MEETING SUMMARY DISTRIBUTION

Docket
NRC PDR
Local PDR
ORB Reading
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HRDenton
EGCase
DEisenhut
RPurple
RTEdesco
TNovak
GLianas
Jolshinski
GZech
JHeltemes, AEOd
CThayer
SVArga
BClark
TIppolito
RReid
Crutchfield
SNowicki
OELD
OI&E (3)
OSD
NRC Participants
NSIC
TERA
ACRS (16)

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

September 22, 1980

Docket No. 50-206

LICENSEE: Southern California Edison Company

FACILITY: San Onofre Unit No. 1

SUBJECT: SUMMARY OF JULY 31, 1980 MEETING TO DISCUSS SLEEVING OF THE SAN ONOFRE UNIT NO. 1 STEAM GENERATOR TUBES

NRC and Southern California Edison (SCE) representatives met in Bethesda, Maryland, on July 31, 1980, to discuss the sleeving design concept for steam generator tube repair and plans to decontaminate the steam generator bowl prior to sleeving. The meeting attendees are listed in Attachment 1.

SCE requested the meeting to present details of the design concept of sleeving steam generator tubes with leak-tight sleeves as a repair mechanism for tubes that had undergone intergranular attack. In addition, SCE representatives presented data and a description of their proposed method of decontaminating the steam generator bowl with a hydro grit stream composed of water and magnitite.

A copy of the material presented at the meeting (minus Westinghouse proprietary data) is enclosed in Attachment 2.

The major items discussed during the meetings are summarized below:

1. The NRC staff indicated some of their concerns related to the sleeving process that need to be addressed. These concerns included: inspectability of sleeved tubes; leak tightness of the sleeves; mechanical strenght of sleeved tubes; radiological exposure to workers during the repair program; pluggability of sleeved tubes; and effects of stagnation of secondary water between the sleeve and tube.

2. The sleeves installed at Palisades were of a different design than proposed for San Onofre Unit 1. The Palisades sleeves were not designed as leak tight.

3. Cold leg inspections had been performed and four (4) tubes had indications of Phosphate thinning. Approximately 1400 tubes were inspected previously and 107 tubes examined during this inspection.

4. Pressure testing was performed on 25 tubes in the hot leg up to 3000 psig and no tubes leaked. The tubes are designed for a differential pressure of 2200 psig following an accident.

5. SCE preposes to sleeve approximately 2500 tubes per steam generator or approximately 7500 tubes out of the 11,382.

6. SCE has performed an evaluation and has concluded that the sleeving does not constitute an unreviewed safety question.

7. SCE has estimated that worker exposures will be 250 man rem for inspection plus tube pulling and approximately 1000 man rem for steam operator repair. ALARA aspects will be covered in the August 15, 1980 meeting.

8. The NRC staff wants design details on the mechanical plugs in time to include this aspect in our review.

9. SCE requested NRC approval to install sleeves and any remaining concerns by September 10, 1980. SCE plans to return San Onofre Unit 1 to power about November 1, 1980.

Stanley J. Nowicki, Project Manager
Operating Reactors Branch #5
Division of Licensing

Attachments:
As stated

OFFICE ▶	DL: ORB#5	DL: ORB #5				
SURNAME ▶	SNowicki:cc	DCrutchfield				
DATE ▶	9/19/80	9/22/80				

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Stanley J. Nowicki

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Operating Reactors Branch #5
Division of Licensing

Attachments:
As stated

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Mayor
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San Clemente, California 92672

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Board of Supervisors
County of San Diego
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California Department of Health
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Division
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ATTACHMENT 1

ATTENDANCE

1.	S. J. Nowicki	NRC
2.	R. W. Krieger	SCE
3.	E. G. Igne	NRC
4.	C. Y. Cheng	NRC
5.	B. L. Curtis	SCE
6.	W. J. Collins	NRC
7.	F. Almeter	NRC
8.	B. Turovlin	NRC
9.	C. Hinson	NRC
10.	J. Wing	NRC
11.	B. D. Liaw	NRC
12.	S. S. Pawlicki	NRC
13.	G. Georgiev	NRC
14.	R. Dermann	NRC
15.	D. Huang	NRC
16.	E. Murphy	NRC
17.	R. Emch	NRC
18.	F. Witt	NRC
19.	L. Barrett	NRC
20.	E. Brown	NRC
21.	H. Conroad	NRC
22.	L. Frank	NRC
23.	D. Meoli	NSD W
24.	P. Dtosa	W NSD
25.	T. Timmons	W NTD
26.	A. Klein	W NTD
27.	E. Murphy	W BLO
28.	C. Hirst	W NSD
29.	J. Taylor	W NSD
30.	P. Matthews	NRC

ATTACHMENT 2

SCE MEETING WITH NRC

JULY 31, 1980

AGENDA

INTRODUCTION	SCE
PROGRAM PLAN STATUS UPDATE	SCE
DECONTAMINATION PROCESS	W
STEAM GENERATOR TUBE SLEEVING PROCESS	W
LICENSING CONSIDERATIONS	SCE
SUMMARY	SCE

ACTIONS

- CONTINUE RPC EDDY CURRENT TESTING
- INDIVIDUAL PRESSURE TEST 5 LEAKERS IN SG-C
- INDIVIDUAL PRESSURE TEST TUBES (TEST FIRST WITH RPC)
- PULL TUBES (TEST FIRST WITH RPC)
- RCS PRESSURE TEST OF BUNDLE
- SS PRESSURE TEST OF BUNDLE
- PLUG TUBES
- CHEMISTRY FLUSHING
- INSTITUTE CHANGES IN CHEMISTRY CONTROL
- REDUCED CONDITIONS OPERATIONS
- REPAIR

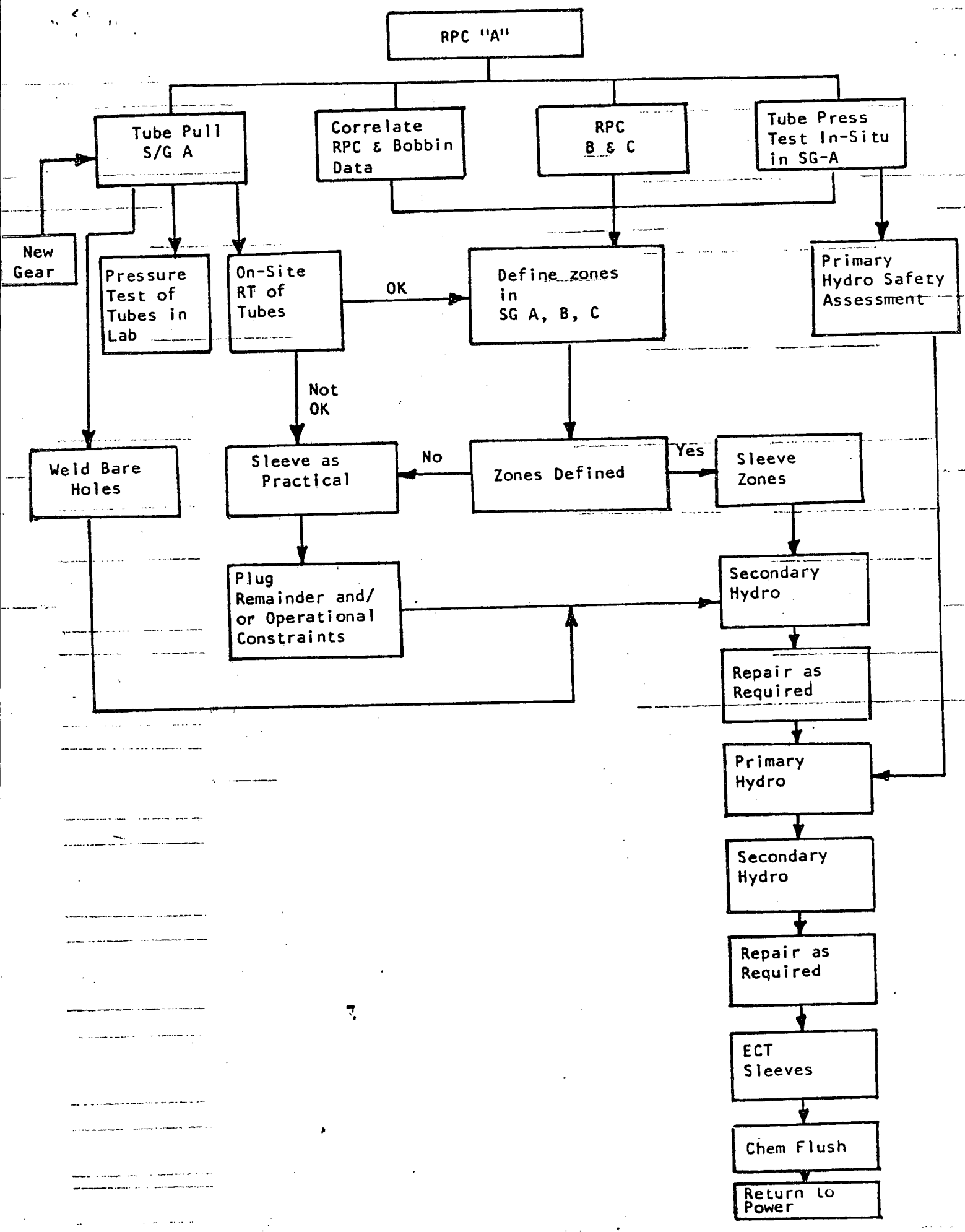
OVERALL OBJECTIVE : Return the unit to power at earliest date consistent with safe operation.

