

LOUISIANA
POWER & LIGHT

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September 28, 1984

J.M. CAIN
President and
Chief Executive Officer

W3B84-0491

Director of Nuclear Reactor Regulation
ATTN: Mr. Darrell G. Eisenhut, Director
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

SUBJECT: Waterford 3 SES
Partial Response to Items
from Waterford Review Team

- REFERENCES: 1) Letter, D.G. Eisenhut to J.M. Cain,
"Waterford 3 Review," dated June 13, 1984
- 2) Letter W3B84-0473, R.S. Leddick to D.G. Eisenhut,
"Program Plan for Resolution of Pre-Licensing
Issues" dated August 20, 1984

Dear Mr. Eisenhut:

The purpose of this letter is to submit Louisiana Power & Light's responses to Issues 17 and 23 as set forth in your June 13, 1984 letter (Reference 1). The response to Issue 17 follows the approach set forth in Attachment 1 to the Program Plan sent to you by LP&L on August 20, 1984 (Reference 2). Limited revision has been made in the Program Plan for Issue 23 (enclosed) in order to reflect the information given to you at the August 17, 1984 meeting in Bethesda. The response to Issue 23 follows this revised approach. Current assessment of each of the issues is as set forth in the responses.

Included with this letter is a supplement to the response to Issue 5, reflecting information developed since our August 27, 1984 submittal. The information contained in this supplement was informally provided to your staff. The logic in our original response to Issue 5 remains unchanged.

The responses and the supplement have been reviewed and verified by LP&L QA in accordance with procedure QASP 19-13. The designated subcommittee of the Waterford Safety Review Committee also has reviewed the adequacy of the responses and the supplement for resolving the issues raised. The subcommittee scope of responsibility does not include independent validation of the facts.

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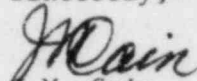
Mr. Darrell G. Eisenhut, Director
W3B84-0491
September 28, 1984

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The Task Force has indicated by separate correspondence (enclosed) that it is satisfied with the logic of the responses to Issues 17 and 23. However, it has not yet completed its independent validation of the facts. The Task Force has committed to notifying me and the NRC immediately should it find significant deviations in the course of its validation. In the event of such notification, LP&L will amend individual responses as may be necessary.

We request that you commence actions you deem necessary to lead to the resolution of these individual issues.

Sincerely,


J.M. Cain

JMC:DA:pbs

Attachments

Mr. Darrell G. Eisenhut, Director
W3B84-0491
September 28, 1984

Page 3

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NUS-W3-A727
September 28, 1984

Mr. J. M. Cain
President and Chief Executive Officer
Louisiana Power and Light Company
317 Barrone Street
New Orleans, Louisiana 70160

Dear Mr. Cain:

I have been authorized by the Prelicensing Issues Task Force to forward to you the attached letter relating to the submittal of Louisiana Power and Light Company responses to Issues 17 and 23 of Mr. Eisenhut's letter to LP&L dated June 13, 1984.

Sincerely,

A handwritten signature in cursive script, appearing to read "Peter V. Judd".

Peter V. Judd
Project Manager
Prelicensing Issues
Task Force Support Group

PVJ/cn
Attachment



510 CLOPPER ROAD
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(301) 258-6000

CG-SL-25-84
September 28, 1984

Mr. P. V. Judd
Pre-Licensing Task Force Support Group
Louisiana Power & Light Company
Waterford # 3 SES
Highway 13
Taft, Louisiana 70066

Reference: Letter from D. G. Eisenhut, Director, Division of Licensing, U. S. Nuclear Regulatory Commission to J. M. Cain, President and Chief Executive Officer, Louisiana Power & Light Company, Waterford # 3 Review, June 13, 1984

Dear Mr. Judd:

We understand that Louisiana Power & Light plans to submit responses to the Nuclear Regulatory Commission covering Issues 17 and 23 of the referenced letter.

The Task Force has no objections to this course of action. We have studied these issues and find the logic stated in the LP&L responses to be adequate. Mr. Cain should note that the Task Force has not yet completed its independent validation of facts presented in the responses. We will notify Mr. Cain and the NRC immediately if we find significant deviations in the course of our continuing validation efforts. Of course, as Mr. Cain knows, our work on all 23 issues and their collective significance is continuing and will culminate in a formal report to him.

I have discussed this matter with Messrs. Robert Ferguson and Larry Humphreys and we have agreed to this together. Please forward this to Mr. J. M. Cain.

Sincerely,

A handwritten signature in cursive script that reads "Saul Levine".

Saul Levine
Vice President and
Group Executive
Consulting Group

PROGRAM PLAN

ISSUE & TITLE	DESCRIPTION OF ISSUE	LP&L APPROACH TO RESOLUTION	CURRENT ASSESSMENT
23. QA Program Breakdown between Ebasco and Mercury.	<p>The NRC Staff review indicated that LP&L, Ebasco and Mercury did not followup on corrective action commitments made to the NRC following NRC enforcement action, that LP&L, Ebasco and Mercury failed to audit the entire QA Programs as required, and that a failure to determine root cause and the lack of corrective action allowed the Mercury problem to persist.</p> <p>LP&L shall provide an assessment of the overall QA program and determine cause of the breakdown, together with corrective action to prevent recurrence. This overall assessment is necessary to provide assurance that the QA program can function adequately when the plant proceeds into operation.</p>	<p>First, LP&L is conducting a thorough review of the underlying causes and corrective actions associated with the 1982 NRC enforcement actions and civil penalty to determine the adequacy of follow-up related to corrective actions.</p> <p>Second, LP&L is conducting a thorough review of its QA audit program, which has been in effect since January 1982, as it related to Mercury activities. Attention will be placed on the adequacy of the audit schedule and whether such audits could have identified the Mercury problem earlier.</p> <p>Third, LP&L is performing an overall assessment of the LP&L QA construction program based on the results of the 23 NRC concerns to identify lessons learned and to determine if any improvements are required to assure adequacy of future operational QA program activities. This response will include lessons learned from the Item 23 review. Overall assessment of the operational QA program will be presented in a separate submittal addressing collective significance of the 23 issues.</p> <p>This response demonstrates that the extensive management and quality assurance actions taken by LP&L, Ebasco and Mercury subsequent to June, 1982, were appropriate; that most of the problems identified were part of the corrective actions on work previously done and are not indicative of continued inferior performance; and that the partial program breakdown did not persist.</p>	The review indicates that there are no open items affecting plant safety.

SEP 28 1984

SUPPLEMENT TO RESPONSE TO CONCERN NO. 5
SUBMITTED AUGUST 27, 1984

DISCUSSION:

The Pre-Licensing Issues Task Force Support Group, during its validation review in support of the Task Force effort, identified two additional CE purchase orders for which unconditional certifications did not exist in the files. This finding prompted a 100% re-review of the quality records associated with CE material and equipment for the existence of conditional certifications. The following revisions to the response of August 27, 1984, have been identified.

- ° Conditional Certifications of Equipment had been received on 54 instead of 45 CE purchase orders.
- ° Of the additional nine purchase orders which had Conditional Certifications of Equipment only one is remaining without an unconditional certification.

It is believed that there are two reasons for not identifying the additional nine purchase orders which had Conditional Certifications of Equipment: (A) In 1978 CE changed the form used. The earlier form had no check-off boxes to clearly state whether the certification was conditional or unconditional. (B) During the initial review, the reviewers saw the unconditional certification and overlooked the possibility that a conditional certification had existed for the purchase order being reviewed.

In conclusion, there remain only two construction related, CE purchase orders that have outstanding conditional certifications. It is anticipated that both of these purchase orders will have unconditional certifications by September 30, 1984.

CAUSE:

There is no change to the previously stated Cause.

GENERIC IMPLICATIONS:

There is no change in the previously stated Generic Implications.

SAFETY SIGNIFICANCE:

There is no change in the previously stated Safety Significance.

CORRECTIVE ACTION PLAN/SCHEDULE:

The only change to the Corrective Action Plan/Schedule, is that the operability review will now cover 54 instead of 45 purchase orders to determine if these conditions could have affected the operability of equipment. This review will be completed by October 15, 1984.

RESPONSE

ITEM NO.: 17

TITLE: QC Verification of Expansion Anchor Characteristics

NRC DESCRIPTION OF CONCERN:

A review of Mercury Construction Procedure SP-666, Revision 8, "Drilled-In Expansion Type Anchors in Concrete for Category I Structures," revealed that it does not require QC verification of many characteristics necessary to ensure proper installation of concrete expansion anchors. These characteristics include:

- Spacing between adjacent anchors
- Spacing between an anchor and the edge of a concrete surface
- Spacing between an anchor and an embedded plate
- Minimum anchor embedment depth
- Grouting of unused/abandoned holes in the concrete
- Mounting plate size
- Size of holes in mounting plates and hole distance from plate edges

Although most of the above characteristics are addressed in Section 6.1 "installation," they are not included within Section 6.2 "Inspection," as items requiring QC verification. In addition, QC Inspection Report Form 277A, Rev. May 1982, "Equipment Installation (Anchors)," does not list these attributes as inspection points.

Therefore, Procedure SP-666 should be revised to include all necessary inspection attributes, and a reinspection program should be initiated. This program should be of sufficient size and scope to indicate whether these concrete anchors, in general, are able to perform their intended function. Detailed results should be made available to the NRC staff for review.

DISCUSSION:

LP&L acknowledges that not all of the expansion anchor characteristics cited by the NRC were specifically included in Mercury QC Inspection Report (Form 277A), although all necessary criteria were included in inspection procedures either by referencing the governing procedure (SP-666) or other inspection checklists. Mercury is no longer on site and it would therefore be of no positive consequence to revise SP-666. The procedures currently used on-site to install expansion anchors, however, will be revised to ensure all necessary inspection attributes are explicitly included on the inspection checklists. The five-part discussion that follows, including a discussion of the LP&L reinspection in-progress, will demonstrate that the overall expansion anchor installation program has led to an end product which will adequately perform its required safety function. The discussion is formatted as follows:

- I. Comparison of Characteristics Cited By the NRC versus Mercury Procedures and Inspection Checklists.

- II. Training of Mercury Personnel on Expansion Anchor Installations.
- III. Corrective Action Programs for Deficiencies Identified While Mercury Was On-site.
- IV. Reinspections After Mercury Left the Site.
- V. Analyses Demonstrating the Conservatism of the Mercury Expansion Anchor Installations.

I. A Comparison of Characteristics Cited By the NRC versus Mercury Procedures and Inspection Checklists.

Mercury Company Procedure SP-666 establishes the method for the installation and inspection of Seismic Class 1 drilled in expansion type anchors. It references project installation documents such as Ebasco Drawings LOU-1564-B430 (Instrument Installation Details) and also states in Section 5.0 that:

"Mercury QA is responsible for the completeness of all documents and to ensure that the quality requirements of this procedure are met."

Included in these "quality requirements" are adherence to the project's installation documents, referenced in SP-666, the Mercury QC Inspection Report (Form 277A) (Attachments 1 and 2) and other Mercury procedures. The following is a cross reference of the characteristics cited by the NRC to these other documents. Also included is a reference to other parts for this discussion for pertinent reinspections or analyses:

A. Spacing Between Adjacent Anchors

This criteria is addressed in Ebasco Anchor Installation Specification 1564.468, which is referenced in all revisions to SP-666 and was directly transcribed into revision 7 (9/28/82).

Ebasco and LP&L QC reinspections to this criteria are discussed in Sections III and IV, respectively.

B. Spacing Between an Anchor and the Edge of a Concrete Surface

This criteria is addressed in Ebasco Anchor Installation Specification 1564.468, which was referenced in all revisions to SP-666 and was directly transcribed into revision 7 (9/28/82).

Ebasco and LP&L QC reinspections to this criteria are discussed in Sections III and IV, respectively.

C. Spacing Between an Anchor (Plate) and Embedded Plate

There are essentially two cases found in the field which related to this characteristic. First, anchor plates may be welded to embedded plates. Second, an anchor plate may be immediately adjacent to an embedded plate. These situations are allowable per design drawings and therefore were not included in the inspection requirements. See Section V for a discussion of each case.

D. Minimum Anchor Embedment Depth

This criteria was required to be verified in Section 6.2 (Inspection) in all procedure revisions of SP-666 and was noted in checklist item 3 of Form 277A associated with SP-666.

Ebasco and LP&L QC reinspections to this criteria are discussed in Sections III and IV, respectively.

E. Grouting of Unused/Abandoned Holes in Concrete

This characteristic was addressed in all procedure revisions of SP-666 and was noted as checklist item 13 of 277A form through revision 4 of SP-666 - (5/18/82). In later revisions, SP-666 required that Ebasco be notified to fill unused holes.

Section V presents the results of an analysis demonstrating the conservatism of the design in regard to this criteria.

F. Mounting Plate Size

This item was verified and signed off by the Q.C. inspector as part of the support inspection checklist (Form 262), which is addressed in Mercury procedures SP-654 and SP-655. In addition, revisions 7 and 8 of SP-666 referenced the Ebasco B-430 drawings which detailed the mounting plate sizes. The specific B-430 drawing used for a particular application was indicated on the completed inspection report form 277A.

G. Size of Holes in Mounting Plate and Hole Distances from Plate Edges

Per paragraph 6.1.2 of all SP-666 procedure revisions, a carbide bit of the same nominal diameter as the expansion bolt was to be used to drill the hole, unless otherwise directed by the Engineer.

The hole distance from plate edge was part of the configuration checkpoint verified by Q.C. during support fabrication noted in Mercury procedures SP-654 and SP-655 and documented on form 262-1. This attribute was also detailed on the Ebasco B-430 drawings which is referenced in revisions 7 and 8 of SP-666. The specific B-430 detail drawing used for installation was referenced on the completed inspection checklist form 277A.

II. Training of Mercury Personnel on Expansion Anchors

The following is a discussion of the training program developed and implemented by Mercury. This program provides additional confidence concerning anchor bolt installations.

All revisions of Mercury procedure SP-666 required training on expansion anchor installation techniques. Revisions 2 through 8 required that this training be documented.

