12/18/84

To: Dennis Crutchfield

From: R. Shewmaker

Subject: SSER 9 INPUT

Attached is the final version of each of the items in the civil-structural area for SSER 9. These are as listed below.

Issue/Allegation	Draft No.	Date
7	2	12/18
9	1	12/4
10*	1	12/18
11	4	12/18
12	1	12/4
14	2	12/18
15	1	12/4
19	2	12/18
20*	1	12/18
A-109	2	12/18
A-141	4	12/18

* Awaiting input from Harrison for merging

I will be on Annual Leave until 1/3/85.

FOIA-85-123 B/16

Document Name:
WATERFORD/2

Requestor's ID:
MARLENE

Author's Name:
SHEWMAKER

Document Comments:
ISSUE 7: SOILS

ISSUE 7: SOILS

The origin of the Task Force's question in this area arose from a sample of soils records reviewed by the Task Force for documentation and technical adequacy which indicated missing records. This was after the records had reportedly received a 100% review by EBASCO. These facts were described in Allegation A-138. The Task Force then requested another review of all soils documentation packages for completeness and technical adequacy and to provide technical justification (either by tests or analysis), if records were in fact missing, that the soils media is adequate to support the structures as founded at the site under all loading conditions.

The applicant, in a response dated August 27, 1984 (W3B84-0475) from J. M. Cain (LP&L) to D. G. Eisenhut (NRR) provided the results of the applicant's additional review on this issue.

The Task Force in reviewing this submittal found several numerical errors, transcribing errors and items needing clarification. Discussions were held with LP&L on these items and a revision was submitted to make the necessary changes. The revision was submitted in a response dated November 21, 1984 (W3B84-0817) from J. M. Cain (LP&L) to D. G. Eisenhut (NRR). The Task Force was of the opinion that the discrepancies found in the original submittal had no impact on the overall conclusions which were reached as a result of the facts which arose from the review and evaluation of the records. The resubmittal has been reviewed by the Task Force and was found to correct the identified discrepancies.

As a result of the applicant's rereview effort in a three staged approach, the records identified by the Task Force in the sample selected which appeared to be missing were located. During Stage I the licensee searched all locations known or thought to contain soil records. Test records, inspection reports, indicies, and tabulations were found which had not been incorporated into the files containing the quality records.

Appendix A of the licensee's submittal contained the records for the in-place soil density tests which had been identified by the Task Force as missing. These represented 34 distinct sample locations within Fill Area No. 5 between Elevation - 41.75 and Elevation - 36.25. These data were found in the subcontractor's facilities and had not yet been transmitted to EBASCO for inclusion in the QA records. This fact was apparently missed in the earlier reported 100% soils records review which the Task Force was told had been completed.

The Task Force has reviewed these records and found them to be acceptable once the various corrections in the submittal noted previously were made. It should be pointed out that within this set of records there are numerous instances to show the close adherence to the quality procedures to place, compact, test, and document the soils work in the 1976 time frame. The documents show that where changes were made in the records to clarify handwriting, renumber or reidentify a test record, correct an elevation or computational result, the initials of the individual making the change and the date of the

change after the lined out portion and corrected information are provided. This corrective work was done in 1976 also, the same year the actual work reported in the document was completed. This points out that the quality review of documentation was in fact taking place and being effective in the same time frame in which work was being completed.

Also within this set of records it is apparent how important the quality of soil placement was for the project and the quality inspectors. For example, at an elevation of -36.75 feet in Fill Area No. 5, tests were completed on October 14, 1976 at 10:40 a.m. at location E4-60N-28E to check in-place density of backfill material. The test results indicated the degree of compaction to be about 10% deficient and the inspector required rework and retest. As is typically done, additional compactive effort was applied to the backfill layer by additional passes by the compaction equipment. At 11:40 a.m. another retest was made which indicated about a 2% deficiency in the degree of compaction. The inspector again required rework and retesting. Two sets of retesting were completed at 12:20 p.m. and 12:30 p.m. Both of these still showed a minor deficiency in the degree of compaction so that another cycle of reworking and retesting was required. The in-place material was accepted on October 14, 1976 as a result of testing performed at 1:16 p.m. The specific test numbers involved in this instance was B0110A through B0110AR4.