REFERENCE APPROACH : Install leak tight sleeves in the largest number of tubes consistent with logistics and channel head access, with the intent to return the unit to 100% power operation.

ALTERNATE APPROACH : Mechanically plug the minimum number of tubes consistent with safe operation. Unit will be returned to operation at reduced conditions to arrest corrosion in unplugged tubes.

OPERATIONAL BASIS : Proceed in parallel with the following major tasks

- o Define zones for repair by means of eddy current testing, tube removals, individual tube pressure tests and primary hydro of tube bundle
- o Develop sleeving process and installation procedure
- o Design and qualify temporary plug to permit recovery of tubes removed from operation
- o Proceed with expedited production of 3/4" conventional plugs
- o Adapt abrasive DeCon System for operation in Model 27 SG's

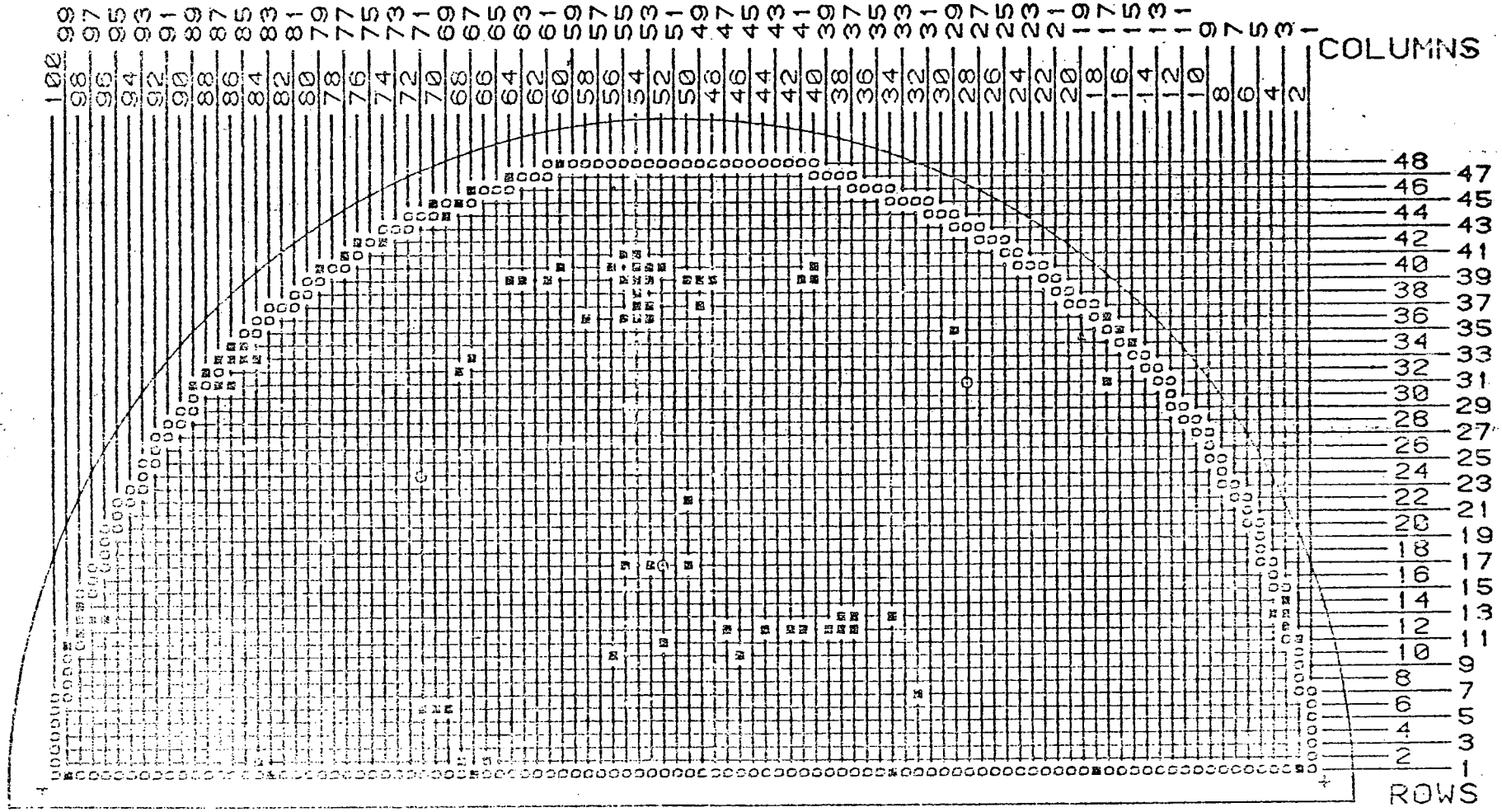

RPC "A"
Tube Pull S/G A
Correlate RPC & Bobbin Data
RPC B & C
Tube Press Test In-Situ in SG-A
New Gear
Pressure Test of Tubes in Lab
On-Site RT of Tubes
OK
Define zones in SG A, B, C
Primary Hydro Safety Assessment
Not OK
Weld Bare Holes
Sleeve as Practical
No
Zones Defined
Yes
Sleeve Zones
Plug Remainder and/ or Operational Constraints
Secondary Hydro
Repair as Required
Primary Hydro
Secondary Hydro
Repair as Required
ECT Sleeves
Chem Flush
Return to Power

SUMMARY OF TUBE EXAMINATION

R24-C71 (DISTORTED DENT)	95% MAX. WALL PENETRATION SEM & MET. COMPLETE
R31-C28 (GRAY TUBE)	∿70% MAX. WALL PENETRATION SEM & MET. COMPLETE
R13-C67 (DISTORTED DENT)	∿90% MAX. WALL PENETRATION SEM & MET. COMPLETE IGA ∿250°
R11-C69 (NON DISTORTED DENT)	∿90% MAX. WALL PENETRATION SEM & MET. COMPLETE IGA ∿180°
R32-C71 (LARGE DENT)	EXAMINATION IN PROGRESS IGA >50% BY VISUAL EXAMINATION
R14-C70 (NORMAL T/S SIGNAL)	BURST TEST COMPLETE 15,000 PSI MAX. PRESSURE ∿1/8" LONGITUDINAL CRACK VISUAL EXAMINATION COMPLETE ∿50-60% WALL PENETRATION BY VISUAL EXAMINATION
R17-C52 (CREVICE INDICATION)	∿80% MAX. WALL PENETRATION MET. COMPLETE

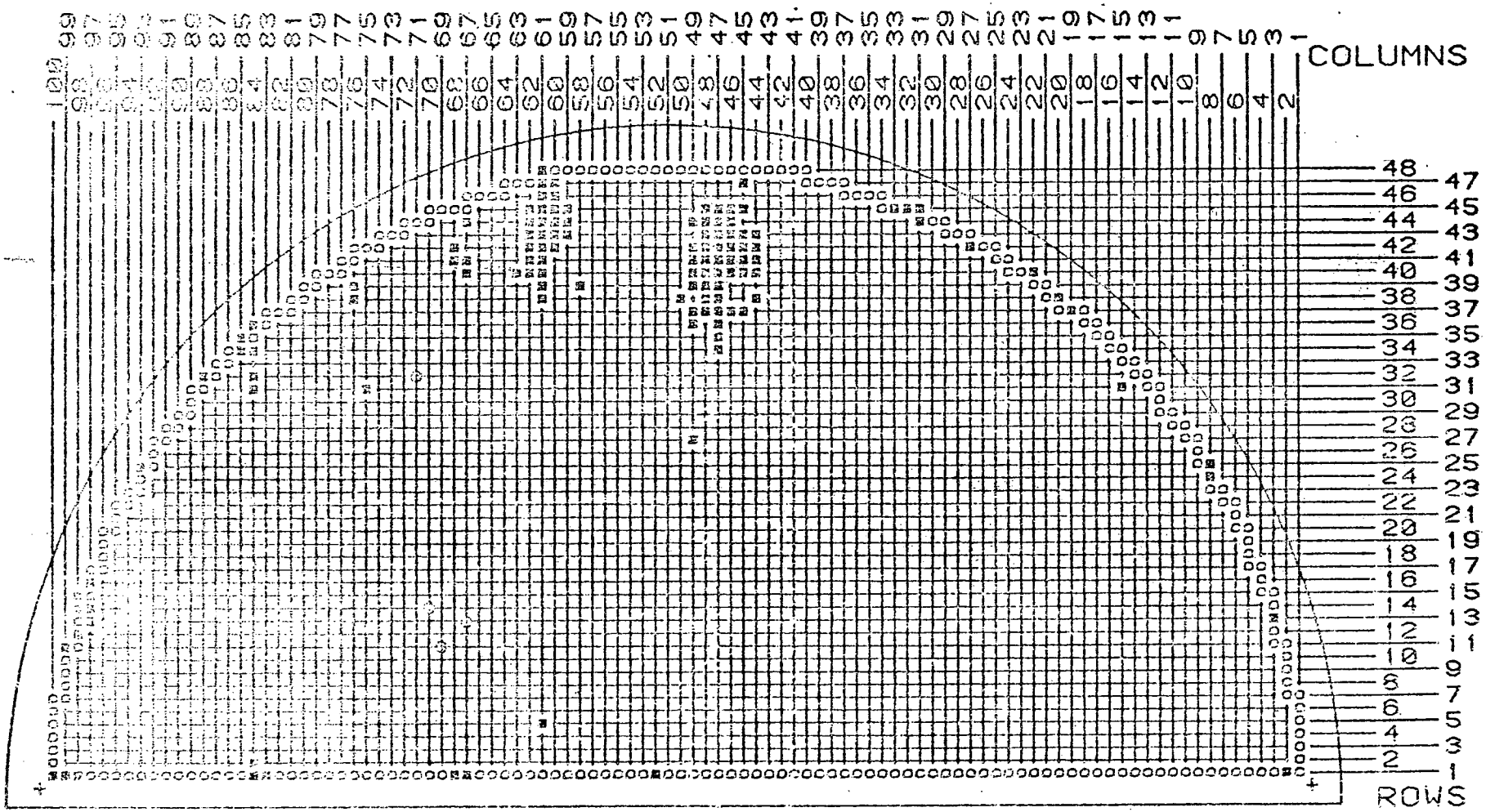
SERIES 27

SCE-A



SERIES 27

SCE-C



○ TUBES REMOVED-4(INLET)

▪ PLUGGED PRIOR TO APRIL, 1980

TUBE REMOVAL AND EXAMINATION

Reasons:
1. To verify RPC data
2. To provide sludge free sample for burst test in laboratory
3. To outline boundary for sleeving

Sample Removal:

Samples #1 & 2: Periphery tube, judged to have a small dent, but in good condition, i.e., <20% wall penetration. This tube will be used to obtain information to support items #1 and #3 above.

