PSEG Public Service Electric and Gas Company

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Robert L. Mittl General Manager
Nuclear Assurance and Regulation

September 12, 1984

Director of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
7920 Norfolk Avenue
Bethesda, MD 20814

Attention: Mr. Albert Schwencer, Chief
Licensing Branch 2
Division of Licensing

Gentlemen:

HOPE CREEK GENERATING STATION
DOCKET NO. 50-354
DRAFT SAFETY EVALUATION REPORT
OPEN ITEM STATUS

Attachment 1 is a current list which provides a status of the open items identified in Section 1.7 of the Draft Safety Evaluation Report (SER). Items identified as "complete" are those for which PSE&G has provided responses and no confirmation of status has been received from the staff. We will consider these items closed unless notified otherwise. In order to permit timely resolution of items identified as "complete" which may not be resolved to the staff's satisfaction, please provide a specific description of the issue which remains to be resolved.

Attachment 2 is a current list which identifies Draft SER Sections not yet provided.

Enclosed for your review and approval (see Attachment 4) are the resolutions to the Draft SER open items, NRC questions and structural audit items listed in Attachment 3.

In addition, enclosed for your review (see Attachment 6) is a response to the Core Performance Branch request on BWR Core Thermal Hydraulic Stability, the Auxiliary System Branch request on IE Bulletin 81-03, and the responses to those open items, listed in Attachment 5, discussed with the Containment System Branch at the August 31, 1984 meeting.

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Drawings To: D. Wagner

Also, enclosed for your review are three (3) sets (see Attachment 7) of the Hope Creek Preservice/Inservice Testing Program - Pumps and Valves; Rev. 0 dated 9/10/84 and its associated drawings.

A signed original of the required affidavit is provided to document the submittal of these items.

Should you have any questions or require any additional information on these open items, please contact us.

Very truly yours,

R J Pettit

Attachments/Enclosure

C D. H. Wagner
USNRC Licensing Project Manager (w/attach.)(w/o dwgs.)

W. H. Bateman
USNRC Senior Resident Inspector (w/attach.)(w/o dwgs.)

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
DOCKET NO. 50-354

PUBLIC SERVICE ELECTRIC AND GAS COMPANY

Public Service Electric and Gas Company hereby submits the enclosed responses to DSER open items, NRC Questions, Structural Audit items, and NRC requests for additional information for the Hope Creek Generating Station.

The matters set forth in this submittal are true to the best of my knowledge, information, and belief.

Respectfully submitted,

Public Service Electric
and Gas Company

By: Thomas J. Martin
Thomas J. Martin
Vice President -
Engineering and Construction

Sworn to and subscribed
before me, a Notary Public
of New Jersey, this 17th day
of September 1984.

David K. Burd
DAVID K. BURD
NOTARY PUBLIC OF NEW JERSEY
My Comm. Expires 10-23-85

MC 28 02

DATE: 9/12/84

ATTACHMENT 1

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
1	2.3.1	Design-basis temperatures for safety-related auxiliary systems	Complete	8/15/84
2a	2.3.3	Accuracies of meteorological measurements	Complete	8/15/84 (Rev. 1)
2b	2.3.3	Accuracies of meteorological measurements	Complete	8/15/84 (Rev. 1)
2c	2.3.3	Accuracies of meteorological measurements	Complete	8/15/84 (Rev. 2)
2d	2.3.3	Accuracies of meteorological measurements	Complete	8/15/84 (Rev. 2)
3a	2.3.3	Upgrading of onsite meteorological measurements program (III.A.2)	Complete	8/15/84 (Rev. 2)
3b	2.3.3	Upgrading of onsite meteorological measurements program (III.A.2)	Complete	8/15/84 (Rev. 2)
3c	2.3.3	Upgrading of onsite meteorological measurements program (III.A.2)	NRC Action	
4	2.4.2.2	Ponding levels	Complete	8/03/84
5a	2.4.5	Wave impact and runup on service water intake structure	Complete	9/7/84 (Rev. 2)
5b	2.4.5	Wave impact and runup on service water intake structure	Complete	9/7/84 (Rev. 2)
5c	2.4.5	Wave impact and runup on service water intake structure	Complete	7/27/84
5d	2.4.5	Wave impact and runup on service water intake structure	Complete	9/7/84 (Rev. 2)
6a	2.4.10	Stability of erosion protection structures	Complete	8/20/84
6b	2.4.10	Stability of erosion protection structures	Complete	8/20/84
6c	2.4.10	Stability of erosion protection structures	Complete	8/03/84

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
7a	2.4.11.2	Thermal aspects of ultimate heat sink	Complete	8/3/84
7b	2.4.11.2	Thermal aspects of ultimate heat sink	Complete	8/3/84
8	2.5.2.2	Choice of maximum earthquake for New England - Piedmont Tectonic Province	Complete	8/15/84
9	2.5.4	Soil damping values	Complete	6/1/84
10	2.5.4	Foundation level response spectra	Complete	6/1/84
11	2.5.4	Soil shear moduli variation	Complete	6/1/84
12	2.5.4	Combination of soil layer properties	Complete	6/1/84
13	2.5.4	Lab test shear moduli values	Complete	6/1/84
14	2.5.4	Liquefaction analysis of river bottom sands	Complete	6/1/84
15	2.5.4	Tabulations of shear moduli	Complete	6/1/84
16	2.5.4	Drying and wetting effect on Vincentown	Complete	6/1/84
17	2.5.4	Power block settlement monitoring	Complete	6/1/84
18	2.5.4	Maximum earth at rest pressure coefficient	Complete	6/1/84
19	2.5.4	Liquefaction analysis for service water piping	Complete	6/1/84
20	2.5.4	Explanation of observed power block settlement	Complete	6/1/84
21	2.5.4	Service water pipe settlement records	Complete	6/1/84
22	2.5.4	Cofferdam stability	Complete	6/1/84

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
23	2.5.4	Clarification of FSAR Tables 2.5.13 and 2.5.14	Complete	6/1/84
24	2.5.4	Soil depth models for intake structure	Complete	6/1/84
25	2.5.4	Intake structure soil modeling	Complete	8/10/84
26	2.5.4.4	Intake structure sliding stability	Complete	8/20/84
27	2.5.5	Slope stability	Complete	6/1/84
28a	3.4.1	Flood protection	Complete	8/30/84 (Rev. 1)
28b	3.4.1	Flood protection	Complete	8/30/84 (Rev. 1)
28c	3.4.1	Flood protection	Complete	8/30/84 (Rev. 1)
28d	3.4.1	Flood protection	Complete	8/30/84 (Rev. 1)
28e	3.4.1	Flood protection	Complete	8/30/84 (Rev. 1)
28f	3.4.1	Flood protection	Complete	7/27/84
28g	3.4.1	Flood protection	Complete	7/27/84
29	3.5.1.1	Internally generated missiles (outside containment)	Complete	8/3/84 (Rev. 1)
30	3.5.1.2	Internally generated missiles (inside containment)	Closed (5/30/84-Aux.Sys.Mtg.)	6/1/84
31	3.5.1.3	Turbine missiles	Complete	7/18/84
32	3.5.1.4	Missiles generated by natural phenomena	Complete	7/27/84
33	3.5.2	Structures, systems, and components to be protected from externally generated missiles	Complete	7/27/84

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
34	3.6.2	Unrestrained whipping pipe inside containment	Complete	7/18/84
35	3.6.2	ISI program for pipe welds in break exclusion zone	Complete	6/29/84
36	3.6.2	Postulated pipe ruptures	Complete	6/29/84
37	3.6.2	Feedwater isolation check valve operability	Complete	8/20/84
38	3.6.2	Design of pipe rupture restraints	Complete	8/20/84
39	3.7.2.3	SSI analysis results using finite element method and elastic half-space approach for containment structure	Complete	8/3/84
40	3.7.2.3	SSI analysis results using finite element method and elastic half-space approach for intake structure	Complete	8/3/84
41	3.8.2	Steel containment buckling analysis	Complete	6/1/84
42	3.8.2	Steel containment ultimate capacity analysis	Complete	8/20/84 (Rev. 1)
43	3.8.2	SRV/LOCA pool dynamic loads	Complete	6/1/84
44	3.8.3	ACI 349 deviations for internal structures	Complete	6/1/84
45	3.8.4	ACI 349 deviations for Category I structures	Complete	8/20/84 (Rev. 1)
46	3.8.5	ACI 349 deviations for foundations	Complete	8/20/84 (Rev. 1)
47	3.8.6	Base mat response spectra	Complete	8/10/84 (Rev. 1)
48	3.8.6	Rocking time histories	Complete	8/20/84 (Rev. 1)

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
49	3.8.6	Gross concrete section	Complete	8/20/84 (Rev. 1)
50	3.8.6	Vertical floor flexibility response spectra	Complete	8/20/84 (Rev. 1)
51	3.8.6	Comparison of Bechtel independent verification results with the design-basis results	Complete	8/20/84 (Rev. 2)
52	3.8.6	Ductility ratios due to pipe break	Complete	8/3/84
53	3.8.6	Design of seismic Category I tanks	Complete	8/20/84 (Rev. 1)
54	3.8.6	Combination of vertical responses	Complete	8/10/84 (Rev. 1)
55	3.8.6	Torsional stiffness calculation	Complete	6/1/84
56	3.8.6	Drywell stick model development	Complete	8/20/84 (Rev. 1)
57	3.8.6	Rotational time history inputs	Complete	6/1/84
58	3.8.6	"O" reference point for auxiliary building model	Complete	6/1/84
59	3.8.6	Overturning moment of reactor building foundation mat	Complete	8/20/84 (Rev. 1)
60	3.8.6	BSAP element size limitations	Complete	8/20/84 (Rev. 1)
61	3.8.6	Seismic modeling of drywell shield wall	Complete	6/1/84
62	3.8.6	Drywell shield wall boundary conditions	Complete	6/1/84
63	3.8.6	Reactor building dome boundary conditions	Complete	6/1/84

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
64	3.8.6	SSI analysis 12 Hz cutoff frequency	Complete	8/20/84 (Rev. 1)
65	3.8.6	Intake structure crane heavy load drop	Complete	6/1/84
66	3.8.6	Impedance analysis for the intake structure	Complete	8/10/84 (Rev. 1)
67	3.8.6	Critical loads calculation for reactor building dome	Complete	6/1/84
68	3.8.6	Reactor building foundation mat contact pressures	Complete	6/1/84
69	3.8.6	Factors of safety against sliding and overturning of drywell shield wall	Complete	6/1/84
70	3.8.6	Seismic shear force distribution in cylinder wall	Complete	6/1/84
71	3.8.6	Overturning of cylinder wall	Complete	6/1/84
72	3.8.6	Deep beam design of fuel pool walls	Complete	6/1/84
73	3.8.6	ASHSD dome model load inputs	Complete	6/1/84
74	3.8.6	Tornado depressurization	Complete	6/1/84
75	3.8.6	Auxiliary building abnormal pressure	Complete	6/1/84
76	3.8.6	Tangential shear stresses in drywell shield wall and the cylinder wall	Complete	6/1/84
77	3.8.6	Factor of safety against overturning of intake structure	Complete	8/20/84 (Rev. 1)
78	3.8.6	Dead load calculations	Complete	6/1/84
79	3.8.6	Post-modification seismic loads for the torus	Complete	8/20/84 (Rev. 1)

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
80	3.8.6	Torus fluid-structure interactions	Complete	6/1/84
81	3.8.6	Seismic displacement of torus	Complete	8/20/84 (Rev. 1)
82	3.8.6	Review of seismic Category I tank design	Complete	8/20/84 (Rev. 1)
83	3.8.6	Factors of safety for drywell buckling evaluation	Complete	6/1/84
84	3.8.6	Ultimate capacity of containment (materials)	Complete	8/20/84 (Rev. 1)
85	3.8.6	Load combination consistency	Complete	6/1/84
86	3.9.1	Computer code validation	Complete	8/20/84
87	3.9.1	Information on transients	Complete	8/20/84
88	3.9.1	Stress analysis and elastic-plastic analysis	Complete	6/29/84
89	3.9.2.1	Vibration levels for NSSS piping systems	Complete	6/29/84
90	3.9.2.1	Vibration monitoring program during testing	Complete	7/18/84
91	3.9.2.2	Piping supports and anchors	Complete	6/29/84
92	3.9.2.2	Triple flued-head containment penetrations	Complete	6/15/84
93	3.9.3.1	Load combinations and allowable stress limits	Complete	6/29/84
94	3.9.3.2	Design of SRVs and SRV discharge piping	Complete	6/29/84

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
95	3.9.3.2	Fatigue evaluation on SRV piping and LOCA downcomers	Complete	6/15/84
96	3.9.3.3	IE Information Notice 83-80	Complete	8/20/84 (Rev. 1)
97	3.9.3.3	Buckling criteria used for component supports	Complete	6/29/84
98	3.9.3.3	Design of bolts	Complete	6/15/84
99a	3.9.5	Stress categories and limits for core support structures	Complete	6/15/84
99b	3.9.5	Stress categories and limits for core support structures	Complete	6/15/84
100a	3.9.6	10CFR50.55a paragraph (g)	Complete	6/29/84
100b	3.9.6	10CFR50.55a paragraph (g)	Complete	9/12/84 (Rev. 1)
101	3.9.6	PSI and IST programs for pumps and valves	Complete	9/12/84 (Rev. 1)
102	3.9.6	Leak testing of pressure isolation valves	Complete	9/12/84 (Rev. 1)
103a1	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
103a2	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
103a3	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
103a4	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
103a5	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
103a6	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
103a7	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
103b1	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
103b2	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
103b3	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
103b4	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
103b5	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
103b6	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
103c1	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
103c2	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
103c3	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
103c4	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
104	3.11	Environmental qualification of mechanical and electrical equipment	NRC Action	

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
105	4.2	Plant-specific mechanical fracturing analysis	Complete	8/20/84 (Rev. 1)
106	4.2	Applicability of seismic andd LOCA loading evaluation	Complete	8/20/84 (Rev. 1)
107	4.2	Minimal post-irradiation fuel surveillance program	Complete	6/29/84
108	4.2	Gadolina thermal conductivity equation	Complete	6/29/84
109a	4.4.7	TMI-2 Item II.F.2	Complete	8/20/84
109b	4.4.7	TMI-2 Item II.F.2	Complete	8/20/84
110a	4.6	Functional design of reactivity control systems	Complete	8/30/84 (Rev. 1)
110b	4.6	Functional design of reactivity control systems	Complete	8/30/84 (Rev. 1)
111a	5.2.4.3	Preservice inspection program (components within reactor pressure boundary)	Complete	6/29/84
111b	5.2.4.3	Preservice inspection program (components within reactor pressure boundary)	Complete	6/29/84
111c	5.2.4.3	Preservice inspection program (components within reactor pressure boundary)	Complete	6/29/84
112a	5.2.5	Reactor coolant pressure boundary leakage detection	Complete	8/30/84 (Rev. 1)
112b	5.2.5	Reactor coolant pressure boundary leakage detection	Complete	8/30/84 (Rev. 1)

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
112c	5.2.5	Reactor coolant pressure boundary leakage detection	Complete	8/30/84 (Rev. 1)
112d	5.2.5	Reactor coolant pressure boundary leakage detection	Complete	8/30/84 (Rev. 1)
112e	5.2.5	Reactor coolant pressure boundary leakage detection	Complete	8/30/84 (Rev. 1)
113	5.3.4	GE procedure applicability	Complete	7/18/84
114	5.3.4	Compliance with NB 2360 of the Summer 1972 Addenda to the 1971 ASME Code	Complete	7/18/84
115	5.3.4	Drop weight and Charpy v-notch tests for closure flange materials	Complete	9/5/84 (Rev. 1)
116	5.3.4	Charpy v-notch test data for base materials as used in shell course No. 1	Complete	7/18/84
117	5.3.4	Compliance with NB 2332 of Winter 1972 Addenda of the ASME Code	Complete	8/20/84
118	5.3.4	Lead factors and neutron fluence for surveillance capsules	Complete	8/20/84
119	6.2	TMI item II.E.4.1	Complete	6/29/84
120a	6.2	TMI Item II.E.4.2	Complete	8/20/84
120b	6.2	TMI Item II.E.4.2	Complete	8/20/84
121	6.2.1.3.3	Use of NUREG-0588	Complete	7/27/84
122	6.2.1.3.3	Temperature profile	Complete	7/27/84
123	6.2.1.4	Butterfly valve operation (post accident)	Complete	6/29/84

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
124a	6.2.1.5.1	RPV shield annulus analysis	Complete	8/20/84 (Rev. 1)
124b	6.2.1.5.1	RPV shield annulus analysis	Complete	8/20/84 (Rev. 1)
124c	6.2.1.5.1	RPV shield annulus analysis	Complete	8/20/84 (Rev. 1)
125	6.2.1.5.2	Design drywell head differential pressure	Complete	6/15/84
126a	6.2.1.6	Redundant position indicators for vacuum breakers (and control room alarms)	Complete	8/20/84
126b	6.2.1.6	Redundant position indicators for vacuum breakers (and control room alarms)	Complete	8/20/84
127	6.2.1.6	Operability testing of vacuum breakers	Complete	8/20/84 (Rev. 1)
128	6.2.2	Air ingestion	Complete	7/27/84
129	6.2.2	Insulation ingestion	Complete	6/1/84
130	6.2.3	Potential bypass leakage paths	Complete	6/29/84
131	6.2.3	Administration of secondary containment openings	Complete	7/18/84
132	6.2.4	Containment isolation review	Complete	6/15/84
133a	6.2.4.1	Containment purge system	Complete	8/20/84
133b	6.2.4.1	Containment purge system	Complete	8/20/84
133c	6.2.4.1	Containment purge system	Complete	8/20/84

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
134	6.2.6	Containment leakage testing	Complete	6/15/84
135	6.3.3	LPCS and LPCI injection valve interlocks	Complete	8/20/84
136	6.3.5	Plant-specific LOCA (see Section 15.9.13)	Complete	8/20/84 (Rev. 1)
137a	6.4	Control room habitability	Complete	8/20/84
137b	6.4	Control room habitability	Complete	8/20/84
137c	6.4	Control room habitability	Complete	8/20/84
138	6.6	Preservice inspection program for Class 2 and 3 components	Complete	6/29/84
139	6.7	MSIV leakage control system	Complete	6/29/84
140a	9.1.2	Spent fuel pool storage	Complete	9/7/84 (Rev. 2)
140b	9.1.2	Spent fuel pool storage	Complete	9/7/84 (Rev. 2)
140c	9.1.2	Spent fuel pool storage	Complete	9/7/84 (Rev. 2)
140d	9.1.2	Spent fuel pool storage	Complete	9/7/84 (Rev. 2)
141a	9.1.3	Spent fuel cooling and cleanup system	Complete	8/30/84 (Rev. 1)
141b	9.1.3	Spent fuel cooling and cleanup system	Complete	8/30/84 (Rev. 1)
141c	9.1.3	Spent fuel pool cooling and cleanup system	Complete	8/30/84 (Rev. 1)

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
141d	9.1.3	Spent fuel pool cooling and cleanup system	Complete	8/30/84 (Rev. 1)
141e	9.1.3	Spent fuel pool cooling and cleanup system	Complete	8/30/84 (Rev. 1)
141f	9.1.3	Spent fuel pool cooling and cleanup system	Complete	8/30/84 (Rev. 1)
141g	9.1.3	Spent fuel pool cooling and cleanup system	Complete	8/30/84 (Rev. 1)
142a	9.1.4	Light load handling system (related to refueling)	Complete	8/15/84 (Rev. 1)
142b	9.1.4	Light load handling system (related to refueling)	Complete	8/15/84 (Rev. 1)
143a	9.1.5	Overhead heavy load handling	Complete	9/7/84
143b	9.1.5	Overhead heavy load handling	Open	
144a	9.2.1	Station service water system	Complete	8/15/84 (Rev. 1)
144b	9.2.1	Station service water system	Complete	8/15/84 (Rev. 1)
144c	9.2.1	Station service water system	Complete	8/15/84 (Rev. 1)
145	9.2.2	ISI program and functional testing of safety and turbine auxiliaries cooling systems	Closed (5/30/84-Aux.Sys.Mtg.)	6/15/84
146	9.2.6	Switches and wiring associated with HPCI/RCIC torus suction	Closed (5/30/84-Aux.Sys.Mtg.)	6/15/84

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
147a	9.3.1	Compressed air systems	Complete	8/3/84 (Rev 1)
147b	9.3.1	Compressed air systems	Complete	8/3/84 (Rev 1)
147c	9.3.1	Compressed air systems	Complete	8/3/84 (Rev 1)
147d	9.3.1	Compressed air systems	Complete	8/3/84 (Rev 1)
148	9.3.2	Post-accident sampling system (II.B.3)	Complete	9/12/84 (Rev. 1)
149a	9.3.3	Equipment and floor drainage system	Complete	7/27/84
149b	9.3.3	Equipment and floor drainage system	Complete	7/27/84
150	9.3.6	Primary containment instrument gas system	Complete	8/3/84 (Rev. 1)
151a	9.4.1	Control structure ventilation system	Complete	8/30/84 (Rev. 1)
151b	9.4.1	Control structure ventilation system	Complete	8/30/84 (Rev. 1)
152	9.4.4	Radioactivity monitoring elements	Closed (5/30/84-Aux.Sys.Mtg.)	6/1/84
153	9.4.5	Engineered safety features ventilation system	Complete	8/30/84 (Rev 2)
154	9.5.1.4.a	Metal roof deck construction classificiation	Complete	6/1/84
155	9.5.1.4.b	Ongoing review of safe shutdown capability	NRC Action	
156	9.5.1.4.c	Ongoing review of alternate shutdown capability	NRC Action	

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
157	9.5.1.4.e	Cable tray protection	Complete	8/20/84
158	9.5.1.5.a	Class B fire detection system	Complete	6/15/84
159	9.5.1.5.a	Primary and secondary power supplies for fire detection system	Complete	6/1/84
160	9.5.1.5.b	Fire water pump capacity	Complete	8/13/84
161	9.5.1.5.b	Fire water valve supervision	Complete	6/1/84
162	9.5.1.5.c	Deluge valves	Complete	6/1/84
163	9.5.1.5.c	Manual hose station pipe sizing	Complete	6/1/84
164	9.5.1.6.e	Remote shutdown panel ventilation	Complete	6/1/84
165	9.5.1.6.g	Emergency diesel generator day tank protection	Complete	6/1/84
166	12.3.4.2	Airborne radioactivity monitor positioning	Complete	9/7/84 (Rev. 1)
167	12.3.4.2	Portable continuous air monitors	Complete	7/18/84
168	12.5.2	Equipment, training, and procedures for inplant iodine instrumentation	Complete	6/29/84
169	12.5.3	Guidance of Division B Regulatory Guides	Complete	7/18/84
170	13.5.2	Procedures generation package submittal	Complete	6/29/84
171	13.5.2	TMI Item I.C.1	Complete	6/29/84
172	13.5.2	PGP Commitment	Complete	6/29/84
173	13.5.2	Procedures covering abnormal releases of radioactivity	Complete	6/29/84

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
174	13.5.2	Resolution explanation in FSAR of TMI Items I.C.7 and I.C.8	Complete	6/15/84
175	13.6	Physical security	Open	
176a	14.2	Initial plant test program	Complete	8/13/84
176b	14.2	Initial plant test program	Complete	9/5/84 (Rev. 1)
176c	14.2	Initial plant test program	Complete	7/27/84
176d	14.2	Initial plant test program	Complete	8/24/84 (Rev. 2)
176e	14.2	Initial plant test program	Complete	7/27/84
176f	14.2	Initial plant test program	Complete	8/13/84
176g	14.2	Initial plant test program	Complete	8/20/84
176h	14.2	Initial plant test program	Complete	8/13/84
176i	14.2	Initial plant test program	Complete	7/27/84
177	15.1.1	Partial feedwater heating	Complete	8/20/84 (Rev. 1)
178	15.6.5	LOCA resulting from spectrum of postulated piping breaks within RCP	NRC Action	
179	15.7.4	Radiological consequences of fuel handling accidents	NRC Action	
180	15.7.5	Spent fuel cask drop accidents	NRC Action	
181	15.9.5	TMI-2 Item II.K.3.3	Complete	6/29/84
182	15.9.10	TMI-2 Item II.K.3.18	Complete	6/1/84
183	18	Hope Creek DCRDR	Complete	8/15/84

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
184	7.2.2.1.e	Failures in reactor vessel level sensing lines	Complete	8/1/84 (Rev 1)
185	7.2.2.2	Trip system sensors and cabling in turbine building	Complete	6/1/84
186	7.2.2.3	Testability of plant protection systems at power	Complete	8/13/84 (Rev. 1)
187	7.2.2.4	Lifting of leads to perform surveillance testing	Complete	8/3/84
188	7.2.2.5	Setpoint methodology	Complete	8/1/84
189	7.2.2.6	Isolation devices	Complete	8/1/84
190	7.2.2.7	Regulatory Guide 1.75	Complete	6/1/84
191	7.2.2.8	Scram discharge volume	Complete	6/29/84
192	7.2.2.9	Reactor mode switch	Complete	8/15/84 (Rev. 1)
193	7.3.2.1.10	Manual initiation of safety systems	Complete	8/1/84
194	7.3.2.2	Standard review plan deviations	Complete	8/1/84 (Rev 1)
195a	7.3.2.3	Freeze-protection/water filled instrument and sampling lines and cabinet temperature control	Complete	8/1/84
195b	7.3.2.3	Freeze-protection/water filled instrument and sampling lines and cabinet temperature control	Complete	8/1/84
196	7.3.2.4	Sharing of common instrument taps	Complete	8/1/84
197	7.3.2.5	Microprocessor, multiplexer and computer systems	Complete	8/1/84 (Rev 1)

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
198	7.3.2.6	TMI Item II.K.3.18-ADS actuation	Complete	8/20/84
199	7.4.2.1	IE Bulletin 79-27-Loss of non-class IE instrumentation and control power system bus during operation	Complete	8/24/84 (Rev. 1)
200	7.4.2.2	Remote shutdown system	Complete	8/15/84 (Rev 1)
201	7.4.2.3	RCIC/HPCI interactions	Complete	8/3/84
202	7.5.2.1	Level measurement errors as a result of environmental temperature effects on level instrumentation reference leg	Complete	8/3/84
203	7.5.2.2	Regulatory Guide 1.97	Complete	8/3/84
204	7.5.2.3	TMI Item II.F.1 - Accident monitoring	Complete	8/1/84
205	7.5.2.4	Plant process computer system	Complete	6/1/84
206	7.6.2.1	High pressure/low pressure interlocks	Complete	7/27/84
207	7.7.2.1	HELBs and consequential control system failures	Complete	8/24/84 (Rev. 1)
208	7.7.2.2	Multiple control system failures	Complete	8/24/84 (Rev. 1)
209	7.7.2.3	Credit for non-safety related systems in Chapter 15 of the FSAR	Complete	8/1/84 (Rev 1)
210	7.7.2.4	Transient analysis recording system	Complete	7/27/84
211a	4.5.1	Control rod drive structural materials	Complete	7/27/84
211b	4.5.1	Control rod drive structural materials	Complete	7/27/84
211c	4.5.1	Control rod drive structural materials	Complete	7/27/84

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
211d	4.5.1	Control rod drive structural materials	Complete	7/27/84
211e	4.5.1	Control rod drive structural materials	Complete	7/27/84
212	4.5.2	Reactor internals materials	Complete	7/27/84
213	5.2.3	Reactor coolant pressure boundary material	Complete	7/27/84
214	6.1.1	Engineered safety features materials	Complete	7/27/84
215	10.3.6	Main steam and feedwater system materials	Complete	7/27/84
216a	5.3.1	Reactor vessel materials	Complete	7/27/84
216b	5.3.1	Reactor vessel materials	Complete	7/27/84
217	9.5.1.1	Fire protection organization	Complete	8/15/84
218	9.5.1.1	Fire hazards analysis	Complete	6/1/84
219	9.5.1.2	Fire protection administrative controls	Complete	8/15/84
220	9.5.1.3	Fire brigade and fire brigade training	Complete	8/15/84
221	8.2.2.1	Physical separation of offsite transmission lines	Complete	8/1/84
222	8.2.2.2	Design provisions for re-establishment of an offsite power source	Complete	8/1/84
223	8.2.2.3	Independence of offsite circuits between the switchyard and class IE buses	Complete	8/1/84
224	8.2.2.4	Common failure mode between onsite and offsite power circuits	Complete	8/1/84

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ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
225	8.2.3.1	Testability of automatic transfer of power from the normal to preferred power source	Complete	8/1/84
226	8.2.2.5	Grid stability	Complete	8/13/84 (Rev. 1)
227	8.2.2.6	Capacity and capability of offsite circuits	Complete	8/1/84
228	8.3.1.1(1)	Voltage drop during transient conditions	Complete	8/1/84
229	8.3.1.1(2)	Basis for using bus voltage versus actual connected load voltage in the voltage drop analysis	Complete	8/1/84
230	8.3.1.1(3)	Clarification of Table 8.3-11	Complete	8/1/84
231	8.3.1.1(4)	Undervoltage trip setpoints	Complete	8/1/84
232	8.3.1.1(5)	Load configuration used for the voltage drop analysis	Complete	8/1/84
233	8.3.3.4.1	Periodic system testing	Complete	8/1/84
234	8.3.1.3	Capacity and capability of onsite AC power supplies and use of administrative controls to prevent overloading of the diesel generators	Complete	8/1/84
235	8.3.1.5	Diesel generators load acceptance test	Complete	8/1/84
236	8.3.1.6	Compliance with position C.6 of RG 1.9	Complete	8/1/84
237	8.3.1.7	Decription of the load sequencer	Complete	8/1/84
238	8.2.2.7	Sequencing of loads on the offsite power system	Complete	8/1/84