Initial training and indoctrination was given by Hilti representatives. Hilti training sessions were conducted on 2/1/79, 6/28/79, 1/29/80 and 8/29/80. Approximately 40 Mercury personnel were trained by Hilti on these dates. Subsequent training was conducted by Mercury.

The Hilti sessions provided the following information:

- A. Proper identification of Hilti bolt lengths. Trainees were instructed to ensure the expansion bolt was identified by a letter designator on the bolt end which identified the bolt length and subsequent embedment after installation. It is noted that Hilti's Manual required considerably shorter embedment depth than that required by Mercury.

Because of the seismic considerations, Hilti initiated recommendations exclusive to the site contractors for installing anchors. The Hilti criteria for embedment depths for expansion anchors was incorporated into Mercury's procedure. The embedment depths are as follows:

Bolt Size	MINIMUM EMBEDMENT		
	Hilti Recommends For Commercial Use	Hilti Recommends For Site Contractors	Mercury Procedure Requires
3/8"	1 5/8"	3 1/2"	3 1/2"
1/2"	2 1/4"	5 1/2"	5 1/2"
5/8"	2 3/4"	6 1/2"	6 1/2"
3/4"	3 1/4"	7"	7"

- B. A discussion on the drilling of concrete with Hilti equipment stressing the use of Hilti drill motors and drill bits.
- C. A demonstration on how to drive the bolt into the drilled out bolt hole.
- D. Instructions for the proper number of turns to "set" and torque the bolt.

Mercury's training program on expansion anchor installation was an on going activity. Documented training sessions, which included anchor bolt training, were administered by Mercury on April 5, April 28 and June 25 of 1982. Mercury memos WA-980 (7/1/82), WA-1047 (7/29/82) and WA-1049 (8/3/82) document the extension of their retraining program to individuals not on site at the time of previously held indoctrination sessions.

III. Corrective Action Programs for Deficiencies Identified While Mercury Was On-site

The site anchor installation activity was addressed by Ebasco in December of 1981. Ebasco Corrective Action Report (C.A.R.) 82-3-2 was written against all companies installing safety related expansion anchors. Ebasco nonconformance report NCR-W3-3316 was written in conjunction with the C.A.R. 82-3-2.

The C.A.R. identified the fact that contractors installing expansion anchors did not fully comply with design specifications 1564-468 (seismic applications) and 1564-467 (non-seismic applications). The specific violation noted in the C.A.R. was that the spacing distance of anchor bolts between adjacent plates was less than 10 bolt diameters and the distance of installed anchors to free edge was less than 5 bolt diameters. It should be noted that this spacing criteria was not included in the Hilti training sessions described in Section III.

As a result of this Corrective Action Report:

- A. Nonconformance Report (NCR-W3-3316) was initiated to evaluate all identified cases where the spacing criteria was not met. This NCR required a walkdown by Ebasco Quality Control to identify previous installations and required Ebasco Design Engineering to evaluate those cases identified as violations. This walkdown was completed, violations were evaluated and the NCR was closed after all identified items were resolved.
- B. Mercury was required by the C.A.R. to retrain personnel on the installation of expansion anchors relative to the distance between anchors and the distance between anchors and a free edge.
- C. Mercury was required by the C.A.R. to revise its procedures as necessary to include the spacing criteria required by Ebasco Specification 1564-468.

IV. Reinspection After Mercury Left the Site

- A. Mercury Records Transfer Review and Field Verification (ECRRI-1)

When Mercury Company left the jobsite, Ebasco assumed the responsibility for the review of Mercury QA records prior to transfer of the records to LP&L. During the course of this review, Ebasco's Quality Assurance Installation Review Group (QAIRG) identified expansion anchor concerns due to incomplete installation or incomplete/questionable documentation (note that some of these conditions were in process when Mercury left the site). When any one of these conditions occurred, a field verification was performed by the Ebasco Quality Control Department utilizing Ebasco Procedure ECRRI-1.

The intent of the field verification by Ebasco QC was to confirm the as-built condition of the expansion anchors and supplement the Mercury QC documentation accordingly. The program utilized "inspection requests" which were initiated by the QAIRG and implemented by Quality Control. There were 896 requests made and implemented relative to the expansion anchor program. Each of the following actions was taken and checked off when an inspection request form was initiated: 1) the Ebasco QC inspectors witnessed the torque verifications of the expansion bolts; 2) the Ebasco QC inspectors checked the identification mark on the anchor bolts to ensure adequate embedment depth of the anchor. If no identification mark was visible, a Discrepancy Notice was initiated and the bolts were ultrasonically measured and replaced as necessary; 3) the Ebasco QC inspectors provided a sketch as necessary, of the expansion plate and the location of the bolts on the plate. This information was then transmitted to the reviewers to determine compliance to the B-430 drawing details.

From this field verification, a total of 196 Discrepancy Notices were written by Ebasco Quality Control. Of the 196 DNs written, fifteen required rework. This rework primarily consisted of changing out one bolt per DN due to unachievable torque. The remaining 181 DNs were resolved as appropriate by ultrasonic measurement, initiation of a Design Change, torquing bolts to proper range or attaching additional documentation. Documentation of the field verification program performed in accordance with Ebasco Procedures ECRRI-1 and ECRRI-3 is available.

B. Additional QA Inspection of Instrument Installations

LP&L has embarked on a reinspection of 100% of the Mercury N1 instrument installations. It is being implemented under LP&L QA procedure QASP 19.15. The program was initiated primarily in response to NRC Concern No. 1 (Inspection Personnel Issues). It does, however, include requirements for reinspection of the following three attributes:

1. Inspection of expansion anchors on adjacent plates to verify adequate spacing between anchors.
2. Inspection of anchors to a free edge to verify sufficient distance between the anchor and the free edge.
3. Inspection of the bolt marking on top of the anchor bolt to verify the embedment.

The reinspection of the Reactor Containment Building has been completed. Very few expansion anchor installation discrepancies were found. Those identified have undergone engineering evaluation and no rework is required. The reinspection is expected to be complete by October 15, 1984. The results thus far, indicate that the Mercury program in conjunction with Ebasco and LP&L corrective actions and reinspections has been effective.

V. Analysis Demonstrating Conservatism of the Mercury Expansion Anchor Installation

A. Analysis of spacing between Embedded Plates and Anchor Plates

Conditions may exist in which an embedded plate is immediately adjacent to an anchor plate. This apparently raised a concern that the anchor bolts and nelson studs may be so close as to create overlapping shear cones with resulting reduction in the capacities of both plates. There is a detail on Ebasco Drawing 1564-G-896S02, Rev. 11 which allows an anchor plate with the drilled in anchor bolt to be adjacent to the edge of an embedded plate.

To fully address this concern, however, a detailed analysis (reference 1) was conducted which considered four combinations of anchor plates installed by Mercury butting up against embedded plates. The combinations chosen represent the most critical cases. The analysis took into account the concrete cone capacity, the ultimate load capacity of an anchor or stud per original design and the required factor of safety per the original design. The results (Attachment 3) indicated that the concrete pull out shear cone capacity is greater than the design pull-out load by a factor of about two with an additional safety factor of at least four. It should be noted that since the loads on the Mercury anchor plates are actually much less than the ultimate load capacity, this was a very conservative analysis.

B. Evaluation of Plate Spacing Concerns Cited by the NRC

The NRC identified six specific cases of concern involving spacing between anchor and embedded plates. As discussed in section V.A above, such configurations are in accordance with Ebasco design drawings and supporting analyses were conducted on various combinations of Mercury anchor plates butting up against embedded plates. However, a specific evaluation (reference 1) of each of the six identified cases was conducted. The results indicate that the concrete pull-out shear cone capacity is much greater than the design pull-out load.

C. Evaluation of Abandoned Holes Adjacent to Installed Hilti Anchor Bolt

An analysis was conducted that assumed the entire shear cone area of a drilled in expansion anchor was damaged by abandoned holes with a depth extending two inches to the outer edge of the reinforcing bars. The analysis is contained in reference 2 and shows that the shear cone pull-out capacity is greater than four times the allowable.

CAUSE:

The basic cause for this concern was the fact that not all expansion anchor characteristics were specifically delineated on the Mercury inspection checklist.

GENERIC IMPLICATIONS:

This concern has been treated generically. The generic review began with the corrective actions undertaken while Mercury was on-site, and continued through the reinspections that took place after their departure, and the 100% reinspections of N1 installations in progress.

In regard to expansion anchors installed by other contractors, the common interface criteria are the distance between adjacent anchors and the concrete edge distance of anchors. These criteria were site addressed and resolved by the previously mentioned Corrective Action Report and NCR-W3-3316. These criteria are also being checked in the LP&L reinspection of the N1 instrument lines.

SAFETY SIGNIFICANCE:

It is LP&L's position that the Mercury expansion anchor installations are capable of performing their design safety-related function based on:

- 1) The requirements within SP-666 as well as those requirements provided in the design documents referenced in SP-666.
- 2) The in-depth review and subsequent field verification and Discrepancy Notice program initiated by Ebasco.
- 3) The results of the inspection of instrument installations performed per procedure QASP-19.15.

Thus, LP&L believes this issue is not a constraint to fuel load or power ascension.

Attachment 4 provides a matrix overview of the inspections, reinspections and analyses discussed in this response.

CORRECTIVE ACTION PLAN/SCHEDULE:

The Mercury Company is no longer on site and it would be of no positive consequence to revise SP-666 as recommended. However, the installation of expansion anchors for instrumentation continued for any remaining work under the Ebasco Force Account Program utilizing CP-674 (Construction Installation Procedure). This procedure is more in-depth relative to installation techniques and inspection attributes but has been revised to ensure all necessary attributes for expansion anchor installations are explicitly included on the inspection checklists.

The reinspection being performed under QASP 19.15 is expected to be complete by October 15, 1984.

ATTACHMENTS:

- 1) Form 277A to SF-666 Procedure (Blank)
- 2) Completed form 277A to SP-666 Procedure
- 3) Results of Analysis of Four Cases of Anchor Plates Adjacent to Embedded Plates
- 4) Summary of Verifications of Expansion Anchor Characteristics Cited By the NRC

REFERENCES:

- 1) Report on Attachment 4 to Allegation 4-84-A-06 #110 and #119 (NRC Concern No. 17) 8/20/84.
- 2) Report on Abandoned Holes Adjacent to the Installed Anchor Bolt 9/11/84.

ATTACHMENT 1

ATTACHMENT 2

SUMMARY OF VERIFICATIONS OF EXPANSION ANCHOR
CHARACTERISTICS CITED BY NRC

Attribute Cited By NRC	Explicit Checkpoint on Form 277A	Checkpoint via Reference on Form 277A	Allowed by Design (G-896 S02) (See para.V)	Analysis (See para.V)	Reinspected Under CAR 82-3-2 (See para. III).	Reinspection Under ECRR1-1 and 3 (See para. IV).	Sample Reinspection to be Conducted under QASP19.15 (See para. IV).
1. Spacing between adjacent anchors.		X (Checklist Item 1)			X		X
2. Spacing between an anchor and the edge of a concrete surface.		X (Checklist Item 1)			X		X
3. Spacing between an anchor (plate) and an embedded plate.			X (Anchor plate welded to embedded plates)	X (Anchor plate butts up against embedded plate)			
4. Minimum anchor embedment depth		X (Checklist Item 3)				X	X
5. Grouting of unused/abandoned holes in the concrete.	X (Checklist Item 13)			X			
6. Mounting plate size.		X				X	
7. Size of holes in mounting plates.		X				X	
8. Holes distance from plate edges.		X (Checklist Item 1)				X	

RESPONSE

ITEM NO.: 23

TITLE: QA Program Breakdown Between Ebasco and Mercury

DESCRIPTION OF CONCERN:

The staff review included evaluation of the implementation of the QA programs of LP&L, Ebasco, and Mercury. The staff performed a follow-up on the previous 1982 NRC review that resulted in NRC enforcement action and a civil penalty. The most recent staff review indicated that LP&L, Ebasco, and Mercury did not followup on the corrective action commitments made to the NRC.

Additionally, LP&L, Ebasco, and Mercury failed to audit the entire QA programs as required (LP&L only performed one-third of their scheduled audits for a five year period). The audits that were conducted identified some problems, however, the required corrective actions were not completed. Management audits, performed by outside consultants, identified problems and concerns that LP&L also failed to take corrective action on.

The results of the NRC task force effort indicate that an overall breakdown of the QA program occurred. Most problems identified by the NRC had been previously identified by the QA programs of LP&L, Ebasco and Mercury. But the failure to determine root cause and the lack of corrective action allowed the problem to persist.

LP&L shall provide an assessment of the overall QA program and determine the cause of the breakdown, together with corrective action to prevent recurrence. This overall assessment is necessary to provide assurance that the QA program can function adequately when the plant proceeds into operations.

DISCUSSION:

Issue #23 stands apart from the other NRC concerns with Mercury Company of Norwood in addressing, primarily, the circumstances surrounding the 1982 NRC enforcement action and civil penalty. To paraphrase the NRC concern, issue #23 centers on whether or not the cause of the Mercury problems that led to Enforcement Action 82-109 was identified, corrective action implemented, and recurrence prevented. The central issue is derived from the following specific NRC concerns:

1. LP&L failed to determine the root cause of the Mercury problems (Section II.A);
2. LP&L/Ebasco/Mercury did not followup on corrective action commitments (Section II.B);
3. LP&L/Ebasco/Mercury failed to audit the entire QA program (Section II.C);
4. The audits that were done identified problems but corrective actions were not implemented (Section II.D);
5. Management audits identified problems on which LP&L failed to take corrective action (Section II.D);
6. The failure to determine root cause of the Mercury problem, and the lack of corrective action, allowed the problem to persist into an overall QA breakdown (Section II.B);
7. On the assumption that an overall QA breakdown occurred, the NRC concludes that an assessment of the overall QA program is necessary, including a determination of the breakdown cause and corrective action to prevent recurrence (Section IV).

Based on the present review, LP&L has concluded that an overall QA program breakdown has not occurred at Waterford 3.