Samples #3, 4, & 5: Tubes judged to have penetration of <20%, 35%, and 62% as determined by RPC. Examinations and laboratory burst tests of these tubes will be used to support items #1 and #2 above.

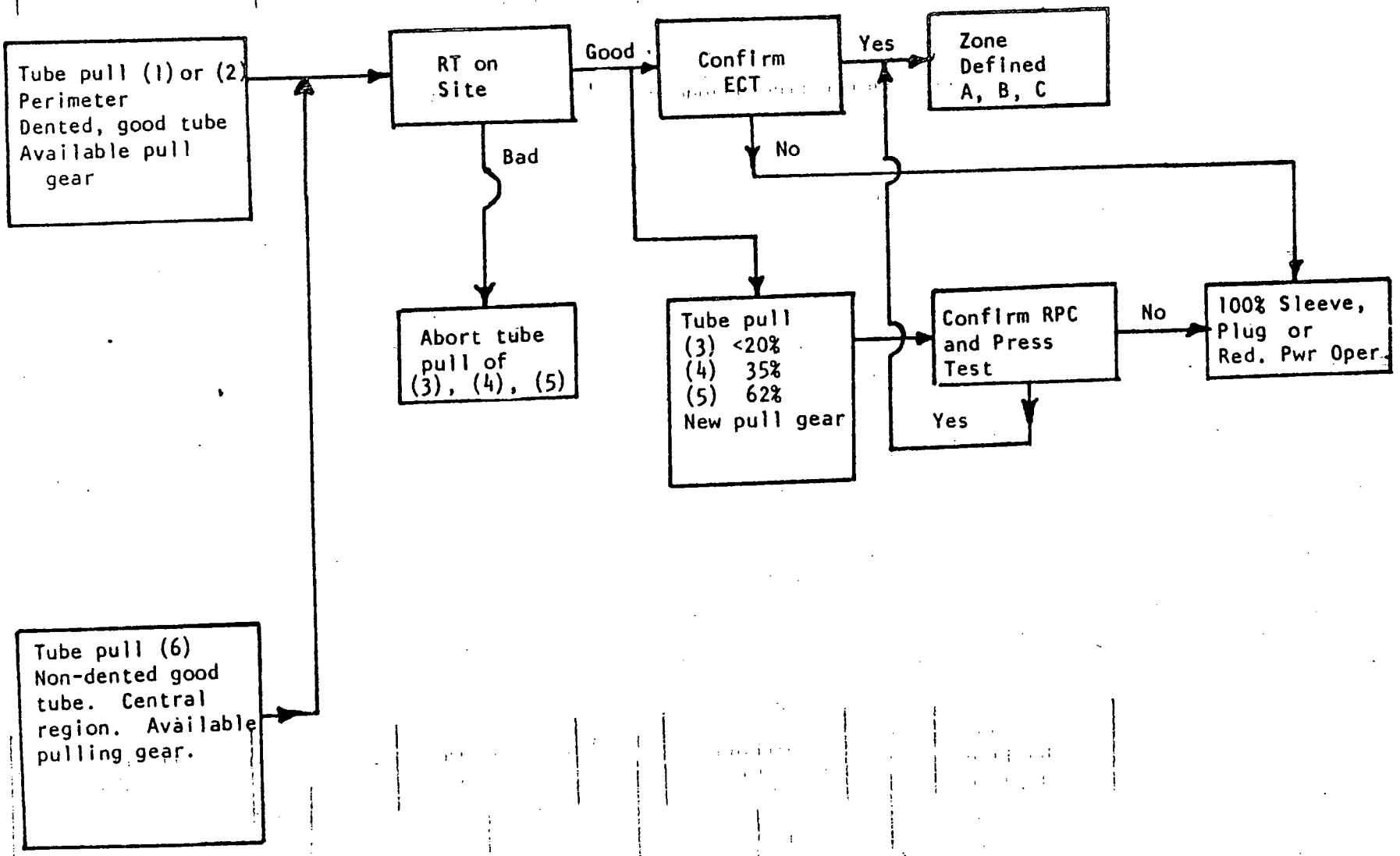
Sample #6: Central region tube judged to be a non-dented "good" (NDD) by RPC. Examination of this tube will be used to support items #1 and #3 above.

Logic:

Sample #1 will be removed first and a preliminary examination undertaken on site. This examination will consist of Visual Examination, Radiography, and Eddy Current testing. The result of this examination will enable a preliminary evaluation to be made on the validity of RPC and the condition of the corrosion free periphery area.

Sample #6 will be removed second to establish the condition of the central corrosion free region.

If sample #1 & #6 agree with expected results, tubes #3, 4, 5 and 2 will then be removed to obtain further confidence in the RPC data and to obtain representative tubes for laboratory pressure/leak rate/burst tests. If sample #1 and #6 do not agree with expected results, tubes #3, 4, 5 and 2 will not be removed since there will be uncertainty as to the actual tube condition and the RPC data is judged to be suspect.



