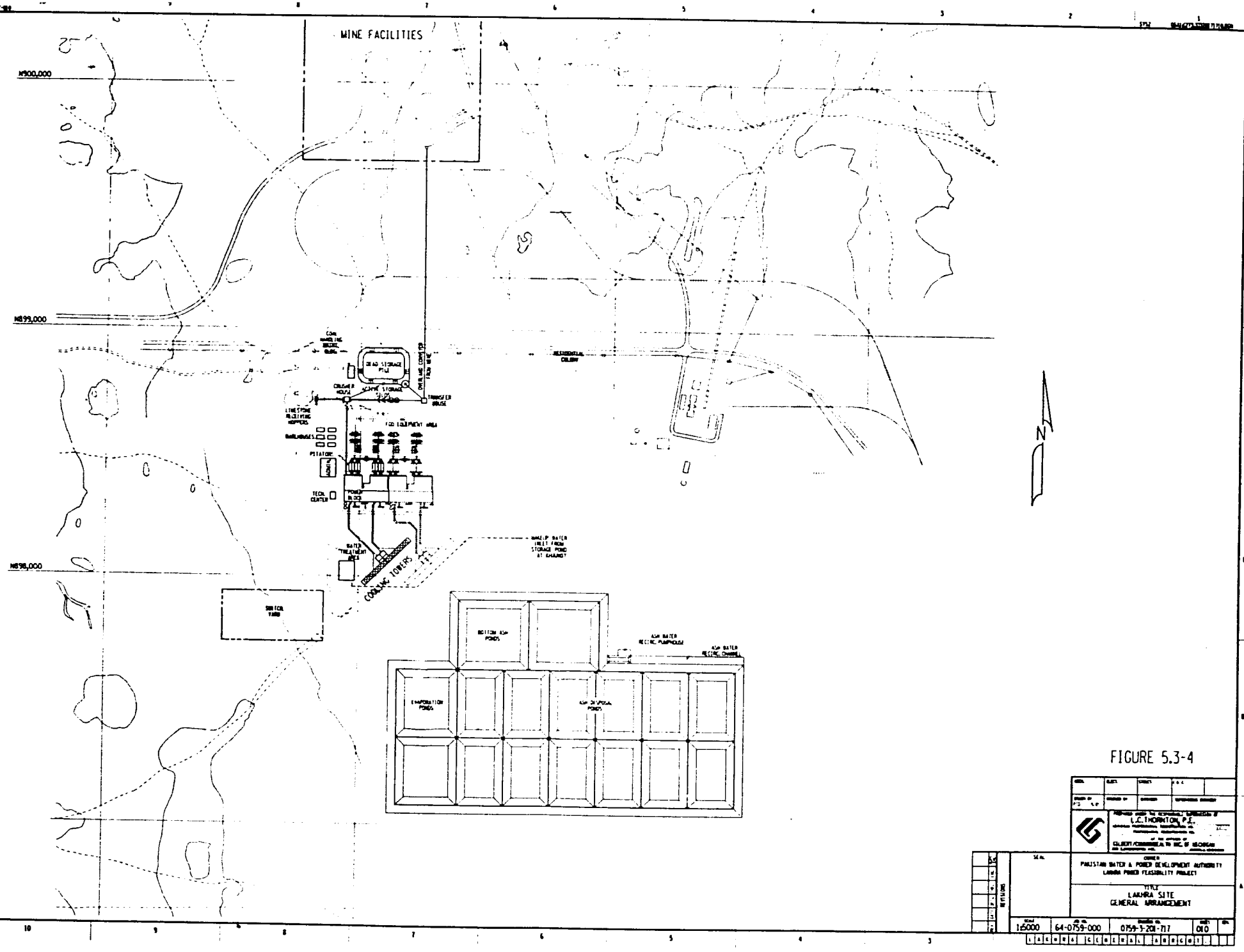


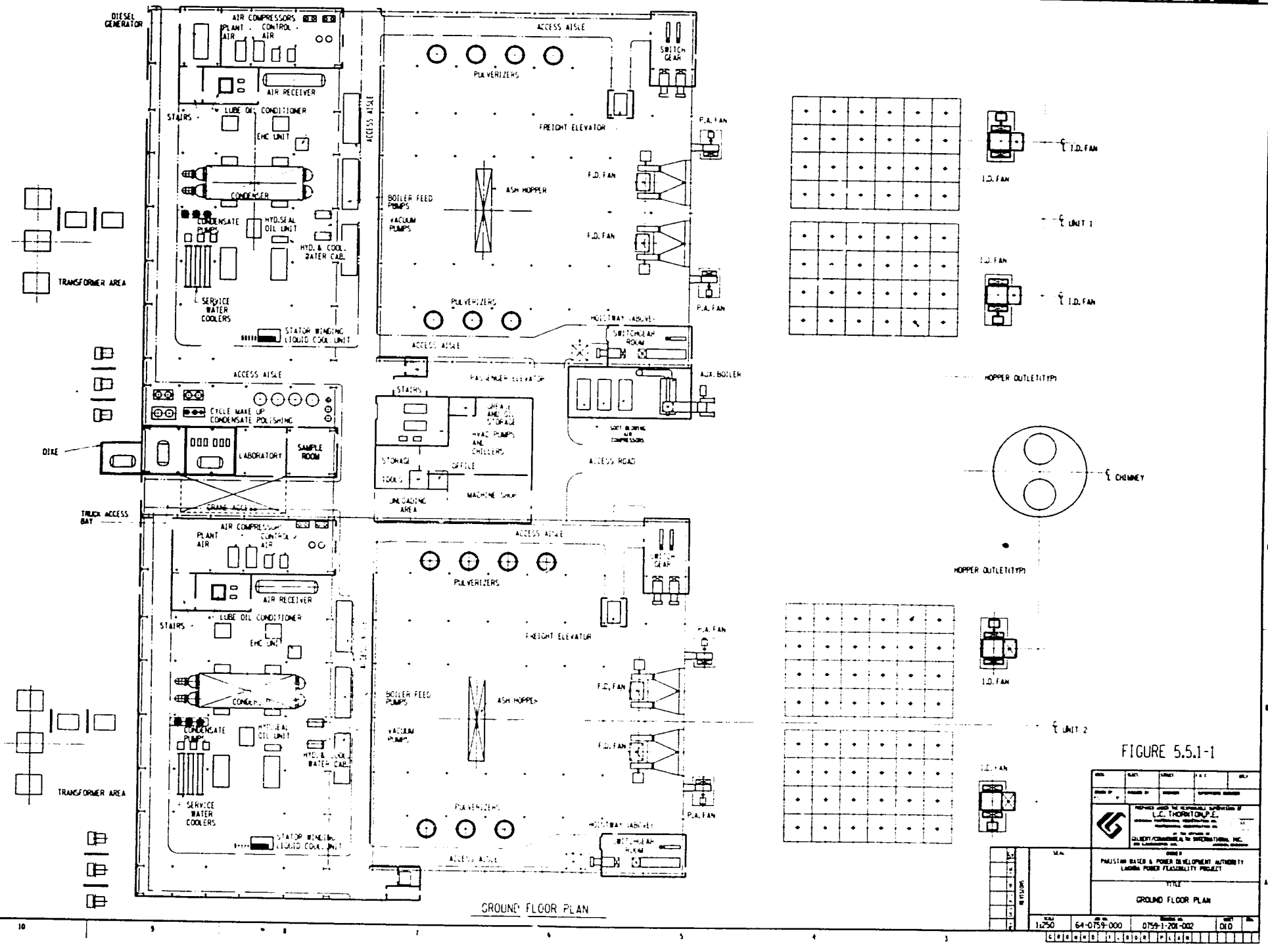
FIGURE 5.3-4

L.C. THORNTON, P.E.

OWNER
PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY
LAKHRA POWER FEASIBILITY PROJECT

TITLE
LAKHRA SITE
GENERAL ARRANGEMENT

SCALE	JOB NO.	DRAWING NO.	SHEET	REV.
1:5000	64-0759-000	0759-1-201-717	010	



GROUND FLOOR PLAN

FIGURE 5.5.1-1

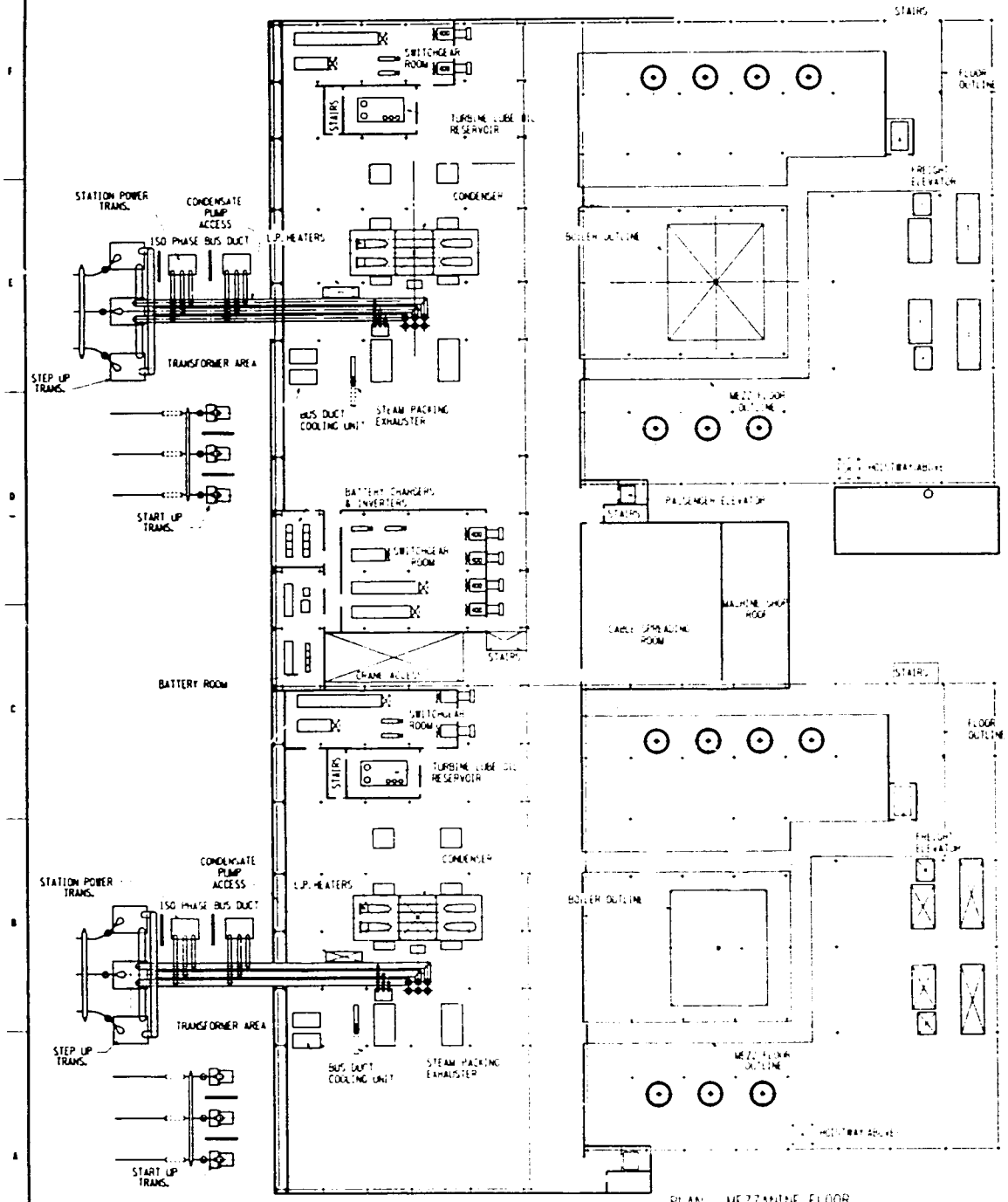
PREPARED UNDER THE RESPONSIBLE SUPERVISION OF
L.C. THORNTON P.E.
OF THE OFFICES OF
GILBERT/COMMONWEALTH INTERNATIONAL INC.