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ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
239	8.3.1.8	Testing to verify 80% minimum voltage	Complete	8/15/84
240	8.3.1.9	Compliance with BTP-PSB-2	Complete	8/1/84
241	8.3.1.10	Load acceptance test after prolonged no load operation of the diesel generator	Complete	8/20/84 (Rev. 1)
242	8.3.2.1	Compliance with position 1 of Regulatory Guide 1.128	Complete	8/1/84
243	8.3.3.1.3	Protection or qualification of Class 1E equipment from the effects of fire suppression systems	Complete	8/1/84
244	8.3.3.3.1	Analysis and test to demonstrate adequacy of less than specified separation	Complete	8/30/84 (Rev. 1)
245	8.3.3.3.2	The use of 18 versus 36 inches of separation between raceways	Complete	8/15/84 (Rev. 1)
246	8.3.3.3.3	Specified separation of raceways by analysis and test	Complete	8/1/84
247	8.3.3.5.1	Capability of penetrations to withstand long duration short circuits at less than maximum or worst case short circuit	Complete	8/1/84
248	8.3.3.5.2	Separation of penetration primary and backup protections	Complete	8/1/84
249	8.3.3.5.3	The use of bypassed thermal overload protective devices for penetration protections	Complete	8/1/84
250	8.3.3.5.4	Testing of fuses in accordance with R.G. 1.63	Complete	8/1/84

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
251	8.3.3.5.5	Fault current analysis for all representative penetration circuits	Complete	8/1/84
252	8.3.3.5.6	The use of a single breaker to provide penetration protection	Complete	8/1/84
253	8.3.3.1.4	Commitment to protect all Class 1E equipment from external hazards versus only class 1E equipment in one division	Complete	8/1/84
254	8.3.3.1.5	Protection of class 1E power supplies from failure of unqualified class 1E loads	Complete	8/1/84
255	8.3.2.2	Battery capacity	Complete	8/1/84
256	8.3.2.3	Automatic trip of loads to maintain sufficient battery capacity	Complete	8/20/84
257	8.3.2.5	Justification for a 0 to 13 second load cycle	Complete	8/1/84
258	8.3.2.6	Design and qualification of DC system loads to operate between minimum and maximum voltage levels	Complete	8/1/84
259	8.3.3.3.4	Use of an inverter as an isolation device	Complete	8/1/84
260	8.3.3.3.5	Use of a single breaker tripped by a LOCA signal used as an isolation device	Complete	8/1/84
261	8.3.3.3.6	Automatic transfer of loads and interconnection between redundant divisions	Complete	8/1/84
262	11.4.2.d	Solid waste control program	Complete	8/20/84

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
263	11.4.2.e	Fire protection for solid radwaste storage area	Complete	8/13/84
264	6.2.5	Sources of oxygen	Complete	8/20/84
265	6.8.1.4	ESF Filter Testing	Complete	8/13/84
266	6.8.1.4	Field leak tests	Complete	8/13/84
267	6.4.1	Control room toxic chemical detectors	Complete	8/13/84
268		Air filtration unit drains	Complete	8/20/84
269	5.2.2	Code cases N-242 and N-242-1	Complete	8/20/84
270	5.2.2	Code case N-252	Complete	8/20/84
TS-1	2.4.14	Closure of watertight doors to safety-related structures	Open	
TS-2	4.4.4	Single recirculation loop operation	Open	
TS-3	4.4.5	Core flow monitoring for crud effects	Complete	6/1/84
TS-4	4.4.6	Loose parts monitoring system	Open	
TS-5	4.4.9	Natural circulation in normal operation	Open	
TS-6	6.2.3	Secondary containment negative pressure	Open	
TS-7	6.2.3	Inleakage and drawdown time in secondary containment	Open	
TS-8	6.2.4.1	Leakage integrity testing	Open	
TS-9	6.3.4.2	ECCS subsystem periodic component testing	Open	

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
TS-10	6.7	MSIV leakage rate		
TS-11	15.2.2	Availability, setpoints, and testing of turbine bypass system	Open	
TS-12	15.6.4	Primary coolant activity		
LC-1	4.2	Fuel rod internal pressure criteria	Complete	6/1/84
LC-2	4.4.4	Stability analysis submitted before second-cycle operation	Open	

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ATTACHMENT 2 DATE: 9/12/84

DRAFT SER SECTIONS AND DATES PROVIDED

SECTION	DATE	SECTION	DATE
3.1			
3.2.1		11.4.1	See Notes 1&5
3.2.2		11.4.2	See Notes 1&5
5.1		11.5.1	See Notes 1&5
5.2.1		11.5.2	See Notes 1&5
6.5.1	See Notes 1&5	13.1.1	See Note 4
8.1	See Note 2	13.1.2	See Note 4
8.2.1	See Note 2	13.2.1	See Note 4
8.2.2	See Note 2	13.2.2	See Note 4
8.2.3	See Note 2	13.3.1	See Note 4
8.2.4	See Note 2	13.3.2	See Note 4
8.3.1	See Note 2	13.3.3	See Note 4
8.3.2	See Note 2	13.3.4	See Note 4
8.4.1	See Note 2	13.4	See Note 4
8.4.2	See Note 2	13.5.1	See Note 4
8.4.3	See Note 2	15.2.3	
8.4.5	See Note 2	15.2.4	
8.4.6	See Note 2	15.2.5	
8.4.7	See Note 2	15.2.6	
8.4.8	See Note 2	15.2.7	
9.5.2	See Note 3	15.2.8	
9.5.3	See Note 3	15.7.3	See Notes 1&5
9.5.7	See Note 3	17.1	8/3/84
9.5.8	See Note 3	17.2	8/3/84
10.1	See Note 3	17.3	8/3/84
10.2	See Note 3	17.4	8/3/84
10.2.3	See Note 3		
10.3.2	See Note 3		
10.4.1	See Note 3		
10.4.2	See Notes 3&5		
10.4.3	See Notes 3&5		
10.4.4	See Note 3		
11.1.1	See Notes 1&5		
11.1.2	See Notes 1&5		
11.2.1	See Notes 1&5		
11.2.2	See Notes 1&5		
11.3.1	See Notes 1&5		
11.3.2	See Notes 1&5		

Notes:

1. Open items provided in letter dated July 24, 1984 (Schwencer to Mittl)
2. Open items provided in June 6, 1984 meeting
3. Open items provided in April 17-18, 1984 meeting
4. Open items provided in May 2, 1984 meting
5. Draft SER Section provided in letter dated \ugust 7, 1984 (Schwencer to Mittl)

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ATTACHMENT 3

OPEN ITEM	DSER SECTION	SUBJECT
100	3.9.6	10CFR50.55a, Paragraph (g)
101	3.9.6	PSI and ISI programs for pumps and valves
102	3.9.6	Leak testing of pressure isolation valves
148	9.3.2	Post-accident sampling system (TMI item II.B.3)

QUESTION NO.	FSAR SECTION
430.88	9.5.4
430.132	9.5.7

STRUCTURAL AUDIT ITEM	MEETING DATE
A.8	1/10/84
B.6	1/10/84
A.2	1/11/84
A.3	1/11/84
A.13	1/11/84

ATTACHMENT 4

Rev 1

DSER OPEN ITEM NO. 101 (Section 3.9.6)

PST AND IST PROGRAMS FOR PUMPS AND VALVES

The applicant has not yet submitted his program for the preservice and inservice testing of pumps and valves.

RESPONSE

The response to FSAR Question 210.57 has been revised to address submittal of the preservice and inservice testing program of pumps and valves.

Rev 1

DSER Open Item No. 100b (DSER Section 3.9.6)

10 CFR 55a, PARAGRAPH (g)

In Section 3.9.2 and 3.9.3 of the Safety Evaluation Report, the staff discussed the design of safety-related pumps and valves in the Hope Creek plant. The load combinations and stress limits used in the design of pumps and valves assure that the component pressure boundary integrity is maintained. In addition, the applicant will periodically test and perform periodic measurements of all its safety-related pumps and valves. These tests and measurements are performed in accordance with the rules of Section XI of the ASME Code. The tests verify that these pumps and valves operate successfully when called upon. The periodic measurements are made of various parameters and compared to baseline measurements in order to detect long-term degradation of the pump or valve performance. The staff reviews the applicant's program for preservice and inservice testing of pumps and valves using the guidance of SRP Section 3.9.6, and gives particular attention to the completeness of the program and to those areas of the test program for which the applicant requests relief from the requirements of Section XI of the ASME Code. The applicant must provide a commitment that the inservice testing of ASME Class 1, 2, and 3 components will be in accordance with the rules of 10 CFR 50.55a, Paragraph (g).

There are several safety systems connected to the reactor coolant pressure boundary that have design pressure below the rated reactor coolant system (RCS) pressure. There are also some systems which are rated at full reaactor pressure on the discharge side of pumps but have pump suction below RCS pressure. In order to protect these systems from RCS pressure, two or more isolation valves are placed in series to form the interface between the high pressure RCS and the low pressure system. The leak tight integrity of these valves must be ensured by periodic leak testing to prevent exceeding the design pressure of the low pressure systems.

Pressure isolation valves are required to be Category A or AC per IWV-2000 and to meet the appropriate requirements of IWV-3420 of Section XI of the ASME Code, except as discussed below.

Limiting conditions for operation (LCO) are required to be added to the technical specifications which will require corrective action; i.e., shutdown or system isolation when the final approved leakage limits are not met. Also, surveillance requirements, which will state the acceptable leak rate testing frequency, shall be provided in the technical specifications.

DSER Open Item No. 100b (Cont'd)

Periodic leak testing of each pressure isolation valve is required to be performed at least once per each refueling outage, after valve maintenance prior to return to service, and for systems rated as less than 50% of RCS design pressure each time the valve has moved from its fully closed position unless justification is given. The testing interval should average to be approximately 1 year. Leak testing should also be performed after all disturbances to the valves are complete, prior to reaching power operation following a refueling outage, maintenance, and so forth.

The staff's position on leak rate limiting conditions for operation is that leak rates must be equal to or less than 1 gallon per minute (GPM) for each valve to ensure the integrity of the valve, demonstrate the adequacy of the redundant pressure isolation function and give an indication of valve degradation over a finite period of time. Significant increases over this limiting value would be an indication of valve degradation from one test to another.

Leak rates higher than 1 GPM will be considered if the leak rate changes are below 1 GPM from the previous test leak rate or system design precludes mesasuring 1 GPM with sufficient accuracy. These items will be reviewed on a case-by-case basis.

The Class 1 to Class 2 boundary will be considered the isolation point which must be protected by redundant isolation valves. In cases where pressure isolation is provided by two valves, both will be independently leak tested. When three or more valve provide isolation, only two of the valves need to be leak tested.

RESPONSE

An evaluation of the pressure isolation features is provided in the response to Question 210.56. attached to DSER open item 102.

QUESTION 210.57 (SECTION 3.9.6)

Provide a schedule for completion of your program for inservice testing of pumps and valves including any request relief from ASME Section XI requirements.

RESPONSE

Hope Creek Generating Station has been designed to accommodate the pump and valve testing requirements of ASME Section XI, Articles IWP and IWV. A review of current design documents has indicated that all testing requirements of Articles IWP and IWV can be met.

The Inservice Testing (IST) Program will be developed from the PST program taking into account any changes required to conform to Technical Specifications. The IST Program will be submitted to the NRC 6 months prior to fuel load. This Program will include any requests for relief from testing requirements of ASME Section XI.

Procedures for the PST program are currently being developed and subsequent field testing will be performed during the startup phase of systems and components; at this time baseline data will be established. In the event it becomes apparent relief request(s) are necessary these requests will be submitted to the NRC.

The HCGS Preservice/Inservice Testing Program Pumps and Valves, Rev. 0, dated September 10, 1984, and associated process and instrumentation drawings, have been submitted under separate cover (letter from R. L. Mittl, PSE&G, to A. Schwencer, NRC, dated September 12, 1984).

Rev. 1

HCGS

DSER Open Items No. 148 (DSER Section 9.3.2)

Postaccident Sampling System, TMI-2 Action Plan Item II.B.3

The information provided through Amendment 3 was not sufficient for the staff to complete its evaluation. This is an open item.

To meet the criteria of NUREG-0737, Item II.B.3, the guidelines of Appendix C to this SER should be implemented.

RESPONSE

For the information requested above, see the response to question 281.15.

In addition, the following information was requested in discussions with the NRC on July 13, 1984:

- The only inaccessible valves are located in the Reactor Building and are discussed in FSAR section 9.3.2.2.2.2.

- Heat tracing of the sample line is discussed in section 9.3.2.2.2.2.

DSER Open Item No. 102 (Section 3.9.6)

LEAK TESTING OF PRESSURE ISOLATION VALVES

The applicant has not yet responded to the staff's concern regarding the leak testing of pressure isolation valves.

RESPONSE

For the information requested above, see the revised response to Question 210.56.

QUESTION 210.56 (SECTION 3.9.6)

There are several safety systems connected to the reactor coolant pressure boundary that have design pressure below the rated reactor coolant system (RCS) pressure. There are also some systems which are rated at full reactor pressure on the discharge side of pumps but have pump suction below RCS pressure. In order to protect these systems from RCS pressure, two or more isolation valves are placed in series to form the interface between the high pressure RCS and the low pressure systems. The leak tight integrity of these valves must be ensured by periodic leak testing to prevent exceeding the design pressure of the low pressure systems.

Pressure isolation valves are required to be category A or AC per IWV-2000 and to meet the appropriate requirements of IWV-3420 of Section XI of the ASME Code except as discussed below.

Limiting Conditions for Operation (LCO) are required to be added to the technical specifications which will require corrective action; i.e., shutdown or system isolation when the final approved leakage limits are not met. Also, surveillance requirements which will state the acceptable leak rate testing frequency shall be provided in the technical specifications.

Periodic leak testing of each pressure isolation valve is required to be performed at least once per each refueling outage, after valve maintenance prior to return to service, and for systems rated at less than 50% of RCS design pressure each time the valve has moved from its fully closed position unless justification is given. The testing interval should average to be approximately one year. Leak testing should also be performed after all disturbances to the valves are complete, prior to reaching power operation following a refueling outage, maintenance, etc.

The staff's present position on leak rate limiting conditions for operation must be equal to or less than 1 gallon per minute (GPM) for each valve to ensure the integrity of the valve, demonstrate the adequacy of the redundant pressure isolation function and give an indication of valve degradation over a finite period of time. Significant increases over this limiting value would be an indication of valve degradation from one test to another.

The Class 1 to Class 2 boundary will be considered the isolation point which must be protected by redundant isolation valves.

In cases where pressure isolation is provided by two valves, both will be independently leak tested. When three or more valves provide isolation, only two of the valves need to be leak tested.

Provide a list of all pressure isolation valves included in your testing program along with four sets of Piping and Instrument Diagrams which describe your reactor coolant system pressure isolation valves.

Also discuss in detail how your leak testing program will conform to the above staff position.

RESPONSE

The reactor coolant pressure boundary has been reviewed for interconnecting safety-related low pressure systems. Table 210.56-1 summarizes the results of this review. The table identifies the reactor coolant system pressure isolation valves and details the extent of compliance with the staff's position. Also identified in Table 210.56-1 are those pressure isolation valves that are leakage tested.

Four sets of full size P&IDs were submitted under separate cover.

The P&IDs that the NRC staff will need to review this response are identified in Table 210.56.

INSERT A

INSERT A

The HCGS uses two isolation valves. The isolation valves are periodically leak rate tested as 10CFR20, Appendix J, Type C valves or ASME, Section XI, Catagory A valves. In the event of isolation valve leakage, a safety relief valve will further protect the low pressure system.

As an alternate to conducting a liquid leak rate test using reactor coolant operating pressure, PSE&G proposes to fulfill these leak rate test requirements using the results of the Appendix J, Type C, test program and assigning each valve an individual leak rate.

In support of conducting Appendix J leak rate testing in place of a liquid test at reactor coolant system operating pressure, PSE&G proposes to conduct a program consisting of analytical justification and, if necessary, physical testing. The intent of this program is to insure that Appendix J testing in conjunction with the pressure relieving device installed in these systems supplies the assurance that the structural integrity of these systems is maintained. In the event this program is unsuccessful, the pressure isolation valves will be leak rate tested in accordance with the NRC staff's position using liquid at reactor coolant system operating pressure. The results of this program will be submitted to the NRC for review prior to fuel load.

In addition to leak rate testing each refueling outage, each pressure isolation valve will be leak rate tested prior to returning to service after:

1. Maintenance has been performed that could affect the seat leakage rate;

2. The systems rated at $<$ 50% of RCS design pressure, each time the valve has moved from its fully closed position, except when testing would put the plant in a limiting condition of operation, or provisions are made to monitor the low pressure side of the valve for leakage or pressure increases.

DSER OPEN ITEM 102

SAFETY-RELATED LOW PRESSURE SYSTEMS
CONNECTED TO THE RCPB

INSERT B

RPV Nozzle	Connecting Line Description	Pressure Isolation Valve	Leak Tested(9)
N1B	RHR Shutdown Cooling Suction	BC-V071 BC-V164	Yes Yes
N2A-E	RHR Shutdown Cooling Return	BC-V013(1)(2)	Yes
N2F-K	RHR Shutdown Cooling Return	BC-V110(1)(2)	Yes
N4A-C	RCIC Discharge	BD-V005 AE-V003 AE-V002	Yes Yes Yes
N4D-F	HPCI Feedwater Discharge	BJ-V059 AE-V007 AE-V006	Yes Yes Yes
N5A	Core Spray	BE-V003(1)(5)	Yes
N5B	Core Spray	BE-V007(1)(6)	Yes
	HPCI Core Spray Discharge	BJ-V001(1)(4)	Yes
N6A	RHR Headspray	BC-V021 BC-V020	Yes Yes
N17A	LPCI	BC-V004(1)(8)	Yes
N17B	LPCI	BC-V016(1)(2)	Yes
N17C	LPCI	BC-V101(1)(7)	Yes
N17D	LPCI	BC-V113(1)(3)	Yes

(1) HCGS uses one pressure isolation valve. The isolation valve is periodically leak rate tested and in the event of valve leakage, a safety-relief valve will protect the low pressure system.

(2) Safety-relief valve BC-PSV-F025B provides overpressure protection. It has a 410 psig set pressure and a 10 gpm capacity.

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Rev. 1

TABLE 210.56-1 (Cont'd) Page 2 of 2

(3) Safety-relief valve BC-PSV-F025A provides overpressure protection. It has a 410 psig set pressure and a 10 gpm capacity.

(4) BJ-V003 provides pressure isolation but is not required to be leak rate tested in order to prevent overpressurization of the low pressure (pump suction) portion of the HPCI system. Should BJ-V003 leak excessively, safety-relief valve BJ-PSV-F020 will prevent the system from being overpressurized. BJ-PSV-F020 has a 100 psig setpoint and a 15 gpm capacity.

(5) Safety-relief valve BE-PSV-F012B provides overpressure protection. It has a 500 psig setpoint and a 100 gpm capacity.

(6) Safety-relief valve BE-PSV-F012A provides overpressure protection. It has a 500 psig setpoint and a 100 gpm capacity.

(7) Safety-relief valve BC-PSV-F025C provides overpressure protection. It has a 410 psig setpoint and a 10 gpm capacity.

(8) Safety-relief valve BC-PSV-F025D provides overpressure protection. It has a 410 psig setpoint and a 10 gpm capacity.

(9) Leak rate tested in accordance with 10 CFR 50, Appendix J, requirements.

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HCGS FSAR

TABLE 210.56-1

SAFETY-RELATED LOW PRESSURE SYSTEMS CONNECTED TO RCPB

RPV NOZZLE	CONTAINMENT PENETRATION	CONNECTING LINE DESCRIPTION	PRESSURE ISOLATION VALVE	LEAK TESTED	SAFETY-RELIEF PROTECTION
N1B	P-3	RHR Shutdown	BC-V164 (2)	(3)	(6)
		Cooling Section	BC-V071 (1)	(3)	
N2A-E	P-4A	RHR Shutdown	BC-V013 (2)	(3)	(7)
		Cooling Return	BC-V014 (1) (5)	(3)	
			BC-V118 (1)	(3)	
N2F-K	P4B	RHR Shutdown	BC-V110 (2)	(3)	(8)
		Cooling Return	BC-V111 (1) (5)	(3)	
			BC-V117 (1)	(3)	
N4A-C	P2A	RCIC to	BD-V005 (15)	(4)	(9)
		Feedwater	AE-V002 (2) (5)	(3)	
			AE-V003 (1) (5)	(3)	
N4D-F	P2B	HPCI to	BJ-V059 (15)	(4)	(10)
		Feedwater	AE-V006 (2) (5)	(3)	
			AE-V007 (1) (5)	(3)	
N5A	P5A	Core Spray	BE-V003 (2)	(3)	(11)
			BE-V002 (1) (5)	(3)	
			BE-V072 (1)	(3)	
N5B	P5B	Core Spray	BE-V007 (2)	(3)	(12)
		HPCI to Core	BJ-V001 (2)	(3)	(10)
		Spray	BE-V006 (1) (5)	(3)	
			BE-V071 (1)	(3)	
N6A	P10	RHR, RPV Head	BC-V020 (2)	(3)	(7)
		Spray	BC-V021 (1)	(3)	
N17A	P6A	RHR, LPCI	BC-V004 (2)	(3)	(14)
			BC-V005 (1) (5)	(3)	
			BC-V122 (1)	(3)	
N17B	P6B	RHR, LPCI	BC-V016 (2)	(3)	(7)
			BC-V017 (1) (5)	(3)	
			BC-V120 (1)	(3)	

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INSERT B (Cont'd)

HCGS FSAR

TABLE 210.56-1

SAFETY-RELATED LOW PRESSURE SYSTEMS CONNECTED TO RCPB

RPV NOZZLE	CONTAINMENT PENETRATION	CONNECTING LINE DESCRIPTION	PRESSURE ISOLATION VALVE	LEAK TESTED	SAFETY-RELIEF PROTECTION
N17C	P6D	RHR, LPCI	BC-V101 (2)	(3)	(13)
			BC-V102 (1) (5)	(3)	
			BC-V121 (1)	(3)	
N17D	P6C	RHR, LPCI	BC-V113 (2)	(3)	(8)
			BC-V114 (1) (5)	(3)	
			BC-V119 (1)	(3)	

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(1) 1st pressure isolation valve

(2) 2nd pressure isolation valve

(3) Leak rate tested in accordance with 10CFR50, Appendix J

(4) Leak rate tested in accordance with ASME, Section XI

(5) Functionally tested as a Catagory C check valve in accordance with ASME, Section XI.

(6) Safety relief valve BC-PSV-F029 provides over pressure protection. It has a 170 PSIG set point and a 10 GPM capacity.

(7) Safety relief valve BC-PSV-F025B provides over pressure protection. It has a 410 PSIG set point and a 10 GPM capacity.

(8) Safety-relief valve BC-PSV-F025A provides over pressure protection. It has a 410 PSIG set pressure and a 10 GPM capacity.

(9) Safety relief valve BD-PSV-F017 provides over pressure protection. It has a 100 PSIG set point and a 10 GPM capacity.

(10) Safety relief valve BJ-PSV-F020 provides over pressure protection. It has a 100 PSIG set point and a 15 GPM capacity.

(11) Safety relief valve BE-PSV-F012B provides over pressure protection. It has a 500 PSIG set point and a 100 GPM capacity.

(12) Safety relief valve BE-PSV-F012A provides over pressure protection. It has a 500 PSIG set point and a 100 GPM capacity.

(13) Safety relief valve BC-PSV-F025C provides over pressure protection. It has a 410 PSIG set point and a 10 GPM capacity.

(14) Safety relief valve BC-PSV-F025D provides over pressure protection. It has a 410 PSIG set point and a 10 GPM capacity.

(15) 3rd pressure isolation valve. Two of the three valves are required to meet the leak rate acceptance criteria.

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TABLE 210.56-2

P&IDS REVIEWED FOR INTERCONNECTING LOW PRESSURE SYSTEMS

M-01-1	Rev. 9
M-05-1, Sh. 3	Rev. 9
M-06-1	Rev. 6
M-08-0, Sh. 1	Rev. 11
M-08-0, Sh. 2	Rev. 11
M-23-1, Sh. 2	Rev. 5
M-38-0, Sh. 1	Rev. 2
M-41-1, Sh. 1	Rev. 8
M-41-1, Sh. 2	Rev. 7
M-42-1, Sh. 1	Rev. 5
M-43-1, Sh. 1	Rev. 8
M-44-1	Rev. 6
M-46-1	Rev. 6
M-47-1	Rev. 7
M-48-1	Rev. 4
M-49-1	Rev. 9
M-50-1	Rev. 9
M-51-1, Sh. 1	Rev. 9
M-51-1, Sh. 2	Rev. 10
M-52-1	Rev. 10
M-55-1	Rev. 10
M-56-1	Rev. 8
M-72-1	Rev. 2

QUESTION 281.15 (SECTION 9.3.2)

The information provided on the Post Accident Sampling System (PASS) is inadequate to demonstrate compliance with NUREG-0737, Item II.B.3. Provide information that satisfies the criteria in the attachment.

RESPONSE

Section 9.3.2 has been revised to provide the information responding to the attachment transmitted with this question.

~~Additional information on the following will be provided in June 1984.~~

- ~~Equipment used to ship samples for offsite analyses~~
- ~~Time to analyze samples~~
- ~~Quantification methods~~ — delete
- ~~Chloride analysis~~
- ~~Compliance with GDC19 for PASS sample analysis~~

~~In addition, HCGS will meet the requirements of GDC 19 and a discussion of HCGS compliance with GDC 19 will be provided by~~ ~~Samp~~ ~~September, 1984.~~

delete

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1.8.1.97 Conformance to Regulatory Guide 1.97, Revision 2, December 1980: Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident

HCGS complies with the BWR Owner's Group position (Reference 1.8-4) on Regulatory Guide 1.97 with the following clarifications and exceptions:

a. Suppression chamber spray flow (Type D variable) - The BWR Owner's Group has recommended not implementing this variable. HCGS has implemented this variable as Category 2.

b. Drywell spray flow (Type D variable) - The BWR Owner's Group has recommended not implementing this variable. HCGS has implemented this variable as Category 2.

c. Condenser cooling water flow (BWR Owner's Group recommended Type D variable) - HCGS deviates from the BWR Owner's Group position on this variable by using the cooling water temperature rise (delta T) across the condenser to provide this information.

Insert E →

See Section 1.8.2 for the NSSS assessment of this Regulatory Guide.

1.8.1.98 Conformance to Regulatory Guide 1.98, Revision 0, March 1976: Assumptions Used for Evaluating the Potential Radiological Consequences of a Radioactive Offgas System Failure in a Boiling Water Reactor

HCGS complies with Branch Technical Position ETSB 11-5, Revision 0, July 1981, in lieu of Regulatory Guide 1.18.

For further discussion, see Section 15.7.1.

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Insert E

d. Total Dissolved Gas Analysis - The guidelines recommended by the BWR owners Group and GE shall be followed. This was agreed to in a meeting between NRC Management (R. Vollmar, et. al.) and GE (J. Quirk, et al.), dated December 12, 1983.

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The post-accident sampling system (PASS) is designed to provide specific samples in the event of a loss-of-coolant accident (LOCA) in compliance with ~~Regulatory Guide 1.97~~ the requirements for accident sampling capability in Item II.B.3 of NUREG-0737.

Radiation monitoring of gaseous and liquid process streams is discussed separately in Section 11.5.

9.3.2.1 Design Basis

9.3.2.1.1 Process Sampling System

The PSS is designed to provide representative samples of all process streams related to plant power operation and liquid radwaste processing.

The system is designed to allow for the collection of data or a grab sample without hazard to the operator or contamination of general working areas.

Sample line size, length, and routing are designed to provide a representative sample by maintaining turbulent flow.

The PSS is designed to ensure representative samples from liquid and gaseous processes in accordance with Regulatory Guide 1.21, Position C.6.

Isolation valves fail in the closed position, in accordance with the requirements of GDC 60 in 10 CFR 50, Appendix A, to control the release of radioactive materials to the environment. Isolation valves are provided to limit reactor coolant loss from a rupture of the sample line in accordance with ALARA provisions in 10 CFR 20.1(c) and GDC 60 in 10 CFR 50, Appendix A, to control the release of materials to the environment.

9.3.2.1.2 Post-Accident Sampling System

The PASS is designed to meet the requirements of Item II.B.3 of NUREG 0737. ~~and Regulatory Guide 1.97, Revision 2.~~

A gaseous radwaste storage tank is not part of the HCGS design. Offgas treatment system radioactivity is monitored downstream of the offgas system charcoal adsorbers, upstream of the offgas system discharge valve. This monitor does not provide for sample removal. It is described in Section 11.5.2.2.6.

Sample flow rates to the analyzer and grab sample panels are designed to provide turbulent flow and to supply a representative sample. The liquid sample stations have flush and blowdown capabilities built into the system to reduce radiation exposure of the operator to as low as reasonably achievable (ALARA). The various sample points and design parameters provided to meet the acceptance criteria are listed in Table 9.3-3.

9.3.2.2.2 Post-Accident Sampling System

The post-accident sampling system~~s~~ (PASS) is ~~are~~ designed to obtain representative liquid and gas grab samples from the primary coolant system and from within the primary and secondary containments for radiological and chemical analysis under accident conditions. The grab samples are subsequently transported to the laboratory for chemical and radiosotopic analysis or shipped offsite for analysis.

The system design minimizes operating complexities and "in-line" instrumentation, is modular for maintenance and contamination control purposes, and is compact in size to reduce the amount of shielding required. The system can be used to provide samples under all plant conditions, ranging from normal shutdown and power operation to post-accident conditions.

Figures 9.3-5 and 9.3-6 show the piping and instrumentation diagrams and the logic diagrams respectively for the PASS. The equipment includes isolation and control valves, piping racks, shielded sample stations (gas and liquid), liquid chillers, and control panels for the sampling stations and the isolation valves. The seismic category, quality group classification, and corresponding codes and standards that apply to the design of the PASS are as shown on Table 3.2-1. Demineralized water, and nitrogen gas ~~and tracer gas~~ are provided as support systems for the PASS.

plate. As reactor pressure decays, low pressure coolant injection (LPCI) is initiated into the core region. This water volume supplies more coolant than is boiled off by the decay heat. X This excess water will flow down past the core, up through the jet pumps, and out through the postulated break, assuring a representative sample at the sample point.