The discussion which follows is not intended to minimize the seriousness of the concerns regarding Mercury. Nor is LP&L maintaining that there were no areas needing improvement in the QA program--such areas will be addressed under the "collective significance" assessment of the 23 NRC concerns. While, in retrospect, there may have been more effective means to resolve the Mercury situation, what deserves emphasis is that a situation such as existed with Mercury has not recurred and furthermore, under the present management philosophy and implementation of quality assurance, adequate assurance exists that such a situation would be unlikely to recur.

IMAGE EVALUATION
TEST TARGET (MT-3)

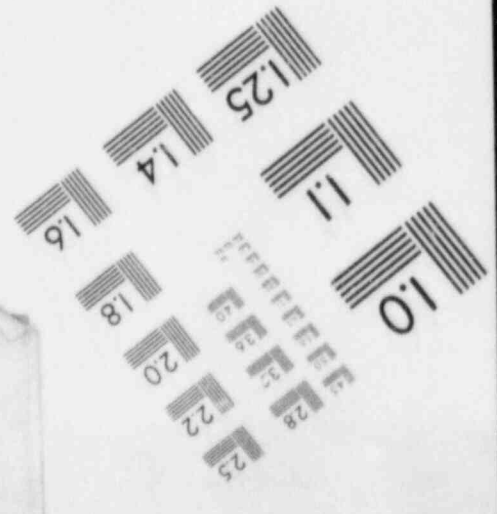
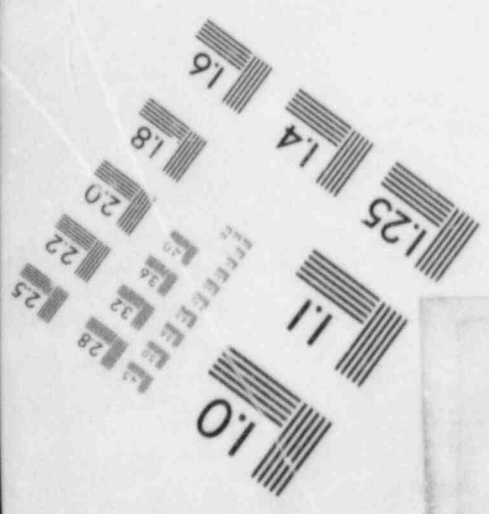
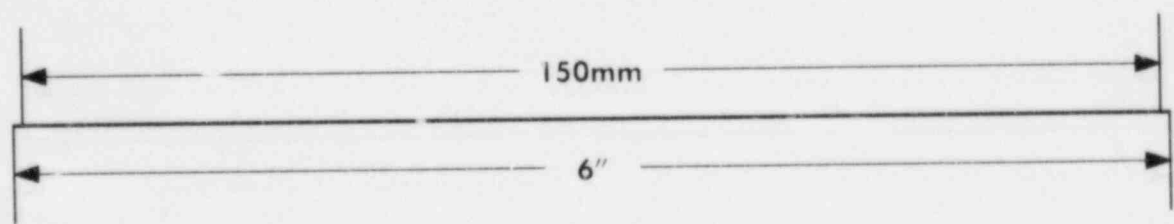
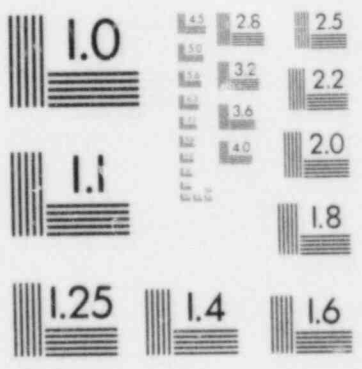
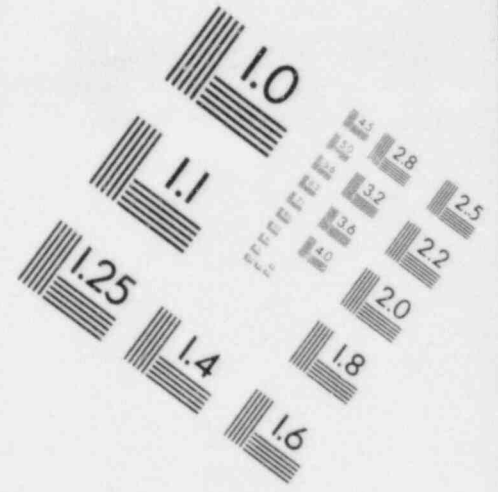
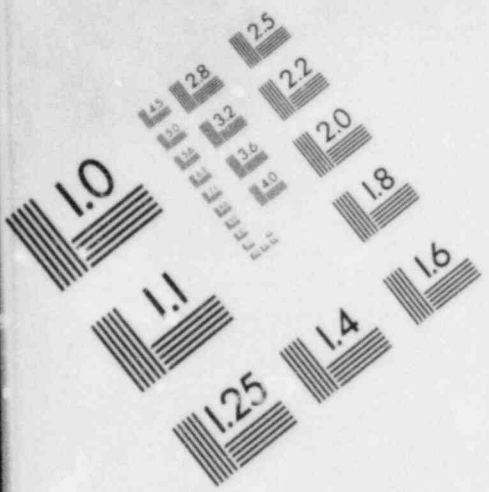
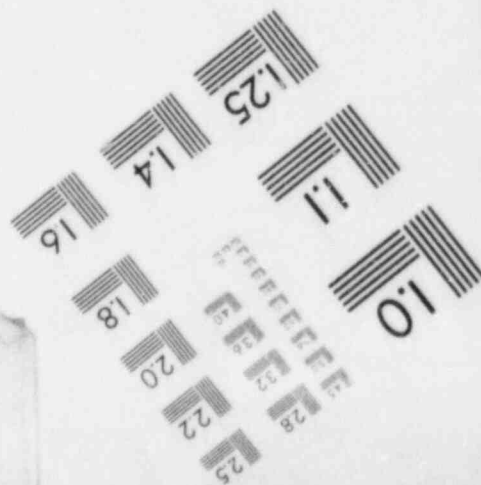
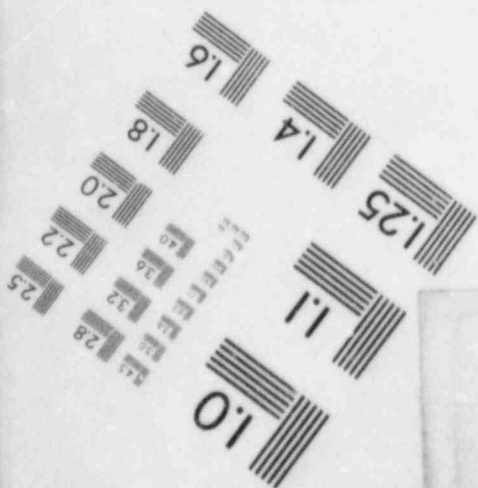
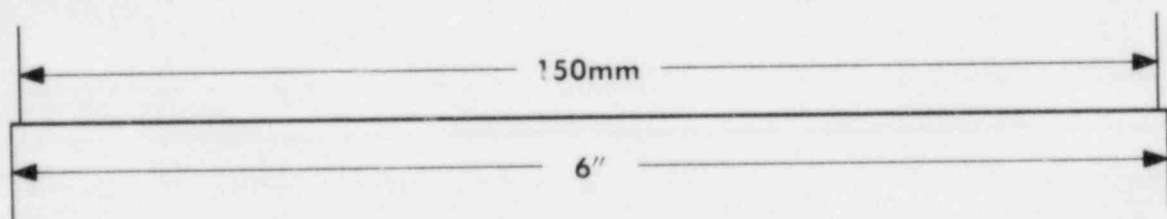
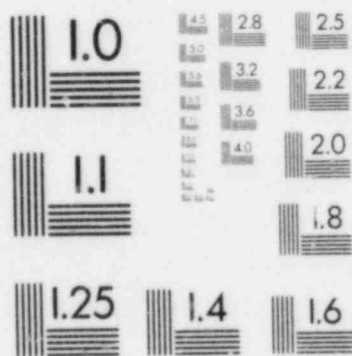
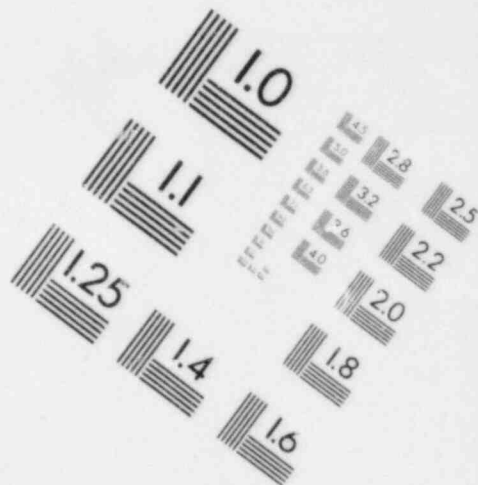
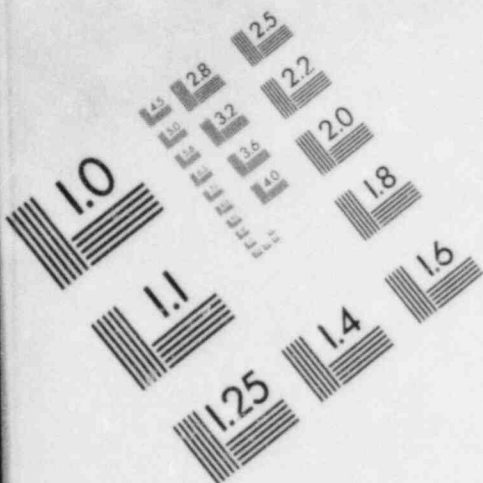


IMAGE EVALUATION
TEST TARGET (MT-3)



I. Background - Identification of the Mercury Problem

During the spring of 1982 the first major piping and instrumentation safety-related systems were approaching construction completion. The first four such systems submitted by Ebasco for turnover were reviewed and rejected as a result of the LP&L Construction QA audits of system turnover packages.¹ The following excerpt from NRC Inspection Report 50-382/82-14 dated December 6, 1982 characterizes the results of the Construction QA audits:

"LP&L learned that, although Ebasco QA had represented the systems as being ready for turnover and had included statements that the quality records had been reviewed, LP&L found that Ebasco QA had not actually compared the records with the as-built systems and that, in fact, the records did not actually represent a true status of the systems at that time. In addition, the turnover packages contained statements by contractors and Ebasco QA indicating that portions of the turnover packages were incomplete and not QA/QC acceptable."

During subsequent review LP&L reported potential significant construction deficiencies related to inadequate instrumentation and control system installation and turnover documentation for the four systems in question. In July, 1982 LP&L reported to the NRC through Significant Construction Deficiency (SCD) 57 that a significant construction deficiency existed and outlined corrective actions. On December 6, 1982 the NRC, via Enforcement Action 82-109, provided formal notification of a Level III Violation and civil penalty with regard to the turnover package deficiencies. The Enforcement Action noted, in part, that "[w]hile we recognize that the quality assurance program did not totally breakdown, there was a breakdown in the subtler programs of your contractor and subcontractor." The NRC further noted that the penalty was mitigated: "[t]he bases for this mitigation are the corrective action you have initiated (the extensive revision of your system turnover process) and your role in identifying and reporting the breakdown of quality assurance programs to the NRC."

¹ It is worthy of note that the four subject systems were the first safety-related instrumentation system documentation packages submitted by Mercury for turnover acceptance. Prior to the time of submittal of the documentation packages each of the instrumentation installations was still in an "in-process" status (i.e. not accepted by the Mercury QA organization).

II. Current NRC Concerns

A. Source of the Mercury Problems

Consistent with the Notice of Violation LP&L acknowledged (LP&L letter W3I83-0001 dated January 4, 1983) that a partial Quality Program breakdown occurred at Waterford 3 at the subtier levels involving contractor/subcontractor organizations.

In the present concern, the NRC has stated that there was a "...failure to determine root cause..." of the Mercury situation. However, during a meeting with the NRC in November, 1982 (as documented in NRC letter from J.T. Collins to L.V. Maurin dated December 6, 1982) LP&L identified the principal cause of the breakdown as "... insufficient participation by LP&L in the implementation of quality assurance programs. LP&L failed to exercise adequate oversight and control over contractors to whom implementation of quality assurance programs had been delegated, and dedicated only minimal LP&L resources to quality assurance programs."

This root cause finding was further refined in the LP&L response to the Notice of Violation (W3I83-0001 dated January 4, 1983):

"Deficiencies noted in Inspection Report 50-382/82-14, were due to insufficient overview and support activities, (i.e., training) necessary to assure compliance to specified quality requirements.

Specifically, areas which contributed to the noted violation are as follows:

- a. Training - training of craftsmen, QC Inspectors and reviewers was apparently insufficient to provide adequate guidance/direction to assure quality results within the principal contractor organization and two subcontractor organizations.
- b. Staffing - staffing of personnel was inadequate, and as a result, personnel were extended beyond their capability to adequately address quality inspections and reviews within the principal contractor organization and two subcontractor organizations.
- c. Walkdowns of completed systems were inadequate as a result of Items a and b."

These root cause findings were factored into the Mercury corrective actions described in the following section.

B. Corrective Actions

As to corrective actions, the NRC notes that "[t]he most recent staff review indicated that LP&L, Ebasco, and Mercury did not followup on the corrective action commitments made to the NRC." However, LP&L is confident that corrective action commitments in respect to Mercury and the Notice of Violation were implemented in an effective manner to produce quality hardware installations.

During walkdowns conducted by LP&L and Ebasco in preparation for turnover of certain Mercury-installed systems in the Spring of 1982, numerous installation deficiencies were identified to Mercury. Despite repeated walkdowns with Mercury and meetings with Mercury management, problems continued to exist to the extent that none of the Mercury systems were acceptable for turnover. Consequently, on June 23, 1982, with the Mercury bulk construction approximately 90% complete, project management ordered Mercury to cease installation of safety related systems - equivalent to a Stop Work Order (SWO), which will be referred to as such in the following discussion.