OWNER
PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY
LAKHRA POWER FEASIBILITY PROJECT

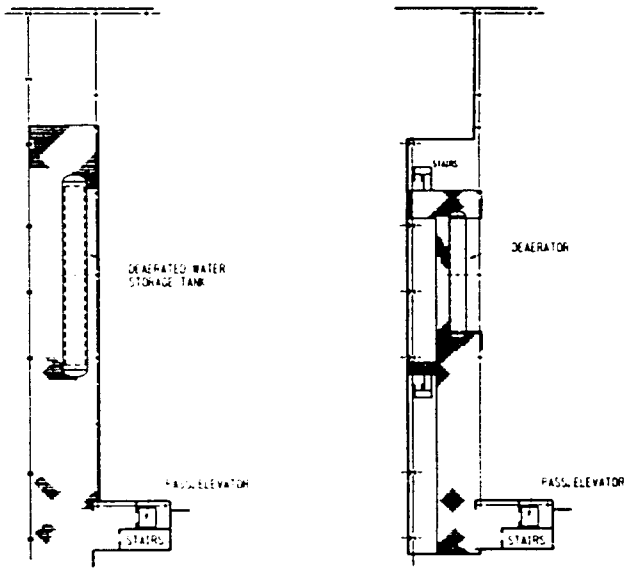
TITLE
GROUND FLOOR PLAN

SCALE	JOB NO.	DRAWING NO.	REV.
1:250	64-0759-000	0759-1-201-002	010

C E G 0 0 7 5 9 P L A N



PLAN MEZZANINE FLOOR



1ST LEVEL 2ND LEVEL

HEATER BAY PLANS -- LEVELS ABOVE OPERATING FLOOR

FIGURE 5.5.1-2

L.L. THORNTON, P.E.

GILBERT/COMMONWEALTH & THE ASSOCIATES, INC.

PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY
LAKHRA POWER FEASIBILITY PROJECT

MEZZANINE FLOOR AND MISC. FLOOR PLANS

SCALE	JOB NO.	DRAWING NO.	SHEET	REV.
1:250	64-0759-000	0759-1 202-002	011	

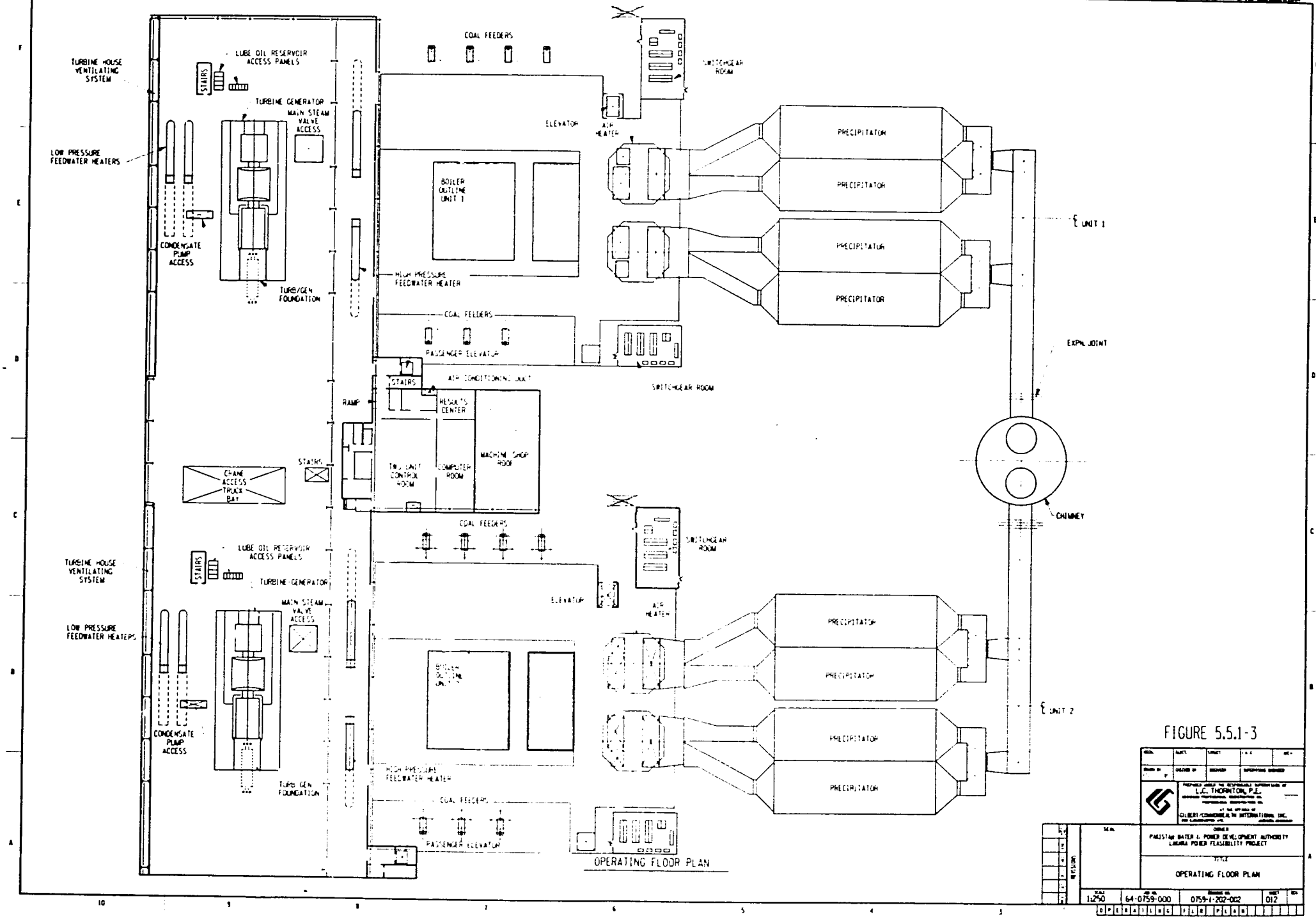


FIGURE 5.5.1-3

DESIGN BY	DRAWN BY	CHECKED BY	SUPERVISING ENGINEER	

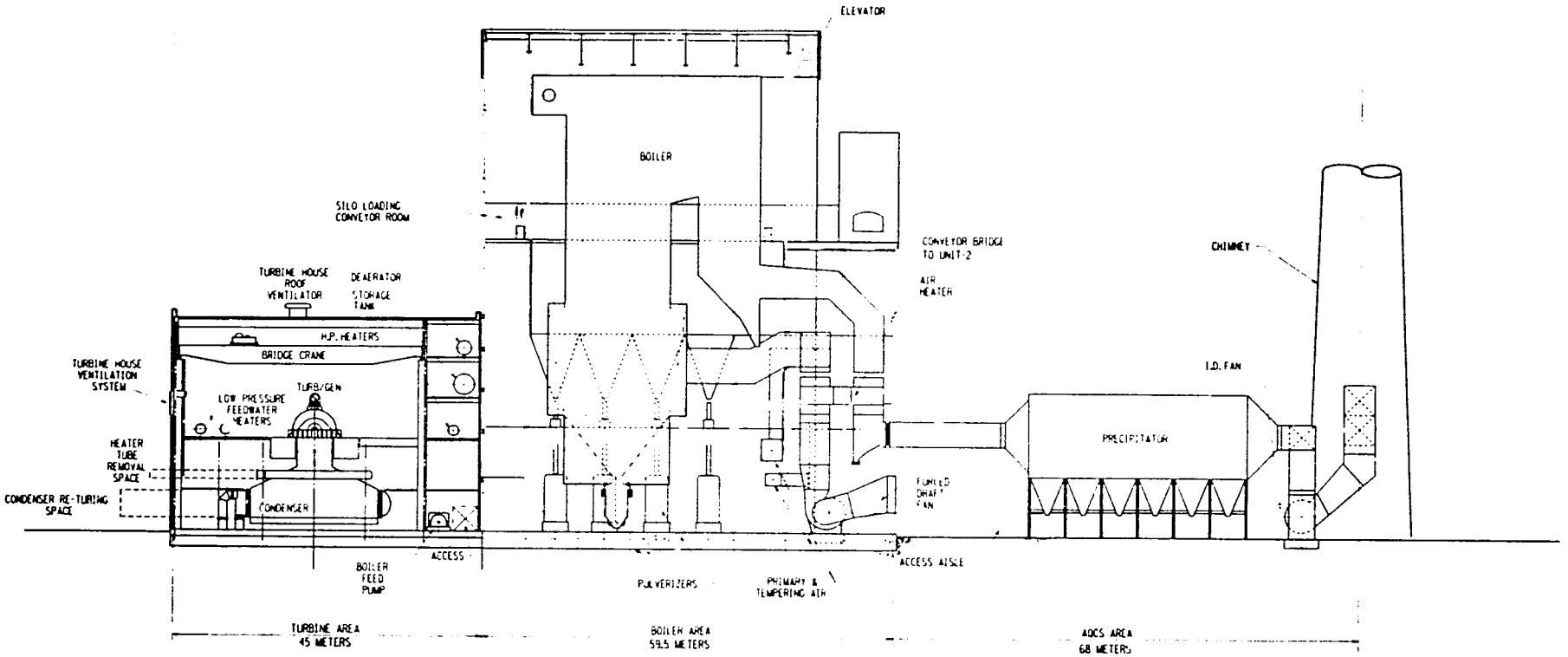
PREPARED UNDER THE RESPONSIBLE SUPERVISION OF
L.C. THORNTON, P.E.
OF THE OFFICES OF
GILBERT/COMMONWEALTH INTERNATIONAL INC.