To ensure a representative liquid sample from the jet pumps at low (<1%) power conditions for small break or non-break events, the reactor water level will be raised to the level of the moisture separator when this action is not inconsistent with station emergency procedures. This will fully flood the separators and will provide a thermally-induced recirculation flow path for mixing.

Samples will be taken from the reactor via the jet pump pressure instrument lines as long as possible. This allows a more direct and therefore faster response to core conditions. Upon decay or loss of reactor pressure, the jet pump sample point is lost, and the RHR loops sample points must be employed for sampling. Reactor coolant and/or suppression pool samples may be taken from the RHR sample lines, depending on the mode of RHR operation. These modes are:

1. LPCI: Suppression pool water is injected into the core, flows up through the jet pumps, and back to the suppression pool via the postulated break. The system will be operated for an estimated 30 minutes minimum prior to sampling of the suppression pool water to ensure that a representative sample is obtained at the sample taps.

2. Shutdown Cooling: The RHR system, aligned in the shutdown cooling mode, provides cooling and circulation of reactor coolant through the core, resulting in a representative sample at the RHR sample taps.

3. Suppression Pool Cooling: The RHR system, aligned in the suppression pool cooling mode, provides cooling and circulation of the suppression pool

water. The system will be operated for an estimated 30 minutes minimum prior to sampling of the suppression pool water to ensure that a representative sample is obtained at the RHR sample taps.

These sample lines tap off upstream of the first isolation valve in the RHR system sample lines at the discharge of each RHR heat exchanger.

9.3.2.2.2.2 Isolation Valves and Sample Lines

Containment isolation for the drywell/suppression chamber gas sample lines, the jet pump instrument liquid sample line, and the gas/liquid sample return lines is provided by the isolation valves noted in Section 9.3.2.2.2.1. System isolation for the RHR liquid sample lines is provided by the isolation valves discussed in Section 9.3.2.2.2.1. All PASS isolation valves in the reactor building are environmentally qualified for the conditions in which they must operate.

The gas sample lines are heat traced to prevent precipitation of moisture and the resultant loss of iodine in the sample lines. Sample line routings are as direct and short as practical. Recirculation flow rates in the liquid sample lines are maintained in the turbulent flow regime.

The liquid sample lines have top or side takeoff taps to minimize the possibility of line plugging.

Primary containment gas/liquid sample lines and secondary containment gas sample lines are designed Seismic Category I up to and including each lines' piping-to-tubing reducer which is located immediately downstream of the restriction orifice. All sample lines beyond the piping-to-tubing reducers conform to quality group D, meet the requirements of ANSI B31.1, Power Piping Code, and are non-Seismic Category I. All isolation valves are located in the Seismic Category I portion of the sample lines.

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PASS control instrumentation is installed in two control panels mounted side by side. One of these panels contains the conductivity and radiation level readouts. The other control panel contains the flow, pressure, and temperature indicators, and various valve controls and switches. A graphic display is provided directly on this control panel which shows the status of the pumps and valves. These panels are located directly outside the PASS room to minimize operator exposure while operating the PASS.

The PASS isolation valve control panels are located adjacent to the PASS control panel outside the PASS room. Once the MCR permissive keylock switch is activated, the isolation valves can be operated from the these panels. Valve status indication is provided on the control panels; 100% closed valve status signals are provided to the computer. The valves close if the MCR permissive is removed.

9.3.2.2.2.5 Gas Sampler

The gas sample system is designed to operate at pressures ranging from sub-atmospheric to the design pressures to the primary containment one hour after a LOCA. The gas samples may be passed through a particulate filter and silver zeolite cartridge for determination of particulate activity and total iodine activity by subsequent spectroscopic analysis. A radiation monitor is mounted close to the filter tray to measure the activity buildup on the cartridges. Alternatively, the sample flow bypasses the iodine sampler, is chilled to remove moisture, and a 15 ~~10~~ milliliter grab sample can be taken for determination of gaseous activity and gas composition by gas chromatography. The gas is collected in an evacuated vial using hypodermic needles. When purging the drywell and suppression chamber gas sample lines to obtain a representative sample, the flow is returned to the suppression chamber. During purging of the secondary containment line and when flushing the sample panel lines with nitrogen, flow is returned to secondary containment. The sample station design allows for sample gas or nitrogen flushing of the entire sample panel line downstream of the four-position selector valve. This capability will minimize cross-contamination between the various samples.

9.3.2.2.2.6 Liquid Sampler

The liquid sample system is designed to operate at pressures from ~0 to 1150 psi. The design recirculation flow rate of 1 gpm is sufficient to maintain turbulent flow in the sample line and serves to minimize cross-contamination between samples. The recirculation flow is returned to the suppression pool. The liquid sampling system is designed to allow demineralized water flushing of the system lines from a point in the piping station through the sampling needles.

9.3.2.2.2.6.1 Diluted Liquid Sample

The small volume

~~All~~ liquid samples are taken into 15 milliliter septum bottles mounted on sampling needles. In the sampling lineup, the sample flows through a conductivity cell (0.1 to 1000 micromhos/cm) and through a ball valve bored to 0.10 milliliter volume. After flow through the sample is established, the ball valve is rotated 90 degrees, and a syringe is used to flush the sample and a measured volume of diluent (generally 10 milliliters) through the valve and into the sample bottle. This provides an initial dilution of up to 100:1. The sample bottle is contained in a shielded cask and remotely positioned on the sample needles through an opening in the bottom of the sample enclosure.

9.3.2.2.2.6.2 Non-Diluted Liquid and Dissolved Gas Samples

of individual species

Alternatively, the sample can be diverted through a 70 milliliter holdup cylinder to obtain depressurized samples of primary coolant gas and liquid phases. A coolant sample is circulated through a holdup cylinder, the cylinder is then isolated and contents circulated through a ~~gas~~ loop, ~~containing a measured amount of inert krypton.~~ The gases are vented to an evacuated gas collection chamber, and a fraction of the gas is expanded into a sample vial for analysis by gas chromatography. ~~The concentration of krypton in the sample is used to calculate the fraction of the dissolved gases recovered. The krypton also serves as a stripping agent at low gas concentrations.~~ Insert A Ten milliliter aliquots of degassed liquid can then be taken for offsite (or onsite depending on activity level) analyses which require a relatively large undiluted sample. This sample is obtained remotely using the large volume cask and cask positioner through needles on the underside of the sample station enclosure.

9.3.2.2.2.7 Piping and Sample Station Ventilation

The sample station enclosure will be vented into the piping station area. The ventilation rate required for heat removal and proper sweep velocity during operation is about 40 scfm. A

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Insert A

The concentration of total dissolved gas is determined by measuring the pressure rise in the gas collection chamber following gas expansion and applying the ideal gas law.

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pressure gauge is attached to the sample station enclosure to monitor the pressure differential between the enclosure and the PASS room. The pressure differential will assure the operator that airborne activity in the sample enclosure will be swept into the piping area.

The piping area is vented into the auxiliary building radwaste area exhaust system discussed in Section 9.4.3.2.2. The nominal exhaust rate is 200 scfm.

Any potential liquid leakage in the piping station area will be collected and processed in accordance with Section 9.3.3 and 11.2.2 respectively.

9.3.2.2.2.8 Sample Station Sump

The sample station is provided with a bottom sump to collect liquid leakage. This sump can be isolated, pressurized, and discharged into the sample station liquid return line to the suppression pool.

9.3.2.2.2.9 Sample Handling Tools and Transport Containers

Appropriate sample handling tools and transporting casks are used. Gas vials are installed and removed by use of a vial positioner through the front of the gas sampler. The vial is manually lowered into a shielded cask directly from the positioning tool. This allows the operator to maintain a distance of about three feet from the unshielded vial. The cask provides about 1-1/8 inches of lead shielding. A 1/8-inch diameter hole is drilled in the cask so that an aliquot can be withdrawn from the vial with a gas syringe without exposing the analyst to the unshielded vial.

The particulate and iodine cartridges are removed via a drawer arrangement. The quantity of activity accumulated on the cartridge is limited by controlling the line flow using a flow orifice and by timing the sample duration either manually or by use of preset timer. In addition, the radioactivity level is monitored during sampling using a radiation probe installed adjacent to the cartridge. These samples will be limited to activity levels that will not require shielded sample carriers.

concentrations are monitored by one of two hydrogen/oxygen analyzers. The Combustible Gas Analyzers are discussed in Section 6.2.5.2.5.

3. Dissolved gases (e.g., H_2), chloride (time allotted for analysis subject to discussion below), and boron concentration of liquids.

Total Dissolved Gas analysis will be performed by the method recommended by the BWR Owners Group and GE (as discussed in FSAR Section 1.8.1.97).

Chloride analysis will be performed by Ion Chromatography, Boron by Specific Ion Electrode.

4. Alternatively, have inline monitoring capabilities to perform all or part of the above analyses.

Inline monitoring capabilities (radiation monitors and conductivity cell) are discussed in Section 9.3.2.5.2.

HCGS will have the capability of sending samples offsite. ~~Arrangements will be made with offsite facilities to perform analyses and an appropriate shipping cask will be obtained prior to core load.~~

Insert C

c. Reactor coolant and containment atmosphere sampling during postaccident conditions shall not require an isolated auxiliary system (e.g., the letdown system, reactor water cleanup system) to be placed in operation in order to use the sampling system.

Isolated auxiliary systems are not required for PASS operation. The PASS is described in Section 9.3.2.2.2.

d. Pressurized reactor coolant samples are not required if the licensee can quantify the amount of dissolved gases with unpressurized reactor coolant samples. The measurement of either total dissolved gases or H_2 gas in reactor coolant samples is considered adequate. Measuring the O_2 concentration is recommended, but is not mandatory.

The method of gathering pressurized and non-pressurized reqactor coolant samples is discussed in Section 9.3.2.2.2.

e. The time for a chloride analysis to be performed is dependent upon two factors: (a) if the plant's coolant water is seawater or brackish water and (b) if there is only a single barrier between primary containment systems and the cooling water. Under both of the above

Insert C

Arrangements will be made with offsite facilities to perform analyses and a licensed shipping cask will be obtained (such as recommended by the BWR Owners group) prior to core load.

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conditions the licensee shall provide for a chloride analysis within 24 hours of the sample being taken. For all other cases, the licensee shall provide for the analysis to be completed within 4 days. The chloride analysis does not have to be done onsite.

A chloride analysis will need to be performed within 4 days of the sample being taken because 1) the plant has brackish coolant water and 2) two barriers are provided between primary containment systems and the cooling water (see Figure 9.2-3).

f. The design basis for plant equipment for reactor coolant and containment atmosphere sampling and analysis must assume that it is possible to obtain and analyze a sample without radiation exposures to any individual exceeding the criteria of GDC 19 (Appendix A, 10 CFR Part 50) (i.e., 5 rem whole body, 75 rem extremities). (Note that the design and operational review criterion was changed from the operational limits of 10 CFR Part 20 (NUREG-0578) to the GDC 19 criterion (October 30, 1979 letter from H.R. Denton to all licensees).)

replace with insert AA

~~The PASS radiation shielding design will be in accordance with Section 12.3.2.2.6 to keep personnel exposures as low as practicable and within the limits established by GDC 19.~~

g. The analysis of primary coolant samples for boron is required for PWRs. (Note that Revision 2 of Regulatory Guide 1.97 specifies the need for primary coolant boron analysis capability at BWR plants.)

HCGS will develop a procedure for Boron analysis ~~(Procedure No. CH-CA 22-25)~~ prior to core load.

h. If inline monitoring is used for any sampling and analytical capability specified herein, the licensee shall provide backup sampling through grab samples, and shall demonstrate the capability of analyzing the samples. Established planning for analysis at offsite facilities is acceptable. Equipment provided for backup sampling shall be capable of providing at least

Insert AA

The PASS radiation shielding design is in accordance with Section 12.3.2.2.6 to keep personnel exposures as low as practicable and within the limits established ~~above~~ by GDC 19. The estimated doses are as follows:

Function	Time		Integrated Whole Body Dose (REM)	Integrated Extremity Dose (REM)
Recirculate and operate sampler	30 min.		2.1	3.9
Transport Sample	20 min.		1.2	0.07
Analyze Sample	30 min.		0.03	0.10
		Total	3.33	4.07

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IMAGE EVALUATION
TEST TARGET (MT-3)

150mm

6"

IMAGE EVALUATION
TEST TARGET (MT-3)

150mm

6″

Sample aliquots are taken from the septum bottles for analysis or further dilution. Aliquoting and transfer will be performed using shielded containers, or behind a lead brick pile. Calibrated hypodermic syringes will be used for aliquoting the higher activity samples. Tongs or other holding/clasping devices will be available for holding the sample bottle during the transfer and dilutions to reduce hand and body exposure. Unless prohibited by the intended analysis, dilutions will be done using very dilute (about 0.01N) nitric acid as the diluent to minimize sample plateout problems.

Primary coolant samples obtained from the sampling station are diluted by a factor of 100 (0.1 ml coolant diluted to 10 ml). Under severe accident conditions, a calibrated syringe would be used to obtain an aliquot for this sample for further dilutions. At the maximum expected primary coolant activity level (3 Ci/cc), a dilution factor of 1 X 10^5 would be required for gamma spectroscopy.

Insert A1

~~Direct counting of the initial 100:1 dilution sample would allow analysis at coolant activity levels down to 1 Ci/cc. In addition, the degassed, undiluted 10 ml sample available from the sample station could be used for analysis of samples in the 10^{-2} to 10^{-3} Ci/cc range.~~ Thus, useful samples may be obtained from the post-accident sampling station for coolant activity levels ranging from design basis accident source terms to well below the maximum level that can be tolerated at the normal reactor sample station.

j. Accuracy, range, and sensitivity shall be adequate to provide pertinent data to the operator in order to describe radiological and chemical status of the reactor coolant systems.

Insert B1

1. Offsite provisions for chloride analysis will be accurate ±10 percent over the range 0.5 to 20 ppm and ±0.05 ppm below concentrations of 0.5 ppm.

2. Onsite chloride will be determined by Ion Chromatography. Table 9.3-7 lists range and accuracy for onsite analysis. No radiation damage is anticipated with resins based on experience developed at Battelle. Resins are conventionally

HCGS

Insert A1

Gross activity measuremements are accurate within a factor of 2.

The onsite radiological and chemical laboratory facilities are equipped with gamma spectral analysis equipment to quantify the radionuclides present in gas and liquid samples. Shielding is provided for the radiation detectors to minimize the effect of background radiation. Initial dilutions are performed in the process of taking liquid samples at the sample stations. Any additional dilutions required will be performed in the laboratory fume hood behind a lead brick pile.

If the levels of noble gases in the ambient atmosphere surrounding the detector are high enough to cause significant interference or to overload the detector, a compressed air or nitrogen purge of the detector shield volume will be maintained.

Insert B1

The analytical methods selected by HCGS were based on research done by NUS, Exxon Nuclear, General Electric, and EPRI using the NRC Standard Test Matrix.

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on the reasonable assumption that chloride level in the primary coolant will generally be below 10 ppm. Sensitivity will be in accordance with EPRI NP-3513.

3. A combination electrode will be used to measure the pH of coolant samples. Testing performed by GE has verified that expected levels of irradiation result in a shift of less than 0.3 pH units.

4. The boron determination is made on a 1:100 dilution of reactor water, the 5 ml sample radiation level is on the order of 30 R/hr at 1 cm two hours after the accident. The total dose to the fluoroborate electrode during the analyses sequence will be on the order of tens to hundreds of rads. The level of exposure is not anticipated to have any significant effect on the accuracy of measurement or operating lifetime of the probe.

5. The post-accident sample station is equipped with a 0.1 uS conductivity cell. The conductivity meter has a linear scale with a six-position range of 0-3, 0-10, 0-30, 0-100, 0-300 and 0-1000 uS when using the 0.1 uS cell. This conductivity measurement system will be used to determine the primary coolant or suppression pool conductivity. During normal operation the BWR technical specifications require maintaining the primary coolant below 1.0 uS/cm, and conductivity measurements are the primary method of coolant chemical control.

Conductivity measurements are, of course, non-specific, but they serve the important function of indicating changes in chemical concentrations and conditions. Perhaps even more important, in the case of the BWR primary coolant, the conductivity measurements can establish upper limits of possible chemical concentrations and can eliminate the need for additional analyses.

The conductivity measurement can also be used to bound the possible range of pH values.

9.3.2.6 SRP Rule Review

In SRP Section 9.3.2, Revision 2, Acceptance Criterion II.5.a implies that the PASS should have the capability for verifying dissolved oxygen concentration in the reactor coolant. The PASS was designed prior to the issuance of SRP Section 9.3.2, Revision 2, and Regulatory Guide 1.97, Revision 2, which both now call for verification of dissolved oxygen.

Insert B →

~~After a December 12, 1983 meeting between the NRC staff and GE personnel, the NRC staff concluded that the accuracy guidelines for the measurement of total dissolved gas could be relaxed, and that the dissolved oxygen measurement is not necessary. The concentration of total dissolved gas in the reactor coolant will be based solely on the readings from the pressure transducer in the gas collection chamber before and after the expansion of the dissolved gas into that chamber. The concentration of dissolved hydrogen will be inferred from the concentration of total dissolved gas. These conclusions are described in a letter dated January 18, 1984 to D.G. Eisenhut of the NRC staff from G.G. Sherwood of GE.~~

9.3.3 EQUIPMENT AND FLOOR DRAINAGE SYSTEMS

The plant equipment and floor drainage systems consist of the radioactive and nonradioactive waste drainage and collection systems. The radioactive and nonradioactive drainage systems are segregated to prevent transfer of radioactive contamination to the nonradioactive liquid wastes and uncontrolled access areas.

The nonradioactive waste drainage systems consist of the normal waste, oily waste, chemical (acid/caustic) waste, sanitary, and plant storm drainage systems. The radioactive waste drainage systems consist of the clean radwaste (CRW), dirty radwaste (DRW), high conductivity radwaste (ARW), decontamination radwaste (DECRW), detergent radwaste (DERW), and oily radwaste (ORW) drainage systems. All of the radwaste drainage systems shown in detail on Figure 9.3-7 collect and transfer potentially radioactive liquid wastes.

The equipment and floor drainage systems are provided throughout the plant to collect liquid wastes from their sources and transfer them to sumps or tanks following selective collection.

Insert B

During a meeting between GE and the NRC staff on May 2, 1984, GE agreeded to include the capability for a dissolved-gas grab sample in the PASS. The accuracies of the dissolved-oxygen and dissolved-total-gas measurements was accepted by the NRC staff in a letter from W. V. Johnston (NRC) to G.G. Sherwood (GE) dated July 7, 1984.

DSER OPEN ITEM 148 -

TABLE 9.3-7

RANGE AND ACCURACY FOR ONSITE ANALYSES

ANALYSIS	EQUIPMENT	SUITABILITY	METHOD	RANGE & ACCURACY
1. Chloride	Dionex 2020-I	Recommended by EPRI (NP- 3513)	Ion Chromatography	0.5 to 20 ppm ± 10% < 0.5ppm± .05 ppm
2. Conductivity	G E PASS Conductivity Meter	Verified by NRC Exxon Study and G E	Direct Measurement by in-line Conductivity cell	0.54 to 2.0 µS ± 10% > 2.0 µS± 20%
3. Radiochemical Gross Gamma Isotopic	G E Detector Multichannel	Recommended by EPRI (NP-3513)	Gamma Spectroscopy	Within a factor of two across the entire range
4. pH	pH Meter	Recommended by EPRI (NP-3513)	Potentiometry with glass Electrode	5 to 9 ± 0.3 pH units < 5 or > 9 ± 0.5
5. Boron	Selective Ion Electrode	Recommended by EPRI (NP-3513)	Potentiometry	50-1000± 50 ppm
6. Dissolved Gas Measurement	G E PASS	Verified by G E & Accepted by the NRC	G E PASS system	< 400 cc/kg as recommended by BWR owners group and accepted by the NRC

DSER OPEN ITEM 148

Rev. 2

QUESTION 430.88 (SECTION 9.5.4)

Provide additional justification to support your statement in Section 9.5.4.3 that sufficient additional fuel can be delivered to the plant site by truck, or barge. In your discussion include sources where diesel quality fuel oil is available and distances travelled from the source to the plant. Also discuss how fuel oil will be delivered onsite under extremely unfavorable environmental conditions. (SRP 9.5.4, Part I)

RESPONSE

~~Standby diesel generator fuel oil storage tank fill connections are discussed in Section 9.5.4.2.6. The total capacity of the SDG fuel oil storage tanks and day tanks is sufficient for seven days of SDG operation at the rated full load indicated in Section 8.3 for a DBA and LOP. Within this period, additional fuel can be delivered to the plant site by truck or barge. The supply depot is located about 44 miles from the plant in Pensauken, N.J. Under extremely unfavorable environmental conditions, deliveries would be made by truck.~~

(INSERT "A")

1/4

INSERT "A" TO 430.88

Site flooding (i.e. flooding above plant grade elevation) is a highly unlikely event. The highest historical high water was 97.5 feet (PS Datum), recorded November 1950, 4 feet below plant grade. As an estuarine, site flooding is primarily a result of the effects of tide combined with severe storms. The tidal cycle being approximately 12 hours in duration would reasonably be expected to contribute to site or local flooding for only a few hours. This would afford the opportunity to refuel the fuel oil storage tanks within a few hours of any scheduled refueling.

Severe site flooding to the design flood level is due to the PMH as defined in Regulatory Guide 1.59. Precise track position and forward speed (27 knots) as well as other assumptions are necessary to develop the flood levels calculated for the design basis event. A description of the analysis is presented in Section 2.4.5. A forward speed of 27 knots would cause the hurricane to move over 300 miles past the site in 10 hours. The maximum winds are assumed to extend 39 nautical miles. The forward travel speed is a critical parameter in the calculation, as this is what causes the large volume of water to be first forced into the Delaware and then carried up the estuary past the site. Even in the event that the storm should stall, flood water will tend to drain out the bay as the forcing function is no longer available to push water into the bay. There would also be a further reduction of flood waters due to the tidal change. It would be unrealistic as to expect site flooding to persist for more than 24 hours. Upon continuous operation of the diesel generators for any 2 day period, a new fuel oil shipment will be delivered.

RSC:vw

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2/4

Question 430.88 con't

While extremely adverse wind, weather and tidal conditions at the Hope Creek Site could interfere with diesel oil delivery for approximately 24-36 hours, it would be a very improbable situation that would preclude delivery by all of the possible avenues (truck, barge or helicopter) for as long as 60 hours.

There are three key factors which support this conclusion. First, while any storm can remain stationary for an extended period, one in an adverse position (onshore) will lose its energy source and be eroded by surface friction. Secondly, any storm remaining offshore where it can retain all or some of its energy source will be in a position either to cause unusually low tides following the initial surge, or at least to provide shelter from the maximum winds because of the long fetch over the lower Jersey peninsula. Thirdly, the storm surge capable of seriously flooding the area is an enormous wave and it will not maintain site area flooding condition for prolonged periods (24-36 hours) even if the driving force continues.

The following is a brief description of three storm variations:

A. Hurricane stationary in the least favorable position (see Figure 430.88-1)
A hurricane in this position is largely cut off from oceanic moisture and it is subject to frictional erosion of its wind speeds. It will decay into a wet, showery situation with modest wind speeds within 12-24 hours.

B. Hurricane stationary off the coast (see Figure 430.88-2)
A hurricane anywhere off the coast would continue to receive a substantial portion of its energy and it would not be affected by friction of the land surface. However, its location would preclude the fetch necessary to drive water directly into the bay, and the flow over the peninsula would moderate the winds at the site. The initial surge should drop within 12 hours and would probably be followed by an abnormally low tide. The clouds and showers associated with the storm might last 24-36 hours.
If the PMH were to stall directly south of the Delaware Bay
If the PMH were to stall directly south of the Delaware Bay
Inlet, westerly winds could cause high water build-up at the entrance to the bay. It would require a continuous wall of water approximately 12 feet high to maintain flooding conditions at the site. A prolonged event (24-36 hours) of this type would be highly improbable.

Question 430.88 cont'd

C. Extra-tropical storms

These storms are much larger than hurricanes, and at times they do remain stationary for very long periods. However, much of the above reasoning remains valid for them also. A stationary storm in the unfavorable position needed to generate strong southeasterly winds would be subject to surface friction, and it would lose much of its energy, although in a different way. The sharp contrast between the cold polar air and the tropical maritime air from which such storms are generated would gradually disappear and the air would become homogenous around the circumference of the low pressure area. Such storms weaken slowly over a period of 24-36 hours.

Storms off the coast can maintain their energy source very well, and they may remain vigorous for three or four days. However, if the storm produced a major surge while reaching the vicintiy of the site. it would then generate a period of very low water. Adverse weather could last for several days, in the sense that the winds might be high and precipitation could continue, but transportation of fuel or lube oil should not be a problem.

Based upon previous discussions, the probable maximum flood would conservatively pass after one day. This would leave 3.5 days of fuel supply in the tanks after providing for a conservative half day to permit settlement of postulated sediment in the tanks.

The normal method of fuel transport would be by tank truck. Should any event preclude delivery by truck, the 3.5 days of remaining fuel will provide ample time to arrange an alternate delivery method. These could include barge or helicopter delivery. The refill line extends to the station barge slip. There are sufficient refineries and military installations within a reasonable distance of the station to assure the credibility of these methods of delivery. Among the available privately owned helicopters, a Sikorski 561 has a minimum lift capacity of 7500 pounds. This equates to 918 gallons of diesel fuel in drums. This quantity of fuel would permit two fully loaded diesels to operate for approximately 85 minutes. Military helicopters with greater lifting capacity would also be available.

Similarly, the commitment to refuel with a remaining five day fuel supply provides ample time to clear roads of any credible snowfall or to arrange an alternate delivery method. Getty, Texaco and the Sun Oil Company have refineries within a 75 mile radius of the site.

Comprehensive emergency plans are required by federal agencies ie FEMA and NRC. These plans require documentation in the form of letters of agreement and memornadum of understanding between the nuclear utility and state and federal governments which provide the use of resources of the various agencies involved. The availability of these resources provides additional assurance that accidents and acts of nature beyond design basis can be addressed.