SAN ONOFRE UNIT 1 TUBE PULL

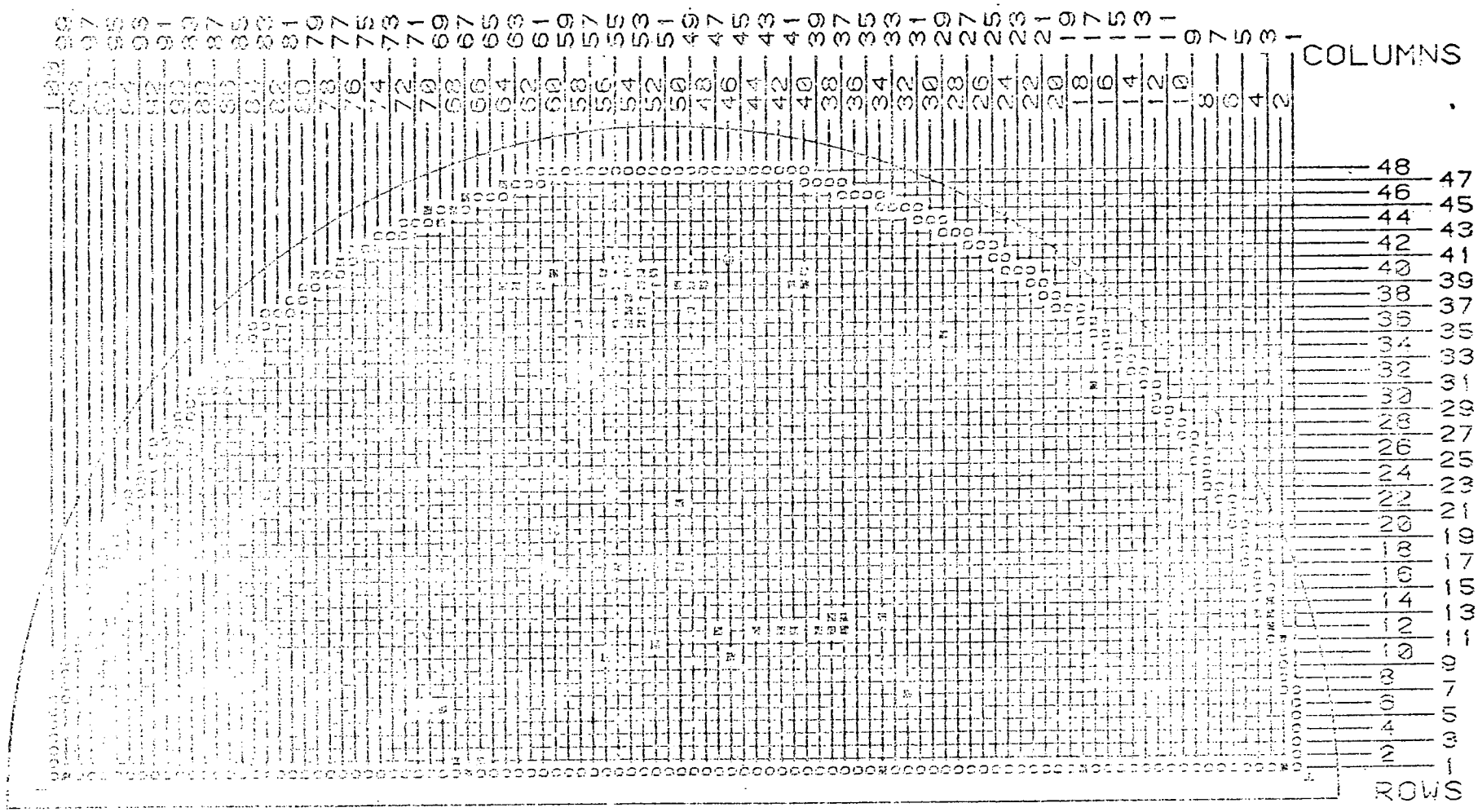
SAN ONOFRE #1

TUBE PULL CANDIDATES

CANDIDATE No.	SG/R-C	BOBBIN			RPC
		400 kHz	100 kHz	Mixed	%
#1	A-R23C83	Med.Dent	Yes	Med.Dent	NDD
#2a	A-R22C83	Med.Dent	Yes	Med.Dent	NDD
#2b	A-R22C84	Sm. Dist. Dent	Yes	Sm. Dent	NDD
#3	A-R12C70	Sm. Dent	Yes	Sm. Dent	20%
#4a	A-R15C70	Sm. Dist. Dent	Yes	Sm. Dist. Dent	35%
#4b	A-R20C85	Med.Dent	Yes	Med.Dent	38%
#5	A-R17C61	Sm. Dent	Yes	Dist.Dent	62%
#6	A-R20C60	Normal Entry	NDD	NDD	NDD

SERIES 27

SCE-A



○ TUBES REMOVED-6(INLET) 1(OUTLET)

* PLUGGED PRIOR TO APRIL, 1980

COLD LEG TUBE REMOVAL AND EXAMINATION

Reasons: To determine the need for additional tubing and to establish the need for sleeving the cold leg side of the steam generators.

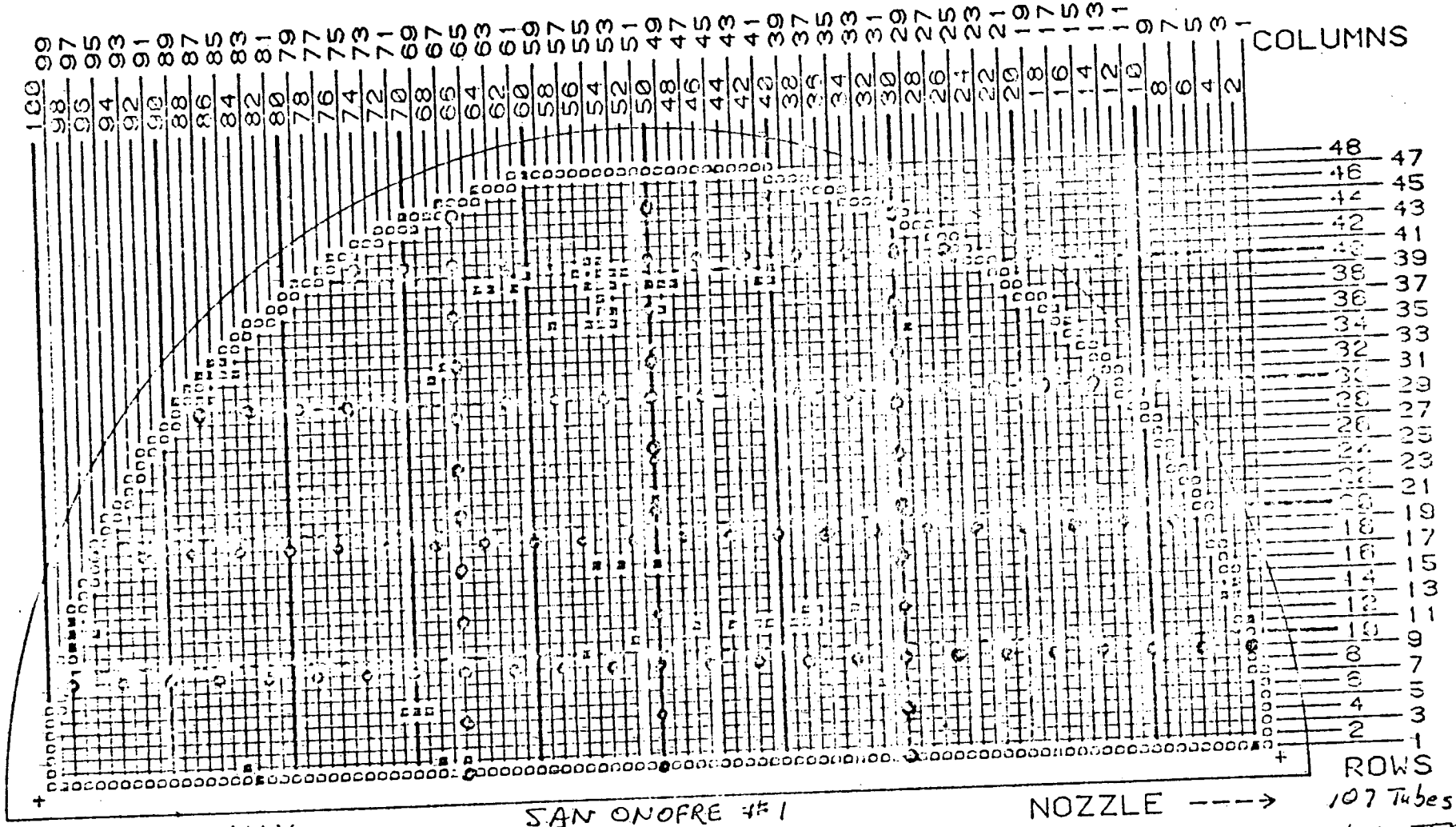
Sample Removal: The sample to be removed should be one showing a large indication by bobbin and/or R.P.C.

Logic: The sample will be removed in a manner that will expedite on site determination of tube conditions. This on site examination will consist of radiography, eddy current and visual examination. This examination will provide the basis for a decision regarding immediate tube procurement. The tube will then be sent to Pittsburgh for a more critical examination to determine its condition.

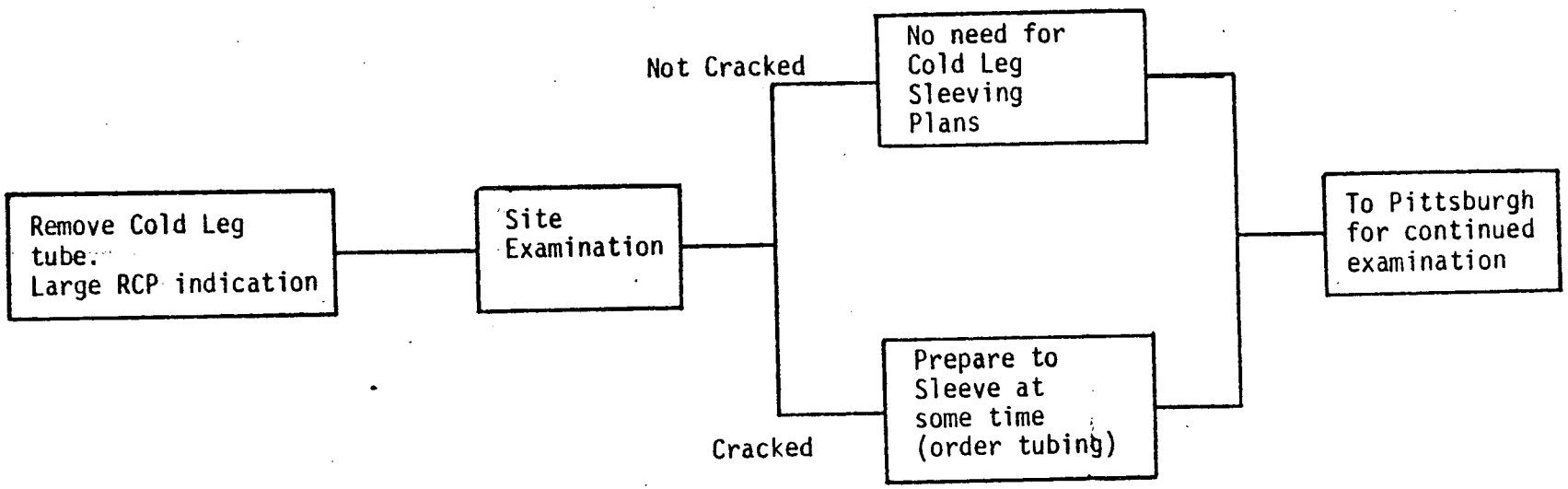
Logic Chart: See attachment.