OWNER
PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY
LAKHRA POWER FEASIBILITY PROJECT

TITLE
OPERATING FLOOR PLAN

SCALE	JOB NO.	DRAWING NO.	SHEET	REV.
1:250	64-0759-000	0759-1-202-002	012	

DPSAS1S0C 7S0P1A0



PLANT CROSS SECTION

FIGURE 5.5.1-4

L.C. THORNTON, P.E.

GILBERT/COMMONWEALTH INTERNATIONAL INC.

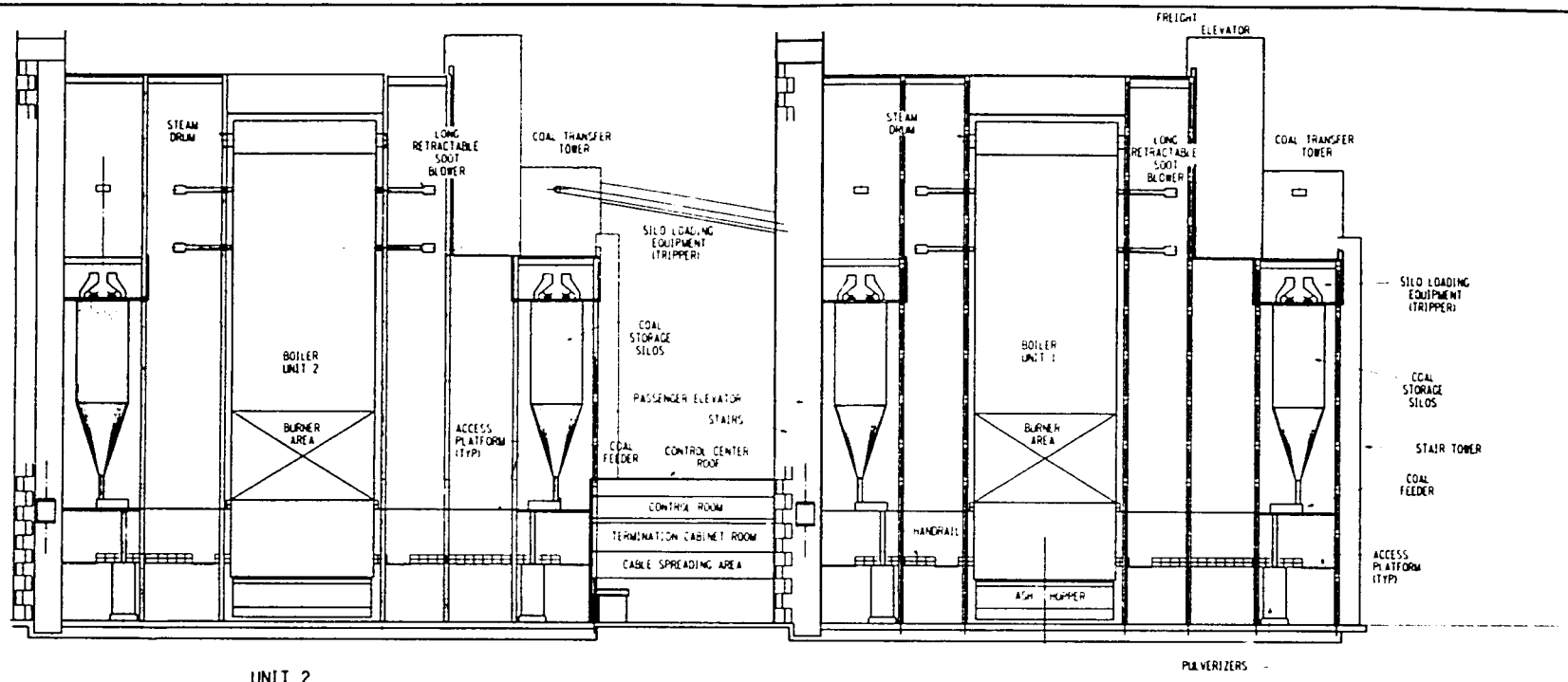
OWNER
PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY
LAKHRA POWER 7. USABILITY PROJECT

TITLE
PLANT CROSS SECTION

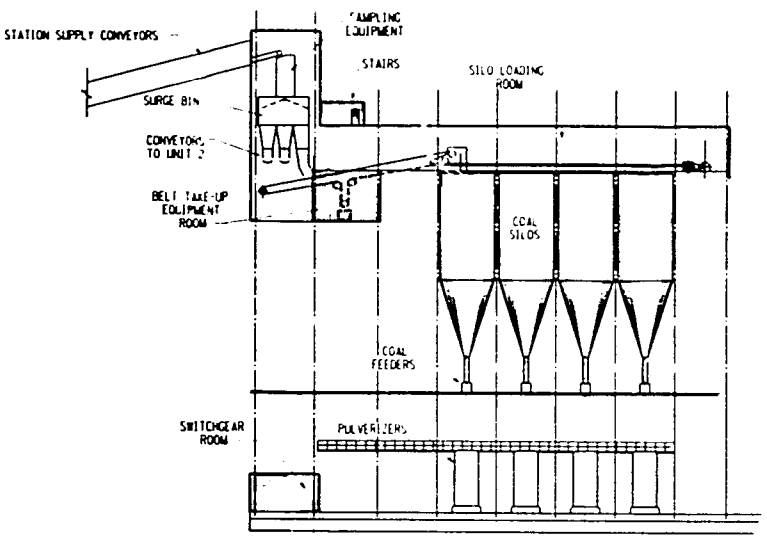
SCALE	JOB NO.	DRAWING NO.	SHEET	REV.
1:250	64-0759-000	0759-I-202-002	013	

PLANTSECTIONS

Flow Diagrams



LONGITUDINAL CROSS SECTION



ELEVATION AT COAL SILOS

FIGURE 5.5.1-5

L.C. THORNTON, P.E.

GILBERT/COMMONWEALTH INTERNATIONAL, INC.