Within the 34 test areas represented in Appendix A the reworking and retesting cycles were evident in five. All five of these local areas had high degree of compaction requirements (99%) which were more difficult to achieve than the general value of 95%. These records clearly indicate that the effort was made and time was spent in construction to properly compact the backfill material and test it for specification conformance. This illustrates an effective quality program in the area of soil compaction.

The Task Force review and evaluation of the records indicated no reason to suspect that the records were anything but the actual records generated in 1976 at the time the work was performed.

Based on the Task Force's review and evaluation the issue of the missing soils records from the sample selected by the Task Force is resolved. In addition, the records illustrate the level of detail required in the quality procedures and the thoroughness of execution.

Stage II of the applicant's effort involved the detailed review of all the soils related documentation in order to address the Task Force's concern over missing records. This concern arose from the Task Force's sample of documents.

The records under review consisted of soil inspection reports and soil test records. As noted by LP&L in the response to this item, there were some 17,000 soil documents examined by the program effort under the direction of the former resident senior site soils engineer from EBASCO. This individual was the responsible engineer in the field during construction and represented the EBASCO design office in New York at the site. These 17,000 records consisted of approximately 12,000 on which were recorded of five different types of inspection and the nearly 5,000 remaining documents were soil test records

which consisted of forms in four different formats. Of nearly these 5,000, about 4,350 represent test records related to the Class A backfill.

Another record which was used during Stage II which proved very valuable in establishing the conclusions relative to the completeness of the soils test records was the soils laboratory Class A backfill test index. This index was created and maintained in a hardcover, bound notebook and lists the test number, test location horizontal coordinates, elevation, date of test, and type of test performed. It was the test laboratory's method of assigning and controlling the numbers to each test as the tests were sequentially performed in the field and in the laboratory. It clearly supports the fact that the test records are complete. In addition, on a daily basis the field and laboratory tests were summarized for the Class A backfill so that there could be supervisory reviews and statistical studies of the in-situ relative density could be made. These records were also available to use as cross reference in the determination of record completeness.

In order to evaluate the completeness of the density records and to facilitate checking the records against the specifications and procedures, which had been instituted by LP&L, EBASCO, and J. A. Jones Company to control the work, EBASCO, for the soil tests, created graphical overlay plots at 1 foot intervals. These allowed the review of the frequency of density testing, the distribution of the testing and to provide for listing the final in-situ relative densities. The focus was on this soil characteristic, density, although other attributes which were determined by testing such as moisture content, gradation, and Proctor tests were also reviewed.

All of these aids or supporting documents indicate that of the 4,350 Class A tests, approximately 3,100 were tests for field density of the soils and that these represent the complete set of field density tests. The Task Force agrees with this conclusion.

To establish the degree of completeness of the inspection records two approaches were utilized. In one case the inspection record packages were compared to the testing records for field density tests and in the second case a comparison was made utilizing fill surface area.

Since in the course of construction of the backfill and the associated inspection both the J. A. Jones procedure (W-SITP-12, Site Inspection & Testing Procedure for Backfill and Compaction) and the EBASCO procedure (QCIP-2, Quality Control Inspection Procedure for Soils Control) which required the documentation of the results of daily backfill inspections, call for testing to be completed, it is possible to use the number of field density tests to determine the number of inspection packages which should exist. That is, the distribution of the inspection documentation throughout the various layers of backfill should be essentially identical to the distribution of the field testing effort (like in-place field density tests) in that where an inspection report is found for a given fill area and elevation, a field density test report should also be found. The reverse is, of course, also true. This indicates a one to one relationship between inspection and testing activities.