SERIES 27

SCE-A



COLD LEG TUBE REMOVAL



INDIVIDUAL PRESSURE TESTS

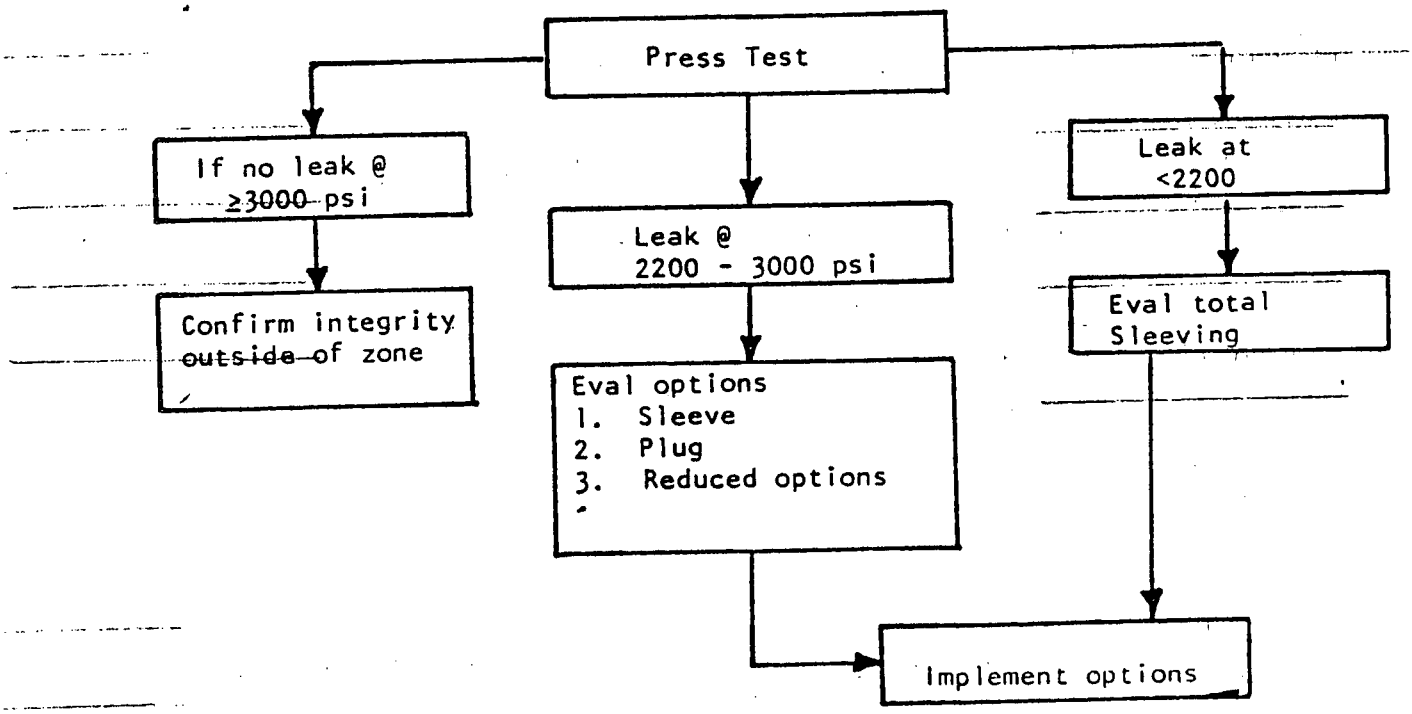
1. Define good tubes/zone boundaries.

   Pressurize to ≥3000 psig
   If no leak, tube can withstand accident conditions
   If tube leaks, evaluate options

   a) Sleeve
   b) Plug
   c) Operate at reduced conditions
   d) Combinations of a) to c).

2. Establish integrity of corroded tube

   a) In good zones
   b) In active zones



SCE #1/A TUBE PRESSURE TEST SELECTION

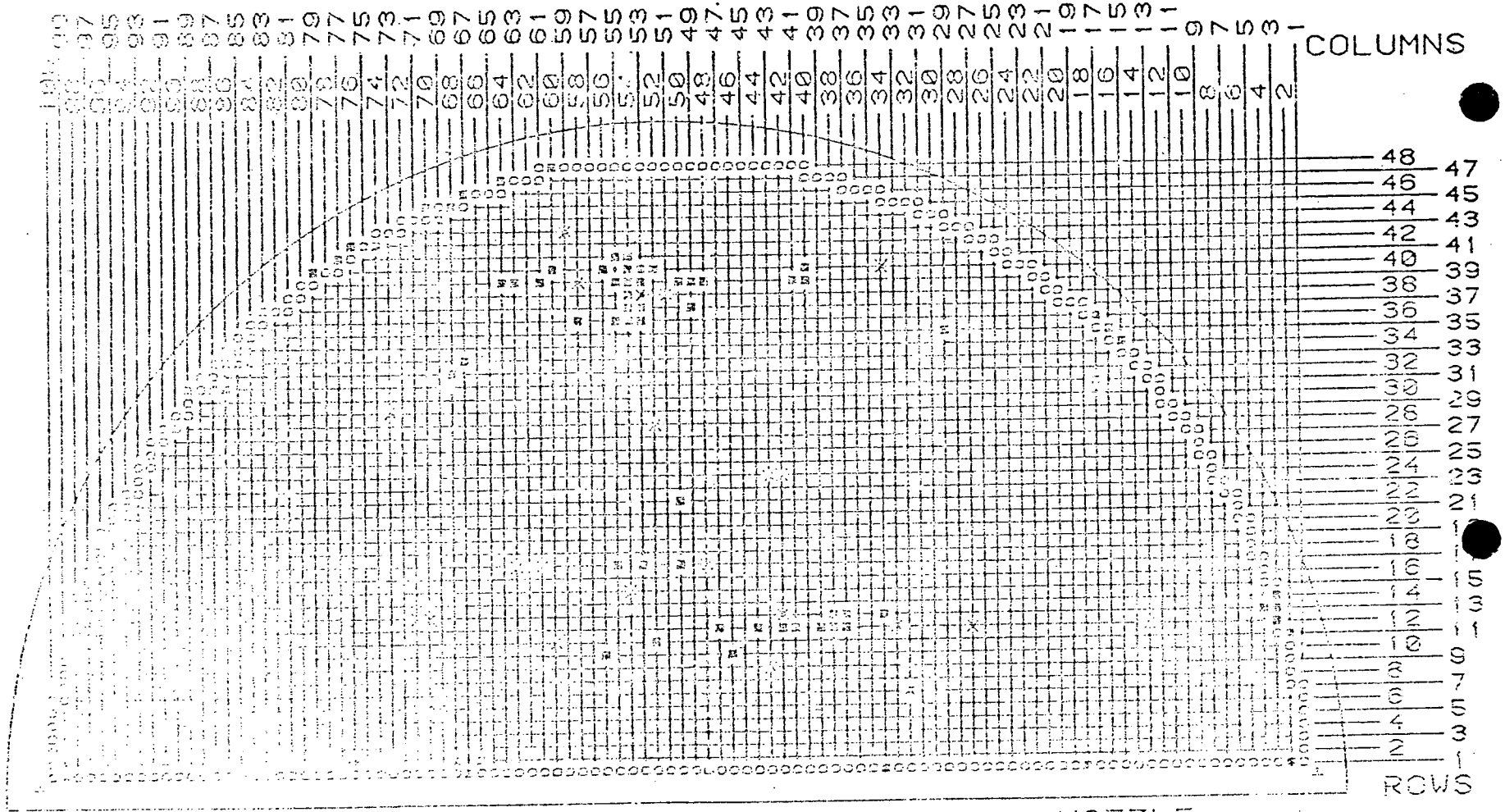
	R-C	RPC %	RPC Arc°	CONV.	TYPE
ZONE 1	A-13-70	55%	220°	NDD	1
	13-71	89	240	NDD	2
	11-60	97	350	NDD	4
ZONE 2	A-12-33	50%	180°	NDD	1
	13-42	86	240	80%	2
	9-43	97	180	45%	3
	12-27	<20	90	NDD	5
ZONE 3	A-24-39	69%	120°	NDD	1
	24-43	64	150	NDD	1
	24-42	83	120	NDD	2
	17-63	96	180	NDD	3
	17-48	94	210	NDD	4
ZONE 4	A-35-47	55%	90°	NDD	1
	38-51	88	210	NDD	2
	38-53	91	180	33%	3
	39-58	96	150	NDD	3
	29-73	96	360	NDD	4
ZONE 5	A-34-76	NDD	-	NDD	5
	43-59	NDD	-	NDD	5
	40-34	NDD	-	NDD	5
	28-18	NDD	-	NDD	5
	12-13	NDD	-	NDD	5
	8-90	NDD	-	NDD	5
ZONE 6	A-15-54	NDD	-	NDD	5
	28-52	NDD	-	NDD	5

ZONE 1 - S/L Accessible Manway
2 - S/L Accessible Nozzle
3 - Quiet Centre
4 - Active Zone R34-40 C40-60
5 - Outer Periphery
6 - Central

TYPE 1 - <80%
2 - 80-90 Large Arc Length
3 - 90-100 Small Arc Length
4 - ≥94% Large Arc Length
5 - ≤20 or NDD

SERIES 27

SCE-A



* PUMPS TESTED-22
* PUMPED PRIOR TO APRIL, 1980

BASIS FOR DEFINING ACTIVE/INACTIVE ZONES

1) Plot RPC and bobbin EC data. Define zones encompasing all indications at top of tubesheet - SG-A.

2) Validate zone boundaries with results of tube pressure tests and tube pull results.

3) Obtain RPC data for B and C and repeat step 1).