OWNER
PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY
LAKHRA POWER FEASIBILITY PROJECT

TITLE
LONGITUDINAL CROSS SECTION

SCALE	JOB NO.	DRAWING NO.	SHEET	REV.
1:250	64-0759-000	0759-1-202-002	014	

LAKHRA POWER FEASIBILITY PROJECT

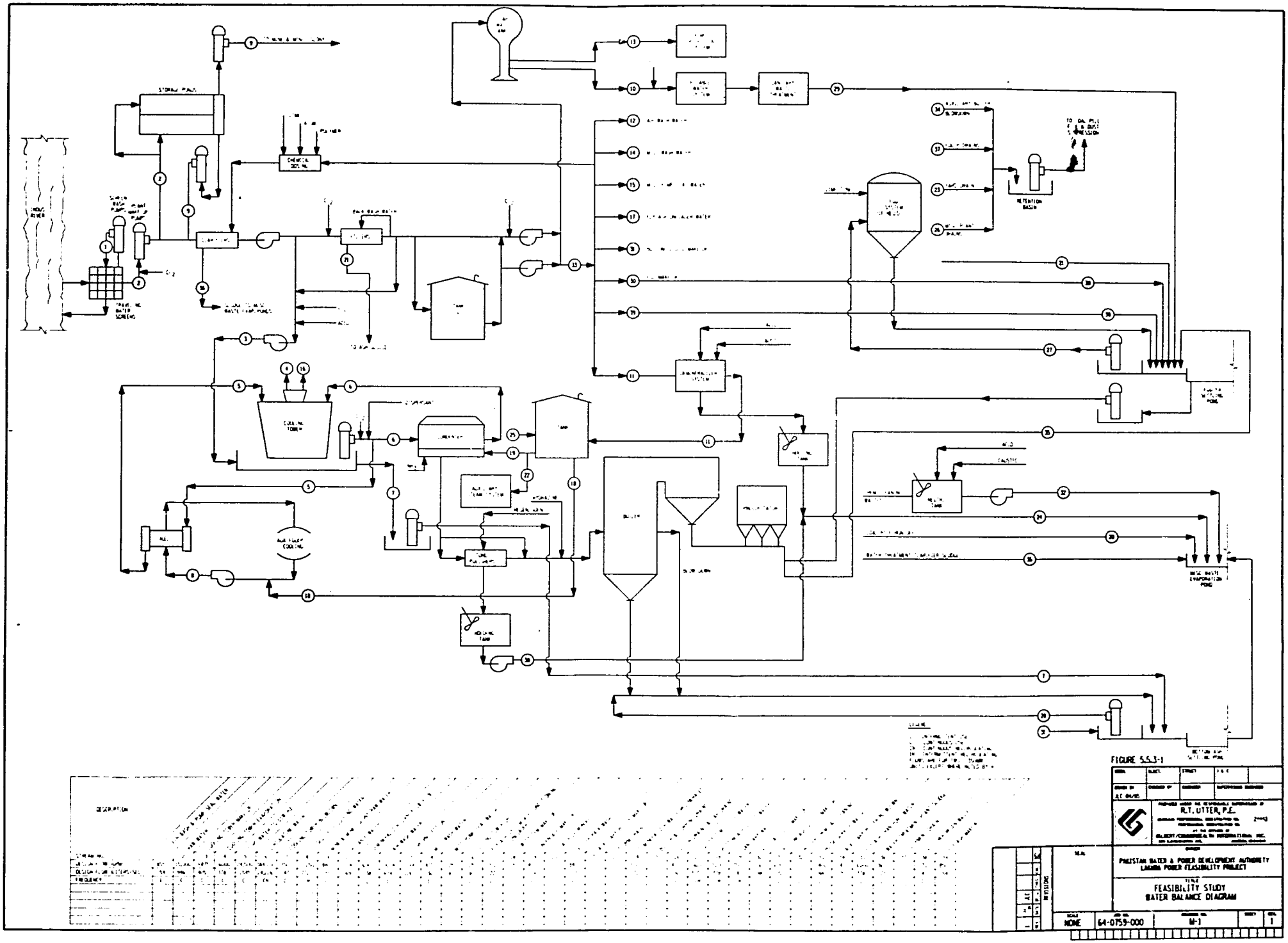


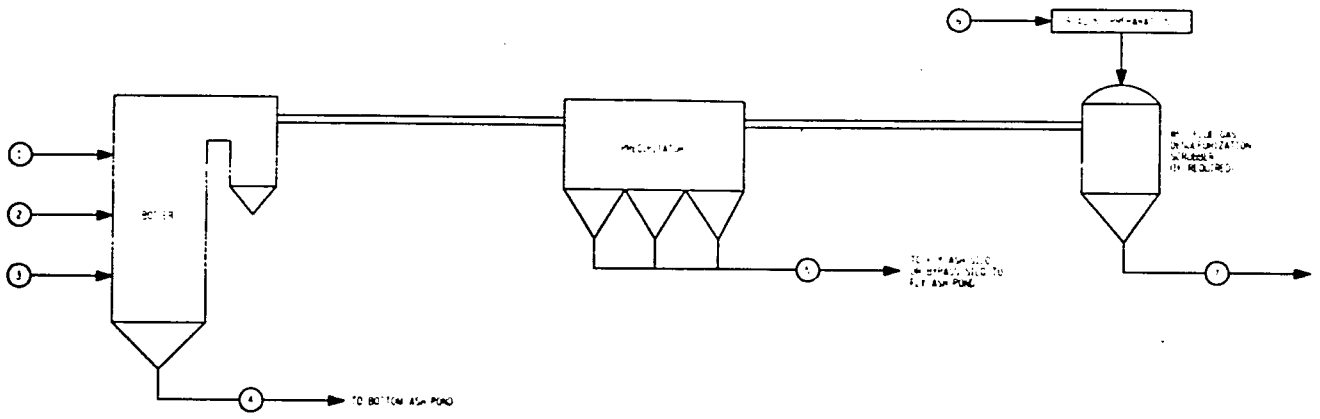
FIGURE 5.5.3-1

R.T. UTTER, P.E.

PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY
LAKHRA POWER FEASIBILITY PROJECT

FEASIBILITY STUDY
WATER BALANCE DIAGRAM

SCALE: NONE | 64-0759-000 | M-1 | SHEET 1 | REV. 1



MATERIAL NUMBER	1	2	3	4	5	6	7
DESIGN TONS/HR	346			24	67		44
DESIGN TONS/HR	346			24	6	240	44
DESIGN GPM		30	455				
DESIGN TEMP/DEG F		210	75				

QUANTITIES LISTED ARE FOR ONE OF TWO 350 MW UNITS

FIGURE 5.5.3-2

DESIGN	DRAWN BY J.C. 06/85	CHECKED BY	SUPERVISION	SUPERVISING ENGINEER

PREPARED UNDER THE RESPONSIBLE SUPERVISION OF
R.T. UTTER, P.E.
REGISTERED PROFESSIONAL ENGINEER IN
PROFESSIONAL REGISTRATION NO.
AT THE OFFICES OF
GILBERT/COMMONWEALTH INTERNATIONAL INC.

OWNER
PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY
LAKHRA POWER FEASIBILITY PROJECT

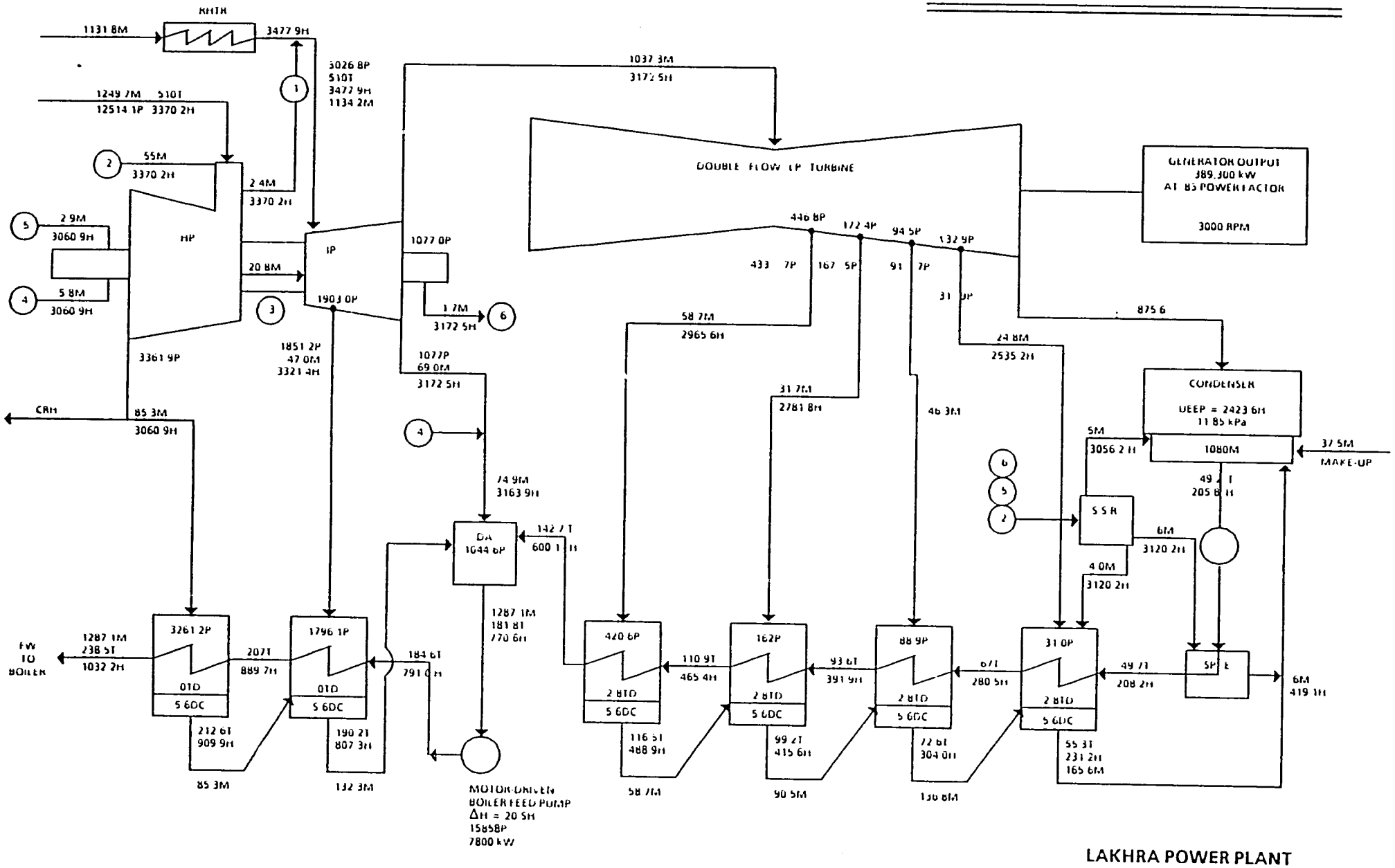
TITLE
FEASIBILITY STUDY
MATERIAL BALANCE DIAGRAM

REVISIONS				
NO.	DATE	BY	CHK'D	APP'D
1	6/85	J.C.		

SEAL

SCALE	JOB NO.	DRAWING NO.	SHEET	REV.
NONE	64-0759-000	M-6	1	1

GUARANTEED – 11.85 kPa, 3% MU, TC2F



GROSS HEAT RATE = 8717 kj/kWh
(Heat Rate may vary depending
on the T/G Vendor Selected)

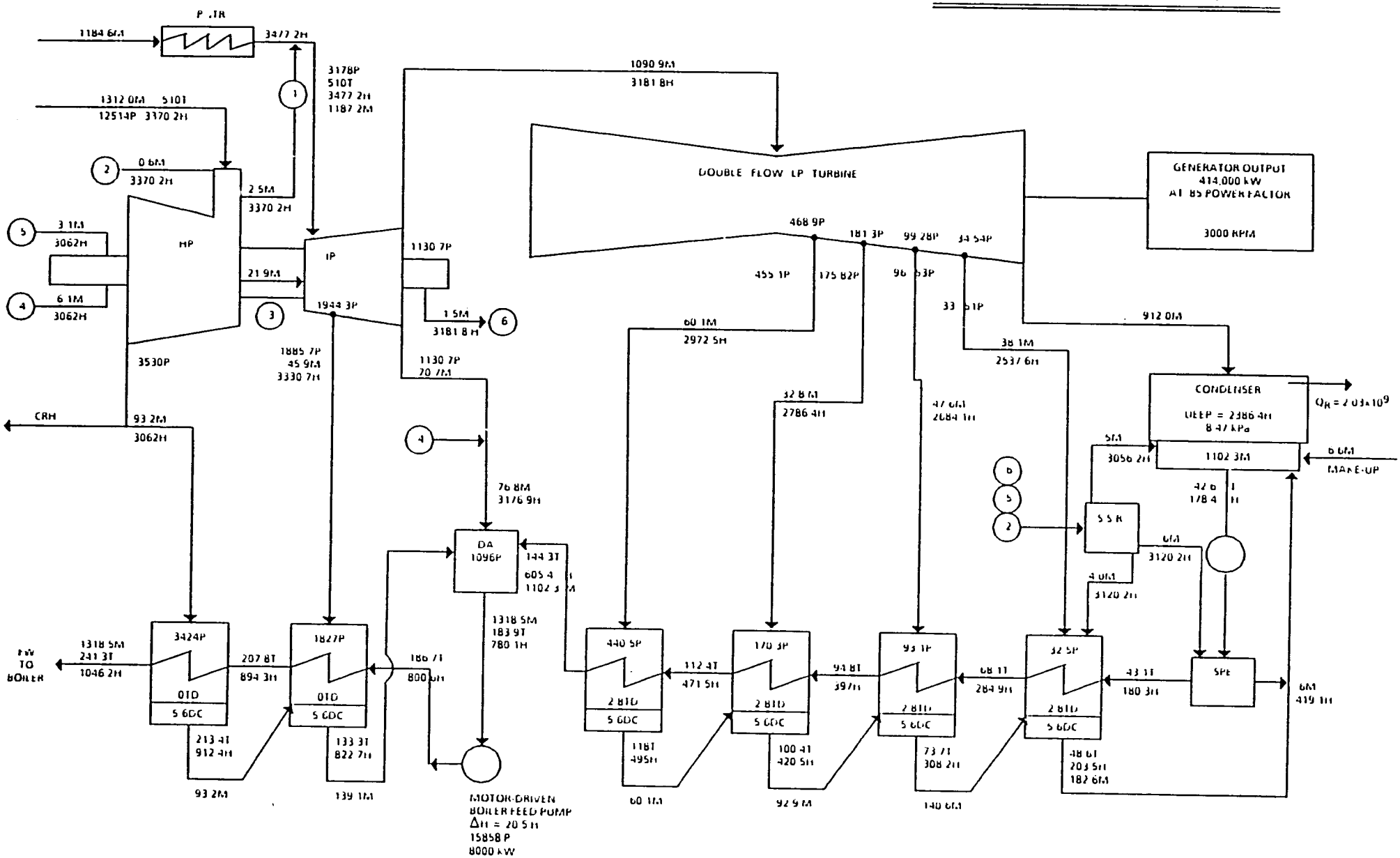
M – Flow – tonnes/hr
P – Pressure – kPa
H – Enthalpy – kj/kg
T – Temperature – °C