Based on LP&L's conclusions relative to the significance of the partial QA breakdown in the Ebasco/Mercury organizations, and taking into account the root cause determination, an extensive corrective action plan was initiated and executed. This plan met or exceeded the corrective action commitments made in response to the Notice of Violation. A summary of the immediate (June, 1982) corrective actions initiated in conjunction with the SWO follows:

- a. Development and implementation of a retraining program involving Mercury personnel including craft, foremen, field engineers, QC inspectors and supervision.
- b. System by system walkdowns on the basis of the startup schedule of all safety class installations for the purpose of identifying hardware deficiencies for evaluation and rework, plus updating the as-built drawings. This effort was initially a joint LP&L, Mercury and Ebasco effort using retrained personnel.
- c. Implementation of extensive organizational changes within Mercury, including assignment of Ebasco Management personnel and engineers to Mercury.
- d. A dramatic increase in the number of Mercury QC Inspectors and QA Engineers. (Questions as to the qualifications of Mercury Inspectors are addressed in the response to NRC Issue #1.)

- e. Mobilization of an Ebasco QA Management Team to support and oversee the Mercury Program.
- f. Other corrective actions taken not specifically related to Mercury, included the increase in LP&L and Ebasco QA Staff, formation of Ebasco QA surveillance and quality analysis groups, and enlargement of the scope and size of the Ebasco QA records review group.

Attachments 1 and 3 provide detailed discussions of these immediate corrective actions and subsequent corrective actions taken as the Mercury problem became well defined.

It is important to point out that prudence dictated that Mercury be retained as the N stamp holder of instrumentation systems to preserve the documentation and installed system ASME Code integrity until another stamp holder could take over the work in a phased manner. Because Mercury continued to be unable to support the project schedule, and due to management concern with respect to the effort required for future quality installation, the Mercury work scope was gradually reduced through June, 1983 when Mercury was relieved of P3-P8 tubing work and all seismic support work including review. Mercury was directed, at that time, to only complete and code stamp P2 instrumentation installation. Ebasco, meanwhile, had obtained an ASME Code Installer's Stamp, allowing them to complete subsequent Code work.

Following the completion of Mercury's initial retraining program Mercury was released to resume safety related installations. However, only personnel successfully completing the retraining program were selected for safety related work.

Throughout the period subsequent to the SWO until Mercury was fully demobilized in November of 1983, LP&L and Ebasco maintained an exhaustive management and QA overview relative to Mercury's overall performance. This scrutiny resulted in the following:

- a. Continuation of management and organization changes within Mercury.
- b. A continuous reduction in Mercury's work scope. Refer to Attachment 1 for details.
- c. An improvement in new system installation quality and documentation for work activities initiated after the June, 1982 SWO. Refer to Attachment 2 for details.
- d. Imposition of program changes, both administrative and quality related, on Mercury by LP&L and Ebasco. Refer to Attachment 3 for details.
- e. Decisions on the part of LP&L and Ebasco to remove Mercury from the quality records-review program. Refer to Attachment 5 for a discussion of the Ebasco QA records review process and statistics.

As a result of the continued oversight of LP&L and Ebasco the corrective action commitments made in response to the Notice of Violation were completed. The specific commitments and their resolutions are discussed in Attachment 3.

The issue #23 concern states that "...failure to determine root cause and the lack of corrective action allowed the problems to persist." As previously noted, root cause was identified and corrective action implemented. LP&L believes that the partial QA Program breakdown did not persist; programmatic corrective action to prevent recurrence of the construction deficiencies in any subsequent work activity was prompt and decisive.

The initial rejection of the four major piping and instrumentation safety-related systems by LP&L and the resulting corrective action is indicative of a working quality management system. The four rejected systems were not unique. Many other Mercury systems were nearing completion in July, 1982. Although deficiencies were identified in subsequent Mercury system packages, the deficiencies were due to similar reasons as the first four on work completed prior to initiation of corrective action. Having identified serious problems with four Mercury systems it was expected that some degree of the same types of problems would exist in other Mercury systems that were substantially completed at the time of the SWO. However, with the initiation of corrective actions those problems were identified and reworked after the SWO at the Ebasco/Mercury level, resulting in generally acceptable turnover packages to LP&L.

In initiating corrective action on all Mercury systems, manpower availability was taken into account. Ebasco proposed, and LP&L agreed to, an orderly approach on a system by system basis rather than addressing all Mercury systems at once. This systematic approach was thorough but also extended the time required to close SCD-57 and NRC Inspection Report 50-384/82-14 into the Spring of 1984. It is possible that this approach may have given the appearance of a continuing Mercury problem to the NRC Inspectors.

In actuality, Non-Conformance Reports (NCRs) continued to be written for some time on Mercury work completed prior to July, 1982. Attachments 2, 3 and 3F provide details and a graphic presentation of the Mercury NCRs. Referring to Attachment 3F, the prominent peaks in the number of NCRs at 11/82 and 3/83 are a manifestation of the continuing walkdowns of old (i.e. work completed prior to July, 1982) Mercury work as opposed to an indication of a continuing problem.

A sampling of construction packages was taken to provide evidence that the majority of NCRs written on Mercury systems were related to work completed prior to July, 1982. The results of this review are contained in Attachment 2, providing further confirmation that the partial breakdown with Mercury did not

persist; actually, because of the corrective actions taken, the quality of Mercury work improved. It must be emphasized that the timing of the NCRs is not significant except that it could give the appearance of a continuing problem. Corrective actions proceeded, and were completed, in an orderly fashion on a schedule consistent with the startup schedule of Waterford 3.

The final phase of corrective action is, of course, verification of installation adequacy. Although addressed in part in various attachments to this response, the bases for Mercury installation verification are collected together in Attachment 5. Based upon the multiple levels of satisfactory review and corrective actions taken, LP&L now has a high degree of confidence that Mercury installations will perform in accordance with design requirements. This is being further confirmed by the reinspections in progress in response to NRC Issue #1.

In summary, the root cause of the Mercury problem was identified and corrective action was implemented both to correct Mercury work prior to July, 1982 and to prevent recurrence. Once the Mercury problem was identified, and corrective action begun, the problems did not persist to the degree that existed prior to the SWO. In fact, the Mercury quality performance improved. Deficiencies in work prior to July, 1982 were identified and reworked on a system by system basis resulting in an extension of the corrective action duration.

C. Audit of Mercury Installations

The NRC has raised the question that:

"...LP&L, Ebasco, and Mercury failed to audit the entire QA program as required (LP&L only performed one-third¹ of their scheduled audits for a five year period). The audits that were conducted identified some problems, however, the required corrective actions were not completed."

LP&L committed to perform a documented schedule of audits based upon the status and safety importance of the activities to be audited. The audits were to be initiated early enough to assess and assure effective control of quality. LP&L maintained a monthly audit schedule and revised it as necessary to assure that the coverage and schedule reflected current activities and delays in construction scheduling. In the case of Mercury, during the life of the Mercury contract (approximately 4 years) LP&L scheduled

¹ Audits were often deferred from month to month (e.g. due to slippage in construction schedule; higher priority audits; QA support of NRC inspection audits; etc.). As an example, upon completion of one audit scheduled in each of four consecutive months, the appearance of a 25% completion rate of scheduled audits would be given. The audit schedule was a guide to provide LP&L QA management overview of construction activities.

twenty-eight audits of the contractor. Twenty-four of the audits (85% of those scheduled) were completed. Although not a commitment in the QA program, thirteen unscheduled surveillances of the Mercury program were also conducted. LP&L delegated the routine auditing of the Mercury QA program to Ebasco Services.

The Ebasco QA program was structured with an audit schedule based upon a yearly audit of applicable 10CFR50, Appendix B criteria. Over the course of the contract, Ebasco went beyond the minimum requirement in performing 114 audits of Mercury. Surveillances which supplemented the audit program were also performed on Mercury activities.

The Mercury program commitments were to perform a minimum of one Internal Audit on each auditable section of the QA manual each calendar year. Mercury performed seventy-four audits during the life of their contract. In preparation of this response, the Mercury audit schedule was reviewed and shown to be deficient in not completing audits of all QA Manual sections in 1981, prior to the SWO. Following the SWO Mercury met their commitments to the end of their contract.

Additional detail as to the audit activities of LP&L/Ebasco/Mercury is provided in Attachment #4.

All audits conducted by LP&L and Ebasco of Mercury activities, including audits performed by Mercury, were reviewed for completion of required corrective action. This review was performed by LP&L QA in conjunction with the preparation for this response. The review revealed that corrective actions required to close identified audit findings were completed.

During the review of the Mercury Audit File the LP&L reviewer had difficulty determining if findings were closed because files were not organized for ease of followup. It appears that this file organization led to the NRC reviewer's assertion that "[t]he audits that were conducted identified some problems, however, the required corrective actions were not completed." The file has since been re-organized to contain audit packages together with the supporting information, and is available for NRC review.

LP&L management questioned if pre-June, 1982 audits could have identified the overall Mercury problem prior to the SWO. The early audits identified many of the individual Mercury problems. However, in retrospect, the collective implication of these audit findings on Mercury was not systematically assessed and therefore the root cause and generic significance were not adequately addressed in corrective actions. Identification of this approach, whereby the individual problem/solution was addressed rather than overall significance, is a major lesson learned from the Mercury situation.

D. Management Assessments by Outside Consultants

Issue #23 states that "[m]anagement audits, performed by outside consultants, identified problems and concerns that LP&L also failed to take corrective action on."

It appears that the management audits referred to by the NRC concern are in actuality management assessment evaluations requested by the executive management of LP&L to provide an independent assessment of nuclear project performance during the early years (1977-1980) of construction. These assessments were evaluated by the appropriate LP&L management and actions taken where it was deemed appropriate. Of the concerns noted during these assessments, the majority dealt with organization and staffing matters that were later implemented. LP&L has previously stated before the ACRS in May, 1982 that management was slow to respond to some of the assessment results.

LP&L management, in recognizing the value of independent management audits, contracted Management Analysis Company (MAC) in 1982 to assist in auditing the Waterford 3 plant training program. Audit findings were promptly presented to management and addressed in a timely fashion. As a result of the audit, the plant training program was improved.

III. Lessons Learned

While the corrective actions required because of Mercury's poor performance were adequate to resolve the quality problems and prevent recurrence, in retrospect, LP&L management would proceed differently today. The listing which follows summarizes the lessons learned from the Mercury experience (both pre- and post-SWO). They will be further addressed in the "collective significance" submittal for the 23 NRC concerns.

1. Delegation to a contractor of the routine QA auditing overview of a subcontractor without adequate utility involvement inhibits the timely recognition by the utility of quality problems.
2. More emphasis should be placed on a QA management overview designed to distinguish generic problem trends and root causes of audit findings from isolated occurrences.
3. Staffing levels should have been higher.

These lessons learned were mainly addressed during the Mercury corrective actions. For instance, LP&L/Ebasco/Mercury QA organizations were increased and LP&L took an active QA role in the review of contractor/sub-contractor programs. Presently, the QA Program reflects lessons learned from the construction phase in the inclusion of requirements for evaluation of root cause and generic significance of audit findings, and the implementation of a trending program to identify and correct adverse quality trends. These subjects are expanded upon in the "collective significance" submittal.

IV. Conclusions

This issue concentrates on the implementation and adequacy of the corrective action commitments made by LP&L to the NRC in response to Enforcement Action 82-109.

There were aspects of the documentation and historical development which may have been difficult to follow. As noted in Section II.C the manner in which the Mercury audit file was organized did not clearly reflect the completion of audit corrective actions. The management decision to address the Mercury work prior to July, 1982 on a system by system basis rather than as a whole could give the appearance of a persisting problem with Mercury due to the continuing number of NCRs written, the majority of which were actually written against pre-July, 1982 Mercury work.

As demonstrated in this response, however, LP&L is confident that corrective action commitments resulting from Enforcement Action 82-109 were effectively implemented to assure quality hardware installation. The Mercury problem, which gave rise to the Enforcement Action, did not persist nor has it recurred. An overall QA program breakdown has not occurred.

LP&L has established a comprehensive program for quality assurance during the operating phase of Waterford 3. The QA Program, which includes provisions for requisite staffing and program audits, is described in Chapter 17.2 of the Waterford FSAR and the LP&L Quality Assurance Manual. Control of all quality related work, a key element of the QA Program, includes use of Condition Identification and Work Authorization (CIWA) procedures. These procedures apply whether work is conducted by LP&L employees or vendors. Procedure implementation was initiated several months ago, along with appropriate training, to ensure worker and supervisor familiarity and capability to maintain the tight quality control required in an operating environment. Due to the tighter quality controls and the direct LP&L authorization, review and closure of CIWA items, there is reasonable assurance that a partial QA program breakdown of the Ebasco/Mercury type should not occur during plant operations. A more detailed description of how the QA program and procedures function and reflect lessons learned during the construction phase and from resolution of the twenty-three NRC issues will be found in the "collective significance" response.

CAUSE:

The essence of NRC issue #23 is that, relative to the Mercury problems previously identified by LP&L, there may have been a failure to determine root cause and implement corrective actions thereby allowing the problem to persist resulting in an overall QA breakdown. This review concludes that an overall QA breakdown did not occur.

GENERIC IMPLICATIONS:

With respect to the Mercury deficiencies, this issue has been treated generically. From the initiation of corrective actions following the SWO the generic implications for other contractors were taken into account. For instance, as noted in Attachment 3, the LP&L Task Force charged with physical verification walkdowns of pre-June, 1982 work covered installations by 15 contractors other than Mercury. The Quality Assurance Installation Review Group software review was directed at all site contractors. Given the quality controls existing in the operations phase QA Program the potential for recurrence of a Mercury type partial QA breakdown has been minimized. Generic implications with respect to the current LP&L QA Program will be appraised in the LP&L response regarding the collective significance of the 23 NRC issues.

SAFETY SIGNIFICANCE:

In view of the adequate corrective actions initiated in response to the Notice of Violation as summarized in this submittal there is no current safety significance associated with Issue #23.

CORRECTIVE ACTION:

There is no further corrective action outstanding for this issue. The Mercury corrective actions were extensive and effective in preventing the continuation of the partial QA program breakdown. Corrective actions for other identified Mercury concerns (e.g. issues 1, 6) are documented in the responses to those concerns. Several significant lessons learned from the subject of issue #23 have been factored into the post-SWO corrective actions and are reflected in the present QA Program. The current status of the LP&L QA Program will be further discussed in the "collective significance" submittal.