The types of inspections performed in the course of the construction and inspection effort were recorded on five (5) different forms. These are summarized as :

Type (1): J. A. Jones - Daily Backfill Inspection Report
Type (2): EBASCO - Borrow Material Inspection Report
Type (3): EBASCO - Excavation and Stripping Inspection Report
Type (4): EBASCO - Daily Backfill Inspection Report
Type (5): EBASCO - Backfill Acceptance Report.

Since J. A. Jones and EBASCO were each independently executing daily backfill inspections, it would be expected that the totals of Type 1 and 4 over the project should be equal. The actual statistics based on the review performed by the applicant indicated a ratio of about 2,000 to 2,900 (Jones to EBASCO). Also it would be expected that the totals of Type 2 and 4 should be equal and the actual statistics indicate each total at nearly 2,900. Based on the actual statistics it is apparent that about 900 J. A. Jones inspection reports addressing the daily backfill records are missing. It is noted, however, that due to the fact there was double inspection coverage on this aspect of plant construction activities there is no break in quality documentation necessary to validate the quality of the completed construction. The Task Force has concluded that approximately 2,900 inspections represent the number of inspections (not including any double coverage) which were performed relative to backfill placement on over 1/2 million cubic yards (600,000 yd^3) of material. This represents inspection activity at the rate of one per each approximately 200 cubic yards of material placed.

Another comparison that was made was between the 2,900 inspections versus the approximately 3,100 Class A field density tests. As stated previously, these should be on a one to one ratio. To further evaluate these numbers the applicant has computed the number of field density test required under the provisions of the EBASCO specification which required one test for each 20,000 square feet of fill layer surface area. This then could be compared to the number of inspections. On this basis approximately 860 field density tests would be required resulting in the number of tests actually performed of nearly 3.5 times that required on the one per 20,000 square feet basis. Another provision of the specification, however, also required one test for each area of less than 20,000 square feet placed in one day. Since many of the placements were smaller in the upper layers around specific areas of construction activity, this 3.5 factor would decrease since this mode of construction would increase the number of inspections and field density tests.

The other approach the applicant presented in the response compared the surface area of the fill as indicated on the inspection reports against the areas determined from the overlay plots for each of the one foot fill increments. The applicant provided the details of the evaluation in tabular form and indicated the following as the results:

1. The actual inspected surface area in some cases was larger than the theoretical surface area (overlay plots). This is because many fill areas were constructed on more than one day, thus generating two reports for the same area.

2. Evaluation of the percent of inspection coverage indicates that for 80% of the volume of the backfill, there exists a sufficient quantity of each type of inspection to document the acceptability of the backfill represented by the inspected surface area.

3. For the remaining 20% of the volume of the backfill which was found to have missing inspection reports, the average percent of inspection coverage was found to be 81%.

Overall, the applicant concluded that the completeness of the inspection documentation was fully complete for 80% of the backfill volume and the remaining 20% of the backfill volumes were represented by inspection documentation with partial deficiencies. The Task Force has reviewed these data and conclusions and are in agreement with them.

The distribution of the material represented by the inspection reports was considered by comparing the distribution of the percentage of in-place density tests in each fill area to the distribution of the percentage of the inspection documents in each fill area. For the seven soil fill areas the matches were within three percentage points of each other, demonstrating the nearly identical distribution of inspection documents as field density test records which were shown to have the proper distribution with the aid of the overlay plots.

Additionally, the applicant constructed a matrix, which defined for each one foot internal and each of the seven fill areas the number of each type of inspection document associated with that soil volume. The summary of what that matrix reveals about the inspection records is as follows:

1. Between elevation -25 and the bottom of the excavation at -44, there exist 52 fill volumes with partial distribution of inspection report documentation, or none at all. Of these 52 fills:

   a. 25 fill areas have some types of inspections by both J. A. Jones and EBASCO. These fills constitute 6.3% of the total number of fills constructed and account for 1.8% of the total volume of Class A backfill constructed.

   b. 21 fill areas have inspection documentation by only J. A. Jones. These fills constitute 5.3% of the total number of fills constructed and account for 2.0% of the total volume of Class A backfill constructed.

   c. 6 fill areas have no inspection documentation. These fills constitute 1.5% of the total number of fills constructed and account for only 0.2% of the total volume of backfill constructed.