FIGURE 430.88-1

HOPE CREEK

GENERATING STATION

Onshore Hurricane - Wind Flows

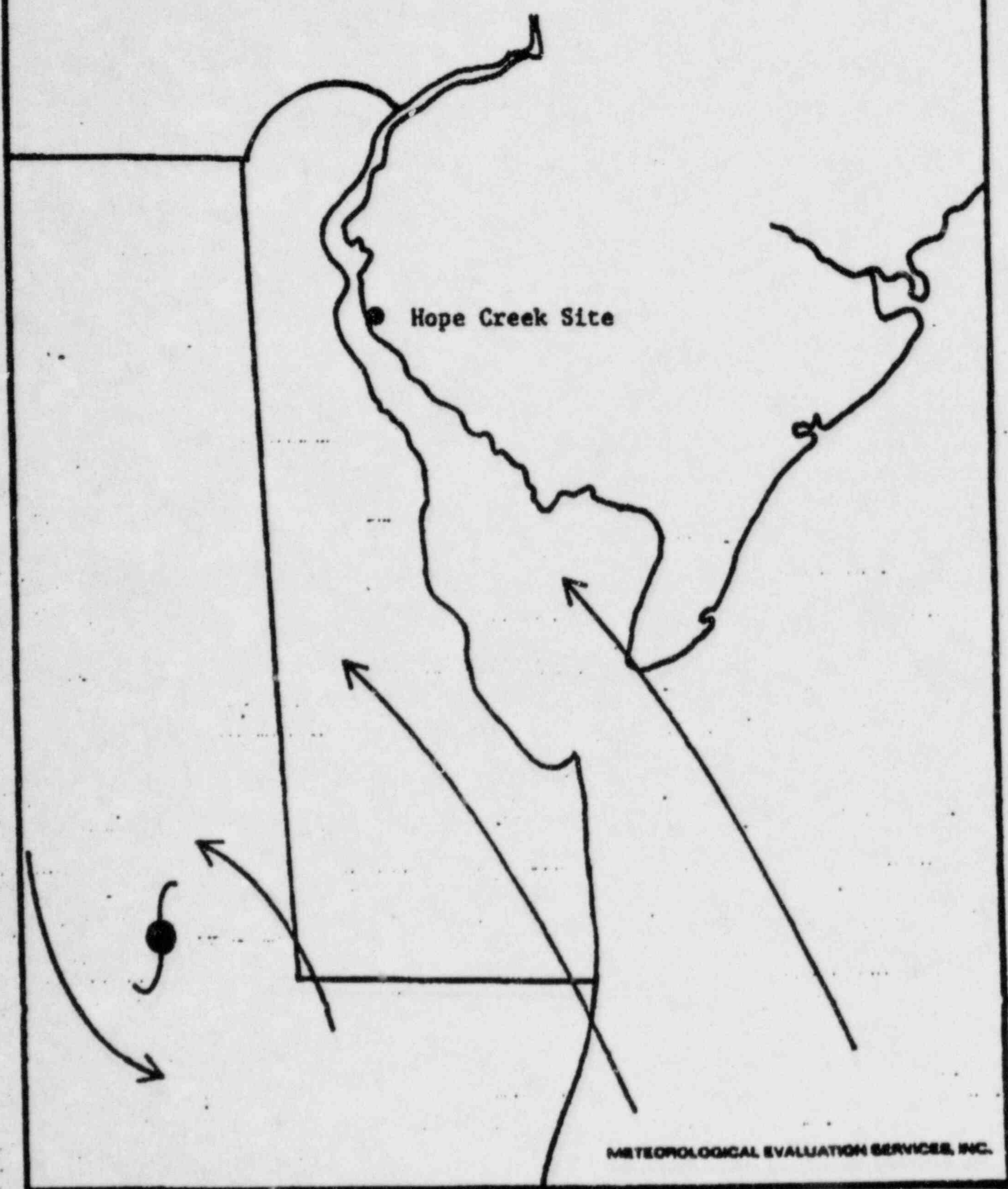
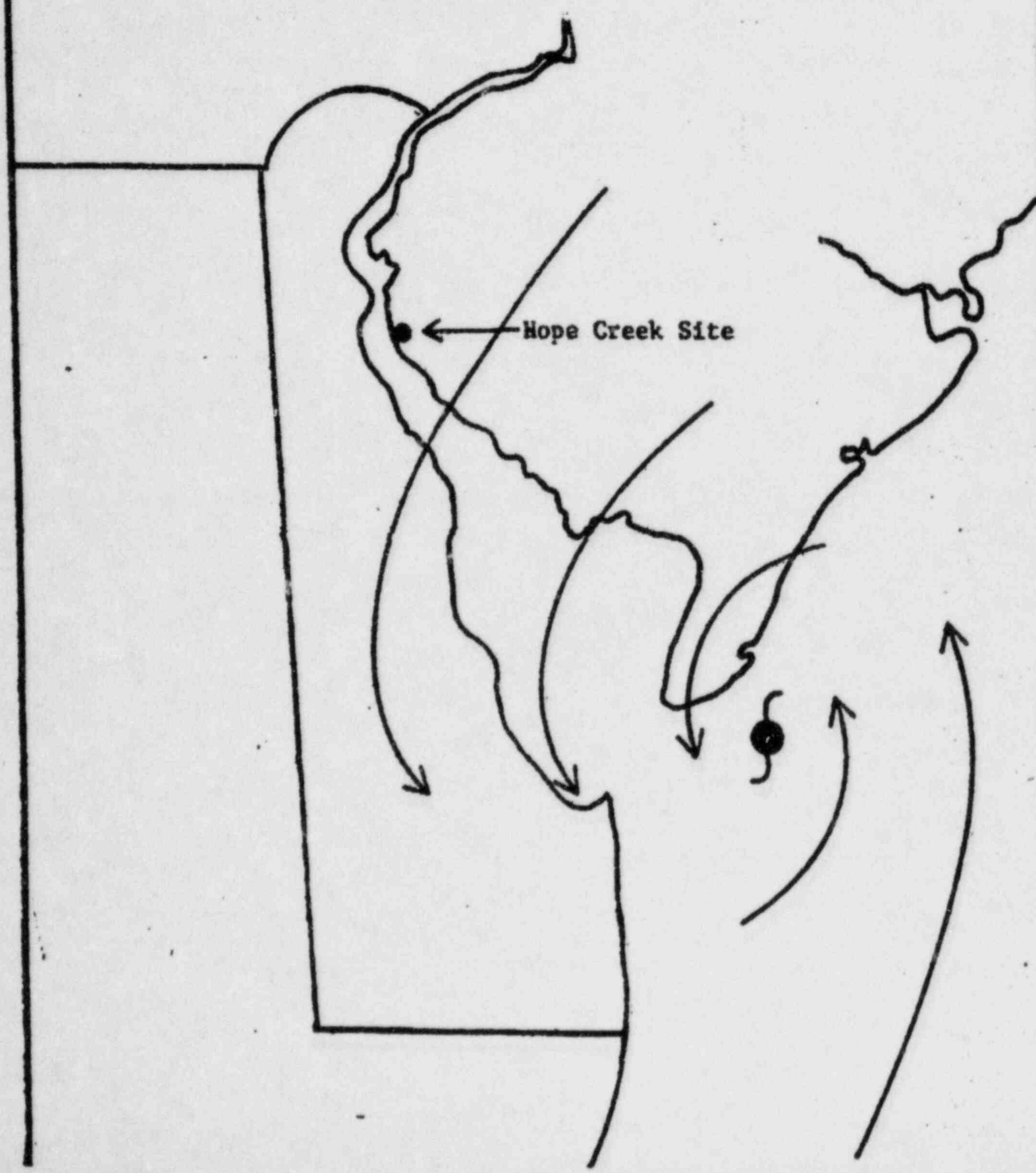


FIGURE 430.88-2

HOPE CREEK

GENERATING STATION

Offshore Hurricane - Wind Flows



Rev 1

QUESTION 430.132 (SECTION 9.5.7)

In Section 9.5.4 you state that diesel fuel oil is available from local distribution sources, but you have not discussed the availability of lube oil. Identify the sources where diesel quality lube oil will be available and the distances required to be travelled from the source(s) to the plant. Also discuss how the lube oil will be delivered onsite under extremely unfavorable environmental conditions. (SRP 9.5.7, Parts II & III)

RESPONSE

Section 9.5.4 has been revised to indicate that diesel fuel oil and lube oil are available from load distribution sources. The lube oil vendor has not been selected yet, but it is expected to be one of several possible vendors within 50 miles of the site.

Since the lube oil makeup tank is refilled from an outside connection on the west wall of the Auxiliary Building at the 105 foot elevation, local flooding could temporarily affect delivery. However, the engines have a minimum of 7 days operating supply of lube oil. ~~and emergency lube oil replenishment can be handled at the same time emergency fuel oil replenishment occurs.~~

(Insert A)

1/2

INSERT A TO 430.132

Site flooding (i.e. flooding above plant grade elevation) is a highly unlikely event. The highest historical high water was 97.5 feet (PS Datum), recorded November 1950, 4 feet below plant grade. As an estuarine, site flooding is primarily a result of the effects of tide combined with severe storms. The tidal cycle being approximately 12 hours in duration would reasonably be expected to contribute to site or local flooding for only a few hours. This would afford the opportunity to refuel the lube oil make up tanks within a few hours of any scheduled refueling.

Severe site flooding to the design flood level is due to the PMH as defined in Regulatory Guide 1.59. Precise track position and forward speed (27 knots) as well as other assumptions are necessary to develop the flood levels calculated for the design basis event. A description of the analysis is presented in Section 2.4.5. A forward speed of 27 knots would cause the hurricane to move over 300 miles past the site in 10 hours. The maximum winds are assumed to extend 39 nautical miles. The forward travel speed is a critical parameter in the calculation, as this is what causes the large volume of water to be first forced into the Delaware and then carried up the estuary past the site. Even in the event that the storm should stall, flood water will tend to drain out the bay as the forcing function is no longer available to push water into the bay. There would also be a further reduction of flood waters due to the tidal change. It would be unrealistic as to expect site flooding to persist for more than 24 hours. Upon continuous operation of the diesel generators for any 2 day period, a new lube oil shipment will be delivered. For additional information, see the response to Question 430.88.

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SEP 10 '84 0270818

Revised Response
Revision 1
9/10/84

Response to NRC Audit

Meeting Date: January 10, 1984

Question No.: A.8

QUESTION: Lab test shear modules values for Vincentown differ from values used in the analysis. Investigate the impact of the use of lab test values on soil structure interaction.

RESPONSE: For low strain values, field test data are considered more accurate than the laboratory test data. This is due to the fact that laboratoy test samples experience more disturbance. Based on this observation, more weight was given to the field test data in developing the design shear modulus curve for Vincentown sand.

For strain values observed in the soil-structure interaction analysis results, the effect of the laboratory test data variation was evaluated by varying the design shear modulus curve $\pm 50\%$. This 50% shear modulus variation envelopes one standard deviation based on soil laboratory test data for strain levels observed in the soil-structure interaction analysis results (See response to Question No. A.5, NRC Structural Audit Meeting Date January 10, 1984). Therefore, the effect of the use of laboratory test values on soil-structure interaction has been taken into account in the design basis analysis.

ADDITIONAL INFORMATION REQUESTED: Provide values of shear moduli at lower strain level (10^{-6} in/in) for both the average and lower bound soil properties used in the analysis.

RESPONSE: Refer to response to Question B .6, Meeting Date January 10, 1984.

Response to NRC Audit

Meeting Date: January 10, 1984

Question No.: B-6

Revised Response
Revision 1
9/10/84

QUESTION: Provide tabulations of shear moduli used for:

- o soil column model
- o design basis model

RESPONSE: Tabulation of shear moduli for both the soil column and design basis model (under Reactor Building Unit 1) was provided in the original response.

ADDITIONAL INFORMATION REQUESTED: Provide tabulation of shear moduli used for the design basis model under Reactor Building Unit 2*. In addition provide values of shear moduli at low strain levels for both average and lower bound soil properties.

RESPONSE: The attached Figure 1 shows a typical soil column used for the deconvolution analysis. The attached Figure 2 shows a schematic representation of the soil model used for the soil-structure interaction analyses.

The attached tables show a comparison of the initial versus final iterated shear moduli used in the deconvolution analysis (which corresponds to free-field conditions) and the initial versus final iterated shear moduli used in the SSI analysis. The data provided in Table 1 corresponds to average soil properties. Table 2 provides similar information for lower bound soil properties. The columns of soil from which the SSI values have been extracted correspond to locations underneath the Reactor Building Unit 1 and Unit 2 as indicated in Figure 2. Note that the data provided corresponds to layers 20 to 53 in the soil column's model. The corresponding element numbers at similar depths underneath the Reactor Building Unit 1 are element numbers 804 to 837 and underneath the Reactor Building Unit 2 are element numbers 346 to 379.

*Reactor Building Unit 2 is now called Plant Cancelled Area.

RESPONSE
(Continued):

As seen from Tables 1 and 2, generally good agreement is demonstrated for the values of the final iterated shear moduli and also the final iterated strain levels for all three columns except at regions immediately below the buildings. The differences at these regions is attributed to different levels of confining pressures exerted on the soil below due to weight of Reactor Buildings Units 1 and 2, respectively.

It is also observed that for both the SSI model and the soil column model, final iterated shear moduli have been degraded to values of the order of 10 to 20 percent of their corresponding moduli at low strain levels (G-max). This trend is seen for both the average and the lower bound soil properties.

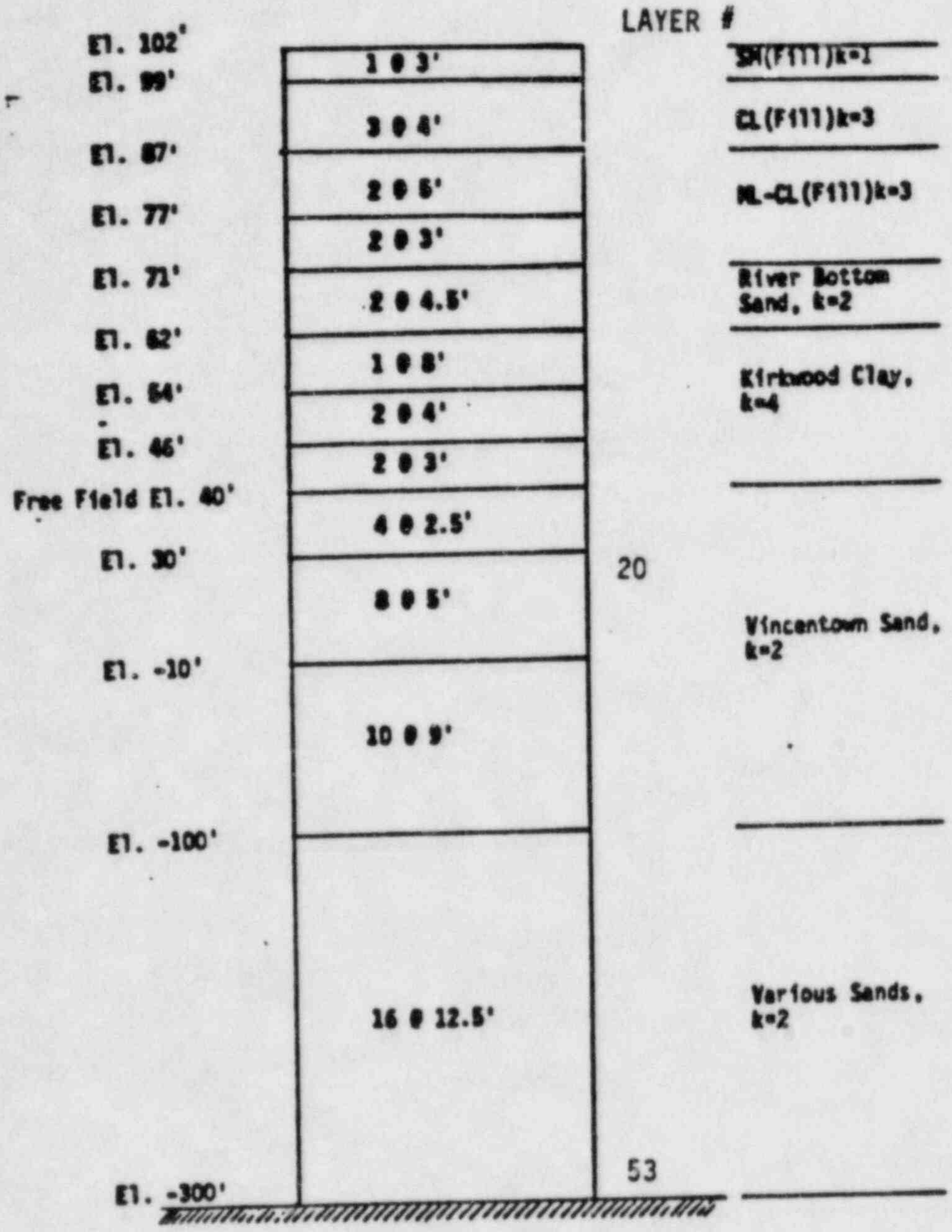

FIGURE 1

IDEALIZED FREE-FIELD SOIL COLUMN FOR DECONVOLUTION
(POWER BLOCK AREA NORTH-SOUTH DIRECTION)

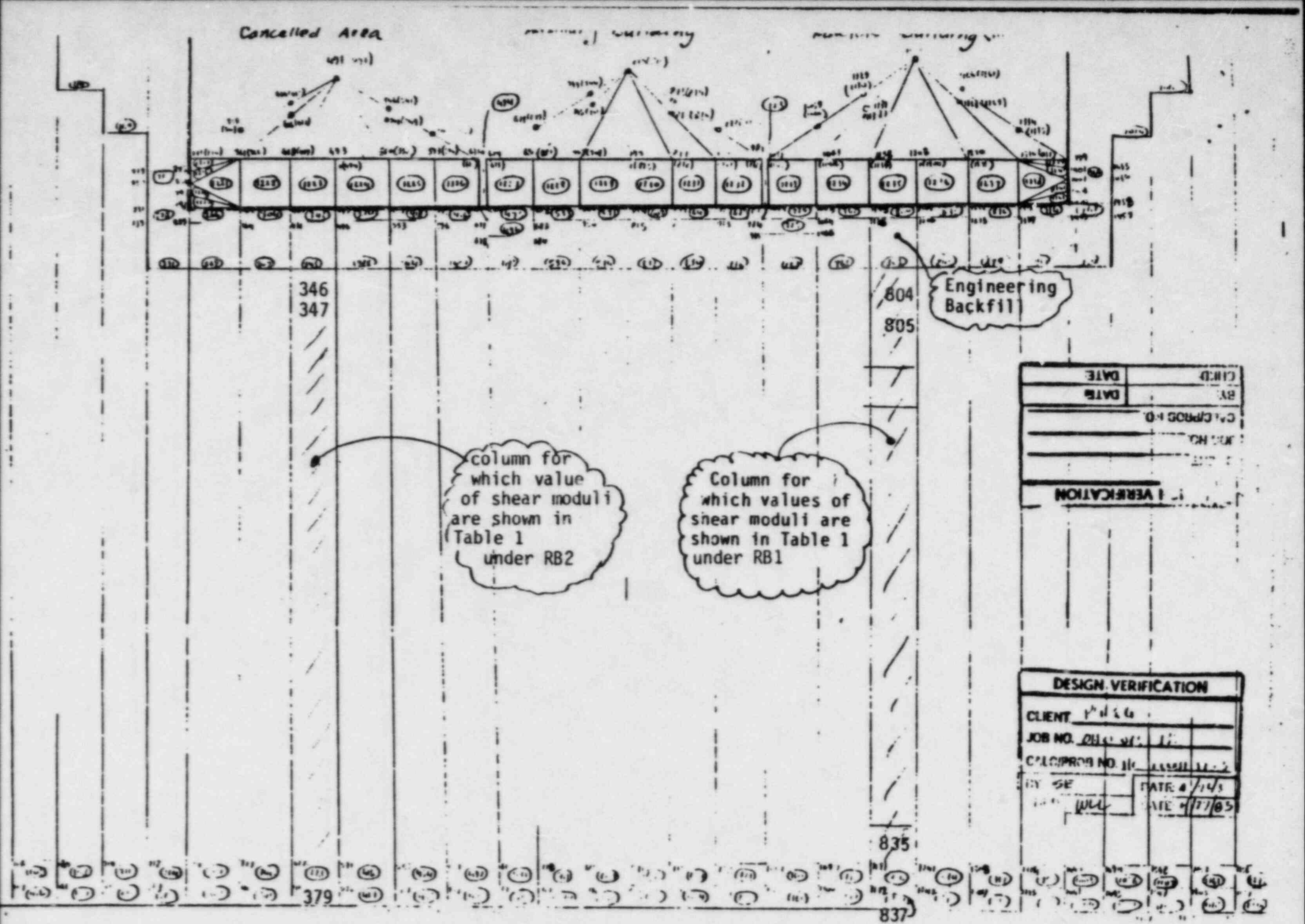

FIGURE 2: SOIL-STRUCTURE INTERACTION MODEL (SCHEMATIC)

Soil Column Model				SSI Model							
Free Field				Under Reactor Building Unit 1				Under Plant Cancelled Area			
Layer	G-Max (KSF)	G-Final (KSF)	Effective Shear Strain %	Elem	G-Max (KSF)	G-Final (KSF)	Effective Shear Strain %	Elem	G-Max (KSF)	G-Final (KSF)	Effective Shear Strain %
20	0.9495E+04	868.	0.8894E-01	804	0.1159E+05	985.	0.1046E+00	346	0.8017E+04	542.	0.1669E+00
21	0.1020E+05	1008.	0.7539E-01	805	0.1280E+05	1295.	0.7926E-01	347	0.9194E+04	731.	0.1221E+00
22	0.1090E+05	1251.	0.6032E-01	806	0.1365E+05	1600.	0.6373E-01	348	0.1010E+05	973.	0.8891E-01
23	0.1161E+05	1395.	0.5456E-01	807	0.1433E+05	1811.	0.5595E-01	349	0.1090E+05	1213.	0.6955E-01
24	0.1231E+05	1550.	0.5047E-01	808	0.1502E+05	2003.	0.5043E-01	350	0.1169E+05	1429.	0.5841E-01
25	0.1303E+05	1664.	0.4910E-01	809	0.1569E+05	2158.	0.4695E-01	351	0.1247E+05	1600.	0.5269E-01
26	0.1374E+05	1762.	0.4892E-01	810	0.1629E+05	2272.	0.4506E-01	352	0.1319E+05	1725.	0.5038E-01
27	0.1444E+05	1849.	0.4940E-01	811	0.1689E+05	2370.	0.4399E-01	353	0.1391E+05	1826.	0.4978E-01
28	0.1543E+05	1986.	0.4989E-01	812	0.1772E+05	2493.	0.4336E-01	354	0.1491E+05	1951.	0.5025E-01
29	0.1671E+05	2121.	0.5108E-01	813	0.1893E+05	2666.	0.4284E-01	355	0.1629E+05	2123.	0.5087E-01
30	0.1798E+05	2376.	0.4885E-01	814	0.2014E+05	2879.	0.4195E-01	356	0.1768E+05	2346.	0.4995E-01
31	0.1926E+05	2653.	0.4597E-01	815	0.2130E+05	3098.	0.4099E-01	357	0.1900E+05	2587.	0.4825E-01
32	0.2053E+05	2836.	0.4449E-01	816	0.2245E+05	3313.	0.3994E-01	358	0.2031E+05	2834.	0.4607E-01
33	0.2161E+05	3086.	0.4182E-01	817	0.2362E+05	3564.	0.3834E-01	359	0.2163E+05	3117.	0.4321E-01
34	0.2307E+05	3292.	0.3986E-01	818	0.2479E+05	3818.	0.3666E-01	360	0.2295E+05	3407.	0.4040E-01
35	0.2434E+05	3595.	0.3702E-01	819	0.2596E+05	4092.	0.3485E-01	361	0.2425E+05	3713.	0.3771E-01
36	0.2562E+05	3885.	0.3480E-01	820	0.2713E+05	4360.	0.3325E-01	362	0.2555E+05	4005.	0.3551E-01
37	0.2609E+05	4109.	0.3355E-01	821	0.2779E+05	4473.	0.3295E-01	363	0.2631E+05	4136.	0.3501E-01
38	0.2568E+05	3629.	0.3910E-01	822	0.2611E+05	3917.	0.3843E-01	364	0.2571E+05	3846.	0.3861E-01
39	0.2607E+05	3672.	0.4003E-01	823	0.2646E+05	3905.	0.3950E-01	365	0.2610E+05	3827.	0.4002E-01
40	0.2652E+05	3682.	0.4136E-01	824	0.2688E+05	3909.	0.4048E-01	366	0.2656E+05	3825.	0.4137E-01
41	0.2695E+05	3721.	0.4234E-01	825	0.2729E+05	3921.	0.4148E-01	367	0.2699E+05	3832.	0.4264E-01
42	0.2737E+05	3727.	0.4362E-01	826	0.2769E+05	3930.	0.4258E-01	368	0.2741E+05	3841.	0.4386E-01
43	0.2778E+05	3771.	0.4434E-01	827	0.2808E+05	3952.	0.4356E-01	369	0.2782E+05	3867.	0.4481E-01
44	0.2815E+05	3792.	0.4525E-01	828	0.2846E+05	3970.	0.4459E-01	370	0.2821E+05	3892.	0.4569E-01
45	0.2854E+05	3802.	0.4622E-01	829	0.2883E+05	3983.	0.4564E-01	371	0.2859E+05	3914.	0.4653E-01
46	0.2890E+05	3815.	0.4712E-01	830	0.2919E+05	3995.	0.4666E-01	372	0.2896E+05	3933.	0.4736E-01
47	0.2926E+05	3810.	0.4823E-01	831	0.2955E+05	3998.	0.4770E-01	373	0.2932E+05	3942.	0.4828E-01
48	0.2961E+05	3810.	0.4925E-01	832	0.2989E+05	4001.	0.4867E-01	374	0.2967E+05	3948.	0.4922E-01
49	0.2994E+05	3801.	0.5039E-01	833	0.3023E+05	4001.	0.4962E-01	375	0.3001E+05	3949.	0.5021E-01
50	0.3023E+05	3787.	0.5159E-01	834	0.3056E+05	4002.	0.5052E-01	376	0.3034E+05	3947.	0.5122E-01
51	0.3058E+05	3779.	0.5271E-01	835	0.3089E+05	4006.	0.5131E-01	377	0.3067E+05	3947.	0.5219E-01
52	0.3090E+05	3758.	0.5404E-01	836	0.3121E+05	4009.	0.5211E-01	378	0.3098E+05	3942.	0.5322E-01
53	0.3120E+05	3731.	0.5549E-01	837	0.3152E+05	4009.	0.5295E-01	379	0.3129E+05	3934.	0.5431E-01

TABLE 1 COMPARISON OF SOIL PROPERTIES AND STRAINS FOR FREE-FIELD AND SSI CONDITIONS-AVERAGE SOIL PROPERTIES - SSE CASE

Soil Column Model				SSI Model							
Free Field				Under Reactor Building Unit 1				Under Plant Cancelled Area			
Layer	G-Max (KSF)	G-Final (KSF)	Effective Shear Strain %	Elem.	G-Max (KSF)	G-Final (KSF)	Effective Shear Strain %	Elem	G-Max (KSF)	G-Final (KSF)	Effective Shear Strain %
20	0.6339E+04	463.	0.1474E+00	804	0.7739E+04	547.	0.1604E+00	346	0.5345E+04	224.	0.3352E+00
21	0.6800E+04	530.	0.1273E+00	805	0.8536E+04	667.	0.1300E+00	347	0.6129E+04	437.	0.1843E+00
22	0.7270E+04	648.	0.1031E+00	806	0.9097E+04	791.	0.1087E+00	348	0.6739E+04	516.	0.1418E+00
23	0.7748E+04	738.	0.9064E-01	807	0.9554E+04	899.	0.9448E-01	349	0.7264E+04	609.	0.1172E+00
24	0.8210E+04	838.	0.8395E-01	808	0.1001E+05	1006.	0.8379E-01	350	0.7793E+04	723.	0.9696E-01
25	0.8690E+04	911.	0.7628E-01	809	0.1046E+05	1084.	0.7765E-01	351	0.8317E+04	821.	0.8517E-01
26	0.9160E+04	973.	0.7400E-01	810	0.1086E+05	1142.	0.7408E-01	352	0.8795E+04	897.	0.7911E-01
27	0.9639E+04	1031.	0.7303E-01	811	0.1126E+05	1192.	0.7188E-01	353	0.9273E+04	959.	0.7614E-01
28	0.1029E+05	1117.	0.7207E-01	812	0.1181E+05	1264.	0.6980E-01	354	0.9942E+04	1038.	0.7447E-01
29	0.1114E+05	1193.	0.7347E-01	813	0.1262E+05	1347.	0.6880E-01	355	0.1086E+05	1121.	0.7597E-01
30	0.1200E+05	1342.	0.7070E-01	814	0.1343E+05	1483.	0.6606E-01	356	0.1179E+05	1247.	0.7342E-01
31	0.1284E+05	1494.	0.6803E-01	815	0.1420E+05	1610.	0.6404E-01	357	0.1266E+05	1374.	0.7196E-01
32	0.1369E+05	1581.	0.6821E-01	816	0.1497E+05	1712.	0.6375E-01	358	0.1354E+05	1467.	0.7197E-01
33	0.1454E+05	1711.	0.6618E-01	817	0.1575E+05	1840.	0.6213E-01	359	0.1442E+05	1594.	0.6992E-01
34	0.1538E+05	1810.	0.6505E-01	818	0.1653E+05	1954.	0.6085E-01	360	0.1530E+05	1713.	0.6798E-01
35	0.1623E+05	1978.	0.6148E-01	819	0.1731E+05	2110.	0.5821E-01	361	0.1617E+05	1877.	0.6429E-01
36	0.1708E+05	2148.	0.5835E-01	820	0.1808E+05	2264.	0.5575E-01	362	0.1704E+05	2042.	0.6078E-01
37	0.1793E+05	2265.	0.5642E-01	821	0.1853E+05	2333.	0.5535E-01	363	0.1754E+05	2123.	0.5987E-01
38	0.1707E+05	1971.	0.6640E-01	822	0.1741E+05	1991.	0.6633E-01	364	0.1714E+05	1921.	0.6775E-01
39	0.1732E+05	1997.	0.6676E-01	823	0.1764E+05	2007.	0.6681E-01	365	0.1740E+05	1946.	0.6817E-01
40	0.1762E+05	2013.	0.6721E-01	824	0.1792E+05	2027.	0.6682E-01	366	0.1776E+05	1973.	0.6818E-01
41	0.1791E+05	2050.	0.6688E-01	825	0.1819E+05	2059.	0.6661E-01	367	0.1799E+05	2011.	0.6773E-01
42	0.1819E+05	2064.	0.6739E-01	826	0.1846E+05	2074.	0.6650E-01	368	0.1827E+05	2032.	0.6797E-01
43	0.1846E+05	2100.	0.6741E-01	827	0.1872E+05	2097.	0.6687E-01	369	0.1855E+05	2060.	0.6820E-01
44	0.1873E+05	2118.	0.6834E-01	828	0.1897E+05	2104.	0.6806E-01	370	0.1881E+05	2070.	0.6932E-01
45	0.1898E+05	2122.	0.7005E-01	829	0.1922E+05	2097.	0.7009E-01	371	0.1906E+05	2066.	0.7124E-01
46	0.1923E+05	2125.	0.7207E-01	830	0.1946E+05	2085.	0.7261E-01	372	0.1931E+05	2056.	0.7362E-01
47	0.1948E+05	2111.	0.7484E-01	831	0.1970E+05	2061.	0.7583E-01	373	0.1955E+05	2033.	0.7671E-01
48	0.1971E+05	2098.	0.7768E-01	832	0.1993E+05	2038.	0.7919E-01	374	0.1978E+05	2010.	0.7998E-01
49	0.1994E+05	2078.	0.8081E-01	833	0.2015E+05	2011.	0.8271E-01	375	0.2001E+05	1984.	0.8339E-01
50	0.2017E+05	2054.	0.8405E-01	834	0.2037E+05	1985.	0.8618E-01	376	0.2023E+05	1956.	0.8684E-01
51	0.2039E+05	2037.	0.8689E-01	835	0.2059E+05	1966.	0.8918E-01	377	0.2044E+05	1937.	0.8988E-01
52	0.2060E+05	2012.	0.8995E-01	836	0.2080E+05	1946.	0.9214E-01	378	0.2065E+05	1914.	0.9299E-01
53	0.2081E+05	1987.	0.9300E-01	837	0.2101E+05	1927.	0.9498E-01	379	0.2086E+05	1893.	0.9608E-01

TABLE 2 COMPARISON OF SOIL PROPERTIES AND STRAINS FOR FREE-FIELD AND SSI CONDITIONS-LOWER BOUND SOIL PROPERTIES - SSE CASE

Revised Response
Revision 1
9/10/84

Response to NRC Audit

Meeting Date: January 11, 1984

Question No. A.2

QUESTION: Review the liquefaction analysis for service water pipeline to check factor of safety of river bottom sands and basal sands. Also, check pore pressure buildup in hydraulic fill.

RESPONSE: As discussed in the response to Item A-15 of the January 10, 1984 meeting, based on various methods of analyses (Refs. 2.5-79 and 2.5-114), the factor of safety against liquefaction of the river bottom sands is generally well above unity. The hydraulic fill materials are primarily cohesive, highly plastic, and will not be susceptible to liquefaction (FSAR Section 2.5.4.8.3, Amend. 3). As a result of the dynamic loading during an SSE, the pore pressure in the hydraulic fill and river bottom sands will rise above the initial hydrostatic conditions. However, the factors of safety against liquefaction in the river bottom sands are relatively high (ranging from 1.6 to 7.8), and the ratio of peak excess pore pressure to effective confining pressure ($\Delta u/\bar{\sigma}_3$) is estimated to be 0.2. In addition, the vertical effective stress in the river bottom sands is greater than that in the hydraulic fill. Thus, it is unlikely that the excess pore pressure in the hydraulic fill would be large enough to cause liquefaction of the river bottom sand. Therefore, the pore pressure buildup in the hydraulic fill will not affect the previous conclusions regarding the liquefaction potential of the river bottom sands.