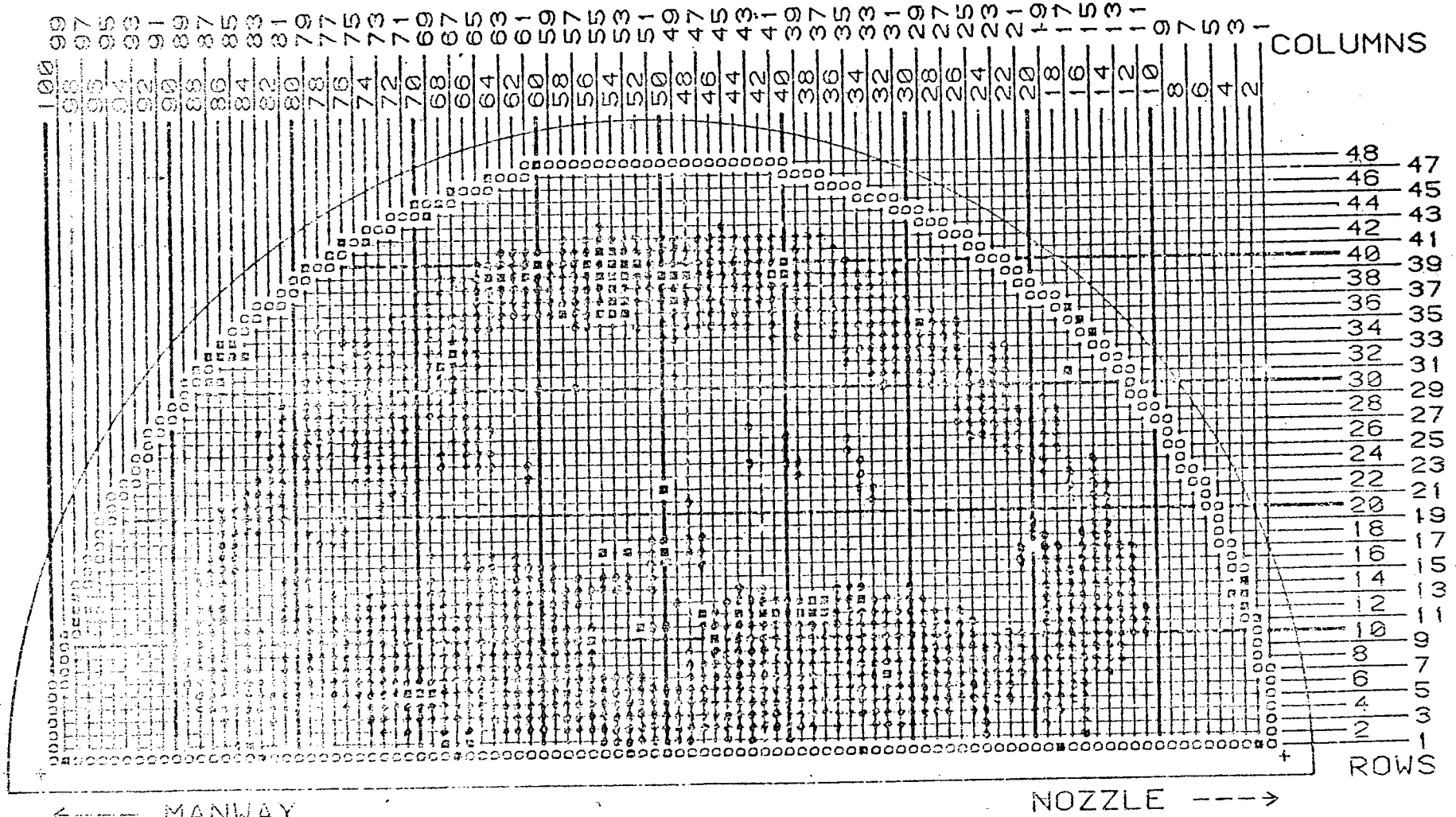
4) Establish zone boundaries with similitude arguments from SG-A tube pressure tests and tube removal results

5) Confirm by results of primary hydro tests.