2. For the remainder of the fill placements between elevation -25 and plant grade with minor exception, the data in Table 2 submitted by the applicant indicates that each type of inspection was performed at least once on each fill area at each elevation. In some cases, as many as 60 inspections of a particular type were performed on one fill at one elevation (Fill No. 6, EL 13.00 -13.99).

Thus, a review of the distribution of the types of inspection reports that are missing indicates that the 52 fill areas with an incomplete distribution of inspection documentation are concentrated in 13.1% of the total number of fill areas constructed and account for only 4% of the total volume of backfill placed. It should also be noted that most of the fill areas (46) where a portion of the reports are missing have duplicative reports for the daily backfill inspection so that only the six fill areas have normally necessary inspection reports missing.

Based on the data resulting from the rereview there has been a comparison made by the applicant in Stage III to the basic criteria defined in the specification to determine if the provisions were met. Those basic, bottom-line criteria are as follows:

1. The Class A backfill should have a relative density of at least 75%.

2. Compaction of the backfill is supported by field in-place density and moisture tests as well as laboratory density and gradation tests at specified frequencies.

3. Evaluation of results were periodically studied on a statistical basis.

To evaluate the test frequency and distribution of in-place densities and moisture content, the numbers of tests were tabulated for layers of a thickness of 1 foot in each fill area. It should be noted that any conclusions related to the in-place densities will also hold true for the moisture content testing since there was a moisture content test run each time a density test was performed. Also tabulated for each fill layer across all seven fill areas was the total number of in-place density tests required based on the frequency of 1 per 20,000 square feet of backfill surface area of a layer. For the soil backfill volume above elevation-40.0 feet and below elevation +13.0 feet (above which liquefaction will not occur) the required number of in-place field density test is about 860 based on 1 test per 20,000 square feet. There were actually about 2800 performed due to small fill areas of less than 20,000 square feet of surface area which had to be tested on the daily basis rather than a square footage basis.

Visually, from the overlay plots based on the one foot interval, one concludes the distribution of the soil density tests as shown by the location of the test results is random. It was noted that some of the locations (5%) were outside the boundaries of the actual fill placement, however, even though the test locations coordinates were given in feet, those locations were determined visually and by pacing from one of the 100 foot interval grid marks above and beside the excavation. The applicant and the Task Force concluded these are still valid sets of test data, representing random samples.

In reviewing the soil volumes it was found that a 3 foot wedge of soil in Fill Area 2 at about the -19 foot elevation did not have adequate in-place soil density tests to represent it. This has been recognized as an insignificant volume with respect to overall plant response to seismic loads.

Based on these facts and evaluations the Task Force concluded that the criteria were met from the standpoint of testing frequency and sample distribution for field samples.

The frequency of the laboratory control tests was also reviewed against the specification which required one set of laboratory tests for each ten sets of field tests. The data show that for the Class A soil backfill volumes placed between the start of backfilling in January of 1976 to completion, a total of aprroximately 3,100 Class A in-place density tests were made, with 2,794 of them related to the backfill subject to liquefaction. Based on the total of 3,100 field density tests and 361 laboratory tests (which include laboratory density, gradation and moisture content) the ratio is approximately 8.6 compared to the required 10. This shows overall conformance to the criterion.

Examination of the details of the individual intervals between laboratory tests revealed that in 27 of the 361 instances the specific interval between the laboratory tests exceeded 10 field tests. There were 20 of the 27 cases where the interval was up to 13 field tests. In each of these cases the extended interval between tests related to material in the same fill which had already been tested so that the laboratory developed value for density and already been established. The Task Force has judged this to be acceptable and that the intent of the specification has been met for these 20 situations.

The remaining seven instances indicated the interval had expanded from 15 to 29. In reviewing the physical location of these occurrences it was found they were completely random in the volume of backfill which exceeded over 1/2 million cubic yards of material. The relative densities obtained within the limits of the interval were also acceptable limits defined in the specification. The Task Force has judged this data to be acceptable and meets the intent of the specification.