FILE 2443.132.10 (5554)
SUBJECT PSE&G Hope Creek
Jan. 11 meeting - Item A.2 SHEET 1 OF 1

REVISIONS
BY ____ DATE ____ TO EO ____
BY ____ DATE ____ TO EO ____

Liquefaction Potential of River Bottom Sands

Explanation of Factor of Safety Calculation from Finite Element analyses:

Refer to Additional Site Stability Evaluation report, December 1976, Reference 2.5-79, Vol. I, Part I.

Table 4-2 provides the information regarding Liquefaction Potential Evaluation from 2-D analyses.

Page 53 of the report is attached.

Element 156 of the Finite Element model on Figure 4-2 represents a typical element of the River Bottom sand layer in "Free Field".

Due to approximately "Free Field" conditions, the σ_{fc} value (effective normal stress on the potential failure plane - in this case near-horizontal) is 1820 psf. This corresponds well with the estimated effective vertical stress as shown on the attached sheet.

Based on Figure A-19A of Reference 2.5-96, the average stress ratio causing ±2.5 % axial strain in 5 cycles for the river bottom sands is 0.55

Therefore the average shear strength (cyclic)

$$= \left(\frac{\tau_{av}}{\sigma_0'}\right)_{\substack{lab\\triaxial}} \times C_r \times \sigma_0' \qquad \text{where } C_r = 0.57 \text{ correction factor}$$

$$= 0.55 \times 0.57 \times 1820 \text{ psf} = 571 \text{ psf}$$

which is comparable to $\tau_{cyclic} = 580.9$ psf in Table 4-2

$\tau_{eq} = 0.65\ \tau_{max} = 178.6$ psf (induced seismic average shear stress) is computed from the finite element analysis which is comparable to that from 1-D analysis.

The Factor of safety against liquefaction is computed as

$$F.S. = \frac{\tau_{av\text{-}cyclic}}{\tau_{eq}} = \frac{580.9}{178.6} = \underline{3.25} \text{ as shown in Table 4.2}$$

BY UKP DATE 2/2/84
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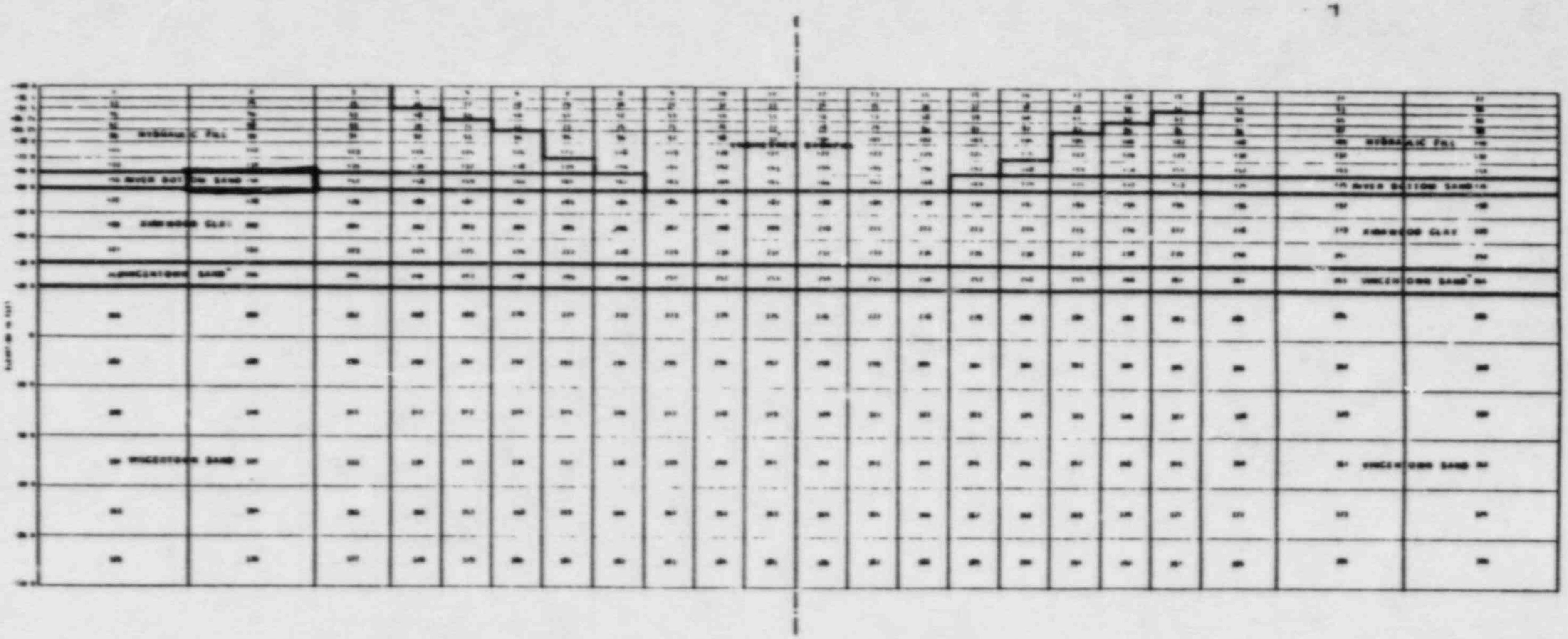
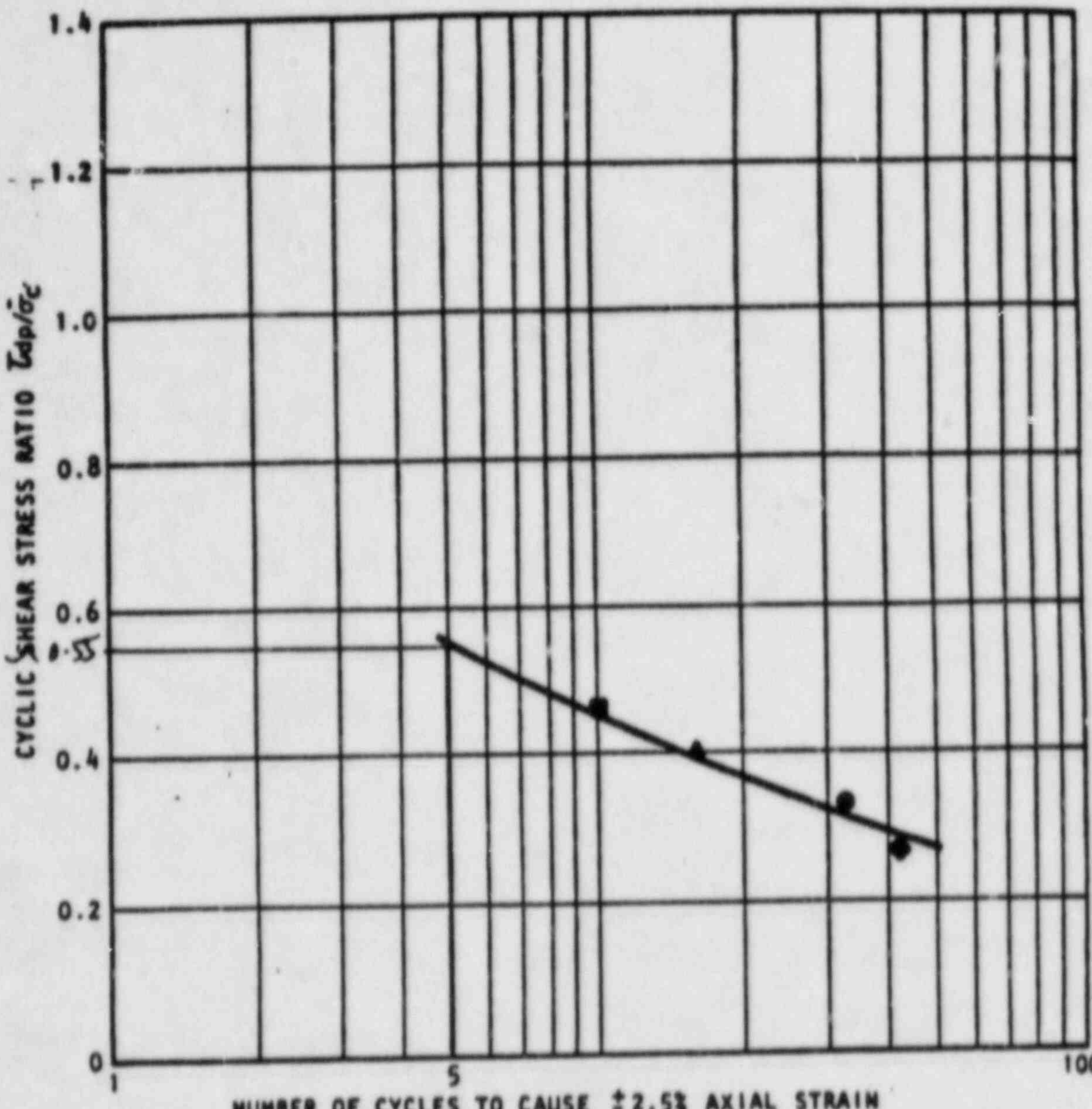
FS of basal sands computed in the same manner

TABLE 4-2 (Continued)

Element No.	Soil Type	σ_{fc} (psf)	τ_h (psf)	$\alpha = \frac{\tau_h}{\sigma_{fc}}$	τ_{cyclic} (psf)	τ_{max} (psf)	$\tau_{eq} = 0.65\ \tau_{max}$ (psf)	F.S.	Seismic-Induced Strain(%)
111,132	H.F.	1273.	4.7	0.004	293.9	269.1	174.9	1.68	$\pm$ .23
112,131	H.F.	1246.	5.6	0.004	287.6	190.6	123.9	2.32	$\pm$ .12
113,130	H.F.	1330.	9.2	0.007	307.0	128.9	83.5	3.66	$\pm$ .07
114,129	H.F.	1446.	27.0	0.019	333.8	136.0	88.4	3.78	$\pm$ .07
115,128	H.F.	1750.	19.5	0.011	404.0	104.1	67.7	5.97	$\pm$ .04
116,127	H.F.	1601.	25.2	0.016	369.6	73.2	47.6	7.77	$\pm$ .03
117,126	B.F.	2203.	65.8	0.030	923.4	495.7	322.2	2.87	$\pm$ .15
118,125	B.F.	2009.	9.4	0.005	779.9	668.2	434.3	1.80	$\pm$ .50
119,124	B.F.	2045.	39.2	0.019	829.3	670.0	435.5	1.90	$\pm$ .44
120,123	B.F.	2058.	8.4	0.004	796.4	590.3	383.7	2.08	$\pm$ .33
121,122	B.F.	2055.	5.8	0.003	792.6	560.3	364.2	2.18	$\pm$ .31
133,154	H.F.	1508.	6.3	0.004	348.1	293.0	190.5	1.83	$\pm$ .18
134,153	H.F.	1496.	3.5	0.002	345.4	241.6	157.0	2.20	$\pm$ .13
135,152	H.F.	1540.	31.3	0.020	355.5	211.9	137.7	2.58	$\pm$ .11
136,151	H.F.	1762.	55.4	0.031	406.8	198.2	128.8	3.16	$\pm$ .08
137,150	H.F.	1821.	14.3	0.008	420.4	176.2	114.5	3.67	$\pm$ .07
138,149	H.F.	2119.	50.6	0.024	489.2	148.0	96.2	5.08	$\pm$ .05
139,148	H.F.	2181.	60.3	0.028	503.5	126.9	82.5	6.10	$\pm$ .04
140,147	B.F.	3670.	117.9	0.047	1165.5	1121.9	729.2	1.60	$\pm$ .74
141,146	B.F.	2418.	18.8	0.008	947.6	748.5	486.5	1.95	$\pm$ .40
142,145	B.F.	2519.	20.9	0.008	987.2	704.2	457.7	2.16	$\pm$ .31
143,144	B.F.	2988.	5.9	0.002	956.6	662.8	430.8	2.22	$\pm$ .29
155,176	R.S.	1822.	1.3	0.001	581.6	320.3	208.2	2.79	$\pm$ .07
156,175	R.S.	1820.	8.6	0.002	580.9	274.8	178.6	3.25	$\pm$ .05
157,174	R.S.	1891.	47.5	0.025	603.6	272.8	177.3	3.40	$\pm$ .04
158,173	R.S.	2027.	63.5	0.031	647.0	273.6	177.8	3.64	$\pm$ .04
159,172	R.S.	2182.	31.4	0.014	696.5	274.6	178.5	3.90	$\pm$ .03
160,171	R.S.	2344.	7.9	0.003	748.2	306.9	195.6	3.83	$\pm$ .04
161,170	R.S.	2693.	95.1	0.035	859.6	500.5	325.3	2.64	$\pm$ .08



FINITE ELEMENT MESH FOR PROFILE B-B



SYMBOL ±2.5% AXIAL STRAIN	BORING NO.	SAMPLE NO.	DEPTH (FT)	$\bar{\sigma}_c$** (P.S.I.)	Blowcounts DRM	SPT
●	AB-1	12	35	11	14	24
▲	AB-1A	11	34 35'	11	21	
■	AB-1A	12	38	11	18	
●*	AB-1	12	35	11	← same	

* RECONSTITUTED SAMPLE

** $\bar{\sigma}_c$ - EFFECTIVE CONFINING STRESS

DYNAMIC STRENGTHS - RIVER BOTTOM SANDS

DAMES & MOORE

FIGURE A-18A

Response to NRC Audit

Revised Response
Revision 1
5/10/84

Meeting Date: January 11, 1984

Question No.: A.3

QUESTION:

Review the power block settlement records in terms of loads and soil properties to explain observed settlements in the power block area.

RESPONSE:

INTRODUCTION

The response to Question 241.25 contains plots of load and settlement vs. time. This information has been reviewed using revised data which includes a reduction in the load resulting from the rise in the water table. The mat supporting the power block is divided into five sections and an average load versus time has been plotted for each section. The settlement data for each marker are plotted on a curve beneath the load versus time curve corresponding to the portion of the mat in which the marker is located. All of the markers are located at the edge of the individual mats. The readings are referred to permanent remote benches established on concrete-filled pipe piles driven into the Vincentown Formation. The settlement markers, originally established on the mats have been transferred as construction progressed to other points higher on the structure.

APPROACH

The approach taken to review the data was to plot the marker locations on one plan and redisplay the load curves separated from the marker curves (there are really only five different load curves). The data for each settlement marker was then evaluated against the load curves for the mat in which it is located plus the adjacent mats. These mats are separated by a 2-in. seismic gap in the upper 10 feet of the mat. The bottom four feet is solid concrete throughout the entire mat. Each marker was categorized as to location (i.e., corner, edge, and center). The net settlement of each marker was then displayed in a graph with settlement vs. location. It would be expected that the larger settlements would occur in the center with the small settlement at the corner and intermediate settlements along the edge. In addition, markers located on separate mats but in very close proximity (e.g., 15 and 4 were compared).

The soil properties for the Vincentown were reviewed to confirm that there are no trends distinguishable in a horizontal direction (Ref. 2.5-57, -58, -59).

DISCUSSION

Revised Response

Accuracy of Data

A review of the settlement data indicates many instances of reverse movement on the order of 1/8 to 1/4 inch over a period of three months. There is no indication that the load has undergone a similar reversal and to the contrary, except for sudden changes in ground water level this could not be possible. Therefore, these reversals in settlement suggest an error in the survey or some form of bias. This is very likely given the conditions under which the surveys were made. Because of this and the complete lack of response of the extensometer after times ranging from July 1977 to June 1979 we conclude that the extensometer data is not reliable and the optic survey has an error band of $\pm$1/4 in. Therefore, one is limited to evaluating general trends in these data. In spite of these shortcomings we believe certain observations can be made and conclusions can be drawn.

Settlement Versus Load

With the exception of markers 16, 18, and 19, all markers were found to respond relatively well in comparison with the applied load. Settlements usually occur as the load is applied. In the cases of 16, 18, and 19, there appears to be an over response to a load on the base mat. However, when surrounding backfill loads are taken into account the settlements seem reasonable.

Comparison of Adjacent Settlment Markers

Five pairs of settlement markers located at the edge of the large mat were compared. In all cases they respond very similarly to the loads applied and net settlement is very close. A pair of markers located near the center of the slab were also compared and were very similar in response to the loads applied. A group of four markers in very close proximity but located on four different mats were also compared and responses were similar to the loads applied and generally were directly proportional to the load versus the settlement.

Settlement Versus Location Within the Mat

As expected there is a rough general trend in magnitude of settlement with the lower settlements being observed in the corner markers and the higher settlements at the center. There is a greater range of settlement along the edge because of the great variation in load on the individual mats.

CONCLUSIONS

In general, the settlements markers are behaving as expected and respond to the applied loads. All of the settlements recorded are well within those predicted including 16, 18, and 19. Settlement markers will continue to be monitored to evaluate the observed trend and to evaluate any heave that migh result from raising the water table.

REQUEST FOR ADDITIONAL INFO (SGEB Meeting, dated August 30, 1984)

In justification of the statement that the settlements measured at marker Nos. 16, 18 and 19, ~~and~~ are due to the surroundinng backfill loads, given in response to FSAR Question No. 241.25, revise the settlement plots for marker Nos. 3, 5, 16 and 18, as follows:

- o Add the loading history due to backfilling operation
- o Show the effect of decommissioning the dewatering system

RESPONSE

The load/settlement plots for markers Nos. 3, 5, 16 and 18, have been revised to include effects of the backfilling and decommissioning of the dewatering system. The revised plots are attached in Figures 1 to 4.

As discussed in the SEGB meeting, dated August 30, 1984, HCGS will continue to monitor the settlement at no more than six months interval until no appreciable settlement is observed.

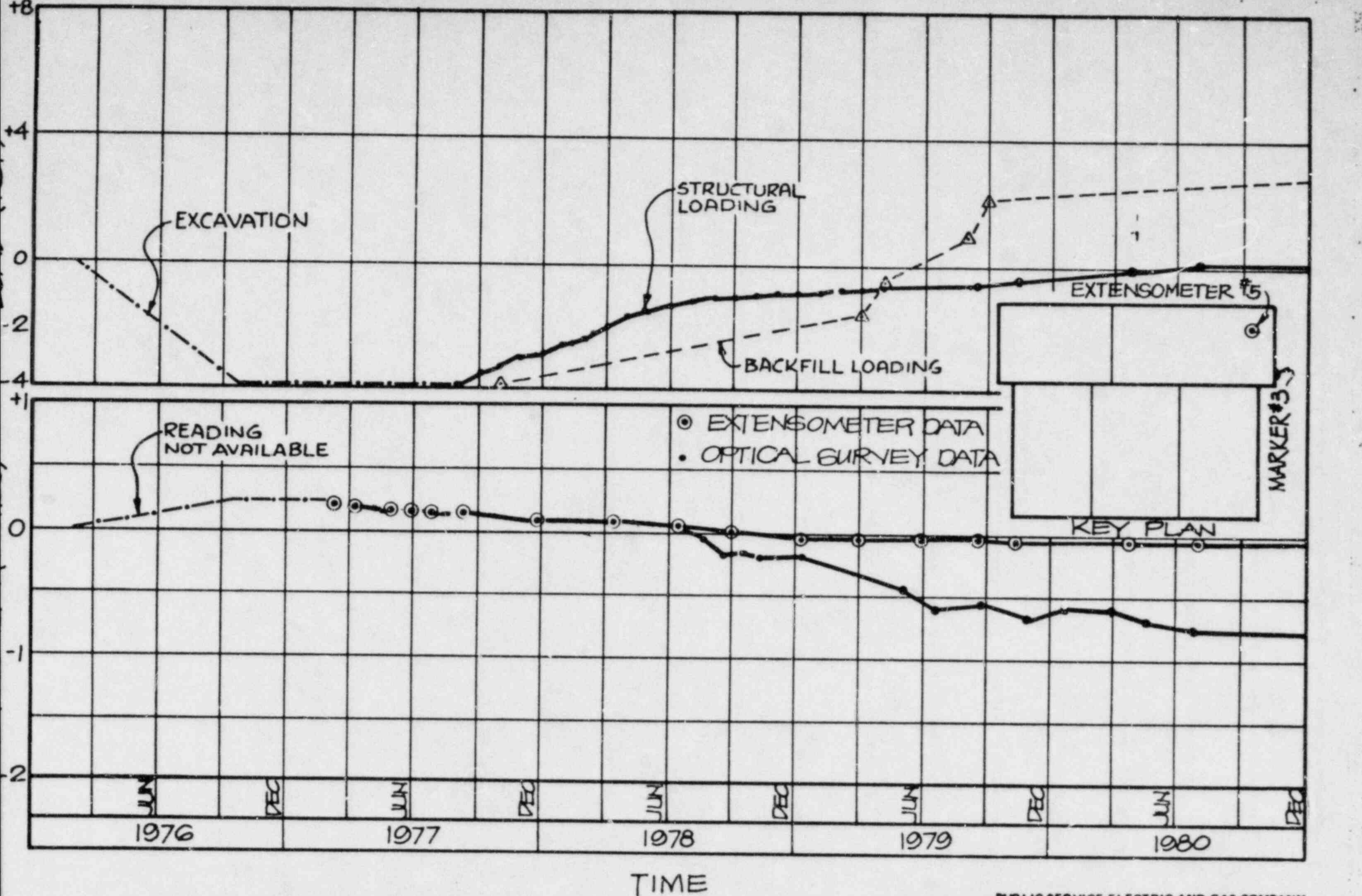


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FIGURE 1

LOAD/ SETTLEMENT PLOT FOR MARKER NO. 3

SHT. 1 OF 2

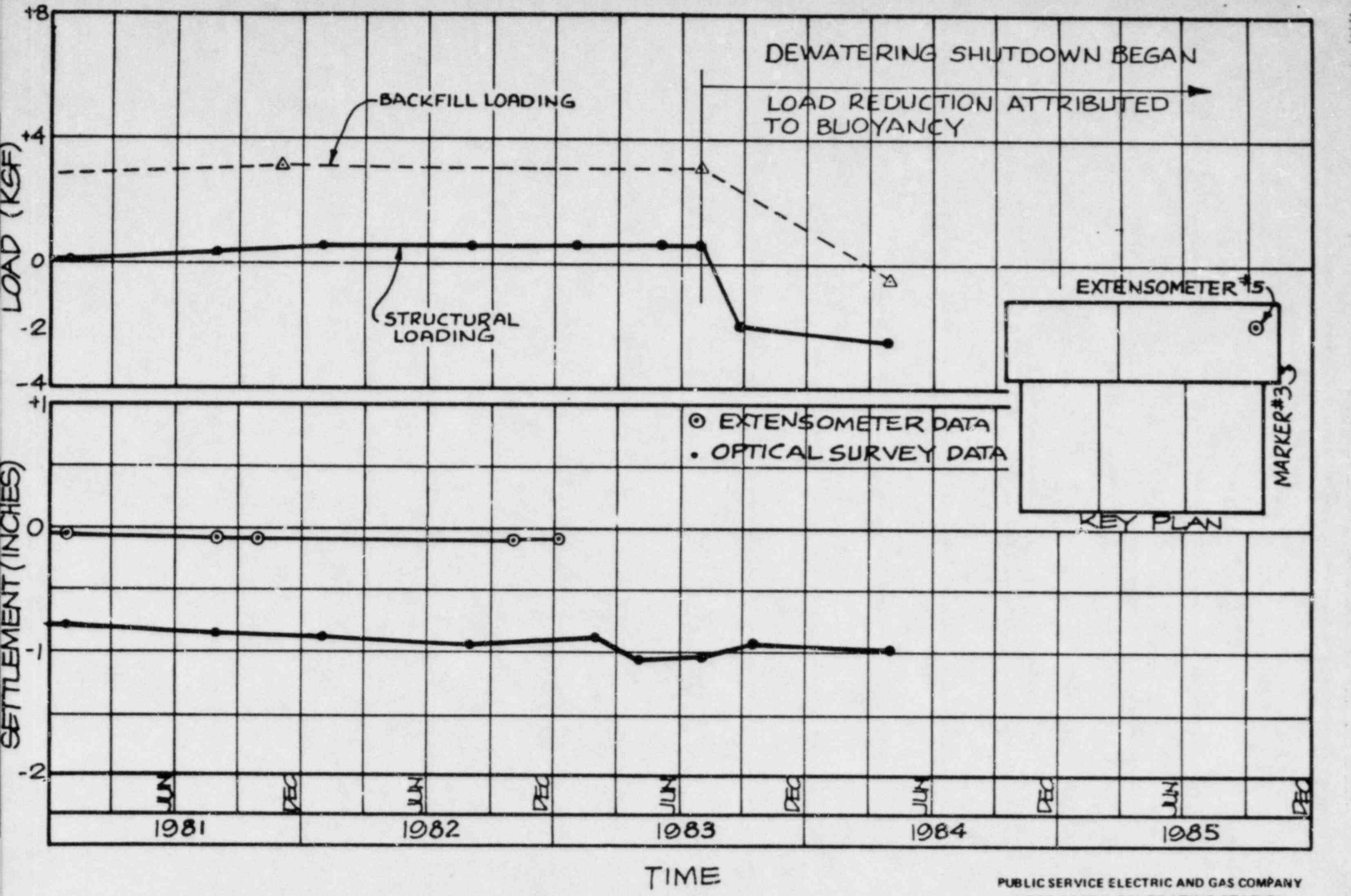

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FIGURE 1 (CONTINUE)

LOAD/SETTLEMENT PLOT FOR MARKER NO. 3

SHT. 2 OF 2

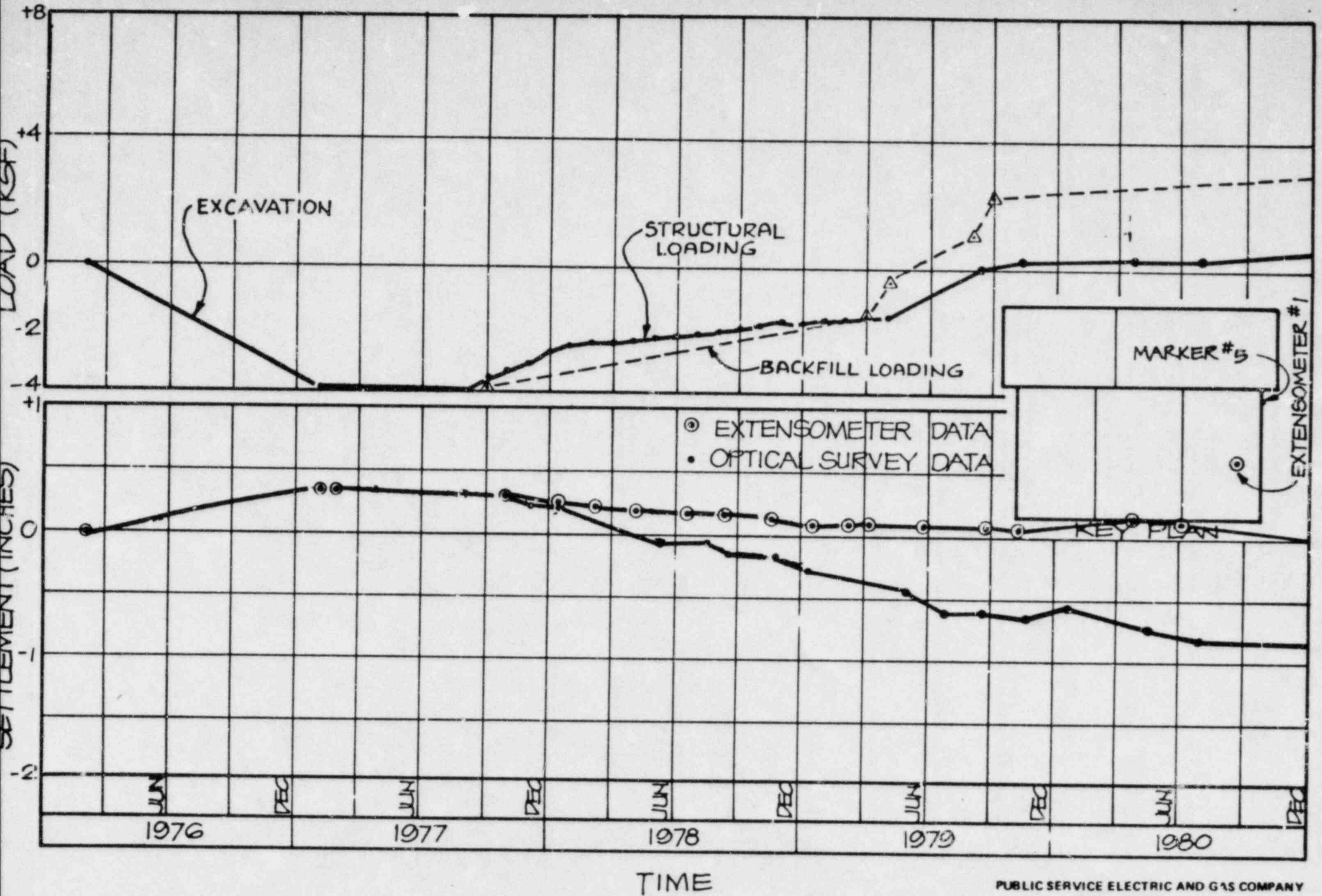

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FIGURE 2

LOAD/SETTLEMENT PLOT FOR MARKER NO. 5

SHT. 1 OF 2

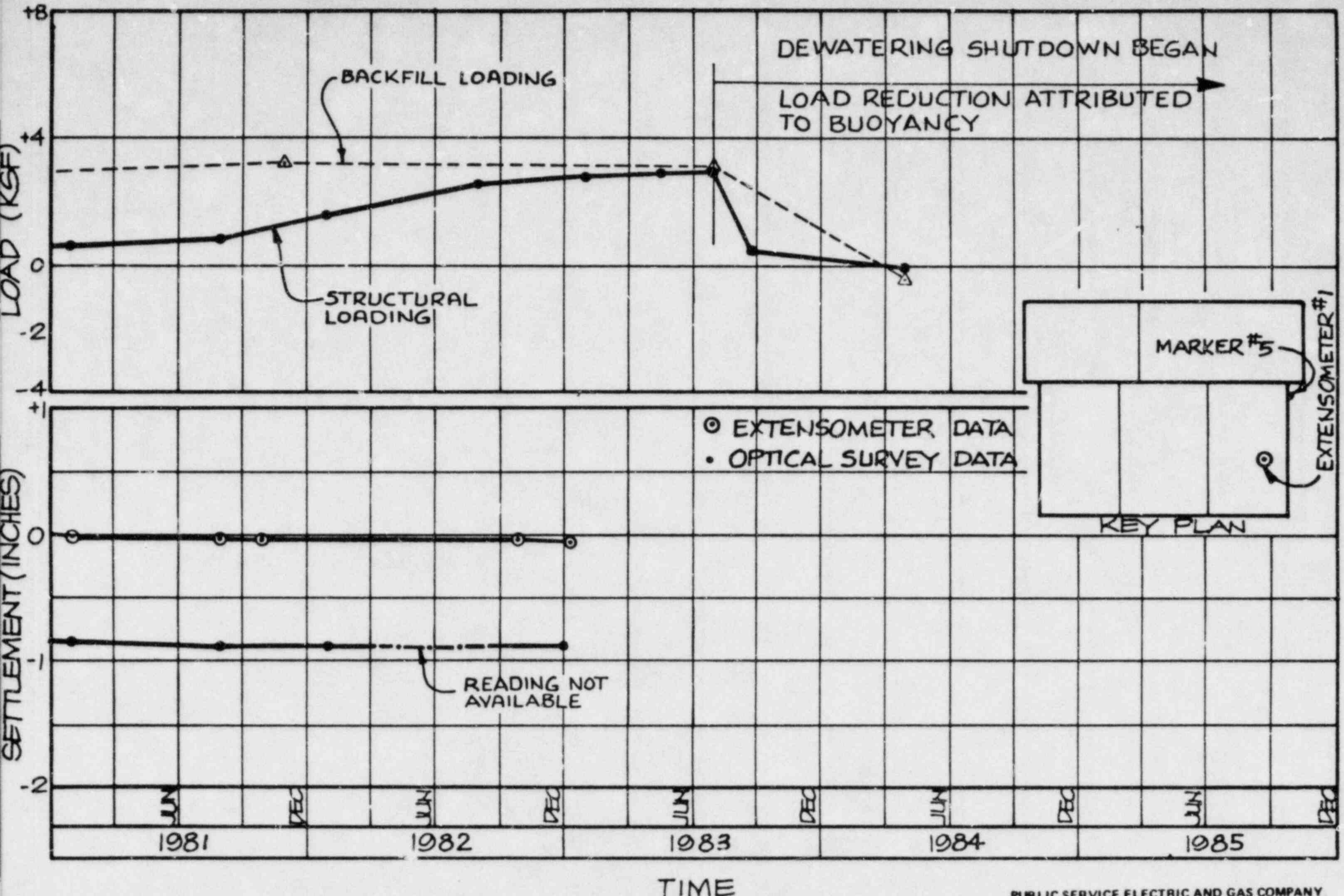

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FIGURE 2 (CONTINUE)