LAKHRA POWER PLANT
FEASIBILITY STUDY
TYPICAL PRELIMINARY TURBINE HEAT BALANCE
SI UNITS
G/C II 11/12/85 HB-1

FIGURE 5.5.AT.1

B1619-4/GF#72

VWO – NP – 8.47 kPa, 0.5% MU, TC2F



GROSS HEAT RATE = 8554 kj/kWh
(Heat Rate May Vary Depending
on T/G Vendor Selected)

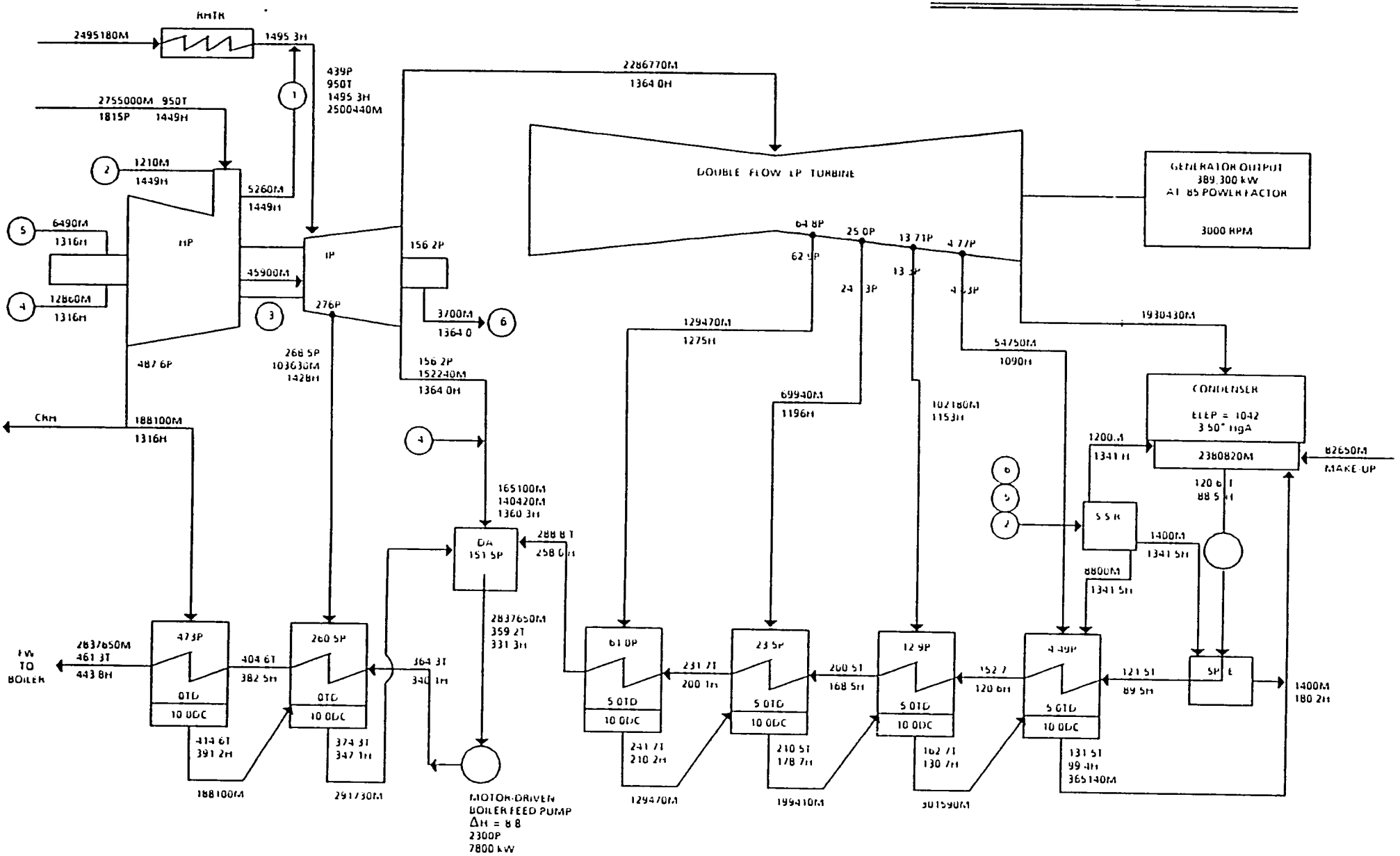
M – Flow – tonnes/hr
P – Pressure – kPa
H – Enthalpy – kj/kg
T – Temperature – °C

LAKHRA POWER PLANT
FEASIBILITY STUDY
TYPICAL PRELIMINARY TURBINE HEAT BALANCE
SI UNITS
G/C II 11/12/85 HB-2

FIGURE 5.5.4I-2

81619-2/GF#72

GUARANTEED – 3.5" HgA, 3% MU, TC2F



GROSS HEAT RATE = 8263 Btu/kWh
(Heat Rate may vary depending
on the T/G Vendor Selected)

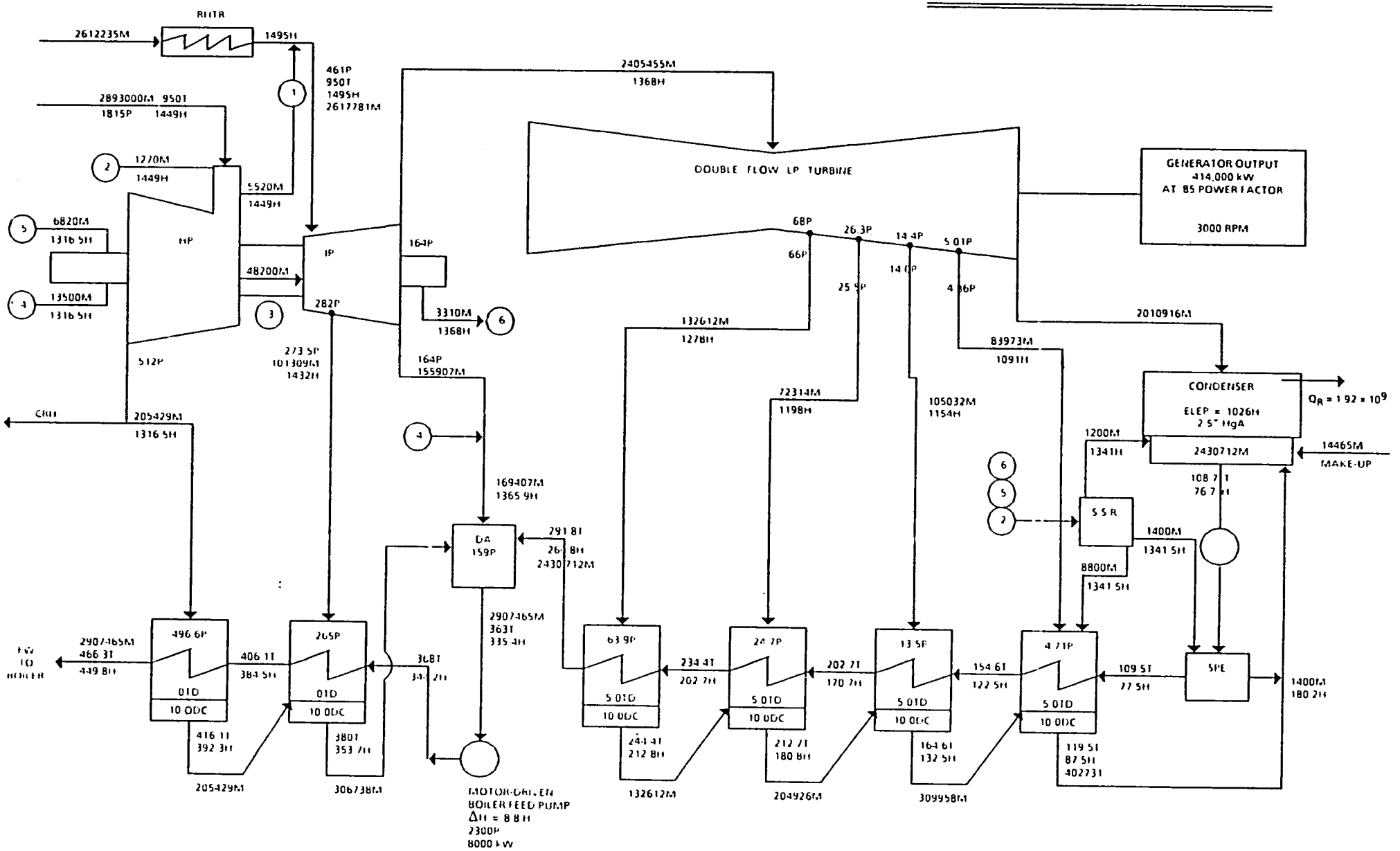
M – Flow – lbs/hour
P – Pressure – psia
H – Enthalpy – Btu/lb
T – Temperature – ° F

LAKHRA POWER PLANT
FEASIBILITY STUDY
TYPICAL PRELIMINARY TURBINE HEAT BALANCE
ENGLISH UNITS
G/C II 11/12/85 HB-1

FIGURE 5.5.A1-3

B1619-3/GF#72

VWO – NP – 2.5" HgA, 0.5% MU, TC2F



GROSS HEAT RATE = 8108 Btu/kWh
(Heat Rate may vary depending on the T/G Vendor Selected)

M – Flow – lbs/hour
P – Pressure – psia
H – Enthalpy – Btu/lb
T – Temperature – °F