SERIES 27

SCE-A

INLET

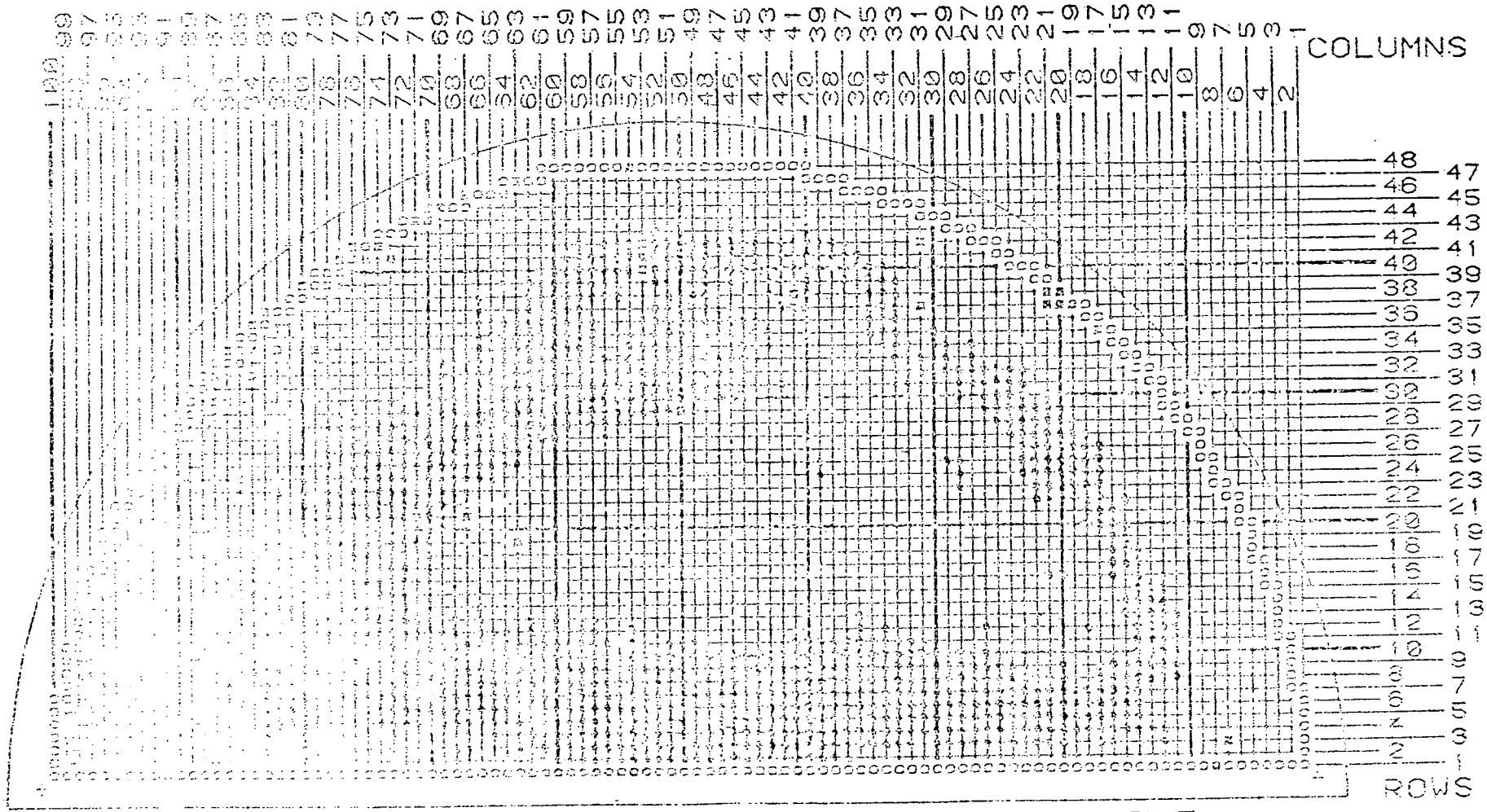


* DISTORTED SIGNALS - 1353

SERIES 27

SCE-B

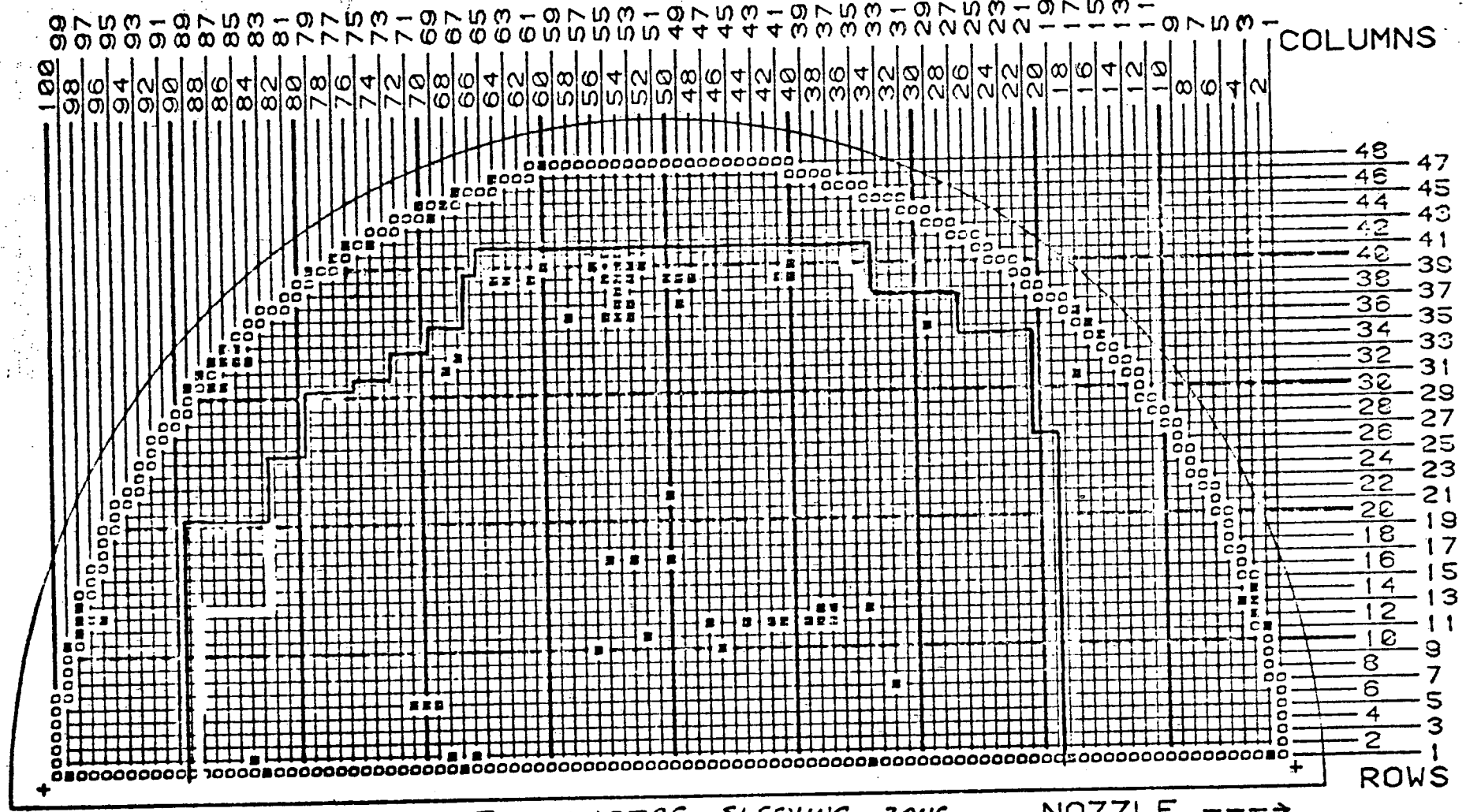
INLET



* DISTORTED SIGNALS-1385

SERIES 27

SCE-A



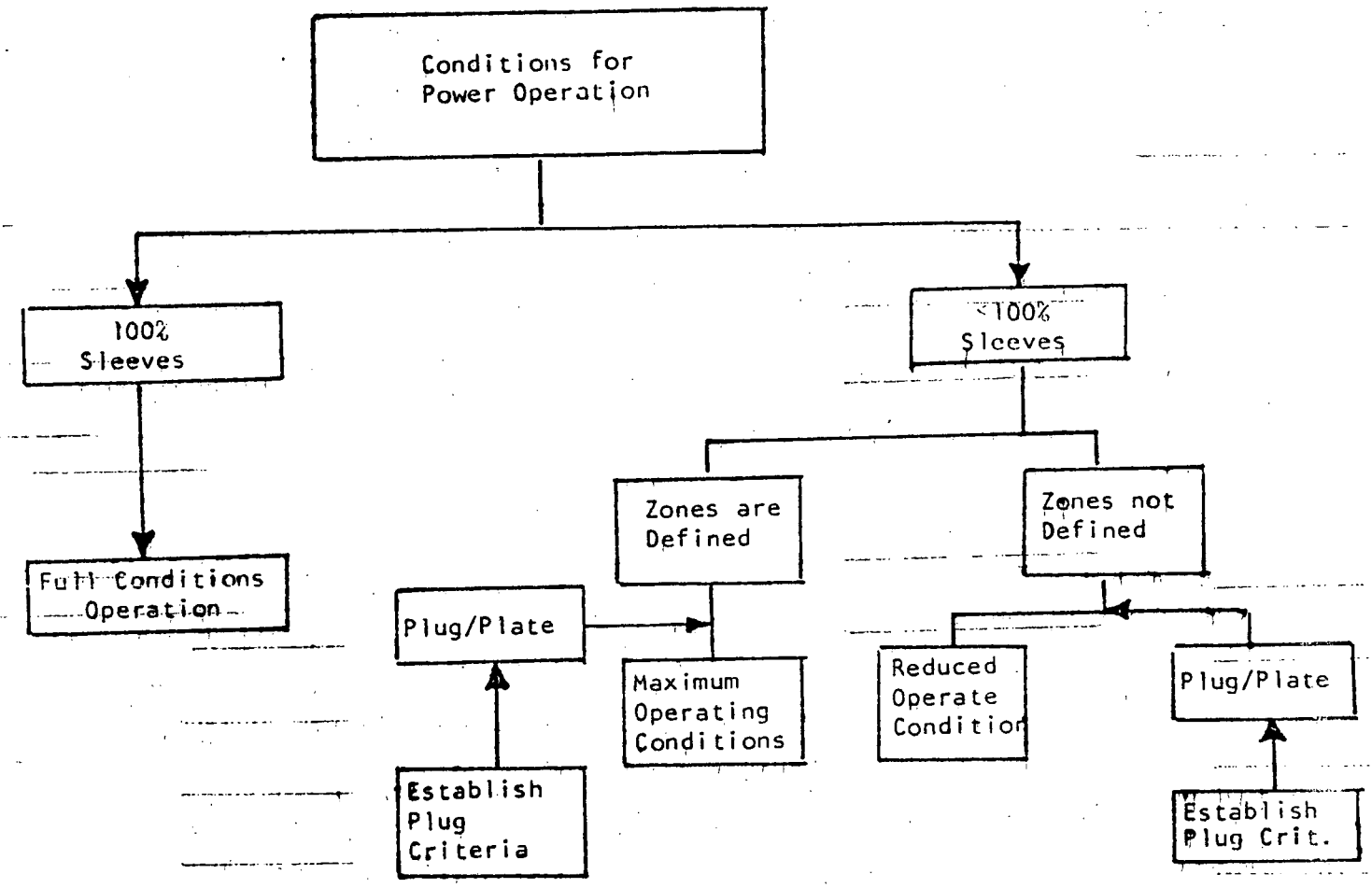
SAN ONOFRE SLEEVING ZONE

TENTATIVE SELECTION

ALL 3 STEAM GENERATORS

approximately 2500/SG
approximately 1 tube beyond any pluggable indication
applies to SG A, B, and C

7/30/80


Conditions for Power Operation
100% Sleeves
<100% Sleeves
Full Conditions Operation
Zones are Defined
Zones not Defined
Plug/Plate
Maximum Operating Conditions
Reduced Operate Condition
Plug/Plate
Establish Plug Criteria
Establish Plug Crit.