ATTACHMENTS

1. Chronology of Organizational/Management and Scoping Changes for Instrumentation Activities
2. Analysis of Mercury Tubing, Tube Track and Support Installation Records
3. Corrective Action Status
4. Audit of Mercury Installations
5. Verification of the Acceptability of Mercury Installations

ATTACHMENT 1

Chronology of Organizational/Management and Scoping Changes for Instrumentation Activities

I. General

The following Sections II-III contain a summary description of the organizational and management changes implemented in the Ebasco and Mercury Organizations as a result of the deficiencies identified in SCD 57 and Enforcement Action 82-109. Section IV discusses the reduction in Mercury work-scope following June, 1982.

II. Chronology

June 1982:

Ebasco notifies Mercury of the documentation discrepancies associated with systems 59, 60A, B, & C. Mercury is ordered to cease safety related activities. Agreement is reached to assign Ebasco personnel within the Mercury organization, reporting to Mercury. Three (3) Ebasco Craft Supervisors are assigned to Mercury.

July 1982:

As a result of meetings and discussions amongst LP&L, Ebasco, and Mercury, it is determined that the overall problem is a result of poor communication and inappropriate management action in Mercury's organization. Mercury agrees to replace their key personnel, but they are unable to provide replacements. Ebasco provides personnel for the key positions of Project Manager and Construction Superintendent. In order that Mercury could retain legal control of their obligations (financial), Mercury establishes a new position of Project Administrator to handle personnel and billings.

The most significant organization change is implemented at this time. The Joint Walkdown Teams (initially 5 teams) are established consisting of an individual from the following: Mercury Engineering, Mercury QC, Ebasco Engineering, LP&L (or Ebasco) QA, and LP&L Start-up.

August 1982:

It is agreed that the personnel supplied by Ebasco to the Mercury organization are temporary, in that, if and when Mercury could supply qualified personnel, then the Ebasco personnel would be returned. To facilitate this move, Mercury establishes the position of General Superintendent (filled by Ebasco personnel) while the position of Construction Superintendent is reassigned to a Mercury employee. LP&L Start-up develops a reasonable level of confidence in the walkdown effort resulting in the removal of their members from the Joint Walkdown Team.

September 1982:

QA/QC reorganizes below the QA/QC Site Manager. Supervisors are assigned to assist in Field Inspection, Records, and Administration. By this time Mercury has added (from Ebasco) 3 Construction Supervisors, 12 Engineer/Designers, and 3 Schedulers. Additionally, Mercury hires 37 QA/QC personnel and 9 engineering personnel.

October 1982:

At this time, while it appears that the quality-related issues are being addressed, Mercury is still not supporting the project schedule. For this reason, Ebasco assigns a small Task Force with members from Construction Management, Design Engineering, and Quality Assurance to work closely with the various organizations and personnel to determine if improvements could be developed. One of the Task Force's initial actions is to increase the Joint Walkdown Teams from 5 to 8.

A position of Project Coordinator is established to provide a means of communicating status to other organizations and communicating priorities within Mercury. Also, an additional Craft Supervisor is assigned to Mercury.

November 1982:

As a result of evaluating the causes for missing completion schedules on open items identified by the Joint Walkdown Teams, the following changes are implemented:

System Administrators are assigned to Mercury, reporting to the Project Coordinator. They are assigned a particular system and responsibility to track all items for that system through the various groups to completion while providing status information to other groups.

It is agreed that the key to getting Mercury on track is to define the remaining scope of work. Therefore the Joint Walkdown Team is again increased to 12 to expedite identification of status.

December 1982:

Because of the release of Mercury's Project Engineer and the resignation of Mercury's QA/QC Site Manager in November, and because Mercury has difficulty finding qualified replacements, the following reassignments are implemented:

Mercury's Construction Manager assumes the position of Project Manager. The Project Manager assumes the position of Project Engineer. The Project Administrator position is eliminated and the individual is reassigned as Assistant Project Manager. Mercury's Corporate QA Manager is sent to the site and assumes the responsibilities of the QA/QC Site Manager.

A new Mercury position of Lead System Administrator is established.

January 1983:

After considerable discussion concerning the QA/QC Site Manager, Mercury assigns the V.P. of F&M Technical Services, as Manager. This new Manager resigns after approximately 2 weeks on the project. An acting QA/QC Site Manager is temporarily assigned and proves capable of retaining the position.

February 1983:

Mercury releases Ebasco personnel assigned as General Superintendent and Assistant to the Construction Superintendent.

March 1983:

Ebasco assigns a new Construction Manager.

August 1983:

Mercury releases the last assigned Craft Supervisor back to Ebasco.

III. Staffing

In addition to the organizational changes described above, the following covers Mercury staffing levels during this time period.

	Manual	Non Manual
June 1982	140	100
July 1982	125	110
August 1982	150	130
September 1982	135	145
October 1982	140	175
November 1982	180	215
December 1982	160	200
January 1983	190	175
February 1983	110	175
March 1983	90	195
April 1983	95	160
May 1983	85	150
June 1983	80	135
July 1983	70	120
August 1983	45	75
September 1983	15	15
October 1983	0	7
November 1983	0	5

IV. Reduction in Mercury Work-Scope

Because Mercury continued to be unable to support the project schedule, and due to management prudence with respect to the effort required for future quality installation, the Mercury work-scope was gradually reduced over the following year. In order to preserve the documentation and installed system ASME Code integrity until another stamp holder could take over in an orderly manner, Mercury was retained on the job.

Shortly after Mercury resumed safety-related work (June/July, 1982) at Waterford the ANSI B31.1 work was reassigned from Mercury to Ebasco. This was accomplished in several ways: 1) by changing the responsibility of work items on Start-up System Punchlists during daily Start-up meetings, 2) by assigning the Completion Verification Sheets of DCNs/FCRs to Ebasco instead of Mercury, and 3) by assigning CIWAs to Ebasco instead of Mercury.

By early 1983, Mercury had been directed not to perform any work in the Turbine Generator Building or the Yard Areas, such work being reassigned to Ebasco. In March, 1983 Mercury was informed that Secondary Sampling System work would be performed by Ebasco and that LP&L would install six temperature elements in the Reactor Coolant System.

In April, 1983 a significant portion of work, installation of instrument drain lines, was deleted from Mercury's scope and transferred to Ebasco. Additionally, the responsibility for performing integrity tests of ANSI B31.1 installations in the Turbine Generator Building was removed from Mercury and assumed by LP&L/Ebasco.

Concurrently, from June, 1982, Ebasco was preparing to assume Mercury responsibilities. Ebasco had assigned a separate group of Construction Engineers, Supervisors, and Quality personnel to prepare procedures, develop detail sketches, work packages, etc. in order that work could be deleted from the scope of Mercury's contract. By July, 1982 Ebasco had initiated procedure preparation; by September, activities were progressing in the field; and by early 1983 Ebasco had received an ASME Survey and "N" Stamp.

As a result of this concurrent ongoing program, in July, 1983 Mercury was relieved of further responsibilities save for ASME P2 work. All other work including engineering and documentation review would be performed by Ebasco. Finally, in late July, Mercury was requested to terminate all work except turnover of QA records and other relevant documentation. The P2 work was accepted by the ANI in July/August of 1983 and Mercury was relieved of further scope. Mercury's last craft personnel were on-site September 13, 1983. The last non-manual and QA personnel were on-site November 22, 1983.

ATTACHMENT 2

Analysis of Mercury Tubing, Tube Track and
Support Installation Records

As a result of the corrective actions initiated in response to the Mercury problems which led up to the June, 1982 Stop Work Order, an improvement in Mercury's quality performance, with respect to hardware installation, is expected. It is reasonable to expect this assumption to be reflected in the Mercury QA records documentation submitted to Ebasco for review. This analysis is intended to provide confirmation of the accuracy of this assumption.

Documentation records for the 19 Mercury OCRs (installation travellers) which were initiated for new system installation begun after the SWO on tubing, tube track and support installations were compared to 19 Mercury OCRs on system work near completion (other than subsequent corrective rework) at the time of the SWO. The 19 post-SWO OCRs comprise the entirety of new Mercury tubing, tube track and support safety-related instrumentation system installations initiated after the SWO.

Two aspects of the documentation were analyzed:

1. Documentation deficiencies were categorized and the quantities of deficiencies for the pre- and post-SWO packages were compared (see the following Section I).
2. The Mercury Non-Conformance Reports (NCRs) written against the systems comprising the 19 pre-SWO OCRs were identified and categorized as to when the work was completed (see the following Section II).

Based on the present review, adequate documentation exists to confirm a definite improvement in the quality of Mercury work following the SWO and initiation of corrective actions. In addition, confirmation was obtained that during the period 6/82 - 8/83 the majority of Mercury NCRs were written against work completed prior to the SWO.

- I. The 38 OCRs were reviewed for documentation deficiencies in two areas - tubing installation and tube track/support installation.

The documentation categorization and review results are as follows:

TUBING INSTALLATION

<u>Category</u>	<u>Description</u>
A	Software discrepancies requiring no QC reinspection or rework to resolve (minor paperwork problems).
B	Software discrepancies requiring Ebasco QC reinspection to resolve; no rework required (e.g. verify support type or heat number).
C	Documentation discrepancies which were upgraded to discrepancy notices or NCRs.

Results

<u>Category</u>	<u>Installation Prior to 7/1/82</u>	<u>Installation After 7/1/82</u>
A	40 (31%)	183 (90%)
B	62 (48%)	8 (4%)
C	27 (21%)	10 (5%)
TOTAL	129	201

TUBE TRACK/SUPPORT INSTALLATION

<u>Category</u>	<u>Description</u>
A	Support or tube track documentation packages with no deficiencies.
B	Support or tube track documentation packages with documentation deficiencies which required Ebasco QA reinspection to resolve; no rework required.
C	Support or tube track installations with missing or incomplete documentation; reinspection required.

Results

<u>Category</u>	<u>Installation Prior to 7/1/82</u>	<u>Installation After 7/1/82</u>
A	109 (51%)	147 (65%)
B	48 (23%)	39 (17%)
C	55 (26%)	39 (17%)
TOTAL	212	225

A comparison of the significant documentation deficiencies, Categories B and C, indicates improved quality performance. The improvement is particularly evident with respect to tubing installations. Although this comparison is limited by the number of OCRs that represent completely new (post-SWO) work, the data suggest that corrective action measures and continued management overview of Mercury were effective in bringing about an improvement in Mercury's quality related activities with respect to hardware installations.

II. Using the same pre-SWO OCRs as the previous section, a review was conducted to identify all NCRs written against the OCRs. During the review, NCRs were categorized according to the following scheme:

<u>Category</u>	<u>Description</u>
1	NCRs written prior to 6/23/82 against work performed prior to 6/23/82.
2	NCRs written subsequent to 6/23/82 against work performed prior to 6/23/82.
3	NCRs written subsequent to 6/23/82 against work performed subsequent to 6/23/82.

Category 1 reflects NCRs written prior to corrective action; Category 2 covers those NCRs written during the corrective action walkdowns of pre-SWO Mercury work; and Category 3 NCRs are those written against work performed following corrective action.

The review results are as follows:

<u>Category</u>	<u>NCRs on Installations Primarily Completed Prior to 6/23/82</u>
1	25
2	65
3	37
TOTAL	127

Of importance is the relationship between Category 2 and Category 3 NCRs - nearly a 2 to 1 ratio between NCRs written on pre-SWO work and NCRs written on post-SWO work. The present review supports the position that the majority of Mercury NCRs written during the 6/82 - 8/83 period (see Attachment 3H) were actually written during the corrective action phase against Mercury work completed prior to 6/23/82 and are not indicative of a continuing problem with Mercury.

ATTACHMENT 3

Corrective Action Status

In response to the Mercury problems encompassed by Issue #23 a number of corrective actions were implemented, several of which went well beyond the Mercury concern by addressing generic problems. The following material details Mercury corrective actions. To assist in identifying those which were commitments to the NRC in response to the Notice of Violation, the table in Attachment 3A is provided.

1. Mercury Company, as a result of the Stop Work Order on 6/23/82, reassigned craft off safety-related system work and began developing a reindoctrination/reorientation program. LP&L QA was directly involved in the development of the documented retraining program which was completed and approved on June 25, 1982. The Mercury program included training for record reviewers, QC inspectors, craft and engineering personnel. The program was submitted and documented in Mercury Letter WA-964 dated June 25, 1982 and reviewed/approved by Ebasco letter F-58853 dated June 25, 1982. The implementation of the retraining of reinspection/rework teams began on June 26, 1982. Verification is available in Ebasco letter F-58490-AST dated June 28, 1982. The Ebasco/LP&L concurrence of proper execution of the retraining program was accomplished on June 29, 1982 and is documented in Ebasco letter F-58490-AST dated June 28, 1982 which released Mercury on safety-related work by retrained personnel. The Mercury retraining program continued through March, 1983.
2. Following the Stop Work Order, Mercury began implementation of corrective action commitments. Concurrently, Ebasco mobilized a QA Management Team on 7/6/82 to support and oversee the Mercury program. On 7/7/82 the Team outlined an action plan which assigned, to Ebasco QA Managers, responsibilities in the areas of:
 - A. Improvement in tracking and timely completion of Significant Construction Deficiencies, Nonconformance Reports, Deficiency Notices and Audits.
 - B. Increased contractor QA Surveillance (actual as-built verification by assigning a QA Surveillance Engineer to Mercury).
 - C. Reorganization of Ebasco QA auditing functions and organization to improve the quality and content of sub-contractor oversight.
 - D. Establishment of a QA Records Turnover Review system and organization, by assigning an Ebasco QA Records Group to work parallel with the Contractor's QA reviewers.

While the action plan of the QA Management Team was initiated in response to the problems identified with Mercury, the scope of the plan included all sub-contractors. Additionally the action plan provided for an increase in the Ebasco document review, QC and supervisory staffs and retraining of personnel involved in documentation review.

The action plan items were implemented as follows:

Area A - established by week 8/30/82.

Area B - established by week 8/30/82 (for detailed information see Item #4 below).

Area C - established by week 7/26/82.