The applicant's agent, EBASCO, performed seven statistical studies during the backfilling operation and periodic updating of correlation testing for relative densities was performed. The schedule indicates an adequate frequency of testing. As a result of the periodic statistical studies the value of the necessary field control (percent compaction) was adjusted appropriately. These records and actions support the fact that statistical studies were performed and engineering control was maintained. The Task Force concluded that the performance of statistical studies were in conformance with the specifications.

With regard to the determination of the relative density of the Class A backfill a statistical approach was utilized by EBASCO in order to provide an assessment on the overall acceptability of the completed work. Data were used throughout the project with studies six and seven being performed which included all material subject to potential liquefaction. During the progress of construction, correlation curves were developed and utilized to relate field in-place densities and relative density. The correlation curves were developed on representative soil samples taken every 200 to 250 in-place field density tests. Control was further exercised by having the field laboratory and the

corporate, home office laboratory both run certain tests. The Proctor densities from these tests showed agreement within ±2 lbs. per cubic foot and the percentages finer the a #200 sieve agreed within ±3%. This showed excellent agreement and demonstrates performance of the testing procedures with a high degree of consistency. The home office, once this type of agreement in test results was evident, would proceed to complete the determination of minimum and maximum densities. With these values and the physical relationship among field in-place dry density, minimum and maximum densities and relative density, a correlation curve for a type of material was plotted and prepared for use.

In the sixth study using cumulative data through August 1978 yielded a backfill relative density mean of 83.8% and a standard deviation of 12.4%. Utilizing a three standard deviation distribution as defining the entire population the statistical limits would be that 13% of the tests could have relative densities ranging from 62.6% to 75% and 3% ranging from 50.2% to 62.6%. All data from the nearly 2,500 tests utilized in this study were in compliance thus establishing conformance to the specification of a minimum of 75% for the relative density.

The seventh study used over 250 tests taken in backfill material placed since August of 1978 within the zone to elevation +13.0 feet, above which liquefaction will not occur. The standard deviation in this instance was 18.6% on the mean value of 91.7%. The same statistical limits as used in Study Six were utilized and only 12.4% of the results were below the minimum value of 75%. The criteria were met and the specification was satisfied. The Task Force has sampled the data and is in agreement with the conclusions provided by the applicant and his agents.

With regard to the inspection reports, which when generated cause the control tests to be performed, it was found in Stage II of data completeness studies that 80% of the total backfill volume has all inspection packages complete. There is 19.8% of the backfill volume with some deficiency in the inspection package and 0.2% of the backfill volume has no inspection documentation which could be located through the onsite search.

The rationale for acceptance of the inspection records which are partially complete hinges on the acceptability of the densities achieved in the actual backfill material. The bottom line so to speak, is that physical test data gained from testing completed as a result of the inspections demonstrates conformance to the technical requirements of the specification which assures a safe foundation response under seismic loadings. The missing inspection reports do, however, indicate that procedural and documentation requirements imposed on the project by the applicant and his agents have not been fully met in all situations.

The Task Force focussed on the 0.2% of the backfill volume for which no inspection records could be located. It was found that this fraction represented only six fill areas, all of which were below elevation -37.0. Several of these involved backfilling of small drainage ditches or trenches cut into natural in-place material. In these situations, however, the records of the density tests are again complete. Since the inspection activity preceded the testing and the testing is complete, the impact on safety of the missing inspection documents is negligible.

The Task Force, in addition, examined other construction requirements for comparison purposes relative to sample testing frequency. As a way of comparison, the US Army Corps of Engineers in Manual EM 1110-2-1911, January 17, 1977, "Construction Control for Earth and Rock-Fill Dams," recommends field density testing at the outset of a project at the rate of 1 per 1,000 cubic yards of previous fill, dropping to 1 per 3,000 thereafter. The rate of testing across the Waterford 3 site was approximately 1 per 200 cubic yards.