LOAD/SETTLEMENT PLOT FOR MARKER NO.5

SHT. 2 OF 2

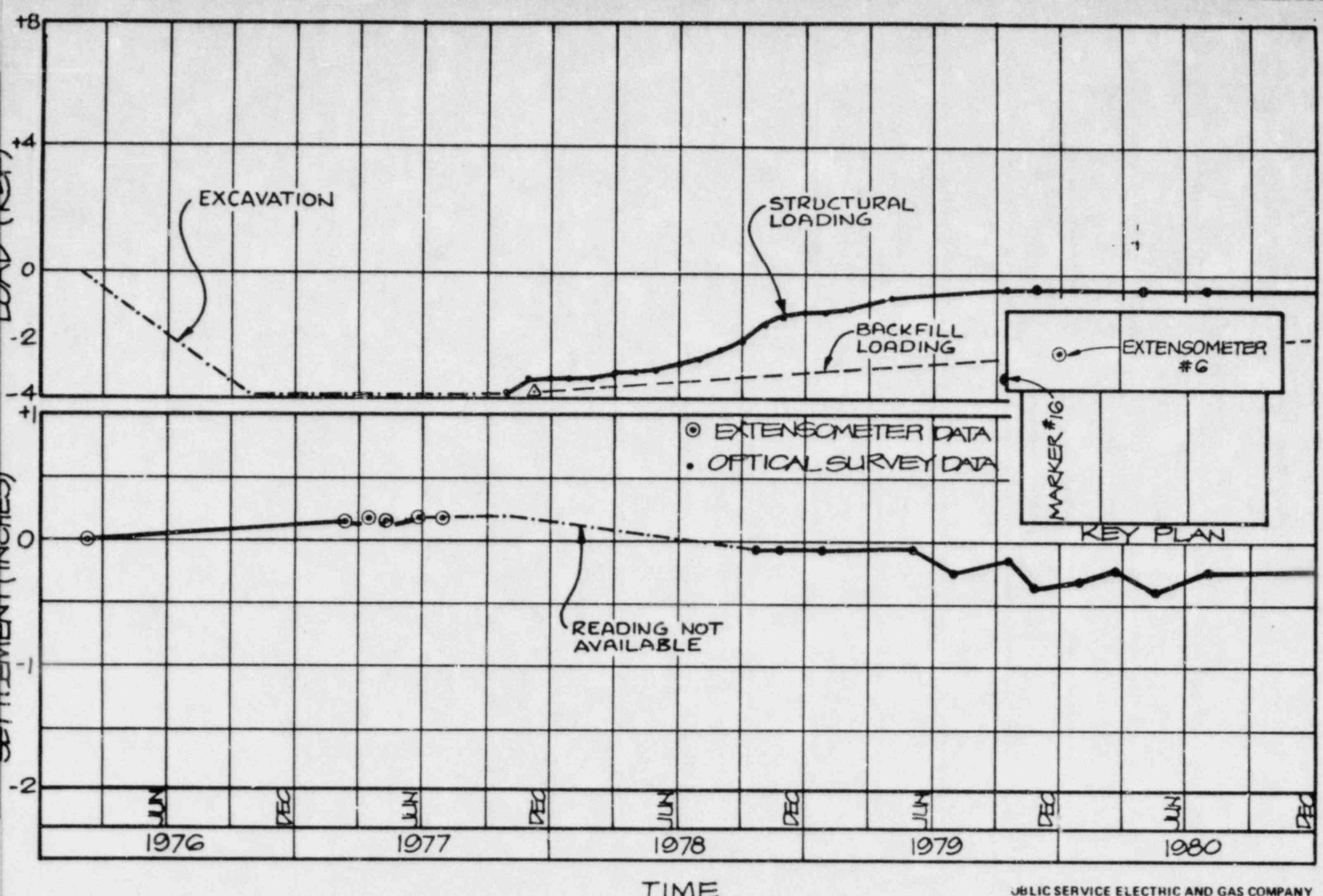

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FIGURE 3

LOAD/SETTLEMENT PLOT FOR MARKER NO. 16

SHT. 1 OF 2

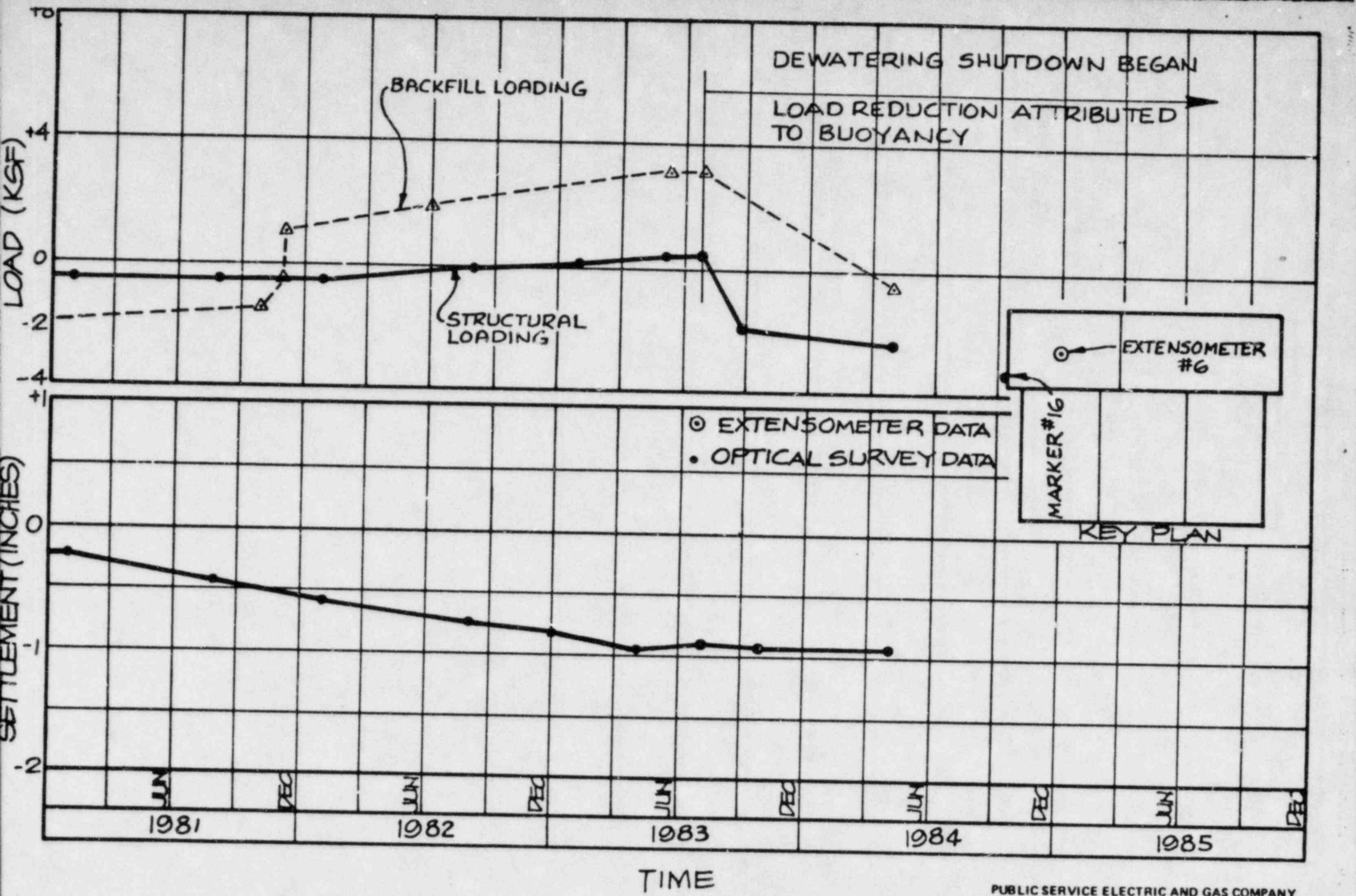

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FIGURE 3 (CONTINUE)

LOAD/SETTLEMENT PLOT FOR MARKER NO. 16

SHT. 2 OF 2

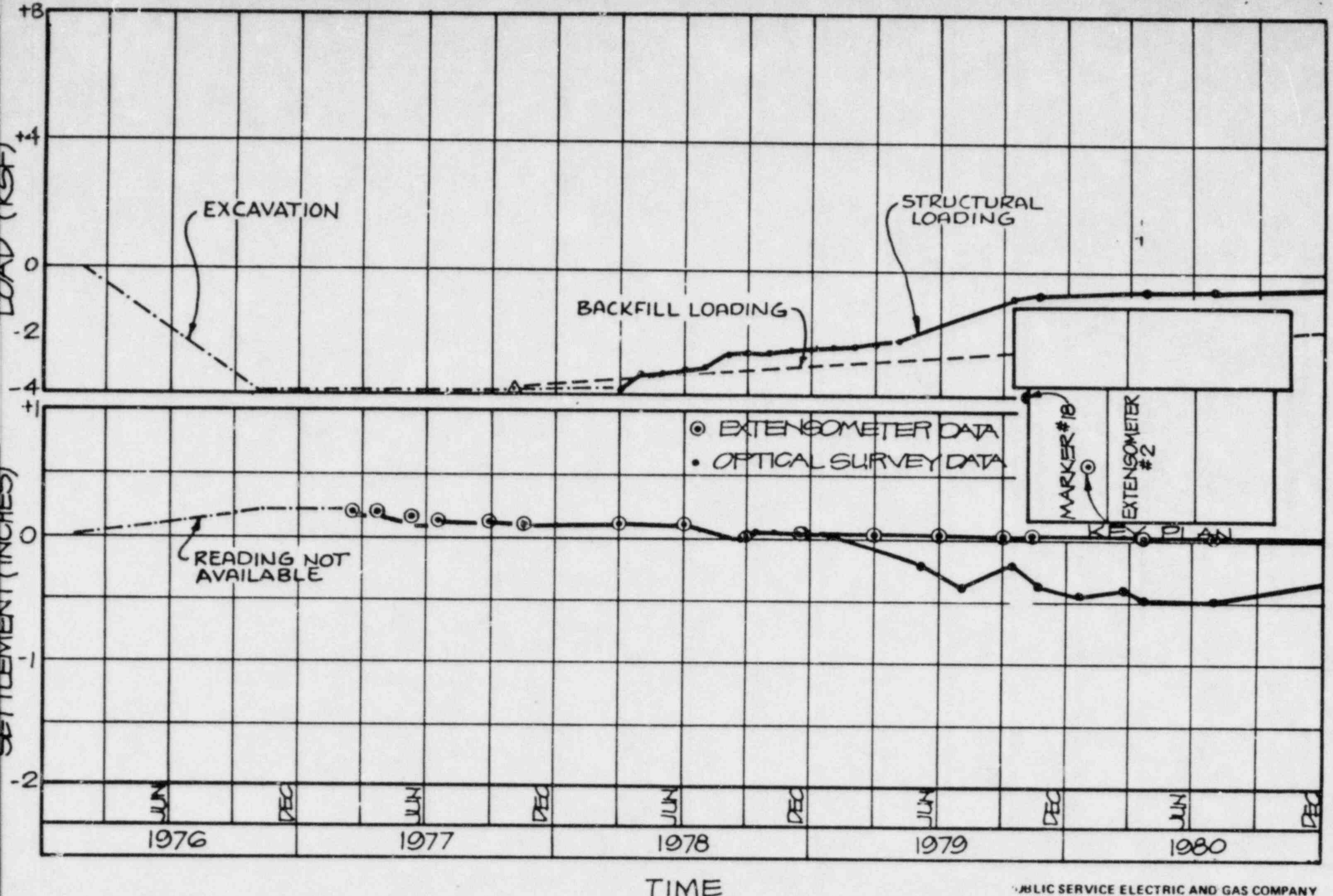

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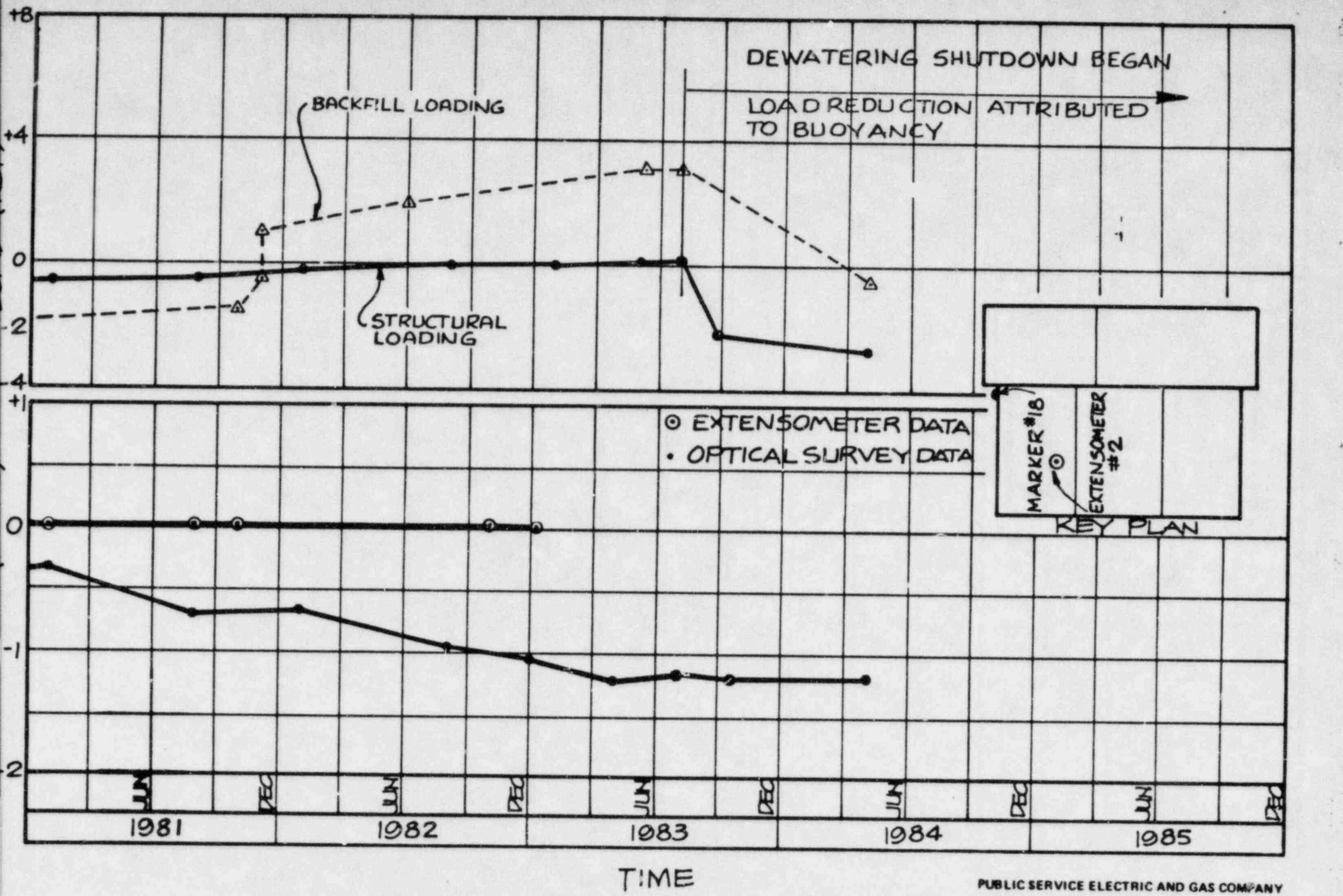
FIGURE 4

LOAD/SETTLEMENT PLOT FOR MARKER NO. 18

SHT. 1 OF 2



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HOPE CREEK GENERATING STATION

FIGURE 4 (CONTINUE)

LOAD/SETTLEMENT PLOT FOR MARKER NO. 18

SHT. 2 OF 2

Response to NRC Audit

Meeting Date: January 11, 1984

Question No.: A-13

Revised Response
Revision 1
9/10/84

QUESTION: Provide results of three soil depth models for Intake Structure.

RESPONSE: Plots of peak shear strain versus depth were developed at various locations on the Intake Structure detailed SSI model. These plots were provided in the original response.

ADDITIONAL INFORMATION REQUESTED: Provide similar plots from the three simplified models which were developed for the Intake Structure Soil Depth study.

RESPONSE: Three models were used for soil depth study of the Intake Structure. These were 200', 300', and 400' simplified soil and structure models. These are shown in Figures 1, 2, and 3; respectively. Deconvolution followed by interaction analyses were performed for each of the three models. The results of these analyses were used to determine the significant depth of interaction.

To show the depth of significant interaction, we compare the variation of peak shear strain with depth for the following locations of each model:

- o Under the structure (where most of the interaction will occur)
- o Next to structure (where interaction will occur due to rocking)
- o Free field (no interaction)

Figure 4 shows this comparison for all models. The strains for all three models converge in the vicinity of elevation -100 feet (200 foot depth of soil), indicating that no interaction occurs below that depth. Based on this, a 300 foot model was used to perform the detailed soil-structure interaction analyses.

RESPONSE
Continued:

To substantiate this conclusion, a similar plot from the detailed SSI model was developed and included in the original response. This plot is attached as Figure 5 to this response. This figure also indicates that strains converge at an elevation of -100 feet, indicating that this elevation limits the depth of significant interaction for the Intake Structure.

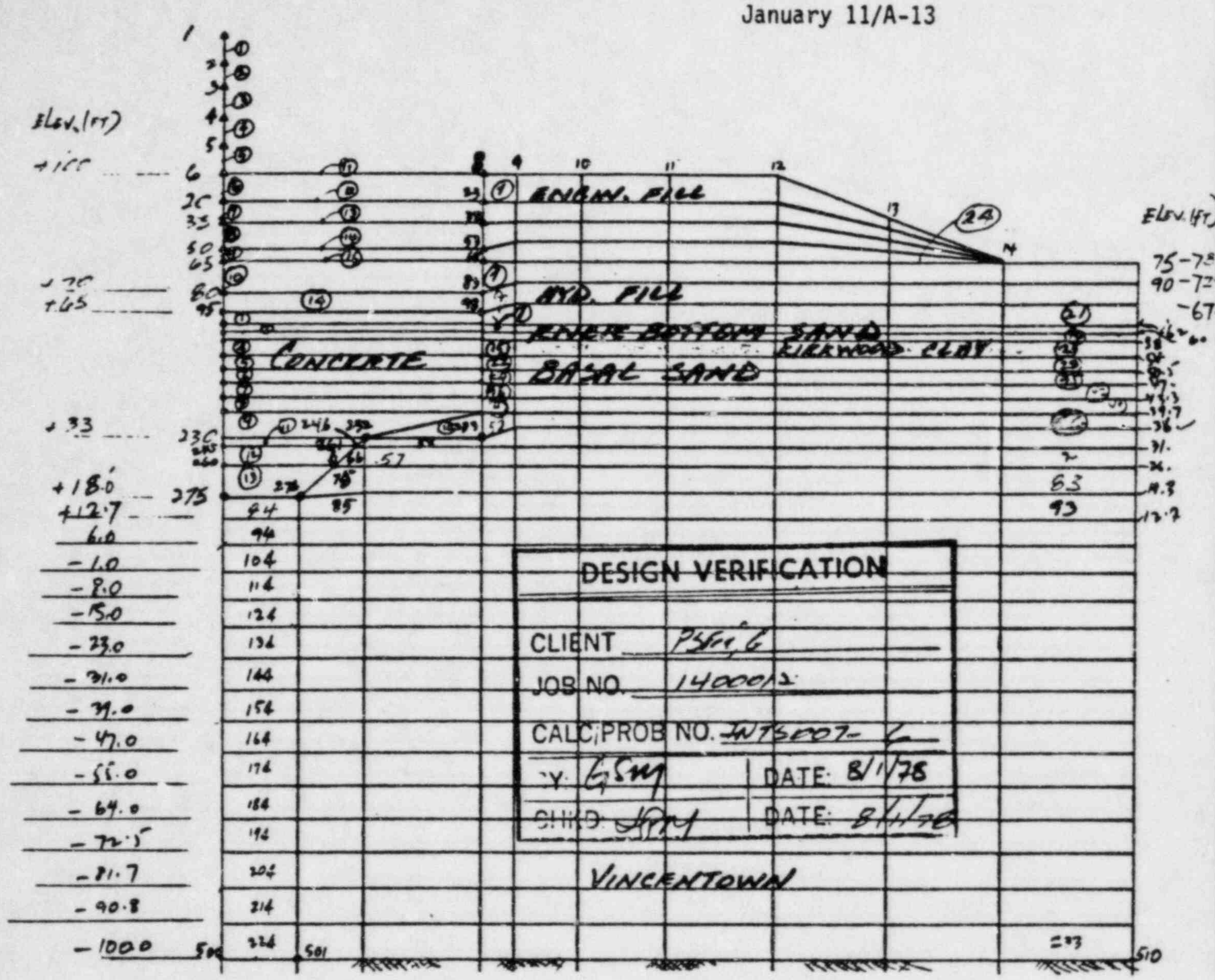

FIGURE 1: 200'Simplified SSI Model Used for Soil Depth Studies for Intake Structure

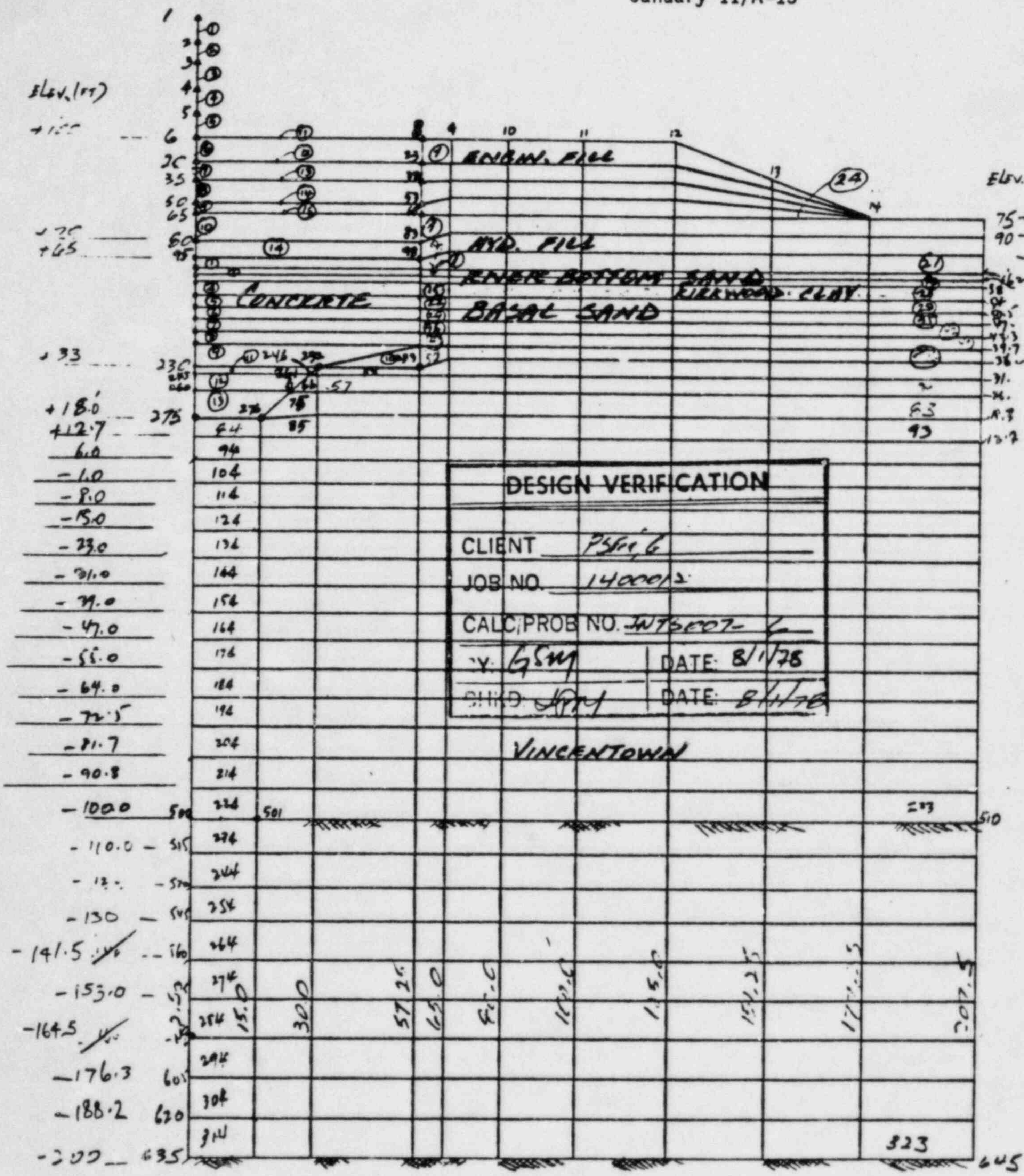

FIGURE 2: 300' Simplified SSI Model Used for Soil Depth Studies for Intake Structure

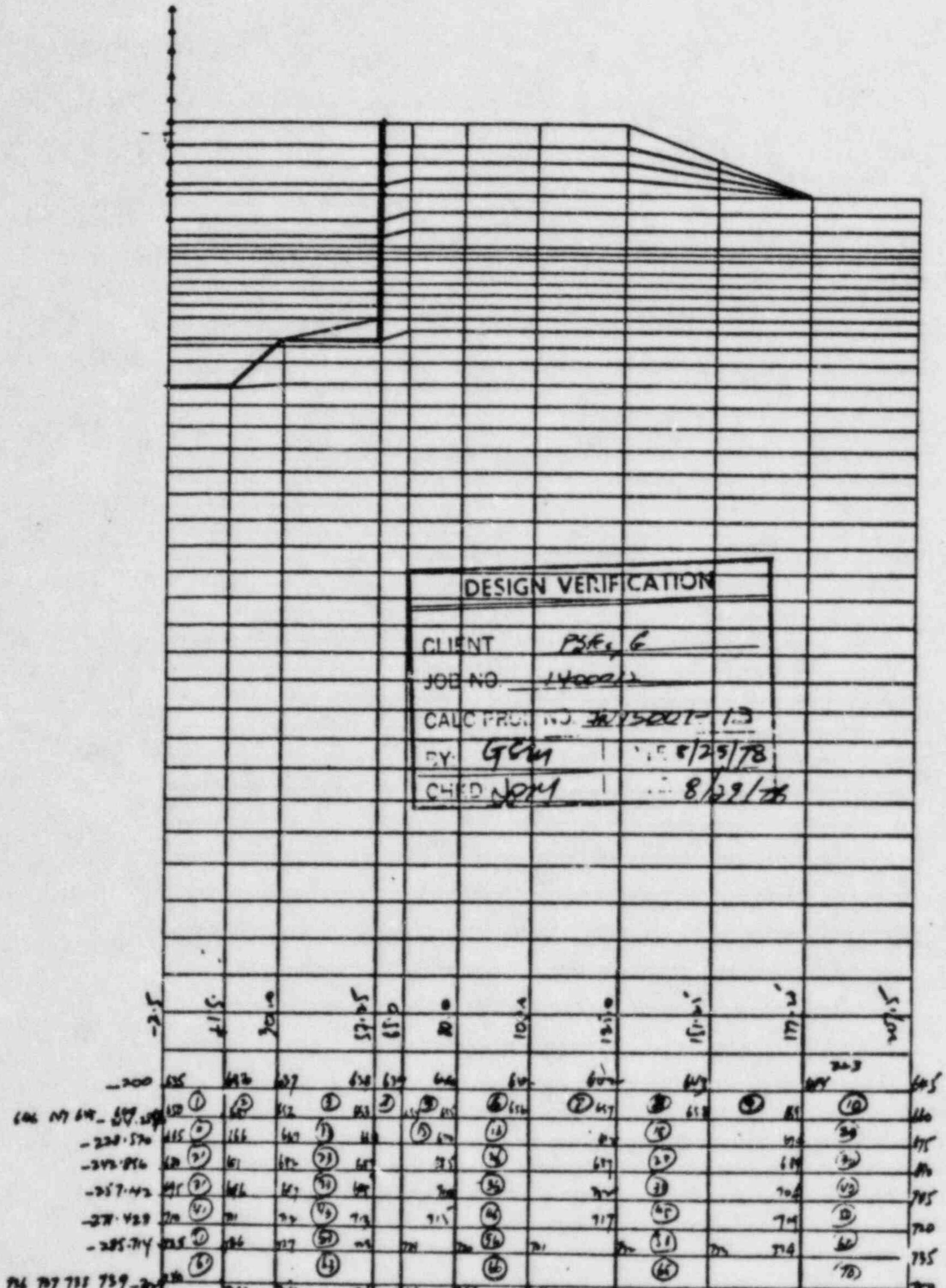

FIGURE 3: 400' Simplified SSI Model Used for Soil Depth Studies for Intake Structure