Area D - Ebasco QA Records Coordinator was assigned on 7/26/82.

3. With LP&L concurrence, Ebasco formed a Quality Assurance Surveillance Group (Action Item B, above) to increase involvement in the in-process construction activities including hardware installation, system turnover, walkdown inspection and system testing.

Actions taken after formation of the Surveillance Group include:

- A) Issuance of a new procedure QAI-15 "Surveillance of Site Contractors" Rev. 0, 7/26/82.
- B) Issuance of a new procedure QAI-16 "Qualification of Quality Surveillance Personnel" Rev. 0, 7/30/82.
- C) The QA Surveillance personnel were trained and recertified to the new procedures.
- D) A QA Surveillance Plan and Schedule was completed on 8/17/82.

The concept of full time QA surveillance of site contractor activities can play an important role in the construction management process. The extent and effectiveness of the surveillance group in identifying deficiencies which addressed not only Mercury but other site contractors is evidenced by the surveillances conducted, and resulting nonconformances identified, which were then resolved by the Site Quality Program. For example, a total of 48 surveillances were conducted on Mercury from 8/82 thru 5/83 which identified non-conforming conditions such as undersize welds (Ref. SH-1, 12/21/82 & TM-1, 12/27/82) and unacceptable welder qualifications (Ref. NB-17, 10/11/82). A listing of the Mercury surveillances is included in Attachment 3B.

4. The Quality Programs and Procedures of affected organizations were reviewed and revised, as applicable.

Mercury Company during the time period from March, 1982 thru June, 1983 revised 32 of the existing 48 approved procedures for use on Waterford 3. This involved a total of 70 actual procedural revisions. Included in these revisions were installation procedures, QA program auditing and process control traveler preparation and control (see Attachment 3D).

Ebasco during the time period from May, 1982 thru May, 1984 revised, voided or issued a total of 30 procedures which are listed in Attachment 3C. The program revisions/additions included the following which are detailed in other corrective action responses or available on site for review:

- A. Establishment of a QA Surveillance Group.
 - B. Redefinition/assignment of site training responsibilities.
 - C. Establishment of a Quality Analysis Group.
 - D. Separation of the Quality Assurance Installation Review Group (QAIRG) from QA Engineering and increased staff levels.
 - E. Development of specific records review forms for individual contractors.
 - F. Stricter controls on the system turnover process.
5. A Task Force was developed, established and staffed separately by the Corporate Management of LP&L to perform Quality Records Review and physical verification by walkdowns of selected activities, of contractors and subcontractors who performed safety-related work prior to June 1, 1982, to assure compliance with the QA program.

The LP&L Task Force was comprised of personnel from LP&L QA and the LP&L Nuclear Project Support Engineering Group. The action plan for the Task Force was approved by the LP&L Vice-President-Nuclear Operations. LP&L procedure QP19.1, "Task Force Installation Verification" was approved and issued on January 11, 1983, under the direction of the QA Manager. The procedure provided direction for the implementation methods and reporting mechanisms necessary to ensure adequacy of contractor work prior to June 1, 1982.

Specifically, for 15 contractors, walkdowns were performed using checklists to verify that the installed condition was in accordance with related documentation. Where system walkdowns were impractical, analytical means were employed to confirm the adequacy of the installation. Where applicable, dimensional checks of mechanical components, inline equipment, cable tray and pipe supports, component locations, welds, and terminations (separation) were verified to ensure agreement with engineered/as-built drawings. Checklists were sufficiently detailed to ensure necessary discipline items were verified. Record reviews were performed on the supporting documentation for the physical activities verified during walkdowns. Checklists were used to document these record reviews. Verification of the as-built drawings to the physical configuration as installed was the prime concern of the record reviews.

In April, 1983 the LP&L Task Force review was completed. The Task Force findings were transmitted to Ebasco as LP&L Audit W3S-83-QP19.1/W3S-83-3 in accordance with the LP&L Quality Assurance Program. In September, 1983, following corrective action, LP&L Audit W3S-83-QP19.1/W3S-83-3 was closed. The Task Force review identified some record and system installation deficiencies requiring further reinspection and corrective actions as documented in W3I83-0115 (4-8-83) and W3K83-1808 (11-21-83).

The NRC (in Inspection Report 50-382/84-34) reviewed the LP&L Task Force implementation and results. An open item was identified by the NRC concerning physical verifications of Chicago Bridge and Iron installations. As noted by the LP&L Task Force, the Hot Functional Testing during the period of their review prevented a walkdown of the physical installations, however, a review of radiographic documentation was conducted. The open item notwithstanding, the NRC indicated that "[t]he Task Force verification effort and findings did contribute to the overall LP&L and NRC assessment of the acceptability of the contractor work and effectiveness of LP&L's QA program."

6. The LP&L QA organization was enlarged and supplemented with contract personnel in order to provide broader QA coverage of safety-related site activities. Attachment 3E details the LP&L QA staffing history demonstrating the dramatic increase in QA personnel over the last half of 1982.
7. The LP&L QA organization developed procedures and conducted audits to verify system configuration and documentation prior to turnover to LP&L Start-up. Procedure QASP 17.5, "Quality Records Review" assures verification of system configuration and documentation prior to system turnover to LP&L.
8. Plant staff, in conjunction with start-up engineers performed system walkdowns and verified status of the configurations of the systems prior to transfer to the plant staff. Thirty days prior to any scheduled system transfer the cognizant Plant Staff engineer along with the Startup and Ebasco engineers perform a system walkdown to generate deficiency lists and review the system configuration to determine that it is constructed as depicted in system drawings. A walkdown by the same personnel and other Plant Staff personnel is then conducted fourteen days prior to scheduled system transfer to verify, among other things, acceptable progress in addressing system deficiencies. The pre-transfer walkdown process is identified in Startup procedure SAP-40, "System Transfer from Startup to Plant Staff", and Plant Operating Manual Procedure UNT-TEM-003 (previously, UNT-1-008), "Review and Approval of System Transfer".
9. The responsibility for Significant Construction Deficiencies, Inspection Reports and other required reporting was transferred from LP&L QA to LP&L Licensing. This change allowed more time for direct involvement by LP&L QA in construction activities.

10. A review of the Mercury Historical Nonconformance Report files indicated a significant increase in the generation/resolution of nonconformance reports after the 6/23/82 Stop Work Order. A total of approximately 436 NCRs had been generated by Mercury prior to the SWO and a total of approximately 3323 NCRs were generated subsequent to the SWO. During the entire program a total of approximately 1632 Mercury Nonconformance Reports were upgraded to Ebasco NCRs. This increase in NCRs can be correlated to the corrective action walkdowns conducted during 1982/83 as shown in Attachment 3F.

The increase is indicative of corrective actions taken particularly in management/supervision attention and the retraining of QC inspection personnel together with a better definition of inspection criteria. It is also indicative of the methodology employed whereby the inspection activities instituted to assure acceptance of all Mercury safety-related work was completed on a system by system basis rather than trying to address all Mercury systems at once. This approach resulted in the identification and closure of deficiencies over a longer period of time. For additional analysis of the Mercury NCRs please see Attachment 2.

11. As effective as the corrective actions were in resolving hardware related concerns and upgrading the Waterford III QA program, problems with Mercury still occurred, but with much less frequency. Examples of these concerns include the reopening of SCD 61 (Sandvik tubing defect) and SCD 84 (tube track welding) cited in NRC Issue #6. Many of the documentation and hardware problems identified after the SWO can be attributed to ineffectual programs in existence prior to the SWO. Nonetheless, the SWO corrective actions were effective in not allowing the partial QA breakdown to continue. The overall impact of the Mercury issues will be addressed in "collective significance".

ATTACHMENT 3A

	<u>Notice of Violation Commitments</u>	<u>Location in Issue #23 Where Addressed</u>
1.	An extensive training/retraining program was implemented by Mercury for their records review, QC inspector, craft and engineering personnel. This program will continue in order to maintain the proficiency of these personnel.	Attachment #3, Item 1
2.	Joint system walkdowns with Mercury and Ebasco have been initiated for the purpose of problem identification and resolution prior to system release and turnover.	Attachment #5, Item 1 Attachment #3, Item 10
3.	Mercury has increased their documentation review and QC inspection staffs.	Attachment #1
4.	Ebasco formed a QA Surveillance Group to perform random physical inspections to assure contractor compliance to established requirements.	Attachment #3, Item 3
5.	Ebasco has increased its document review, QC and supervisory staffs and has retrained personnel involved in review of documentation.	Attachment #3, Item 2
6.	The LP&L QA organization has been enlarged and supplemented with contract personnel in order to provide broader QA coverage of safety-related site activities.	Attachment #3, Item 6
7.	LP&L QA has developed procedures and will conduct audits to verify system configuration and documentation prior to turnover to LP&L Start-up.	Attachment #3, Item 7
8.	Plant staff, in conjunction with Start-up engineers, will perform system walkdowns and will verify the status of the current as-built configuration of the system prior to transfer to plant staff.	Attachment #3, Item 8
9.	Responsibility for Significant Construction Deficiencies, Inspection Reports, and other required reporting has been transferred from QA to Licensing.	Attachment #3, Item 9

Notice of Violation Commitments

Location in
Issue #23 Where
Addressed

10. LP&L has developed an aggressive plan to establish methods for quality record reviews and applicable physical verification for selected activities performed by 15 contractors who performed safety related activities prior to June 1, 1982. The plan will be implemented by LP&L QA and Engineering personnel.
11. LP&L and its contractors have reviewed for adequacy those procedures related to the turnover process and have revised them as necessary to assure that review requirements are clearly stated.

Attachment #3,
Item 5

Attachment #3,
Item 4

ATTACHMENT 3B

Ebasco Surveillance Group
Surveillances of Mercury

8/18/82	W3-NY-15	NB1	Surveillance - Walkdown
8/18/82	W3-NY-15	NB2	Procedure Revision Form 276-1
8/25/82	W3-NY-15	NB3	Review OCR Package 607
8/23-24/82	W3-NY-15	NB4	Review OCR Package 607 SP-660
8/26-27/82	W3-NY-15	NB5	Review OCR Package 1312
9/1/82	W3-NY-15	NB6	Piping & Tubing - Code Stamping
9/7/82	W3-NY-15	NB7	Walkdown - Welding
9/8-12/82	W3-NY-15	NB8	Walkdown & Review Instr. Packages
9/15/82	W3-NY-15	NB9	Weld Machine Calibration
9/18/82	W3-NY-15	NB10	Measuring & Test Equipment
9/23/82	W3-NY-15	NB11	Walkdown
9/27/82	W3-NY-15	NB12	Visual Exam Proc. QCP-3110/R3
9/30/82	W3-NY-15	NB13	Mercury Removal of Items
10/1/82	W3-NY-15	NB14	Walkdown of Sys RCP Support 1B
10/4/82	W3-NY-15	NB15	FCR-AS-2066
10/5/82	W3-NY-15	NB16	Instrument/Support
10/11/82	W3-NY-15	NB17	Welder Qualifications
10/14/82	W3-NY-15	NB18	Audit of QA/QC Personnel - Cert
10/14/82	W3-NY-15	NB19	In process support
10/14/82	W3-NY-15	NB20	Storage SS Tubing
10/19/82	W3-NY-15	NB21	NCRs Assoc Sus 46
10/21/82	W3-NY-15	NB22	DN USE
11/12/82	W3-NY-15	NB23	Walkdown OCR 670
11/12/82	W3-NY-15	NB24	Removal of Items
11/12/82	W3-NY-15	NB25	Walkdown OCR-388/758
11/18/82	W3-NY-15	NB26	Removal of Items
11/19/82	W3-NY-15	NB27	Walkdown OCR 1756
11/19/82	W3-NY-15	NB28	Thermowell Installation Procedure
11/20/82	W3-NY-15	NB29	NCR-W3-4504 SUS 47
11/23/82	W3-NY-15	NB30	OCR 1687
11/29/82	W3-NY-15	NB31	Mercury QA Training
12/3/82	W3-NY-15	NB32	NCR Admin. Closure
12/3/82	W3-NY-15	NB33	Instrument TE-MS-83455
1/6/82	W3-NY-15	NB34	Use of Form 211 to Doc. NCR Condition Program
12/21/82	W3-NY-15	SH1	Walkdown SUS 43A-9
12/27-31/82	W3-NY-15	TM1	Walkdown Instr. Lines
12/28/82	W3-NY-15	TM2	Walkdown Surveillance
12/29/82	W3-NY-15	TM3	CAR #129 Review
1/4/83	W3-NY-15	TM4	Pneu Test Witness
1/6/83	W3-NY-15	TP1	Walkdown Inst. Lines
1/17-18/83	W3-NY-15	TP2	Training
1/26/83	W3-NY-15	NB35	ISO Revision
2/15/83	W3-NY-15	SH2	QCP-3110.5
2/18/83	W3-NY-15	TM5	Use of Correspondence
4/18/83	W3-NY-15	TM6	Inst. Cabinets & Racks
4/25/83	W3-NY-15	TP3	SP-663 (R-2)
5/20/83	W3-NY-15	TM7	Hydro/Pneu Testing
5/27/83	W3-NY-15	GM1	SP-664

ATTACHMENT 3C

Ebasco Procedural Revisions
May 1982 - June 1984

Procedure No.	Procedure Title		Revision/Dates
QAI-1	QA Records Management Instructions	11	2/8/84
			10 8/5/82
			9 8/3/82
QAI-2	QA Review of Site Gen. Procedure of Activities Affecting Quality		3 7/2/82
QAI-6	Processing of Safety Related PR/PO		7 6/4/84
			6 5/9/84
			5 10/28/82
			4 7/1/82
QAI-7	QA Instruction for Surveillance & Corrective Action		2 2/21/84
			1 7/2/82
QAI-9	• Review & Handling of Construction Installation Records		2 4/20/83
QAI-14	Training & Qualification Requirements for QA Records Personnel		4 6/5/83
			3 9/24/82
			2 8/24/82
			1 8/10/82
			0 7/26/82
QAI-15	Surveillance of Site Contractors		4 6/5/83
			3 9/24/82
			2 8/24/82
			1 8/10/82
			0 7/26/82
QAI-16	Qualification of Quality Surveillance Personnel		2 3/13/84
			1 9/28/82
			0 7/30/82
QAI-18	Data Report Processing Quality Assurance Engineering Department		3 10/3/83
			2 8/30/83
			1 8/3/83
			0 6/1/83
QAI-19	Processing of Discrepancy Notices (DNs) and Engineering Discrepancy (EDNs)		2 2/10/84
			1 7/15/83
			0 6/15/83
QAI-20	Walkdown Reverification of Hangers		1 7/11/83
			0 6/27/83