In final summary, the Task Force has concluded that the soil backfill records relative to the in-place densities are complete and demonstrate conformance with the prescribed construction specification as developed by engineering principles and judgment. While some documents created during the inspection process have not been located, the tests directly support the conclusion that the construction as completed in the field meets the construction specification.

The Task Force, as a result of this extensive effort, both on the part of the applicant and his agents, as well as the NRC staff, believes that the facts clearly demonstrate that there is no question remaining with regard to the safety of the soil backfill to resist all the imposed loads including seismic effects. Therefore, the Task Force considers this issue resolved.

Document Name:

SSER ISSUE 9

Requestor's ID:

MARLENE

Author's Name:

SHEWMAKER

Document Comments:

WELDER CERTIFICATION

DRAFT 1
December 4, 1984

SSER

ISSUE 9: WELDER CERTIFICATION

This issue arose as a result of the Task Force's inquiry into Allegation A-160 and the review of the records for the installation of the supports for certain of the instrumentation cabinets in the reactor containment building (RCB). The review included an examination of procurement records for the support material, weld rod control documents, welder certification records and QC inspection records.

Based on Task Force review, it appeared that documentation was missing on a number of support welds and it was not clear that the welders were certified for all of the weld positions used. Thus, the quality of the supports for the instrument cabinets was declared indeterminate.

Based on these findings the applicant, LP&L, was requested to attempt to locate the missing documents and determine if the welders were appropriately certified. If the documentation could not be located, appropriate action was to be taken to assure the quality of the cabinet supports.

The applicant provided a response to this issue in a letter dated October 19, 1984 (W3B84-0801) from J. M. Cain (LP&L) to D. G. Eisenhut (NRR).

The applicant in responding to this item generalized the concern since the specific welding questioned by the NRC in this instance was performed by the J. A. Jones Company whose primary responsibility did not include welding. The applicant, as a result of the finding, conducted reviews on the remaining scope of J. A. Jones welding and the extent of the available documents.

For the specific instrument cabinets in the RCB the applicant first attempted to review all weld inspection reports related to the support steel for the RCB instrument cabinets. This review indicated that the welders were certified for the positions used on 11 of 18 cabinets and that documentation on the other 7 instrument cabinets was incomplete.

LP&L then did a complete reinspection of the subject welds on 6 of 7 instrument cabinets with the seventh cabinet welds being inaccessible. The results on the 6 indicated deficiencies in the welds. These were documented in a nonconformance report and an engineering evaluation of the conditions was performed. The evaluation of the conditions, which included undercut, porosity and undersizing, confirmed that the support steel and the associated welding was adequate to meet all expected loadings in the as-built condition.

As a result of the as-built findings LP&L initiated a reinspection of the 11 which had full documentation available. The findings and actions were similar to the previous 6 which had been inspected. On the basis of the reinspection of 17 out of 18 and the partial records which were located, the eighteenth cabinet's supports were noted by the applicant as acceptable.

The Task Force reviewed a sample of six of the engineering reviews performed by EBASCO for the applicant which were completed to evaluate the deficiencies found in the as-built conditions. It was determined that the weld capacity exceeded the need load capability and no rework was needed to the as-built weld supports. The Task Force determined that all 18 of the supports were acceptable on the basis of the facts determined by LP&L and the NRC Task Force.

The applicant, from a generic view point, in reviewing other J. A. Jones Company welding, found that only 22 other work packages existed, some of which was temporary construction or non-safety related welding. A review of the documentation for the additional safety-related welding resulted in finding generally better documentation than existed for the RCB instrument supports. Three Field Change Requests (FCRs) are missing from the documentation, however, the documents verifying that the work was performed have been located. The welds in this additional J. A. Jones construction of safety related work were also found to have low stress imposed during seismic and other loading. In total, the J. A. Jones welding on the RCB instrument supports represented a large percentage of their total welding effort for safety-related items.