DECON PROCESS DEVELOPMENT

FOR STEAM GENERATOR

CHANNELHEAD MAINTENANCE ACTIVITIES

HIGH PRESSURE WATER

CHEMICAL

DRY GRIT

HYDRO/GRIT

HYDRO/GRIT

- GRIT OPTIONS
  - BORIC ACID
  - MAGNETITE
  - ALUMINA

- EXPECTED SURFACE DF
  - BORIC ACID 5 - 10
  - MAGNETITE 20 - 50
  - ALUMINA 20 - 50

MAGNETITE GRIT

RECOMMENDED PROCESS

HI DF - 10 OR GREATER

RECYCLE - MINIMIZE WASTE VOLUME

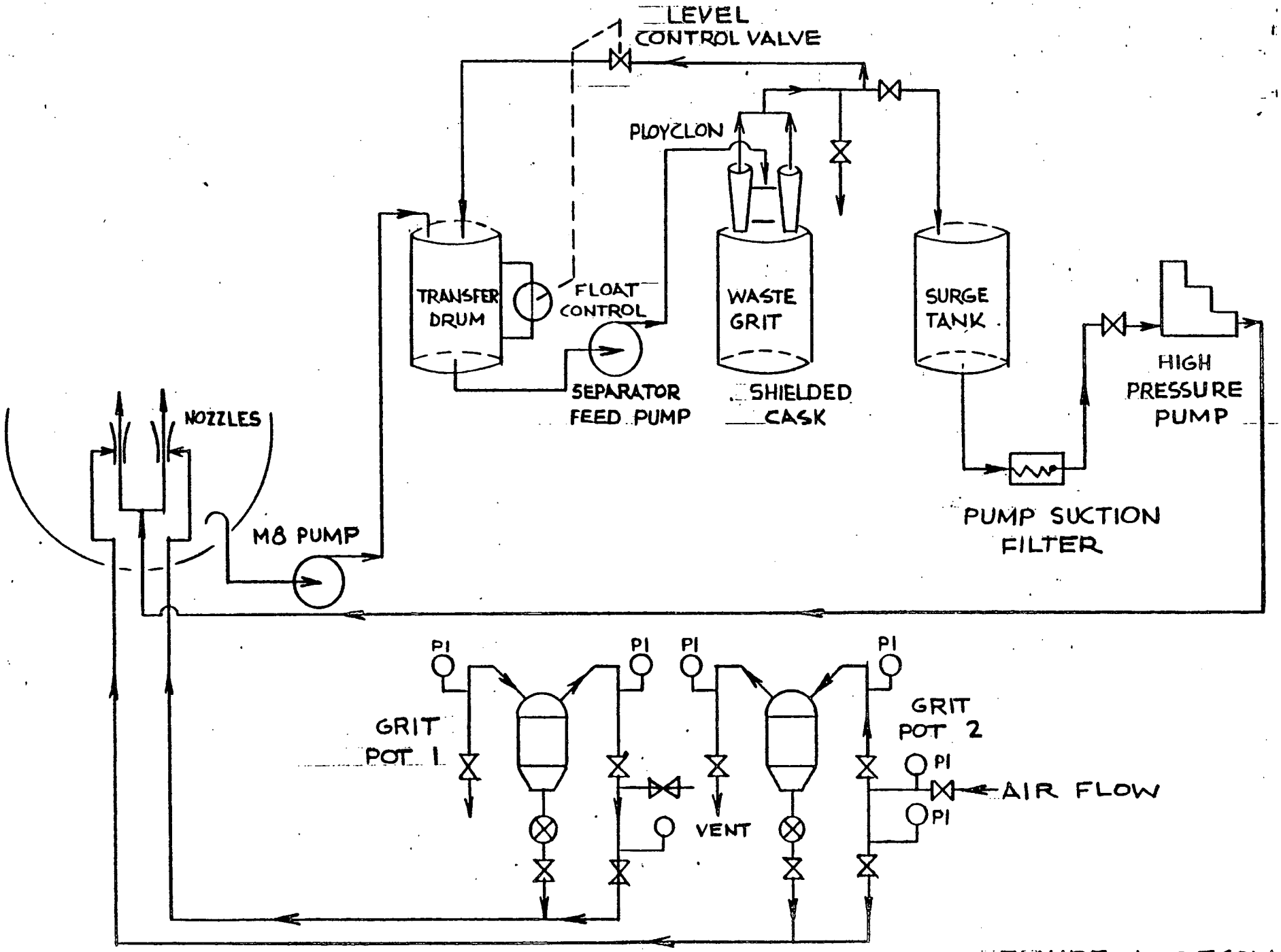


FIGURE 1: DECON RECYCLE SYSTEM

EXPERIENCE

BORIC ACID GRIT - ONCE THRU SYSTEM

- DEVELOPMENT PROGRAM QUALIFICATION COMPLETE
- POINT BEACH, ONE CHANNEL HEAD - NO SIGNIFICANT DF
- TAK I, SIX CHANNEL HEAD - 2.5 DF.

MAGNITATE GRIT - RECYCLE SYSTEM

- QUALIFIED DURING RETUBE PROGRAM
- HOT TEST SURFACE DF OF GREATER THAN 10 ACHIEVED

TECHNICAL ISSUES

1. CLAD CONDITION AFTER DECON
2. RESIDUAL GRIT
   - CHEMISTRY COMPATIBLE
   - R.C. PUMP SEALS/CRDM
3. DILUTION
4. WASTE HANDLING

EXPECTED WASTE PER STEAM GENERATOR

- THREE TONS OF MAGNETITE GRIT, (APPROXIMATELY 5 MICROCURIES PER GRAM)

- EIGHT TO TWELVE, 55 GALLON DRUMS

- 600 GALLON OF RECYCLE WATER (0.5 MICROCURIES PER MILLILITER)

- 2000 GALLONS OF RINSE WATER

- MORE ABRASIVE GRIT

- TUBE DECON

- PIPE NOZZLE SHIELD

- HAND CLEANUP

PRELIMINARY LICENSING INFORMATION SCHEDULE

PRELIMINARY DISCUSSIONS W/NRC	6/18, 7/1, 7/10
PRESENTATION OF PROGRAM PLAN	7/22
NRC MEETING TO DISCUSS SLEEVING	7/31
NRC MEETING TO UPDATE INFORMATION	8/15
NRC MEETING & SLEEVING REPORT	9/1
NRC APPROVAL TO INSTALL SLEEVES	9/10
FINAL 50.59 REPORT	10/7
NRC APPROVAL TO RESUME OPERATION	11/1

PURPOSE OF MEETING

- OPENING TECHNICAL DISCUSSION OF THE SCE SLEEVING PROGRAM
- DESIGN AND PROCESS DISCUSSION
- ALARA CONSIDERATIONS
- ESTABLISH CONTENTS OF 8/15 MEETING

SLEEVING PROGRAM

PURPOSE

- TO DEVELOP A REPAIR PROCEDURE FOR A DEFECTIVE TUBE AS AN ALTERNATE TO PLUGGING, THUS EXTENDING STEAM GENERATOR LIFE

OVERALL TECHNICAL OBJECTIVE

- DEVELOP A LEAK TIGHT BOND BETWEEN SLEEVE AND TUBE
- DEVELOP A REMOTE TOOLING INSTALLATION SYSTEM

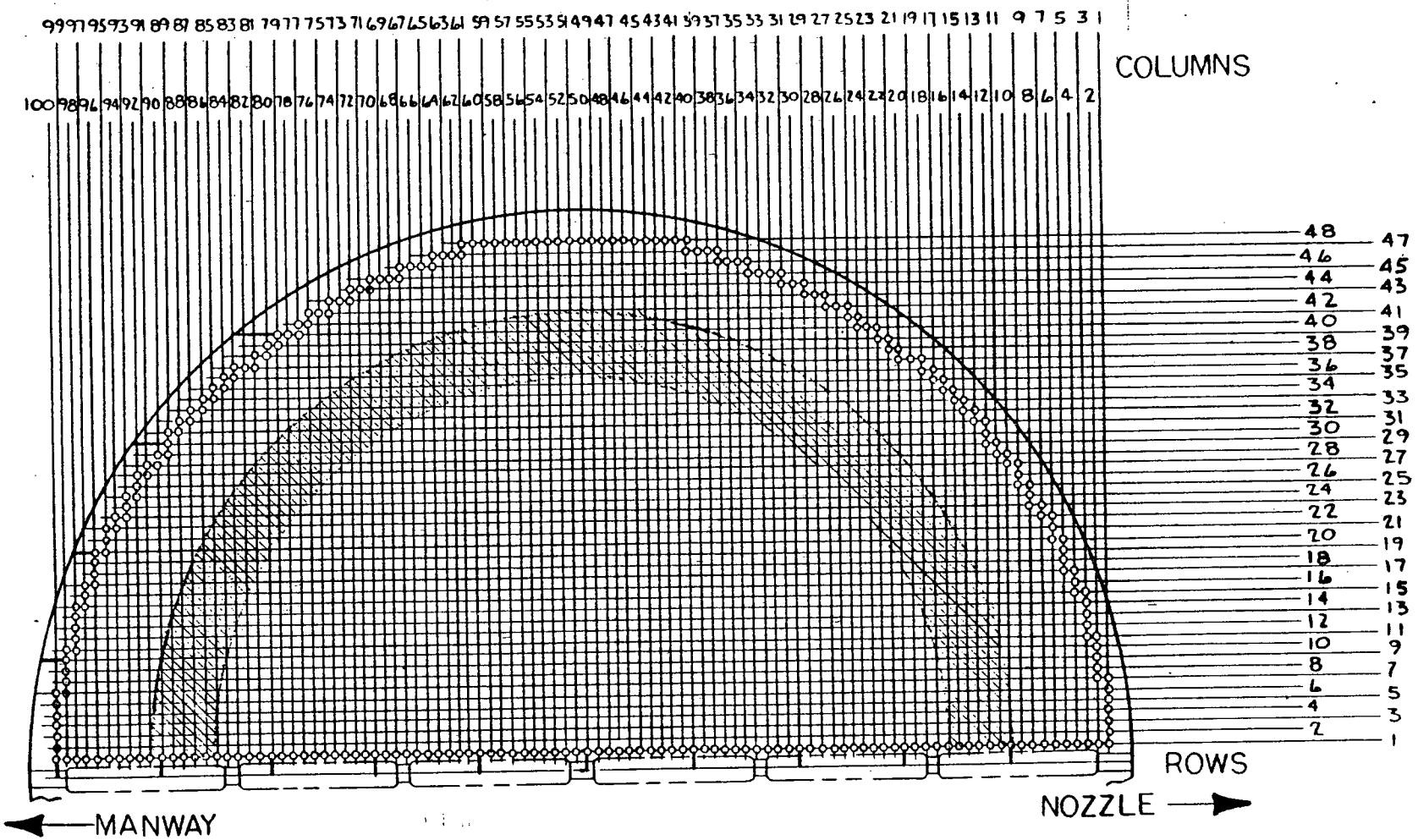
POTENTIAL SEALING METHODS

- BRAZING
- MECHANICAL
- WELDING

POTENTIAL EXPANSION METHODS

- HYDRAULIC
- ROLL

SERIES 27



ALARA ACTIVITIES

- DECON BOWL AND TUBES
- REMOTE TOOLING
- SHIELDING
- MOCK-UP TRAINING
- TV SURVEILLANCE
- ADMINISTRATION CONTROLS
- ENVIRONMENTAL CONTROLS
- MODEL AND MONITOR EXPOSURES

Licensing Information Schedule

Preliminary Discussions w/NRC	6/18, 7/1, 7/10
Presentation of Program Plan	7/22
NRC Meeting to Discuss Sleeving	7/31
NRC Meeting to Update Info	8/15
NRC Mtg & Sleeving Report Including Zones to be Repaired	9/1
NRC Approval to Install Sleeves	9/10
Final Revised Reload Safety Evaluation Report	10/7
NRC Approval to Resume Operation	11/1

SLEEVING REPORT

LICENSING INFORMATION

- Design Concept
- Design Analysis
- Prototype Testing
  - Pressure Testing
  - Thermal Cycling
  - Corrosion Testing
- Inspectability
  - Installation
  - Inservice
- Material Compatibility
- Installation Concept
- ALARA
- Criteria for Zones Repaired
- 10 CFR 50.59 Design Change Review

Revised Reload Safety Evaluation Report

Description of Repaired Steam Generators

- Inspection Results
- Tube Removal and Examination Results
- Individual Tube Pressure Test Results
- Zones Repaired (Sleeved and/or Plugged)
- Sleeving Report (Referenced)

Evaluation of Plant Performance

- Reduced Temperature, Pressure and Power
- T/H Effects of Sleeving
- LOCA Analyses
- Non-LOCA Analyses
- Functional Set Point Changes

Licensing and Technical Specification Changes

Operational Considerations

- Chemical Flushing
- Chemical Control Improvements