LAKHRA POWER PLANT
FEASIBILITY STUDY
TYPICAL PRELIMINARY TURBINE HEAT BALANCE
ENGLISH UNITS
G/C II 11/12/85 HB-2

FIGURE 5.5.4.4

1619-1/GF#72

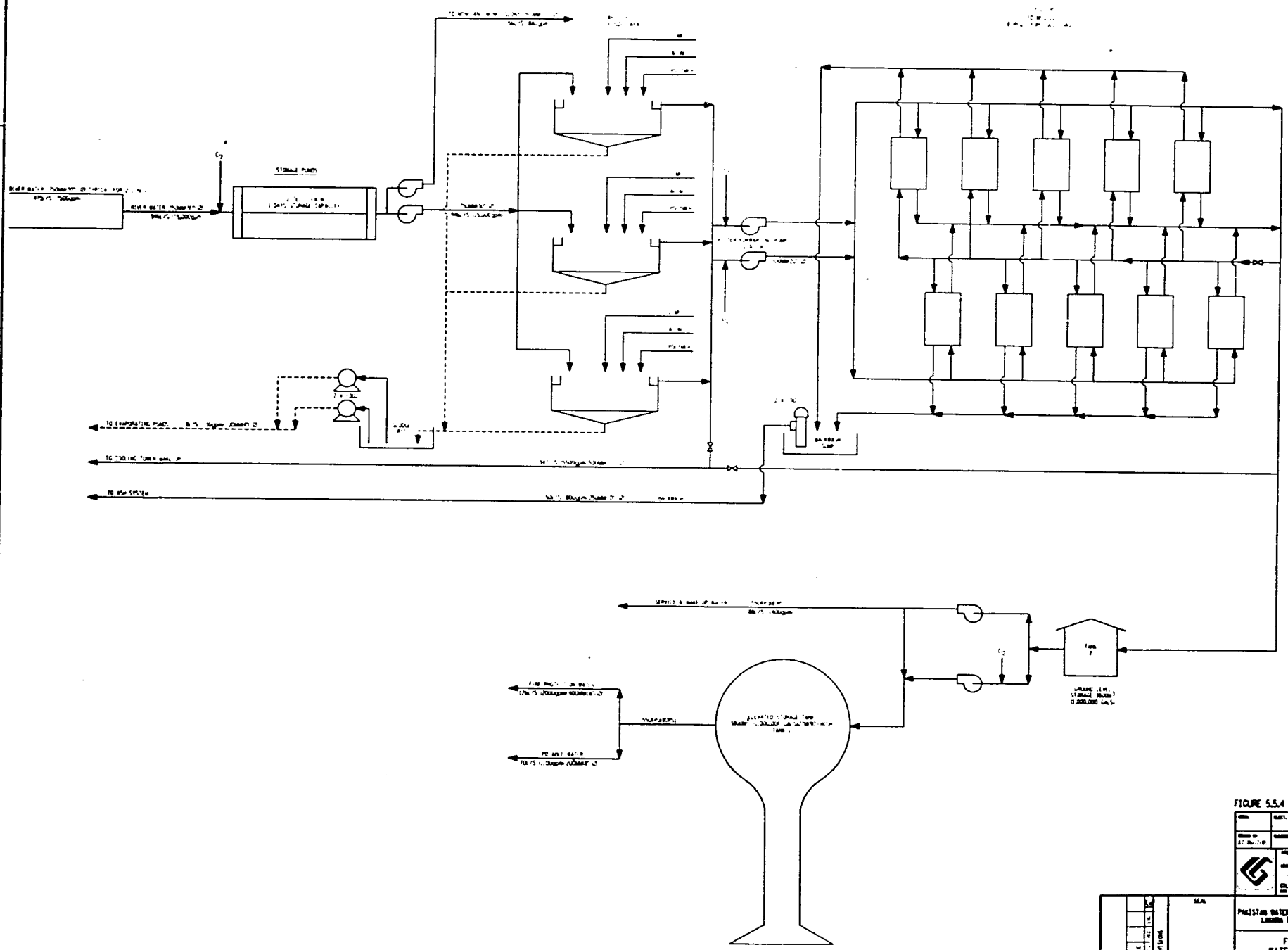


FIGURE 5.5.4 IX-1

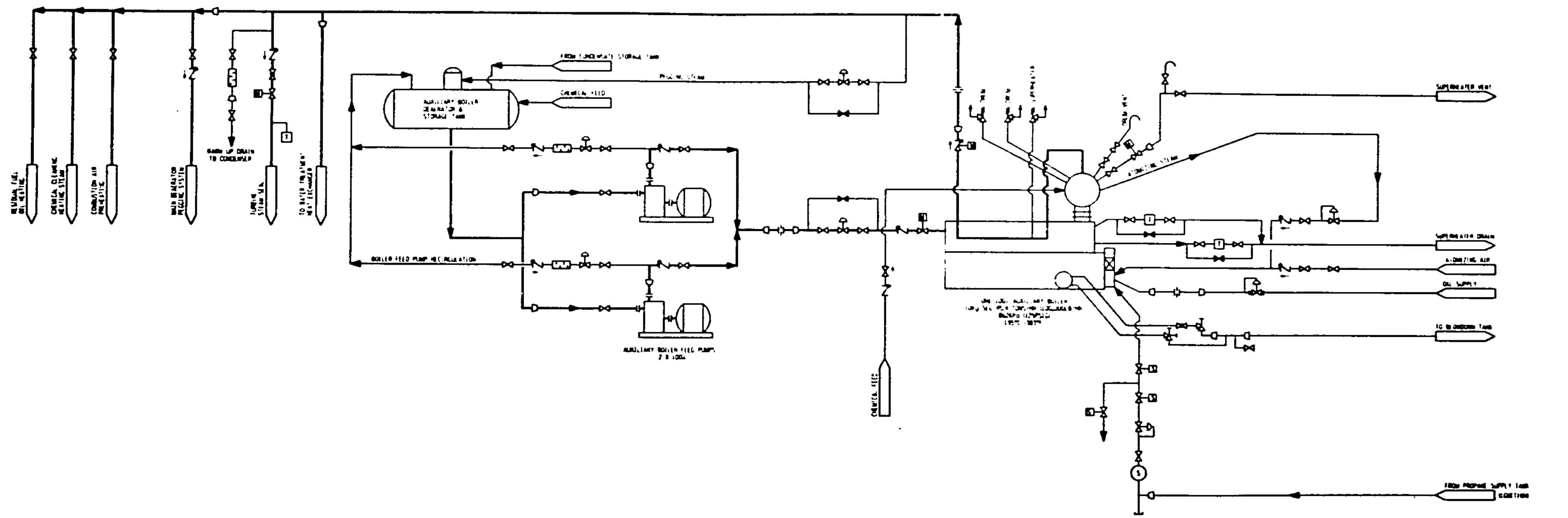


FIGURE 5.5.4 XI-1

R.T. UTTER P.E.

PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY
LAKHRA POWER FEASIBILITY PROJECT

TITLE
FEASIBILITY STUDY
AUXILIARY STEAM DIAGRAM

SCALE NONE | 64-0759-000 | M-5 | 1

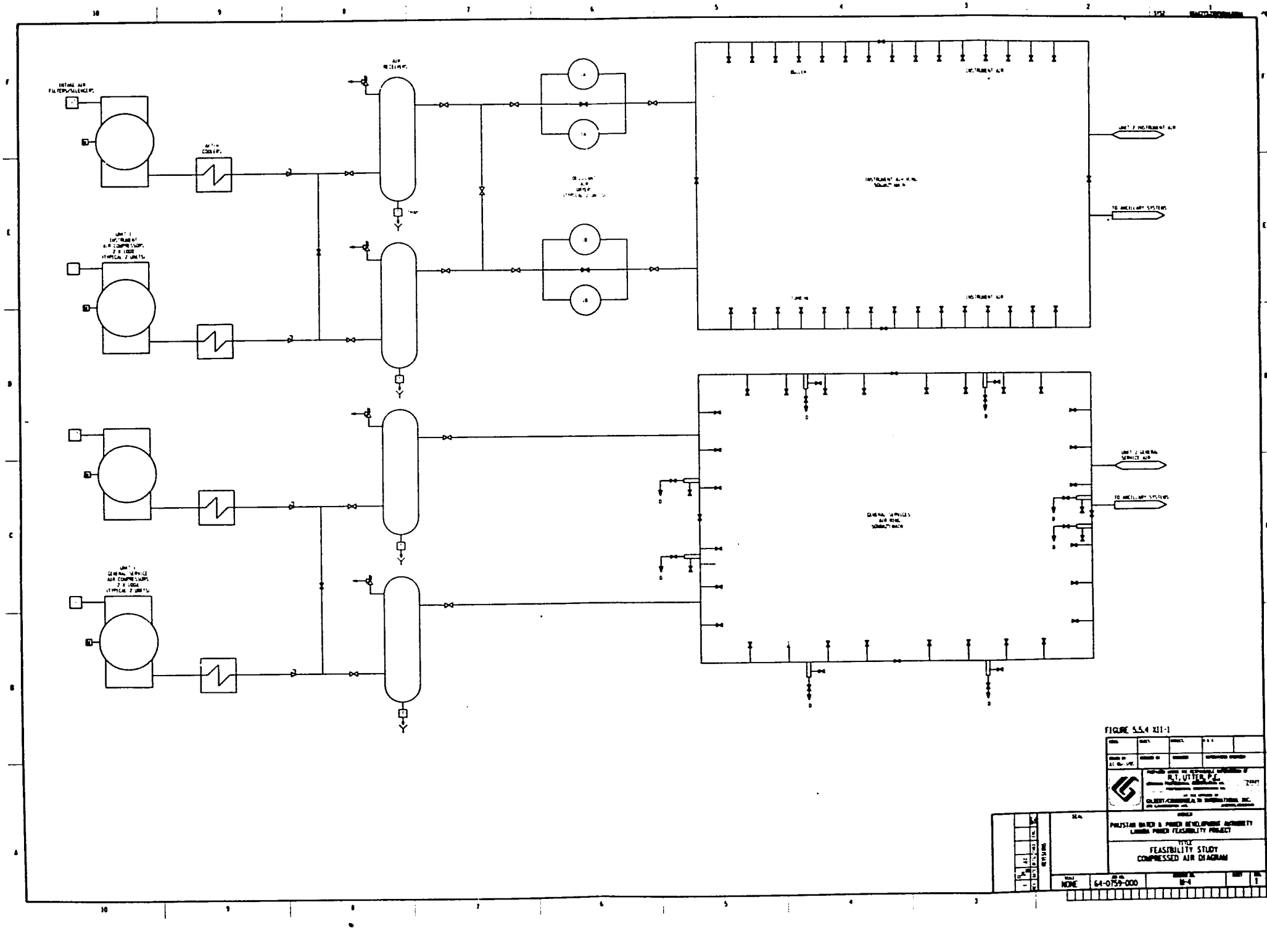


FIGURE 5.5.4 XII-1

PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY
LAKHRA POWER FEASIBILITY PROJECT