Ebasco Procedural Revisions

May 1982 - June 1984

Procedure No.	Procedure Title	Revision/Dates	
QAI-22	Preparation of Response to NRC Inspection Reports	1 0	8/30/83 8/2/83
QAI-23	Review of Ebasco Construction Quality Records	4 3 2 1 0	2/4/84 11/30/83 11/8/83 10/18/83 8/29/83
QAI-25	QA Instruction for Auditing at Waterford 3	0	8/22/83
QAI-26	Initiation/Preparation of PRI/SCD Reports	0	2/10/84
QAI-29	Review & Recurrence Control of Adverse Trends Reported by the Ebasco Trend Analysis	0	1/30/84
QAI-30	Documentation Statusing Review Instruction	0	2/1/84
QAI-31	Processing of Nonconformance Reports	0	2/9/84
WQC-167	Review/Trans. of Quality Related Records	1	5/24/82
WQC-168	Inspection of Instrumentation Installation	3A1	6/22/82
WQC-169	General QC Inspections	1	6/22/82
WQC-200	Inspection & Test Status ASME QC	VOIDED	
WQC-201	Control of Weld Filler Metals ASME QC	VOIDED	
WQC-202	Inspection of Piping Hangers/Supports Including Rupture & Whip Restraints	2A3	10/18/82
WQC-204	ASME Piping/Tubing Installation Inspection	1	10/20/82
WQC-205	Inspection of In-Place Storage & Maintenance of Mech. Piping; Permanent Plant Items	0	10/26/82
WQC-208	Piping System Cleanliness Inspection Procedure	3A1	9/9/82
WQC-209	Inspection & Surveillance of Ebasco Installed Conditional Acceptance Items	0	10/26/82
WQC-212	Ebasco QC Requirements of NDE Services ASME	2	10/20/82
WQC-213	Quality Control Review of ASME Section III Piping/Tubing Travelers	0	10/25/82

ATTACHMENT 3D

Mercury Procedural Revisions

May 1982 - June 1984

<u>Procedure No.</u>	<u>Procedure Title</u>	<u>Revisions/Dates</u>	
MCP-2100	Welding Control	13	3/3/83
		12	1/13/83
		11	9/27/82
MCP-2101	Welding Repair	4	1/25/83
		3	10/13/83
MCP-2170	Pressure Testing	8	4/19/83
		7	2/20/83
		6	6/22/82
		5	5/3/82
PCP-2010	Document Control	10	5/17/83
		9	10/4/82
		8	6/4/82
		7	6/2/82
		6	3/11/82
PCP-2030	Material & Equipment Control	5	10/11/82
QCP-3010	QA Records Control	4	10/16/82
QCP-3020	QA Program Auditing	4	9/13/82
		3	7/26/82
QCP-3050	Qualification of Inspection & Test Personnel	4	10/17/82
QCP-3110	Visual Examination	4	9/30/82
QCP-3110.4	Pipe & Tubing Inspection	10	2/18/83
		9	9/29/82
QCP-3110.5	Welding Inspection	8	2/21/83
		7	1/19/83
		6	8/6/82
		5	4/5/82
SP-650	Preparation, Review & Approval of Special Procedures	4	3/15/82
SP-652	Installation of Process Pipe Hanger Supports	10	1/14/83
		9	10/17/82
		8	6/29/82
		7	6/12/82

Mercury Procedural Revisions

May 1982 - June 1984

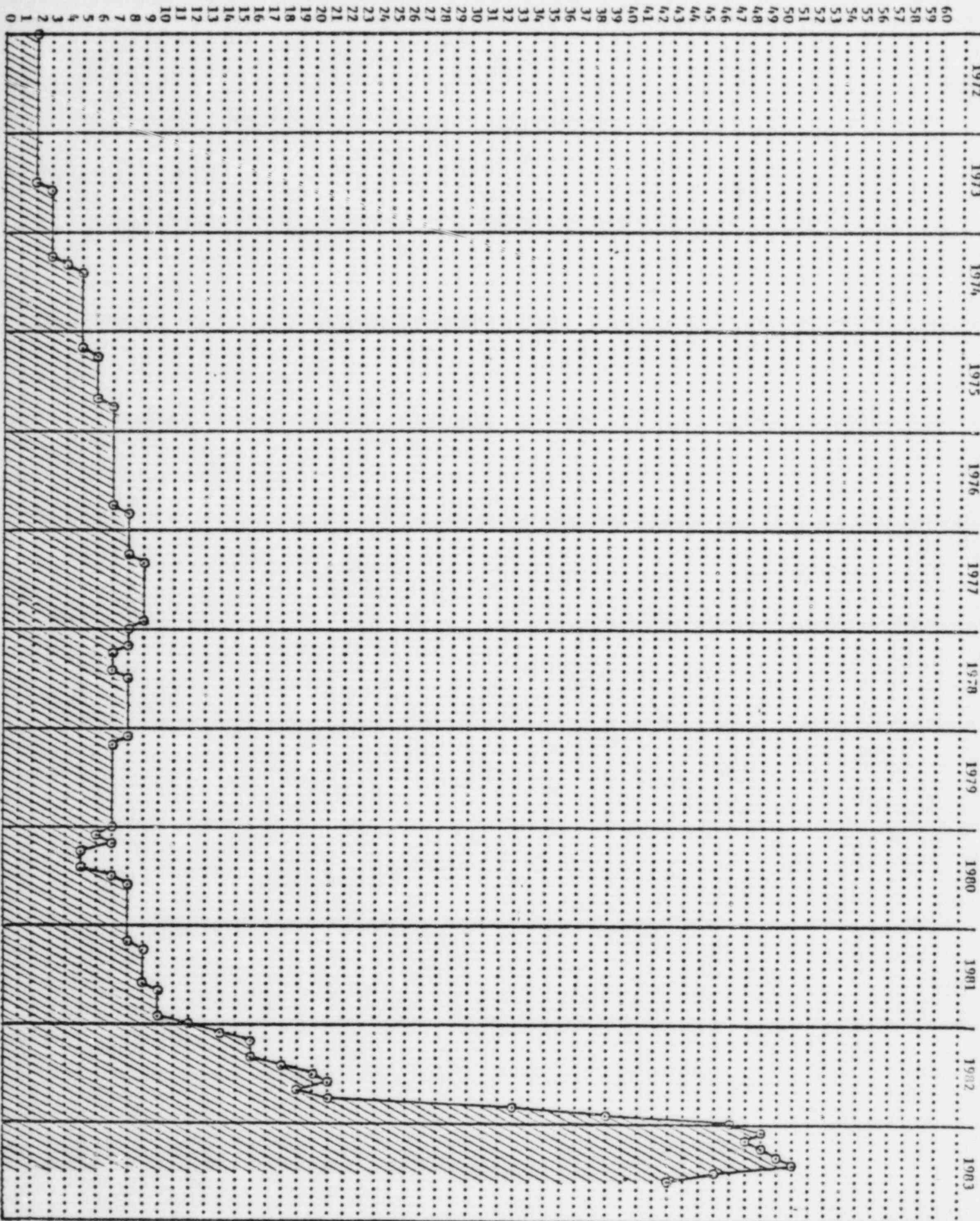
Procedure No.	Procedure Title	Revision/Dates	
SP-653	Fabrication & Installation of Safety Class 2 & 3 Process Pipe	6	1/13/83
		5	10/12/82
SP-654	Tube Tray Hanger Fabrication & Installation	9	1/14/83
		8	12/20/82
		7	9/28/82
		6	7/21/82
SP-655	Construction Procedure for Assembly Fabrication & Installation of Seismic Class 1 Local Instrument Assemblies	5	1/12/83
SP-656	Fabrication of Local Instrument Piping & Tubing Assemblies	5	1/13/83
		4	10/12/82
SP-657	Installation of Impulse Lines	6	3/2/83
		5	1/13/83
		4	10/12/82
SP-658	Installation of Seismic 1 Tube Tray for ASME Class 2 & 3 Tubing	4	3/15/83
SP-659	Procedure for Receiving Interface	4	2/8/82
SP-660	Procedure for Preparation & Control of the Process Control Traveler	7	12/17/82
		6	10/21/82
		5	9/27/82
		4	6/7/82
SP-661	Welding NDE Interface	4	4/4/83
SP-664	Handling of Nonconformances & Corrective Action	4	6/20/83
		3	5/10/83
		2	3/8/83
		1	9/27/82
SP-666	Drilled-In Expansion Type Anchors In Concrete for Category I Structures Seismic Class I	8	2/24/83
		7	9/28/82
		6	8/16/82
		5	5/18/82
SP-667	Control of As-Built Information	5	9/30/82
		4	5/14/82

Mercury Procedural Revisions

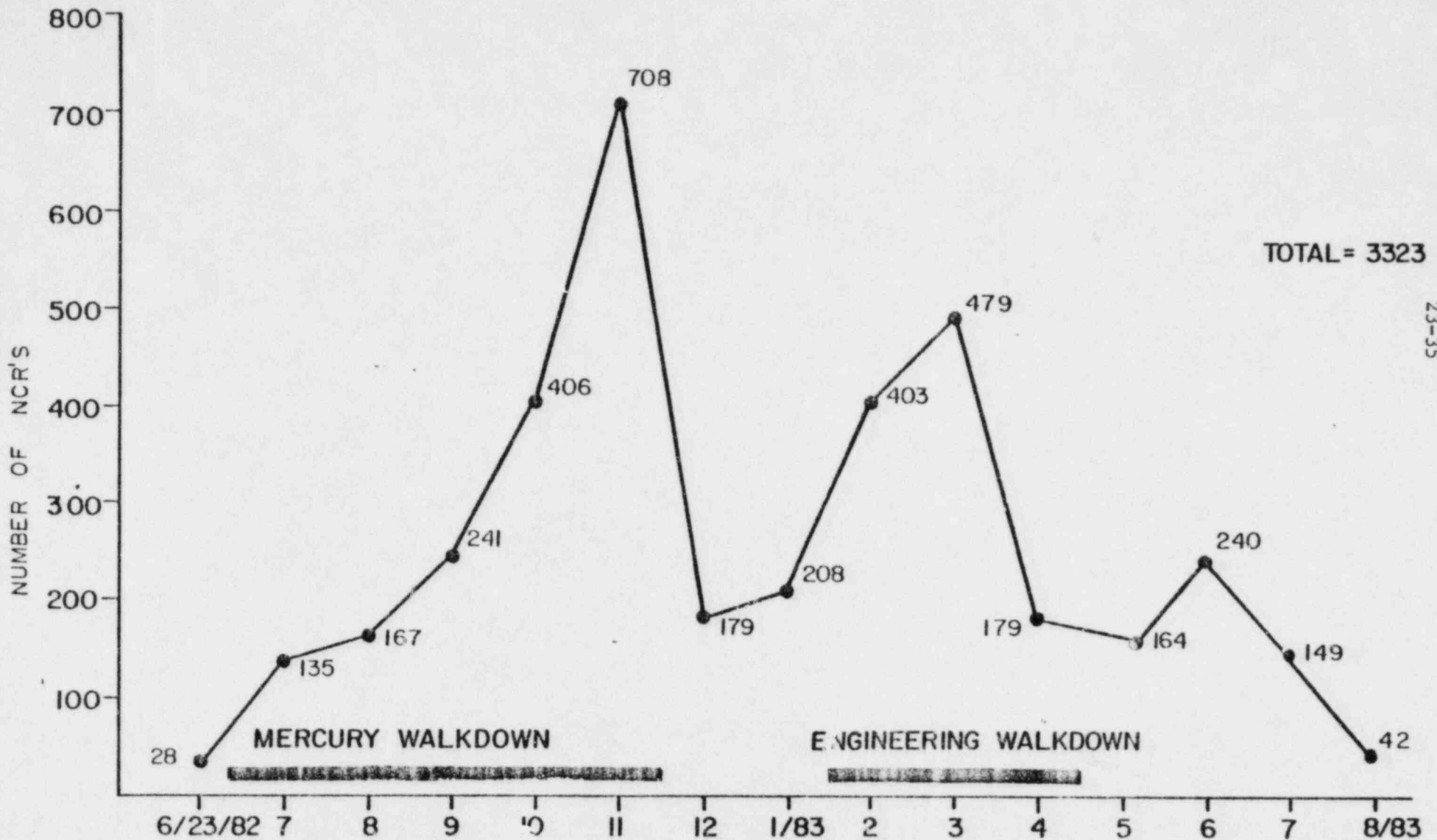
May 1982 - June 1984

Procedure No.	Procedure Title	Revision/Dates	
SP-671	Release and Turnover from Mercury to Ebasco Construction	1	2/14/83
SP-672	Welding Parameter Card Procedure	0	8/13/82
WPS-B	Welding Procedure "B"	12 11	11/2/82 8/12/82
WPS-D	Welding Procedure "D"	13 12	11/2/82 8/12/82
WPS-E	Welding Procedure "E"	11	11/2/82
WPS-G	Welding Procedure "G"	11 10	11/2/82 8/12/82
WPS-Y	Manual Gas Tungsten Arc/Shield Metal Arc Welding ASME Section IX Group Metal Thickness Range	10	8/13/82

LP&L QUALITY ASSURANCE STAFFING HISTORY



MERCURY NCR'S WRITTEN BETWEEN 6/23/82 & 8/83



ATTACHMENT 3F
23-35

ATTACHMENT 4

Audit of Mercury Installations

The established Quality Programs of LP&L, Ebasco and Mercury were approved and accepted by all required organizations. They meet the requirements of 10 CFR 50 Appendix B Criterion XVIII and ANSI N45.2 standards invoked on the Waterford III project. With respect to the NRC concern regarding the apparent failure to audit the entire QA Program the following is provided.