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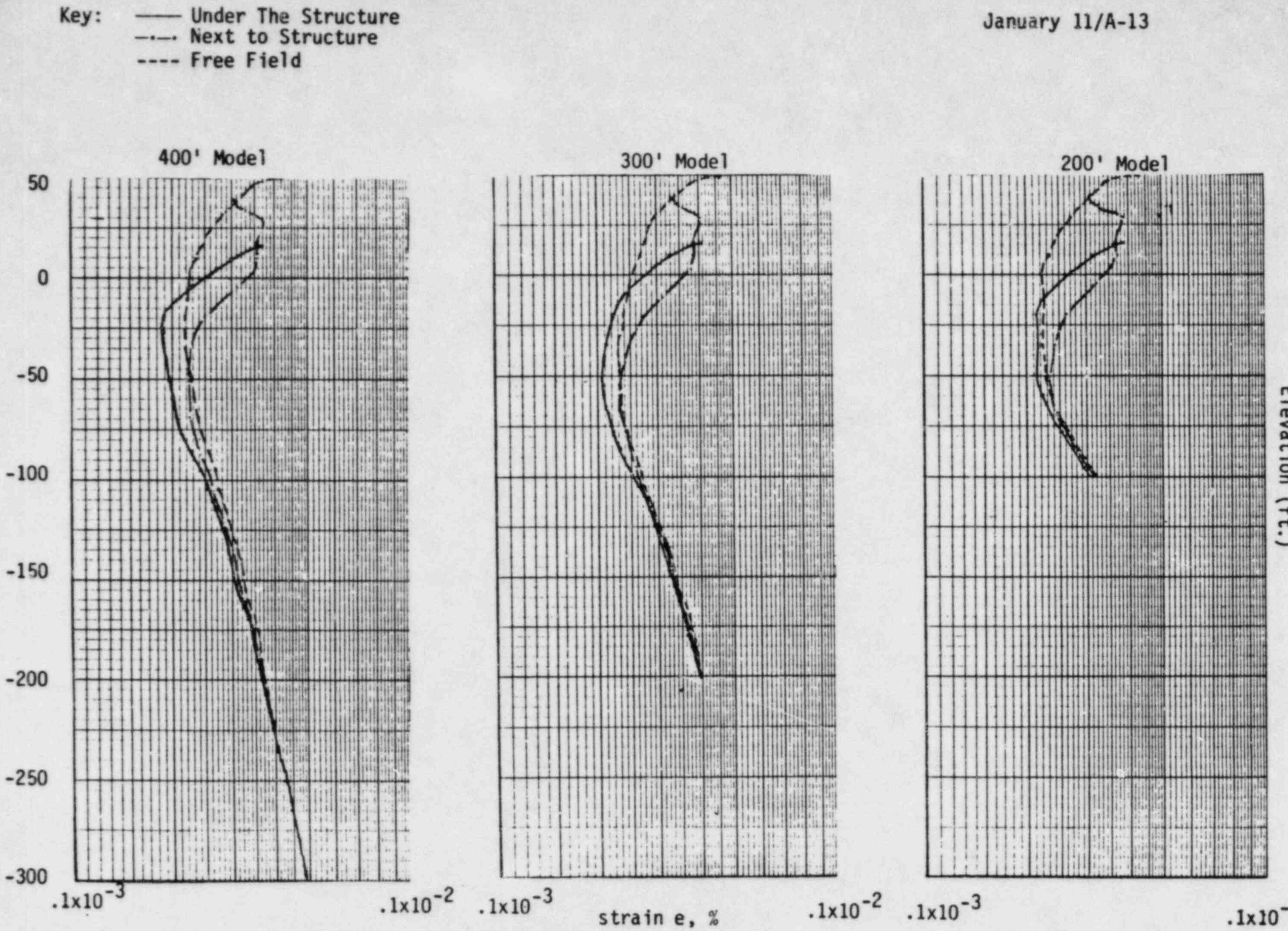

FIGURE 4 Comparison of Peak Shear Strain Versus Depth, Intake Structure - Model Depth Study

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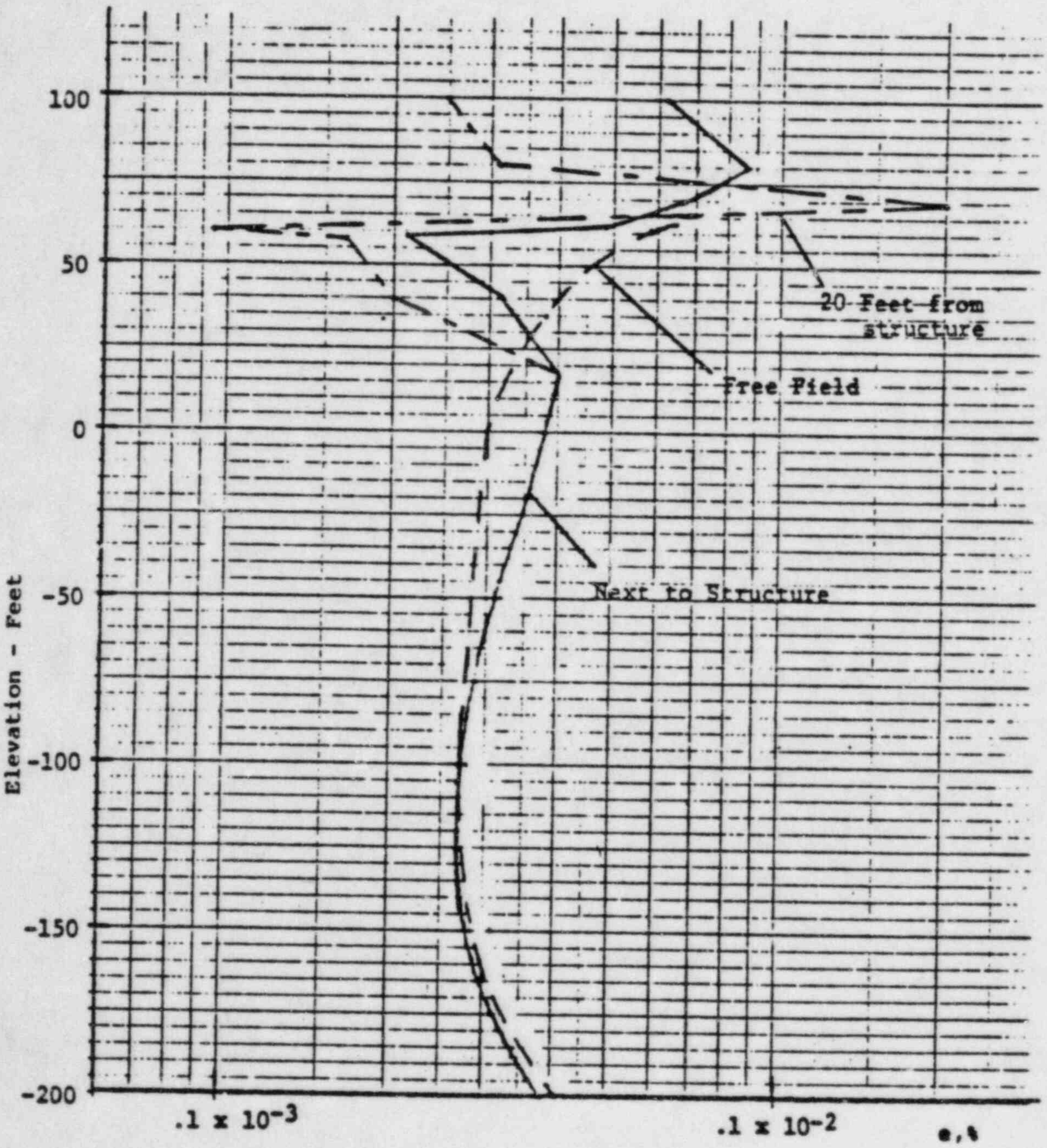

FIGURE 5: Intake Structure Detailed SSI Model
Comparison of Peak Shear Strain Versus Depth,
Suggested Soil Properties

ATTACHMENT 5

Containment System Branch Open Items

SUBJECT	REVISED FSAR PAGES
Containment Purge Valves	1.14-60, 1.14-63, 6.2-52, 6.2-62a and T6.2-16 pg 3 and 8
Negative Pressure Analysis	6.A-14 and T6A-3
Hydrogen Generation	6.2-84, T6.2-16 pg 7, T6.2-24 pg 4 and 5, T6.2-26, F5.4-13, F6.2-28 pg 23 and 27 and F6.2-47

ATTACHMENT 6

CPB OPEN ITEM

BWR CORE THERMAL HYDRAULIC STABILITY

Core thermal hydraulic stability will be assured by compliance with the Stability Technical Specification recommended by GE in a letter dated June 14, 1984, to the BWR Owners Group (BWROG). GE has written this specification to address the concerns of BWR Thermal Hydraulic Stability which are presented in SIL No. 380. This specification will be adopted in the Hope Creek Technical Specifications. The requirements of the limiting condition for operation will be addressed in the integrated operating and abnormal operating procedures. A surveillance test procedure will be developed to establish the baseline APRM and LPRM neutron flux noise levels and to check the existing noise levels against baseline values when required.

M P84 144/05-cag

ASB OPEN ITEM
IE BULLETIN 81-03

Hope Creek has been requested to address the applicability of IE Bulletin 81-03: Flow Blockage of Cooling Water to Safety Components by Corbicula sp. (Asiatic Clam) and Mytilus sp. (Mussel).

RESPONSE

Experience at the site has been shown that the referenced organisms are not indigenous to the local esturay. However, biofouling by similar species could potentially occur.

At Hope Creek, the only safety related heat exchangers which receive esturine water are the safety auxiliaries cooling system (SACS) heat exchangers. The balance of safety related heat exchangers are cooled with condensate quality water which is cooled on the shell side of the SACS heat exchangers.

Biofouling will be controlled by the continuous injection of sodium hypochlorite in front of the service water pumps. Should this control be temporarily disrupted, sodium hypochlorite can be injected at a higher rate to assure the cleanliness of the system.

Biofouling would be detected by monthly measurement of differential pressure across the SACS heat exchangers. The heat exchangers will also be visually inspected during refueling outages. The SACS heat exchangers are tubed with 3/4 inch diameter titanium tubes. Titanium is not subject to erosion from contact or turbulent flow.

Since the service water system incorporates redundant equipment with piping cross ties, it would be possible to physically clean a SACS heat exchanger while operating.

Chlorine discharge for the service water system is not a concern since the service water system discharges to the closed loop circulating water systems. Blowdown from the circulating water system will be dechlorinated.

JES:vw

MB 18 01-A

1.14.1.71.2.4.1 Response

The isolation provisions for the bypass vent path fully comply with the required standards of an engineered safety feature. The redundant isolation valves and the bypass vent valve are designed to Seismic Category I standards, classified as Quality Group B, protected from missiles, and are powered and actuated by diverse means, thus allowing them to accommodate a single failure.

1.14.1.71.2.5 Criterion 1.e

The instrumentation and control systems provided to isolate the vent system lines should be independent and actuated by diverse parameters. Motive power to close the isolation valves should also be from diverse sources.

1.14.1.71.2.5.1 Response

The instrumentation and controls provided to isolate the bypass vent path comply with the stated criterion.

1.14.1.71.2.6 Criterion 1.f

The isolation valve closure times should not exceed five seconds to facilitate compliance with 10 CFR 100.

1.14.1.71.2.6.1 Response

less than 15 does

The isolation valve closure time is 5 seconds. The bypass valve closure time is 29 seconds. Although the bypass valve closure time exceeds the NRCs criteria, the vent path not allow releases to ~~the~~ exceed the radiological limits of 10 CFR 100, because of the flow resistance afforded by the 2 inch vent line.

1.14.1.71.2.7 Criterion 1.g

Provisions should be made to ensure that isolation valve closure will not be prevented by debris which could potentially become entrained in the escaping air and steam.

SEP -7 '84 0270735

1.14.1.71.2.12.1 Response

The 2-inch bypass vent line discharges into a 32-inch purge duct downstream of the outboard isolation valve. The purge duct in turn exhausts into the reactor building ventilation system (RBVS). The large pressure drop across the 2-inch line will not permit sufficient mass flow to ~~damage anything downstream of the bypass valve.~~ Insert B

1.14.1.71.2.13 Criterion 5.c

The affects on ECCS of a loss of containment atmosphere through the containment purge during a LOCA should be analyzed.

1.14.1.71.2.13.1 Response

There will be no significant reduction in containment pressure resulting from the blowdown through the bypass vent line. Furthermore, this reduction would have no effect on ECCS performance, since the ECCS pumps are sized for atmospheric suction pressure. No credit is taken for containment pressure acting on the pump suction.

1.14.1.71.2.14 Criterion 5.d

The maximum allowable leak rate of the purge isolation valves shall be specified based on proper consideration of valve size, allowable containment leakage, and bypass leakage limitations (if applicable).

1.14.1.71.2.14.1 Response

Leakage rates on the purge and vent isolation valves are based on complying with the limits established by the HCGS Technical Specifications and 10 CFR 50, Appendix J, and are periodically tested to verify their performance.

Although the HCGS bypass vent valve does not comply explicitly to all BTP CSB 6-4 criteria, the design and operation of this bypass line meets the functional intent of the criteria. When coupled with the extremely unlikely event of a LOCA occurring while the

SEP -7 '84 0270735

Insert B p. 1.14-63

. . . cause the loss of function of any safety-related fans, filters or ductwork located downstream of the bypass valve.

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6.2.4.4 Tests and Inspections

The containment isolation system incorporates the components and isolation functions of all systems penetrating the primary containment. It also has the capability for periodic testing and the determination of containment system leakage.

As required bv the testing requirements of Chapter 16, the system is periodically tested to meet the leakage testing requirements of 10CFR50, Appendix J, and the inservice testing requirements of ASME, Section XI. This is discussed in Sections 3.9.6 and 6.2.6.
← Insert C

Specific exceptions to Appendix J are discussed below:

a. Requirement: Section III.C.2.6 states, "Valves, which are sealed with a fluid from a seal system shall pressurized with that fluid to a pressure not less than 1.1 Pa."

b. Exception: A seal system is used on the main steam lines. This system is manually initiated approximately 20 minutes after a LOCA. It pressurizes the pipe between the MSIVs and between the outboard MSIV and tho MSSV to maintain a pressure differential 5 psid. Separate leakage rates from the total allowable Type B and C limits are specified for the MSIV seal system in Chapter 16. Reference FSAR Section 6.7 for further discussion.

c. Requirement: Section III.C.1 states, "Type C tests shall be performed.... in the same direction as that wher the valve would be required to perform its safety function unless it can be determined that the results from the test for a pressure applied in a different direction will provide equivalent or more conservative results."

d. Exception: Three types of valves are leak rate tested in a direction other than the anticipated accident flow direction. Justification that such testing will provide equivalent or more conservative results relative to those resulting from test pressure applied in the direction of anticipated accident flow includes:

Insert C p. 6.2-622

The soft seated containment purge isolation valves will be tested for gross leakage at least once every 6 months when sealed closed and at least once every 3 months if operated.

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In addition to the containment isolation for the main drywell purge vent line, there is an inlet line to the A train containment hydrogen recombiner that connects to the vent line between the primary containment and the first containment isolation valve. This line is isolated by two motor-operated gate valves. All isolation valves receive a containment isolation signal.

Also connected to the primary containment purge vent line is a 2-inch exhaust line that connects to the vent line between the two main isolation valves. This line is isolated by the isolation valve on the purge line and by ~~a motor-operated globe valve.~~ an air operated globe valve ← The valve is normally closed and is maintained closed by a containment isolation signal. For a detailed evaluation of the primary containment venting operation against BTP CSB 6-4 requirements see Section 1.14.1.71.

During normal operation, the 26- and 24-inch containment purge valves are sealed closed except for the inboard valve on the drywell purge outlet vent line (GS-V024). This 26-inch valve can be periodically opened to permit venting of the primary containment to relieve pressure. ~~during power ascension from cold shutdown.~~ INSERT A All the 26-inch and 24-inch containment isolation valves will be under administrative control to assure that they cannot be inadvertently opened. The valve position indicating lights in the main control room will be checked periodically to verify that the sealed closed valves remain closed.

To prevent the unlikely event of a containment purge valve being prevented from closing by debris that could be entrained in the containment purge lines, the drywell purge lines discussed in Section 6.2.4.3.2.14 are provided with debris screens. Debris screens are not provided for the suppression pool purge lines for the following reasons:

a. There are no high energy lines in the suppression pool.

b. There is no insulation or other loose debris in the suppression pool to become entrained in exiting fluid.

The debris screens are designed based on the following criteria:

Insert A p.6.2-52

This 26 inch valve is qualified to close against the flow through the 2 inch valve following a postulated LOCA. The 2 inch valve is also qualified to close against this flow.

PE7/5

SEP -7 8110270735

TABLE 6.2-15

CONTAINMENT PENETRATIONS

Containment Penetration Number	Line Isolated	Fluid	Line Size, in.	NRC General Design Criterion	ESF System(1)	Valve Number and/or Orifice Plate	Valve Type(1)	Valve Location	Valve Arrangement(2) PSID(8)	Type C Test	Length of Pipe from Cont. to Outside Valves, ft.	Primary Method of Actuation(3)	Secondary Method of Actuation	Normal Valve Position(5)	Shutdown Valve Position(10)	Post-Accident Position(9)	Power Failure Valve Position	Containment Isolation Signal(5)	Valve Closure Time, s	Power Source(6)	Remarks(7)
P-217A	Core Spray Test to Suppression Pool	Water	2	56	Yes	BE-PSV-F012B	SRV	Outside	30/V	No	50.4	Pressure	None	C	C	C		-	-	-	G,H
			10			BE-V226	GT	Outside		Yes	22.8	AC motor	Manual	C	C	C		B,F	72	[illegible]	
			6			BE-V030	[illegible]	Outside		Yes	54.2	AC motor	Manual	[illegible]	C	C	AS IS	None	30	B	J
P-217B	Core Spray Test to Suppression Pool	Water	2	[illegible]	Yes	BE-PSV-F012A	SRV	Outside	30/V	No	100.3	Pressure	None	C	C	C		-	-	-	G,H
			10			BE-V025	GB	Outside		Yes	21.8	AC motor	Manual	C	C	C		B,F	72	A	
			6			BE-V035	GB	Outside		Yes	33.5	AC motor	Manual	O	C	C	AS IS	None	30	A	J
P-218A	Spare																				[illegible]
P-218B	Spare																				[illegible]
P-218C	Spare																				[illegible]
P-218D	Spare																				[illegible]
P-219	Suppression Chamber Purge Vent & Vacuum Relief	Gas	24	56	Yes	GS-V080	BF	Outside	33/N	Yes	27.8	Instr air	Spring	C	C	O	C	None	3-9	A	[illegible]
			24			GS-PSV-5030	PSV	Outside		Yes	27.8	Comp air	Spring	C	C	C	C	-	NA	B	[illegible]
			6			GS-V007	GT	Outside		Yes	-	AC motor	Manual	C	O	C	AS IS	A,H,I	30	B	[illegible]
			6			GS-V006	GT	Outside		Yes	30.9	AC motor	Manual	C	O	C	AS IS	A,H,I	75	[illegible]	[illegible]
			24			GS-V028	BF	Outside		Yes	-	Comp air	Spring	C	C	C	C	A,H,I	3-9	[illegible]	[illegible]
			2			GS-V076	[illegible]	Outside		Yes	31.9	~~AC motor~~ Comp air	[illegible]	C	C	C	~~AS IS~~ C	A,H,I	~~30~~ 15	[illegible]	[illegible]
			24			GS-V027	[illegible]	Outside		Yes	37.7	Comp air	Spring	C	C	C	C	A,H,I	3-9	B	[illegible]
P-220	Suppression Chamber Purge Inlet & Vacuum Relief	Gas	24	56	Yes	GS-V022	BF	Outside	32/N	Yes	33.3	Comp air	Spring	C	C	C	C	A,H,I	3-9	A	S,V,W
			6			GS-V310	GT	Outside		Yes	33.3	AC motor	Manual	C	O	C	AS IS	A,H,I	30	A	[illegible]
			6			GS-V018	GT	Outside		Yes	41.8	AC motor	Manual	C	O	C	AS IS	A,H,I	30	C	[illegible]
			24			GS-V038	BF	Outside		Yes	-	Instr air	Spring	C	C	O	C	None	3-9	B	
			24			GS-PSV-5032	PSV	Outside	-/Y	Yes	45.6	Comp air	Spring	C	C	C	C	-	NA	B	
P-221 (A-D)	Construction Drains																				[illegible]
P-222	Suppression Pool Cleanup Return	Water	6	56	No	EE-V002	GT	Outside	33/N	Yes	36.0	AC motor	Manual	C	C	C	AS IS	A,H,I	30	A	[illegible]
			6			EE-V001	GT	Outside		Yes	[illegible]	AC motor	Manual	C	C	C	AS IS	A,H,I	30	B	
P-223	Suppression Pool Cleanup Supply	Water	6	56	No	EE-V003	GT	Outside	33/N	Yes	20.4	AC motor	Manual	C	C	C	AS IS	A,H,I	30	A	[illegible]
			6			EE-V004	GT	Outside		Yes	22.8	AC motor	Manual	C	C	C	AS IS	A,H,I	30	B	
P-224	Spare																				[illegible]
P-225	Not Used																				

Comp air

T1002776

TABLE 6.2-16

CONTAINMENT PENETRATIONS

Containment Penetration Number	Line Isolated	Fluid	Line Size, in.	NRC General Design Criterion	ESF System(11)	Valve Number and/or Orifice Plate	Valve Type(1)	Valve Location	Valve Arrangement(2) P&ID(8)	Type C Test	Length of Pipe from Cont. to Outside Valves, ft.	Primary Method of Actuation(3)	Secondary Method of Actuation	Normal Valve Position(4)	Shutdown Valve Position(10)	Post-Accident Position(9)	Power Failure Valve Position	Containment Isolation Signal(5)	Valve Closure Time, s	Power Source(6)	Remarks(7)
P-19	Recirc Pump Seal Water	Water	3/4	55	No	BB-V043	CK	Inside	12/K	Yes	-	Flow	None	O	C	C	NA	-	NA	NA	5
			3/4			BF-V098	GB	Outside			15.0	AC motor	Manual	O	C	C	AS IS	B,X	30	B	
P-20	Recirc Pump Seal Water	Water	3/4	56	No	BB-V047	CK	Inside	12/K	Yes	-	Flow	None	O	C	C	NA	-	NA	NA	5
			3/4			BF-V099	GB	Outside			23.7	AC motor	Manual	O	C	C	AS IS	B,X	30	B	
P-21	Spare																				n
P-22	Drywell Purge Inlet Vent	Gas	26	56	Yes	GS-V009	BF	Outside	13/H	Yes	-	Compr air	Manual	C	C	C	C	A,H,I	3-8	A	1,5,m,n
			6			GS-V023	BF	Outside		Yes	43.6	Compr air	Manual	C	C	C	C	A,H,I	3-8	B	n
			26			GS-V021	BF	Outside		Yes	43.6	Compr air	Manual	C	C	C	C	A,H,I	3-8	B	n
			26			GS-V020	BF	Outside		Yes	(242)	Compr air	Manual	C	C	C	C	A,H,I	3-8	B	n
			4			GS-V006	GT	Outside		Yes	-	AC motor	Manual	C	O	C	AS IS	A,H,I	30	B	n
			4			GS-V005	GT	Outside		Yes	30.7	AC motor	Manual	C	O	C	AS IS	A,H,I	30	B	n
P-23	Drywell Purge Outlet Vent	Gas	26	56	Yes	GS-V024	BF	Outside	14/H	Yes	-	Compr air	Manual	C	C	C	C	A,H,I	3-8	A	1,5,n
			26			GS-V026	BF	Outside		Yes	5.3	Compr air	Manual	C	C	C	C	A,H,I	3-8	B	n
			2			GS-V025	GB	Outside		Yes	25.7	Compr air ~~AC motor~~	Manual	C	C	C	~~AS IS~~ C	A,H,I	~~30~~ 15	B	n
			4			GS-V002	GT	Outside		Yes	-	AC motor	Manual	C	O	C	AS IS	A,H,I	30	A	n
			4			GS-V003	GT	Outside		Yes	7.6	AC motor	Manual	C	O	C	AS IS	A,H,I	30	C	n
P-24A	RHR Containment Spray	Water	16	56	Yes	BC-V019	GT	Outside	15/D	Yes	-	AC motor	Manual	C	O	C	AS IS	None	12	B	n
			16			BC-V018	GT	Outside		Yes	6.0	AC motor	Manual	C	O	C	AS IS	None	12	B	
P-24B	RHR Containment Spray	Water	16	56	Yes	BC-V116	GT	Outside	15/D	Yes	-	AC motor	Manual	C	O	C	AS IS	None	12	A	n
			16			BC-V115	GT	Outside		Yes	7.9	AC motor	Manual	C	O	C	AS IS	None	12	A	
P-25	Drywell Floor Drain Sump Discharge	Water	3	56	No	HB-V005	GT	Inside	16/H	Yes	-	AC motor	None	C	C	C	AS IS	A,H,I	25	B	5,n
			3			HB-V006	GT	Outside		Yes	6.5	AC motor	Manual	C	C	C	AS IS	A,H,I	25	B	n
P-26	Drywell Equip. Drain Sump Discharge	Water	3	56	No	HB-V045	GT	Inside	16/H	Yes	-	AC motor	None	O	C	C	AS IS	A,H,I	21	C	5,n
			3			HB-V046	GT	Outside		Yes	15.0	AC motor	Manual	O	C	C	AS IS	A,H,I	21	B	n
P-27	Service Air to Drywell	Air	3	56	No	SA-V039	GT	Inside	17/D	Yes	-	Manual	None	C	C	C	NA		NA	NA	F,5
			3			SA-V038	GT	Outside		Yes	0.2	Manual	None	C	C	C	NA		NA	NA	F
P-28A	Instrument Gas to Drywell	Gas	2	56	Yes	KL-V026	GB	Inside	18/F	Yes	-	AC motor	None	O	O	C	AS IS	B,I,X	20	B	5,n
			2			KL-V025	GB	Outside		Yes	20.0	AC motor	Manual	O	O	C	AS IS	B,I,X	20	B	n
P-28B	Instrument Gas to Drywell	Gas	2	56	Yes	KL-V028	GB	Inside	18/F	Yes	-	AC motor	None	O	O	C	AS IS	B,I,X	20	A	5,n
			2			KL-V027	GB	Outside		Yes	17.5	AC motor	Manual	O	O	C	AS IS	B,I,X	20	C	n

Amendment 6, 6/84

T3002775

6A.4 DETERMINATION OF WORST CASE

The worst case of inadvertent spray actuation was determined from comparing results from a suppression chamber-to-drywell valve failure and a suppression chamber-to-reactor-building valve failure. This approach is based on a single-failure. In addition, the conservative assumption of two spray loops being activated is used.

A tabulation of all cases analyzed is presented in Table 6A-2.

The results are illustrated in Figures 6A-3, 6A-4, 6A-5, and 6A-6. These results indicate a maximum negative drywell pressure of -2.82 psig with two heat exchanger trains and only one purge valve operational. ← Insert A

The differential pressure between the suppression chamber and drywell during this transient is illustrated in Figure 6A-5. As indicated in this figure, a maximum Δp of 2.24 psid results. This is below the 3 psid design value. The worst case was for two heat exchanger trains and a failed vacuum breaker.

6A.5 REFERENCES

6A-1 Tagami and Takashi, "Interim Report on Safety Assessment and Facility Establishment (SAFE) Project," February 28, 1966, Hitachi Ltd, Tokyo, Japan.

6A-2 Donal J. Wilhelm, Condensation of Metal Vapor-Mercury and the Kinetic Theory of the Condensation, ANL-6948, October 1964.

Insert A   6A-14

during normal operation

In order to assure that this evaluation envelopes the case of an inadvertent spray actuation, the drywell conditions when drywell pressure reaches atmospheric (14.696 psia) were compared with drywell conditions during normal operation (150°F and 100% relative humidity). The results of this comparison are presented in Table 6A-3. The SBA case evaluated envelopes the normal operation case.