FEASIBILITY STUDY
COMPRESSED AIR DIAGRAM

NONE | 64-0759-000 | W-4 | 1

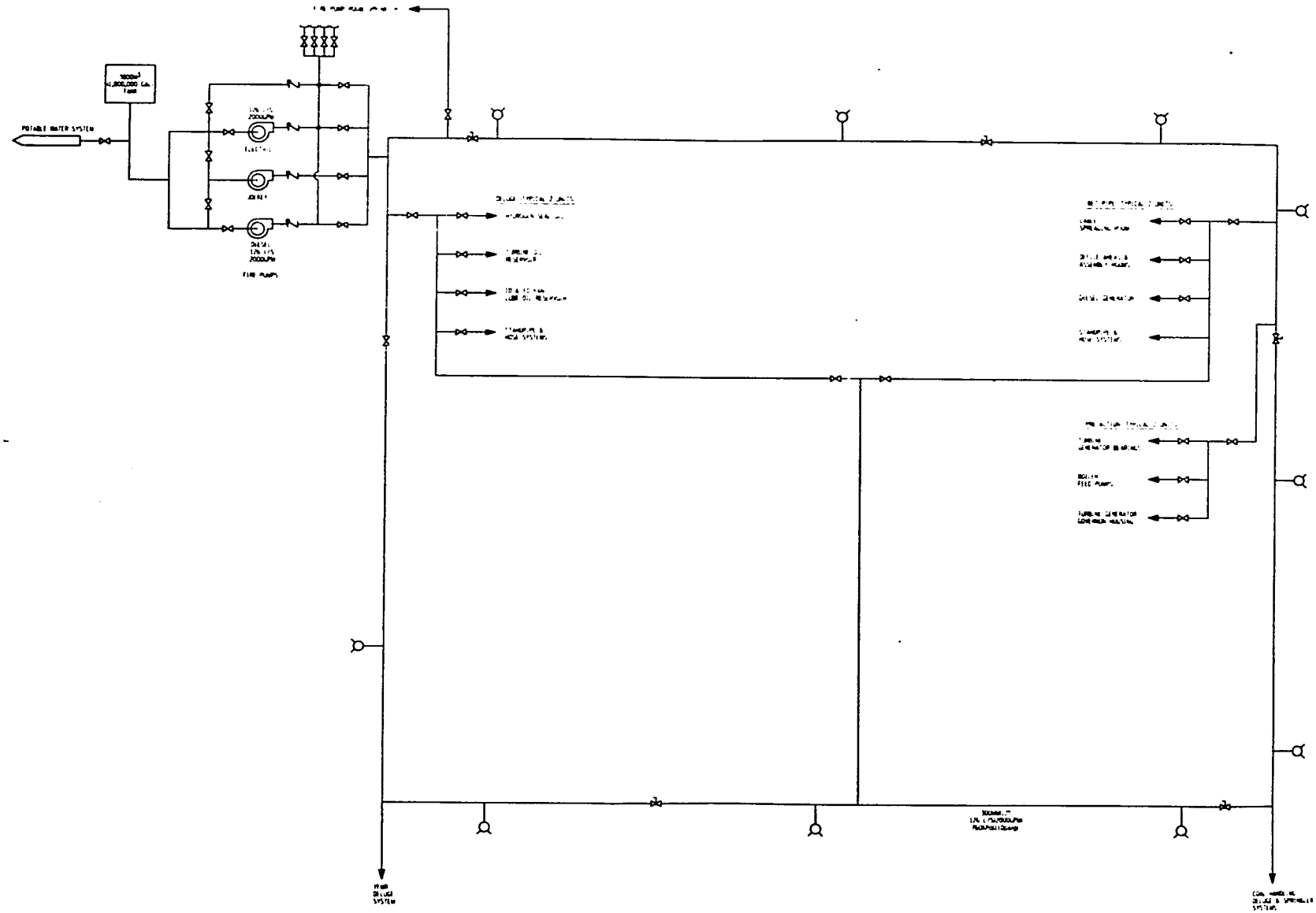
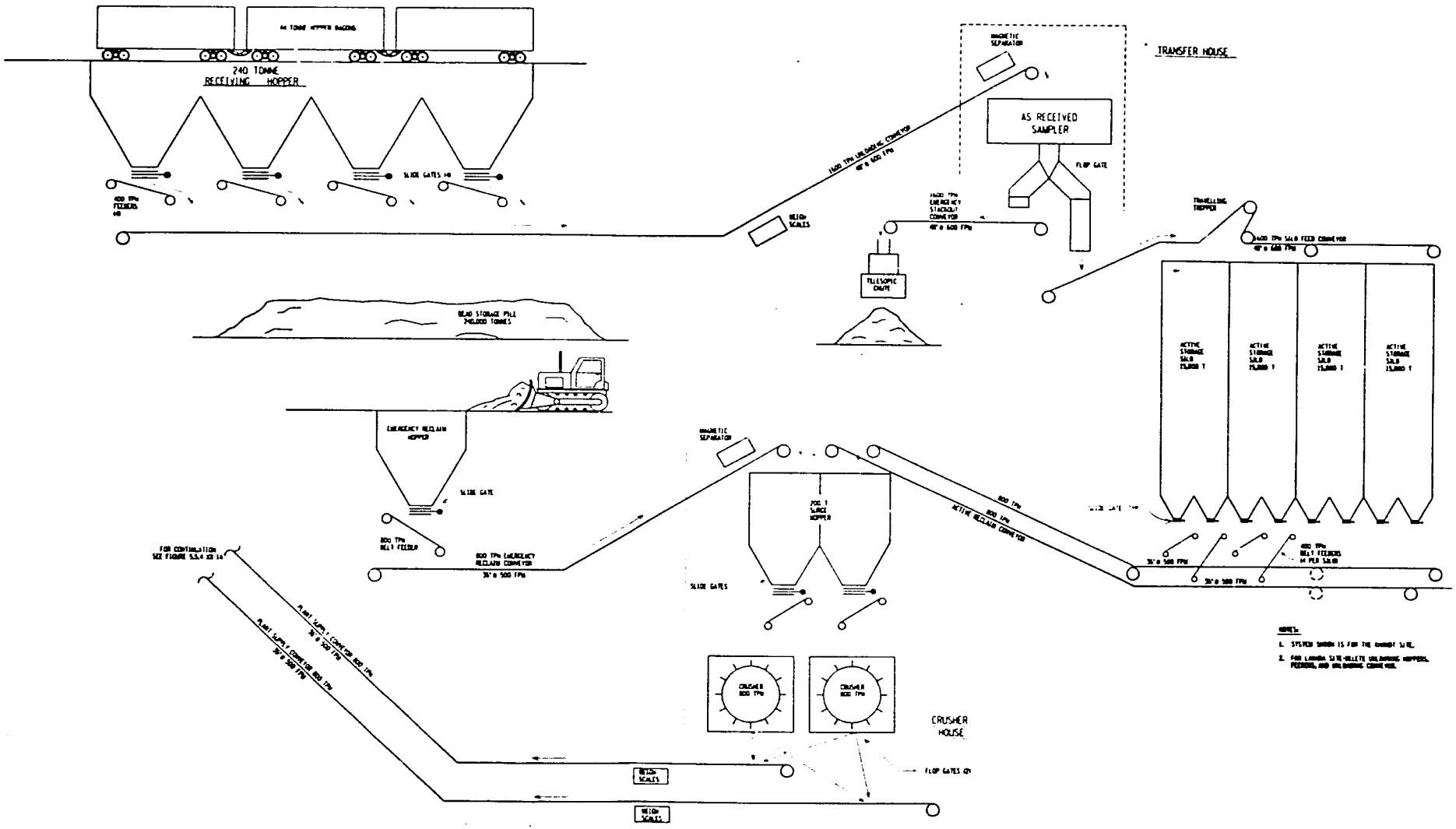


FIGURE 5.5.4 XVI-1

PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY
LAKHRA POWER FEASIBILITY PROJECT

FEASIBILITY STUDY
FIRE PROTECTION SYSTEM DIAGRAM

SCALE	JOB NO.	DRAWING NO.	REV.	SHT.
NONE	64-0759-000	M-3		1



NOTES:

1. SYSTEM SHOWN IS FOR THE CHOSEN SITE.
2. FOR LAKHRA SITE-ULLETE UNLOADING HOPPERS, FEEDERS, AND UNLOADING CONVEYOR.

FIGURE 5.5.4 XX-1

L.C.THORNTON, P.E.