I. LP&L QA Audit Program

As documented in the Waterford 3 PSAR, during the construction phase LP&L Quality Assurance was committed to function primarily as a Quality Surveillance group. Ebasco was responsible for assuring contractor compliance with their respective QA program requirements. In fulfillment of its role, LP&L QA conducted audits of contractor activities as deemed necessary. LP&L QA maintained a monthly audit schedule and revised it based upon available resources and criticality of activities to be monitored. In the case of Mercury, a total of 28 audits were scheduled. Attachment 4A is a summary of the completed LP&L QA audits of Mercury. Additionally, 13 unscheduled surveillances of Mercury were conducted by LP&L as shown in Attachment 4B.

II. Ebasco QA Audit Program

The Ebasco QA audit program was structured to audit contractors yearly for compliance with the applicable 10CFR50 Appendix B criteria. In the case of Mercury, Mercury compliance to criterion IV was not audited by Ebasco since permanent installation material procurement was handled by Ebasco. Attachment 4C provides a matrix of Ebasco audits of Mercury with respect to the Appendix B criteria. This attachment demonstrates that the required audits were conducted.

III. Mercury QA Audit Program

The Mercury Quality Assurance Program required a minimum of one internal audit be conducted annually on each auditable QA Manual Section. The Mercury audit schedule was reviewed and shown to be deficient in not completing audits of all QA Manual sections as required during 1981, prior to the SWO. Following the SWO, Mercury met their commitment requirements to the end of their contract. Information on the Mercury internal audits is available for NRC review.

ATTACHMENT 4A

LP&L AUDITS
OF
MERCURY COMPANY
(1979 - 1983)

1979	W3S79-6	1/15/79	EEI Checklist
	W3S79-18	3/19/79	EEI Checklist
	W3S-79-36	5/29/79	Criteria V - Mercury Procedures
	W3S-79-37	6/7/79	Criteria VI - Mercury Procedures
	W3S-79-41	6/25/79	Criteria X - Mercury Procedures
	W3S-79-42	12/5/79	Criteria IX - Mercury Procedures
1980	W3S-80-35	9/12/80	Criteria II, X - Mercury Procedures
	W3S-80-39	7/2-10/2/80	QA Program Review
1981	W3S-81-8	1/12-2/23/81	SP 654, 666
	W3S-81-15	3/25/81	SP-655, MCP 2140
	W3S-81-32	8/27/81	Mercury QA Program
	W3S-81-36	8/21-9/2/81	Criteria XIII - Mercury Procedures
	W3S-81-39	10/8/81	Criteria V - SP-660
	W3S-81-41	10/16/81	Criteria II - Mercury Procedures
	W3S-81-51	12/7/81	Criteria III - SP-667
1982	W3S-82-13	1/20/82	Criteria XI - Mercury Procedures
	W3S-82-14	2/4/82	Criteria XII - Met. Lab
	W3S-82-62	7/22/82	Criteria V, X, III
	W3S-82-62	7/22/82	Criteria III, V, X
	W3S-82-64	7/30/82	Criteria XV, XVI
	W3S-82-77	10/5/82	Criteria II, X, QCP-3050
	W3S-82-84	11/8/82	Criteria VI
	W3S-82-85	10/25-11/8/82	10CFR50/ANSI N45.2
1983	W3S-83-10	7/8/83	Criteria V - Mercury Procedures

ATTACHMENT 4B

LP&L SURVEILLANCES

OF

MERCURY COMPANY

(1979-1983)

1979	No Surveillance Performed		
1980	W3S-80-8s	2/21/80	Mercury Walkdown RAB
	W3S-80-36s	9/22/80	Mercury Criteria V
	W3S80-40s	10/17/80	Protection of SR Instrument Impulse Line
1981	W3S-81-31s	8/7/81	Mercury Mechanical Separation
1982	W3S-82-56s	7/6/82	Mercury 10CFR50/ANSI N45.2
	W3S-82-57s	7/11/82	Mercury 10CFR50/ANSI N45.2
	W3S-82-54s	6/28/82	Mercury 10CFR50/ANSI N45.2
	W3S-82-55s	6/24/82	Mercury 10CFR50/ANSI N45.2
	W3S-82-59s	7/23/82	Mercury SP-665
	W3S-82-61s	7/21/82	Mercury ANSI N45.2.2
	W3S-82-73s	9/23/82	Seismic/Tube Track
	W3S-82-79s	10/18/82	Mercury Criteria V
	W3S-82-81s	10/28/82	SP-667, QCP-3110.4
1983	W3S-83-19s	8/19/83	Hydro-Pneumatic Testing

ATTACHMENT 4C

18 CRITERIA - 10 CFR50 APPENDIX B

Ebasco
Audits
of
Mercury

	I	II	III	IV	V	VI	VII	VIII	IX	
1979	Note 2	79-11-1 79-10-3 79-3-8 79-2-5 79-3-1	79-12-4	N/A	79-2-1 79-2-3	79-10-2 79-4-4 79-1-5	79-11-2 79-1-8	79-2-3	79-11-3 79-1-1 79-2-3 79-3-3 79-3-2 79-4-3 79-4-3 79-5-3 79-6-2	79-7-1 79-6-6 79-7-3 79-8-2 79-8-4 79-8-5 79-8-7 79-10-4
1980	80-12-1	80-2-3 80-4-7 80-8-4	80-9-1	N/A	80-9-2	80-4-6	Note 5	80-2-8 80-6-1	80-7-2 80-2-1 80-4-2	80-6-2 80-7-1
1981	81-9-1	81-1-4 81-3-2 81-12-1	81-9-3	N/A	81-4-1	81-2-2	Note 5	81-1-3 81-5-2	81-2-3	
1982	82-2-1	82-11-1 82-6-1 82-7-11 82-11-1	82-7-6	N/A	82-2-1 82-2-2	82-5-1	Note 5	82-11-2	82-1-2 82-2-1 82-7-1	82-10-1 82-10-2
1983	83-2-3	83-2-3	83-1-2	N/A	83-5-1	83-3-1	Note 5	83-6-2	83-6-1	

NOTES: 1. Pertinent Chronological Events

1978 - Fall Mercury Mobilization

1980 - Mercury Audit for code stamping (80-3-7)

1981 - Mercury Audit for seismic support (81-11-1)
attachment

1983 - Mercury demobilized August 1983

- Mercury Organization was reviewed by Ebasco as part of the QA Program Manual Review conducted in 1978 and 1979. Ref. file folder F NY-15 Ebasco QA Records Vault
- ASME hydro testing commenced in late 1981
- Audits not performed due to Contract Closure
- Ebasco audits of services used by Mercury would be conducted as part of Ebasco audits performed relative to other Criterion (e.g. Criterion XII)

ATTACHMENT 4C (CONT'D)

18 CRITERIA - 10CFR50 APPENDIX B

Ebasco
Audits
of
Mercury

	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII
1979	79-11-4 79-6-2 79-6-3 79-4-6 79-3-7 79-3-3 79-2-1 79-2-3	79-3-3 79-2-1 79-2-3 79-3-7	79-8-6 79-8-2 79-3-6	79-4-5 79-3-1	79-12-4	79-10-4 79-4-2	79-10-4	79-11-2 79-4-7 79-4-2 79-2-1 79-2-2 78-12-2	79-9-4
1980	80-3-2 80-1-1 80-1-2 80-3-1 80-5-1 80-7-3 80-7-4	Note 3	80-4-8	80-7-2	80-10-5	80-1-3 80-3-8	80-1-3 80-3-8	80-6-4	80-8-3 Program Audit
1981	81-2-1 81-3-4 81-12-3	Note 3	81-3-1	81-9-4	81-9-2	81-1-1	81-1-1	81-4-2	81-5-1
1982	82-7-4 82-7-5	82-5-3	82-7-9	82-11-3	82-12-2	82-4-2	82-4-2	82-6-5	82-6-1
1983	83-5-2	83-6-1	83-2-2	Note 4	Note 4	83-6-2	83-6-2	Note 4	83-5-2

ATTACHMENT 5

Verification of the Acceptability of Mercury Installations

Since the Stop Work Order on Mercury safety related activities in June 1982, Mercury installed systems have been heavily scrutinized by LP&L and Ebasco. The Mercury installations have also been subjected to NRC field review. Additionally, Kemper Insurance participated in the ASME Section III N-Stamp application process and, as such, was required to witness hydrostatic testing of all ASME Safety Class 2 installations.

In consideration of these activities and corrective action taken, LP&L now has a high degree of confidence in the adequacy of the Mercury installations.

The following is a brief discussion of some of the significant LP&L and Ebasco verification activities with respect to Mercury installations.

1. A direct result of the Stop Work Order, was the initiation in July 1982 of joint Mercury and Ebasco walkdowns of instrumentation installations on a startup system basis. LP&L QA and Startup were involved in the initial phases of the program. Walkdown results were documented on punch lists and evaluated for nonconforming conditions and establishment of corrective action. The walkdowns were conducted in two phases. The first phase consisted primarily of tubing along with the associated tubetrack and clamps. The second phase consisted of a walkdown of supports which commenced in January 1983. The walkdowns resulted in the generation of a large number of NCRs and rework. Attachments 2, 3 and 3F discuss the significance of the NCRs.
2. In addition to LP&L QA participation in the corrective action walkdowns discussed above, LP&L QA performed a status review at the time of system turnover in accordance with the requirements of LP&L procedure QASP 17.5. This review consisted of a minimum 10 percent review of the documentation, and a random field sampling of hardware versus as-built drawings. Portions of the Mercury installation for the following startup systems were field verified:

18-3, 36-1, 36-3, 39, 43A, 43B, 43E, 43H, 43J, 46A, 46B, 46C, 46D, 46E, 46H, 52A-1, 52A-2, 52B, 52C, 53A, 55A, 56A, 58, 59, 60A, 60B, 60C, 66, 71B, 73 and 76.

As a result of these reviews LP&L was able to conclude that the as-built conditions generally reflected the system drawings, and that no significant hardware deficiencies were encountered.

3. Ebasco conducted various other field verification activities relative to Mercury installations. These are summarized as follows:

- a. As part of the closure of SCD 57, Ebasco QA initiated a corrective action supplement which consisted in part of a sample field inspection of various attributes related to Mercury installations. This inspection took place in February, 1984.
 - b. Ebasco engineering conducted a plant walkdown in order to identify and correct miscellaneous hardware deficiencies which normally result from ongoing construction activities. This walkdown was conducted in accordance with Ebasco procedure ASP-IV-141 and included all safety related areas of the plant. Deficiencies, along with QA/QC verification of corrective action on safety related items, were documented on punch lists. The program was established in support of the area closeout and transfer process, which took place in March, 1984 through May 1984. This walkdown provided another level of assurance on the Mercury installations.
 - c. Since August, 1982 the Ebasco QA Surveillance Group has conducted 48 documented surveillances of Mercury hardware and documentation. Any findings were resolved and, when necessary, NCRs were initiated to evaluate potentially significant discrepancies. The activities of the Ebasco QA Surveillance Group are discussed in greater detail in Attachment 3. Generally, this in-process surveillance program provided another means of monitoring Mercury activities, thus ensuring the adequacy of the installations.
4. The most significant activity, aside from the corrective action walkdown discussed in item 1, involved the Ebasco QA records review of Mercury documentation. This review was necessary due to the demobilization of Mercury in August of 1983 without the completion of the Mercury records review. The review commenced in November, 1983 and was completed in March, 1984. A group of 46 QA reviewers, inspectors, supervisors and clerical staff was assembled for this effort. The review was conducted in accordance with QA instruction QAI-23. As deficient or missing documents were identified QC inspectors were dispatched to re-verify the installations. As a result, approximately 67% of tube track installations were reinspected; approximately 35% of Seismic Category 1 supports were reinspected; and approximately 24% of the Mercury installed anchors were reverified for proper torque. Attachment 5A provides a summary of the review and reinspection scope resulting from the Ebasco QA records review. Available records indicate that an insignificant amount of rework resulted from the reinspection process.
 5. The adequacy of Mercury installations is being further confirmed by reinspections in progress in response to NRC issue #1.

ATTACHMENT 5A

Summary of the Ebasco QA Records Review

I. The following is a summary of the work scope related to the Mercury documentation review conducted by Ebasco QA. Further, a summary of field QC verifications resulting from the review process is provided in Section II.

A. Tubing Installations Records Review

<u>Review Scope</u>	<u>ASME Section III-Class 2</u>	<u>ASME Section III-Class 3</u>	<u>Total</u>
Number of Systems	13	36	49
Number of Mercury Travelers (OCRs)	86	284	370
Number of Instruments	150	835	985

B. Seismic Category 1 Support, tube track, and other miscellaneous hardware installations

<u>Review Scope</u>	<u>Quantity</u>
Tube track supports	5142
Primary sample line pipe supports	314
Tube track installations	665
Instrument stands	184
Bulk fabricated supports/fittings/ anchor plates	7230 (approx.)
Instrument mounts	267

II. QC reinspections were initiated in order to resolve documentation deficiencies identified in the review process. A summary of re-inspections is as follows:

A. Tubing Installations

Reinspections were initiated to verify the following:

<u>Attribute</u>	<u>Quantity</u>
Heat number	30
Material Identification	15
Welder's I.D.	11
Tube Slope	4
Verify repair of damaged tubing	7
Wall thickness	2
Defective weld	1
Instrument installation	3
TOTAL	73 (Note 1)

B. Supports/tube track and other miscellaneous Seismic Category 1 installations

Reinspections were initiated to verify the following:

<u>Attribute</u>	<u>Quantity</u>
Support configuration, location and welds	2058
Tube track	514
Instrument Stands	211
Torque verification of anchor bolts including proper imbedment and thread engagement	896
Support type only	159
Final visual of support weld only	88
Pipe support configuration	77
Miscellaneous attributes (Ht. No., Welder I.D., etc.)	216
TOTAL	4219 (Note 1)

As a result of these re-inspections a total of 113 NCRs, and 1035 Discrepancy Notices were dispositioned.

Note 1 - Some duplication of reinspection or unsuccessful inspection is included in these numbers.