PE7/3

TABLE 6A-3

Comparison of Spray Actuation
For SBA and Normal Operation

Parameter	SBA	Normal Operation
Pressure, psia	14.696	14.696
Temperature, °F	163.3	150
Steam/Non-Condensable Ratio	0.44	0.21

the post-LOCA containment pressure versus time up to 180 days after the accident.

The discussion above indicates that the recombiners are adequate to control the oxygen concentration inside the primary containment post-LOCA. The results presented are based on the following conditions:

1. 4% initial oxygen concentration

2. 4-1/2% oxygen concentration for recombiner actuation

3. 11.5 scfh air inleakage per MSIV.

4. 150 scfm maximum recombiner flow.

Figures 6.2-32 and 6.2-33 show the hydrogen and oxygen concentrations versus time in the drywell. Figures 6.2-34 and 6.2-35 show the concentrations in the suppression pool air space. All four figures show the concentrations for the case using no recombiners and for the case with one train of the recombiner system operating at its design flow of 150 scfm.

Figures 6.2-36 and 6.2-37 show the cumulative total oxygen and hydrogen generated inside the containment. As indicated by the oxygen and hydrogen concentrations in the previous figures, the recombiner capacity of 150 scfm exceeds the hydrogen and oxygen generation rates at all times during the accident.

← INSERT A

6.2.5.4 Tests and Inspections

The CACS is preoperationally tested in accordance with the requirements of Chapter 14 and periodically tested in accordance with the requirements of Chapter 16. Inservice inspection of the safety-related systems will be in accordance with the ASME B&PV Code, Section XI, for Section III, Class 2 components. See Section 6.2.6 for additional testing requirements.

Inzert A p. 6.~~1~~2-84

Both hydrogen and oxygen concentrations are monitored following a postulated LOCA. The hydrogen recombiners will be started under either of the following conditions:

a. Cxygen concentration is greater than 5% and hydrogen concentration reaches 3.5%, or

b. Hydrogen concentration is greater than 4% and oxygen concentration reaches 4.5%.

TABLE 6.2-16

CONTAINMENT PENETRATIONS

Containment Penetration Number	Line Isolated	Fluid	Line Size, in.	NRC General Design Criterion	ESF System(1)	Valve Number and/or Orifice Plate	Valve Type(1)	Valve Location	Valve Arrangement(2) Fig. 6.2-	Type C Test	Length of Pipe from Cont. to Outside Valves, ft.	Primary Method of Actuation(3)	Secondary Method of Actuation	Normal Valve Position(4)	Shutdown Valve Position(10)	Post-Accident Position(9)	Power Failure Valve Position	Containment Isolation Signal(5)	Valve Closure Time, s	Power Source(6)	Remarks(7)
P-212B	RHR Suppression Pool Cooling & System Test	Water	1	56	Yes	BC-PSV-F025C	SRV	Outside	26/B	No	218.5	Pressure	None	C	C	C	NA	-	-	NA	[illegible]
			1			BC-PSV-F025A	SRV	Outside		No	170.4	Pressure	None	C	C	C	NA	-	-	NA	[illegible]
			18			BC-V124	GB	Outside		Yes	49.8	AC motor	Manual	C	C	C	AS 15	H,E	180	A	[illegible]
			18			BC-V125	GB	Outside		Yes	63.6	AC motor	Manual	C	C	C	AS 15	H,E	180	C	[illegible]
			4			BC-V126	GT	Outside		Yes	100.1	AC motor	Manual	C	C	C	AS 15	H,E	77	A	[illegible]
			4			BC-V128	GT	Outside		Yes	62.4	AC motor	Manual	O	C	C	AS 15	None	77	A	[illegible]
			4			BC-V131	GT	Outside		Yes	48.8	AC motor	Manual	O	C	C	AS 15	None	77	C	[illegible]
			4			BC-V206	CK	Outside		Yes	65.7	Flow	None	O	C	C	NA	-	-	NA	[illegible]
P-213A	RHR Relief to Suppression Pool	Steam/Water	[illegible]	56	Yes	[illegible]	SRV	Outside	27/D	No	40.0	Pressure	None	C	C	C	AS 15	-	-	[illegible]	[illegible]
			[illegible]			[illegible]	SRV	Outside		No	58.4	Pressure	None	C	C	C	AS 15	-	-	[illegible]	P,S
			1			BC-PSV-4431B	SRV	Outside		No	35.5	Pressure	None	C	C	C	AS 15	None	[illegible]	[illegible]	[illegible]
			[illegible]			[illegible]	[illegible]	Outside		[illegible]	[illegible]	AC motor	Manual	[illegible]	C	C	AS 15	None	[illegible]	[illegible]	[illegible]
			[illegible]			[illegible]	[illegible]	Outside		[illegible]	[illegible]	AC motor	Manual	[illegible]	C	C	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			[illegible]			[illegible]	[illegible]	Outside		[illegible]	[illegible]	AC motor	Manual	[illegible]	C	C	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
P-213B	RHR Relief to Suppression Pool	Steam/Water	[illegible]	56	Yes	[illegible]	SRV	Outside	27/D	No	[illegible]	Pressure	None	C	C	C	AS 15	-	-	[illegible]	P,S
			1			BC-PSV-4431A	SRV	Outside		No	71.3	Pressure	None	C	C	C	AS 15	None	[illegible]	[illegible]	[illegible]
			[illegible]			[illegible]	[illegible]	Outside		[illegible]	[illegible]	AC motor	Manual	[illegible]	C	C	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			[illegible]			[illegible]	[illegible]	Outside		[illegible]	[illegible]	AC motor	Manual	[illegible]	C	C	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			[illegible]			[illegible]	[illegible]	Outside		[illegible]	[illegible]	[illegible]	Manual	C	O	C	AS 15	H,E	60	B	[illegible]
P-214A	RHR to Suppression Chamber Spray Header	Water	6	56	Yes	BC-V015	GB	Outside	26/B	Yes	125	AC motor	Manual	C	O	C	AS 15	H,E	60	A	[illegible]
P-214B	RHR to Suppression Chamber Spray Header	Water	6	56	Yes	BC-V112	GB	Outside	26/B	Yes	19.0	AC motor	Manual	C	O	C	AS 15	H,E	60	A	[illegible]
P-215A	Spare																				
P-215B	Spare																				
P-216A	Core Spray Pump Suction	Water	16	56	Yes	BE-V019	GT	Outside	29/B	Yes	32.0	AC motor	Manual	O	O	O	AS 15	None	96	B	[illegible]
P-216B	Core Spray Pump Suction	Water	16	56	Yes	BE-V020	GT	Outside	29/B	Yes	32.3	AC motor	Manual	O	O	O	AS 15	None	96	B	[illegible]
P-216C	Core Spray Pump Suction	Water	16	56	Yes	BE-V018	GT	Outside	29/B	Yes	32.3	AC motor	Manual	O	O	O	AS 15	None	96	C	[illegible]
P-216D	Core Spray Pump Suction	Water	16	56	Yes	BE-V017	GT	Outside	29/B	Yes	32.3	AC motor	Manual	O	O	O	AS 15	None	96	A	[illegible]

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TABLE 6.2-24 (cont)

Penet Number	P&ID Number	System Description	Test Type	Inboard Isolation Barrier Description/ Valve Number	Notes	Inboard Isolation Barrier Description/ Valve Number	Notes
P 213A	M-51	RHR relief to torus line	A	BC-PSV-4431B	9,7,12,17	-	-
P 213B	M-51	RHR relief to torus line	~~C(W)~~	~~BC-V155~~	~~3,9,12~~	~~BC-V156~~	
			~~C~~	~~BC-V255~~	~~3,9,12~~	~~BC-256, BC-255~~	~~5~~
			~~A~~	~~BC-PSV-F055A~~	~~9,7,12,17~~		-
			A	BC-PSV-4431A	9,7,12,17	-	-
P 214A	M-51	RHR to torus spray header	C	BC-V015	7,12,14	-	-
P 214B	M-51	RHR to torus spray header	C	BC-V112	7,12,14	-	-
P 216A	M-52	Core spray pump suction	C(W)	BE-V019	7,8,9,12,14	-	-
P 216B	M-52	Core spray pump suction	C(W)	BE-V020	7,8,9,12,14	-	-
P 216C	M-52	Core spray pump suction	C(W)	BE-V018	7,8,9,12,14	-	-
P 216D	M-52	Core spray pump suction	C(W)	BE-V017	7,8,9,12,14	-	-
P 217A	M-52	Core spray test and min flow to torus	A	BE-PSV-F012B	7,12,17	-	-
			C(W)	BE-V026	9,12,14	-	-
			C(W)	BE-V036	9,12,14	-	-
P 217B	M-52	Core spray test & min flow to torus	A	BE-PSV-F012A	7,12,17	-	-
			C(W)	BE-V025	9,12,14	-	-
			C(W)	BE-V035	9,12,14	-	-
P 219	M-57	Torus purge outlet & torus vacuum relief	C	GS-V080	3,12	GS-PSV-5030	-
			C	GS-V028	3,12	GS-V076, GS-V027	-
			C	GS-V007	8,12	GS-V006	-
P 220	M-57	Torus purge outlet & torus Vacuum relief	C	GS-V022	3,5	GS-V020, GS-V021, GS-V023, GS-V009	5, 5
			C	GS-V010	8	GS-V008	-
			C	GS-V038	3	GS-PSV-5032	-
P 221A-D		Construction hatch	A	-	19	-	-
P 222	M-53	Torus water cleanup return	C(W)	EE-V002	8,9,12	EE-V001	-
P 223	M-53	Torus water cleanup supply	C(W)	EE-V003	8,9,12	EE-V004	-
P 224		Spare	A	-	-	-	-

(W) Tested with water.

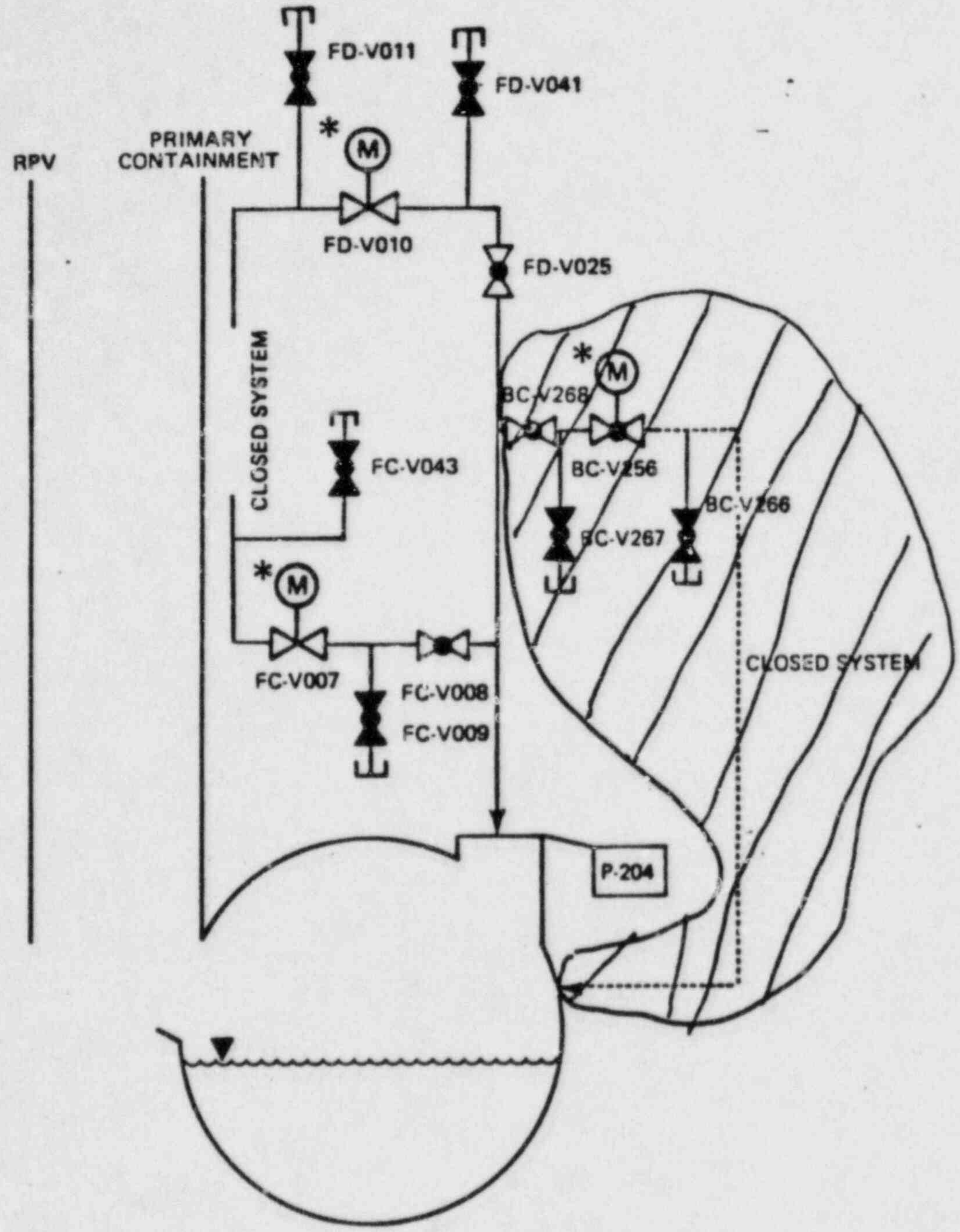
TABLE 6.2-24 (cont)

Penet Number	P&ID Number	System Description	Test Type	Inboard Isolation Barrier Description/ Valve Number	Notes	Inboard Isolation Barrier Description/ Valve Number	Notes
P 201	M-55	HPCI turbine exhaust	C(W)	FD-V006 FD-V007	8, 12 8, 12	FD-V004	7
P 202	M-55	HPCI pump suction	C(W)	BJ-V009	8, 9, 12, 14	-	-
P 203	M-55	HPCI minimum return	C(W)	BJ-V016	8, 9, 12, 14	-	-
P 204	M-55	HPCI & RCIC vacuum network	C C	FC-V007, FD-V010, BC-V256	12		-
P 207	M-49	RCIC turbine exhaust	C(W) C	FC-V005 FC-V006	8, 12 8, 12	FC-V003	7
P 208	M-49	RCIC pump suction	C(W)	BD-V003	8, 9, 12, 14,	-	-
P 209	M-49	RCIC min return	C(W)	BD-V007	9, 12, 14	-	-
P 210	M-49	Non-condensable gas from RCIC vacuum pump	C(W)	FC-V011	7, 9, 12, 20	FC-V010	7
P 211A	M-51	RHR pump suction	C(W)	BC-V001	7, 9, 12, 14, 8	-	-
P 211B	M-51	RHR pump suction	C(W)	BC-V006	7, 9, 12, 14, 8	-	-
P 211C	M-51	RHR pump suction	C(W)	BC-V103	7, 9, 12, 14, 8	-	-
P 211D	M-51	RHR pump suction	C(W)	BC-V098	7, 9, 12, 14, 8	-	-
P 212A	M-51	RHR torus water cooling & system test	A A C(W) C(W) C(W)	BC-PSV-F025 D BC-PSV-F025 B BC-V028, BC-V027 BC-V026, BC-V034 BC-V031, BC-V260	7, 12, 17 7, 12, 17 9, 12, 14 9, 12, 14 9, 12, 14	- - - - -	- - - - -
P 212B	M-51	RHR torus water cooling & system test	A A C(W) C(W) C(W)	BC-PSV-F025 A BC-PSV-F025 C BC-V124, BC-V125 BC-V126, BC-V128 BC-V131, BC-V206	7, 12, 17 7, 12, 17 9, 12, 14 9, 12, 14 9, 12, 14	- - - - -	- - - - -
~~P 213A~~	~~M-51 A~~	~~RHR relief to torus line~~	~~C(W)~~ ~~C~~ ~~A~~ ~~A~~	~~BC-V037~~ ~~BC-V253~~ ~~BC-PSV-F097~~ ~~BC-PSV-F055B~~	~~3, 8, 12~~ ~~9, 8, 12~~ ~~9, 7, 12, 17~~ ~~9, 7, 12, 17~~	~~BC-V036~~ ~~BC-V250, BC-V252~~	~~5~~

(W) Tested with water.

SYSTEM ISOLATION VALVES WITH PRIMARY CONTAINMENT ISOLATION(1)

Line Isolated	Valve(4) Number	Operator Number	Essential/ Non-Essential	Isolation(2) signals	(3) Comments
RHR to Radwaste	BC-V042 BC-V041	HV-F049 HV-F040	Non-Essential Non-Essential	B,D B,D	A
RHR to Process Sampling	— —	BC-SV-F079A BC-SV-F080A	Non-Essential Non-Essential	B,D B,D	A
RHR To Process Sampling	— —	BC-SV-F079B BC-SV-F080A	Non-Essential Non-Essential	B,D B,D	A
RHR to Post-Accid. Sampling	— —	RC-SV-F0645A RC-SV-F0645B	Non-Essential Non-Essential	None None	A,B,C
RHR to Post-Accid. Sampling	— —	RC-SV-F0646A RC-SV-F0646B	Non-Essential Non-Essential	None None	A,B,C
RHR to Contain. Hydrogen Recomb.	GS-V520 GS-V150	HV-5055A HV-5057A	Non-Essential Non-Essential	A,B,C A,B,C	A
RHR to Contain. Hydrogen Recomb.	GS-V521 GS-V151	HV-5055B HV-5057B	Non-Essential Non-Essential	A,B,C A,B,C	A
RCIC to CST	BD-V012	HV-F022	Non-Essential	A	D
RCIC from CST	BD-V001	HV-F010	Essential	None	
RCIC to Lube Oil Cooler	BD-V022	HV-F046	Essential	None	
HPCI to CST	BJ-V010	HV-F008	Non-Essential	A,B	
HPCI from CST	BJ-V005	HV-F004	Essential	None	
HPCI to Lube Oil Cooler	BJ-V028	HV-F059	Essential	None	
Steam Condensing	BC-V161	HV-F052A	Non-Essential	None ~~A,B~~	E
Steam Condensing	BC-V022	HV-F052B	Non-Essential	None ~~A,B~~	E
Steam Condensing Warmup	BC-V374	HV-4428	Non-Essential	None ~~A,B~~	E



DETAIL 23

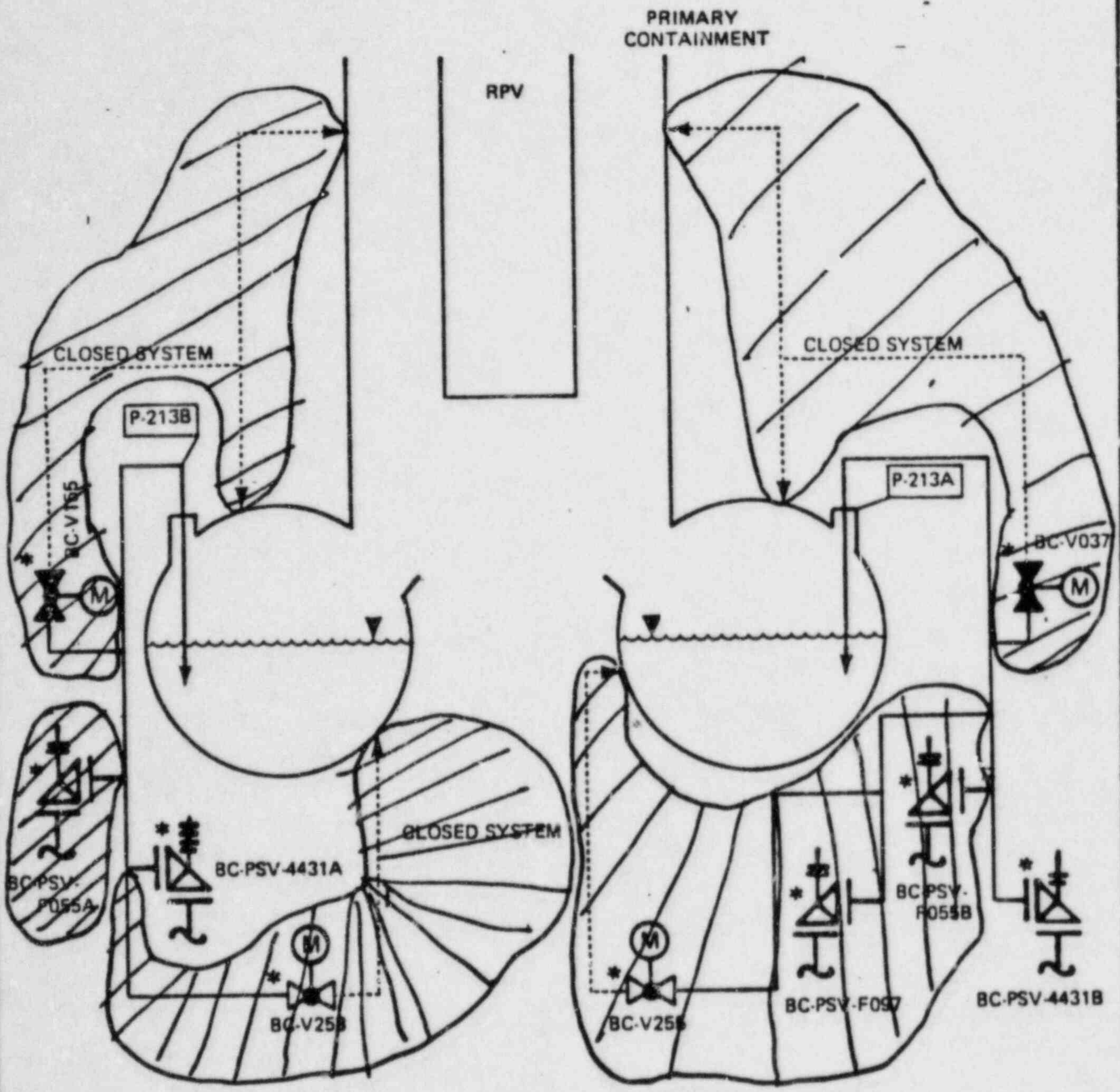
*(SEE LEGEND)

HOPE CREEK
GENERATING STATION
FINAL SAFETY ANALYSIS REPORT

HPCI AND RCIC
VACUUM BREAKER NETWORK LINE

FIGURE 6.2-28
SHEET 23 OF 48

AMENDMENT 6, 06/84



DETAIL 27

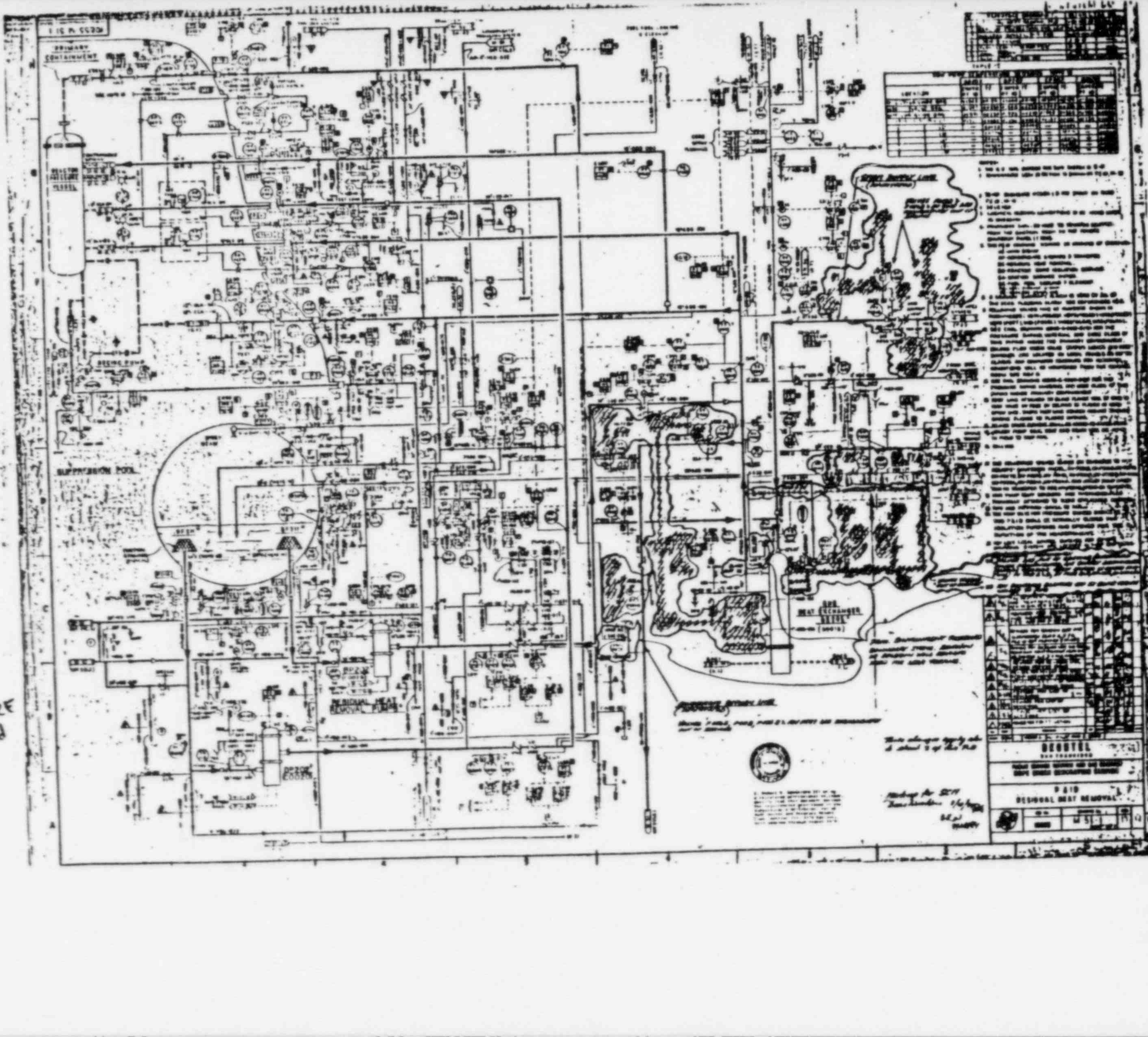
HOPE CREEK
GENERATING STATION
FINAL SAFETY ANALYSIS REPORT

RHR RELIEF TO
SUPPRESSION CHAMBER LINES

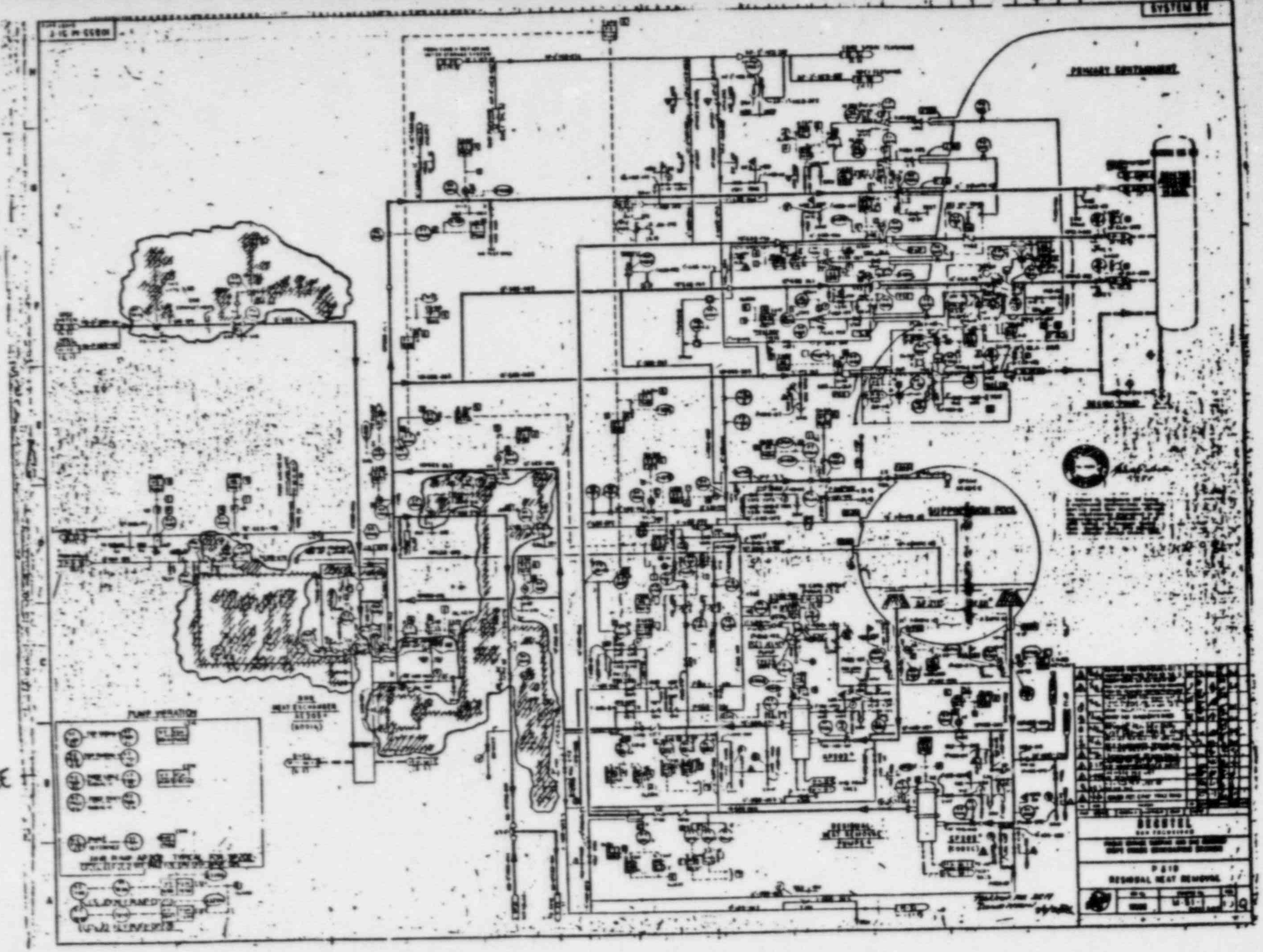
*(SEE LEGEND)

FIGURE 6.2-28
SHEET 27 OF 48

AMENDMENT 6, 06/84



FSAR FIGURE
5.4-13 and
6.2-47



FSAR FIGURE
5.4-13 and
6.2-47

ATTACHMENT 7