OWNER
PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY
LAKHRA POWER FEASIBILITY PROJECT

TITLE
LAKHRA POWER PROJECT
COAL FLOW DIAGRAM

SCALE	JOB NO.	DRAWING NO.	SHEET	REV.
	64-0759-000	0759-1-241-002	001	

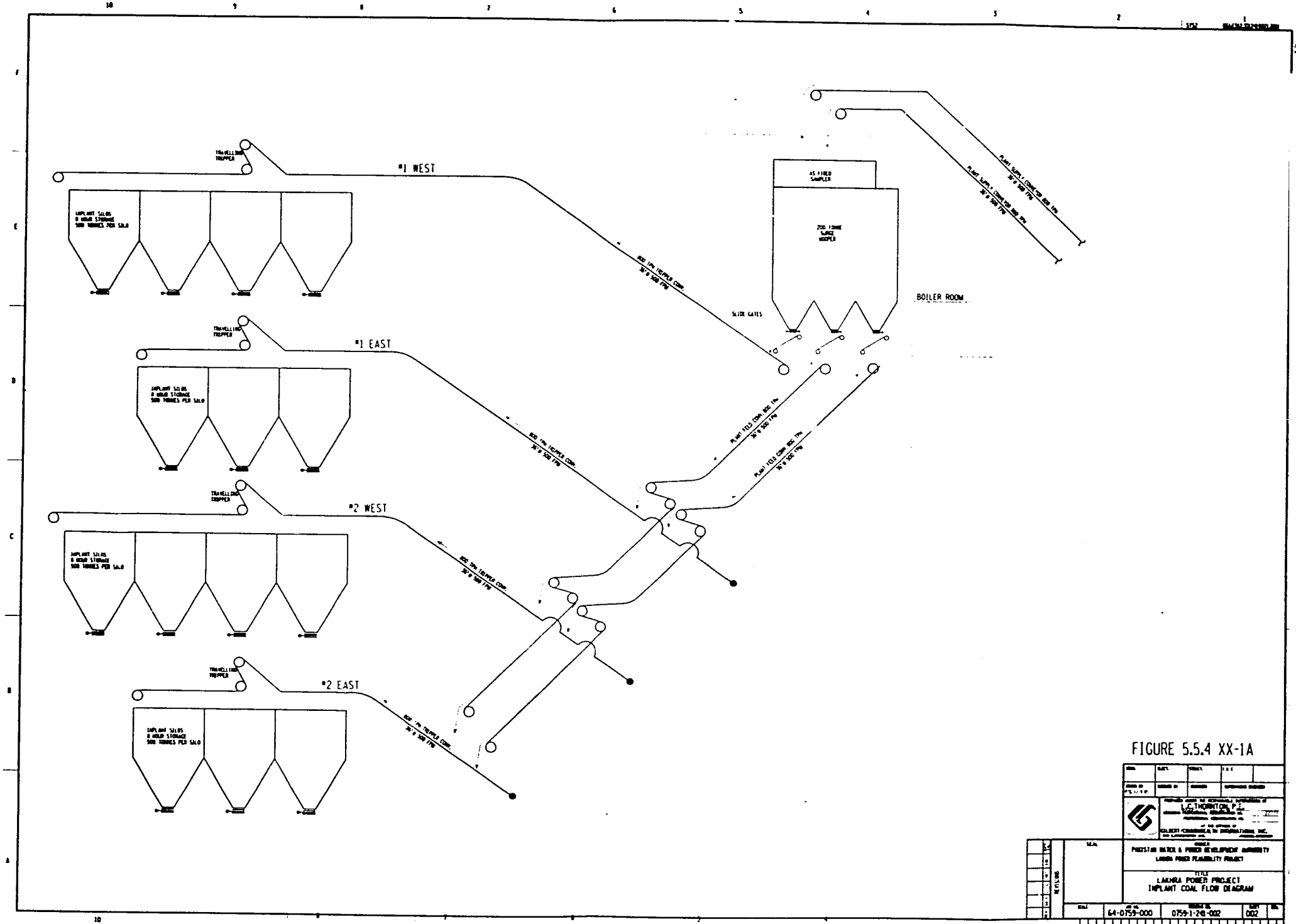


FIGURE 5.5.4 XX-1A

L.I. THORNTON P.E.

PREPARED UNDER THE RESPONSIBLE SUPERVISION OF

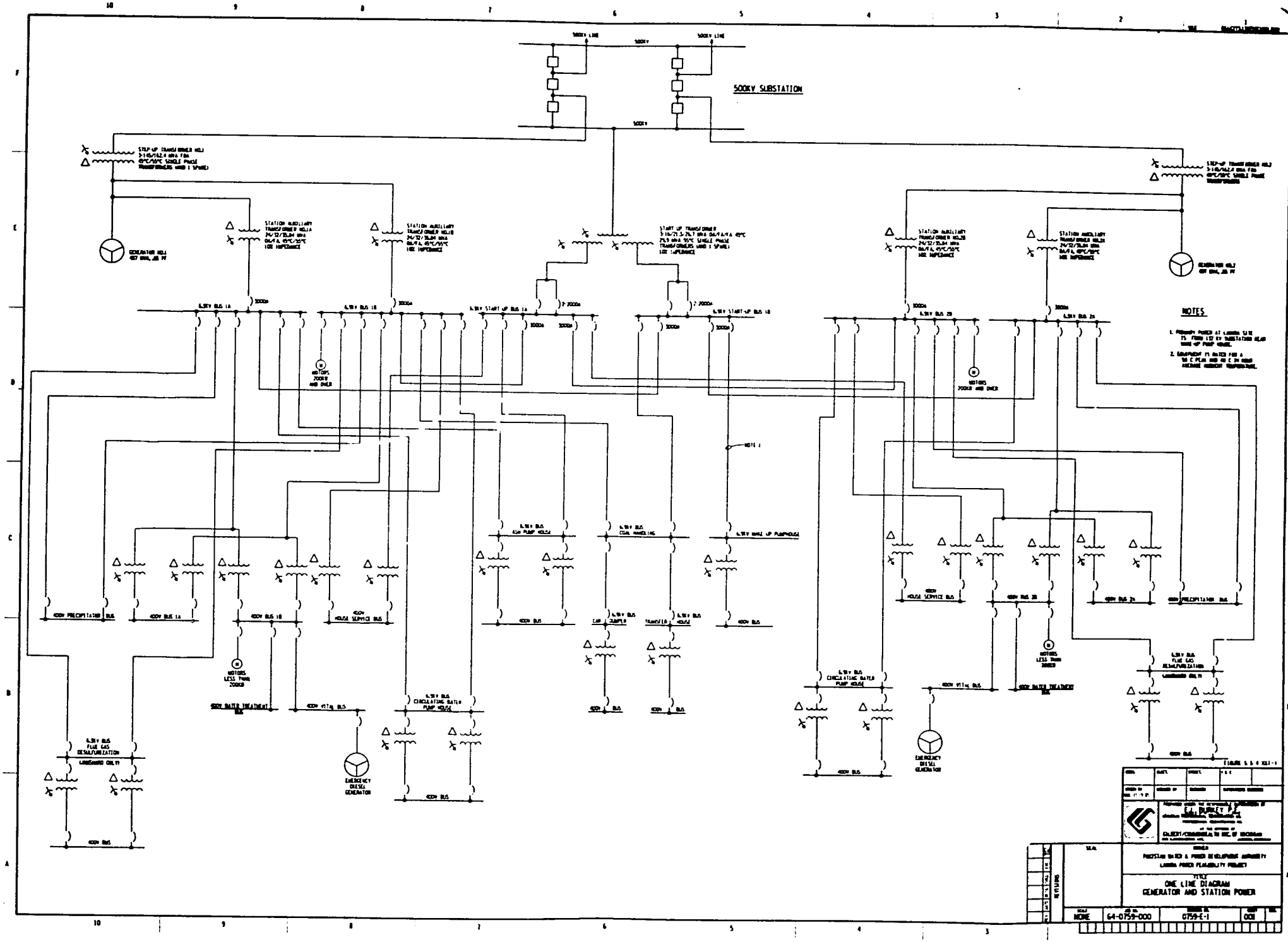
CLIENT: PRINCE RUPERT DEVELOPMENT CORPORATION

PROJECT: PRINCE RUPERT WATER & POWER DEVELOPMENT AUTHORITY
LAKHRA POWER FEASIBILITY PROJECT

TITLE: LAKHRA POWER PROJECT
INPLANT COAL FLOW DIAGRAM

SCALE: NTS | JOB No. 64-0759-000 | DRAWING No. 0759-1-241-002 | REV. 002

Single Line Diagrams


500KV SUBSTATION
NOTES
PRESTON SMITH & PEIRCE ENGINEERS
LABRA POWER FEASIBILITY PROJECT
ONE LINE DIAGRAM
GENERATOR AND STATION POWER
64-0759-000
0759-E-1

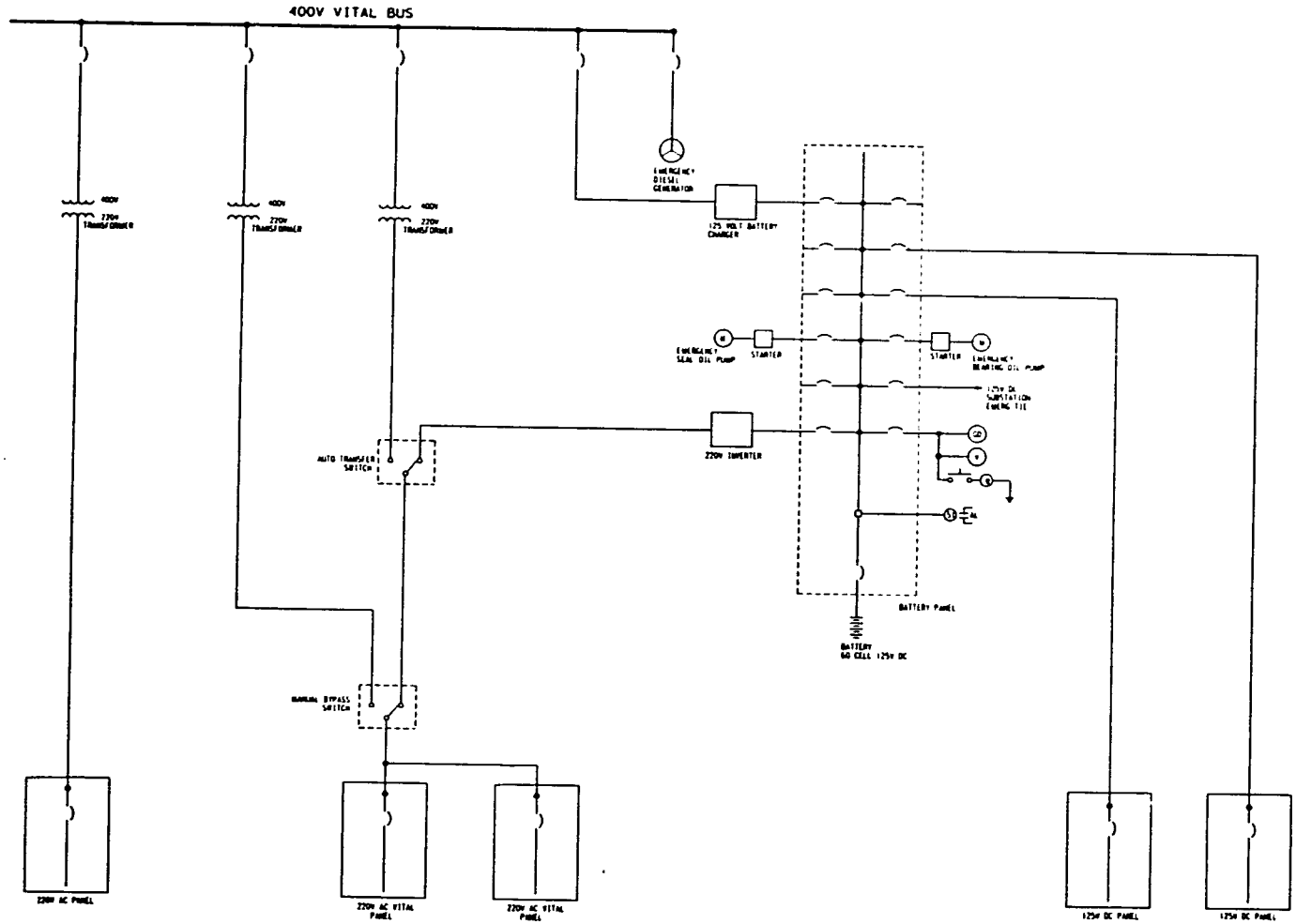


FIGURE 5.5.4 (CII)-1

PREPARED UNDER THE SUPERVISION OF
P.L. BURKEY P.E.

OWNER
PHILSIGEN OILFIELD & POWER DEVELOPMENT AUTHORITY
LAGUNA POWER FEASIBILITY PROJECT

TITLE
ONE LINE DIAGRAM
EMERGENCY POWER SYSTEM

SCALE	JOB NO.	DRAWING NO.	SHT	REV
NONE	64-0759-000	0759-E-1	002	