The NRC Task Force, after having reviewed the facts and calculations for the RCB instrument cabinets has concluded that the specific item identified as well as the generic aspects have been adequately evaluated and that this issue is resolved.

Document Name:

ISSUE 10

Requestor's ID:

MARLENE

Author's Name:

SHEWMAKER

Document Comments:

QUALIFICATION OF INSPECTION PERSONNEL OF J. A. JONES CO. & F

SSER

Draft 1
December 18, 1984

ISSUE 10: QUALIFICATION OF INSPECTION PERSONNEL OF J. A. JONES COMPANY AND FEGLES POWER SERVICES

The Task Force found that in sampling the qualifications of inspection personnel that certain deficiencies were found among certain of the inspectors from the J. A. Jones Company and Fegles Power Services. By in large, the types of deficiencies found in the qualifications related to the experience periods for prior work in the specific type of inspection work being not equal to that specified in the appropriate reference procedure. The Task Force requested the applicant to review all inspector qualifications for J. A. Jones and Fegles and to show that each met the qualification requirements, or if not to provide information on the impact of any deficiencies on safety. The basis of this issue arose from Allegation A-110.

The applicant responded to this issue in a letter from J. M. Cain (LP&L) to D. G. Eisenhut (NRR), dated October 31, 1984 (W3B84-0807), and then revised that response and submitted Revision 1 by a letter from J. M. Cain (LP&L) to D. G. Eisenhut (NRR), dated December 6, 1984 (W3B84-0818).

With regard to the disposition of deficiencies defined because of "unqualified" individuals as a result of the applicant's additional study, the Task Force reviewed the applicant's resolution in order to place a status on the work these individuals performed as well as the impact of their work on plant safety. Either the status of the work would be unacceptable or acceptable.

For inspection of the basemat construction and soil backfill activities performed by J. A. Jones Company personnel the work of 25 inspectors was in question as a result of the applicant determining this group to be "unqualified." Further study into this matter by the applicant due to the double inspection that was known to exist in the early civil construction activities, revealed that where an inspection function was performed by an "unqualified" J. A. Jones inspector, there was an equivalent EBASCO inspection performed. In each case the EBASCO inspector was found to have been qualified at the time the inspection activity was performed.

Issue 11 has addressed the aspect of this issue relative to qualification of inspectors responsible for the quality of Cadweld splices. The finished splice and the resulting test data and the statistical analysis for consistency of test results clearly demonstrates there is no unresolved safety issue.

Fegles Power Services personnel were not involved in any stages of construction of the common basemat and therefore are not discussed herein.

The Task Force has reviewed the applicant's response and verified the data by sampling. Based on this information, the Task Force has concluded that qualified inspectors from one organization or another did in fact complete inspections. Therefore, in the case of the common basemat, there are no unresolved safety issues relative to "unqualified" inspection personnel. Issue 10 is considered to be resolved.

Document Name:
WATERFORD

Requestor's ID:
CATHY

Author's Name:
SHEWMAKER

Document Comments:
ISSUE 11 CADWELDING

SSER

DRAFT 4
DECEMBER 18, 1984

ISSUE 11: CADWELDING

The NRC staff in initiating the review of the applicant's response to this issue determined that a typographical error had occurred in the NRC letter to J. M. Cain, dated June 13, 1984. The third sentence in Item No. 11 addressed the statistics for the Cadwelds in the basemat which included a range of strengths of "60,750 - 107,051 psi." The range value should have been listed as "80,750 - 107,051" as was indicated in the handwritten draft. This correction should be noted.

The basis for the NRC questions contained in Issue No. 11 arose from the NRC staff review of NRC-W3-6234 in conjunction with Allegations A-113 and A-146 and the fact that the basic data on Cadwelders and Cadwelds were not in a form to allow ready comparisons to the inspection, testing, and acceptance criteria used for the Waterford 3 project and repeated changes and clarifications were continually needed as a result of the mass of data.

NRC-W3-6234 addressed several issues pertaining to Cadweld activities and the associated deficiencies. Deficiencies such as implementation of Cadweld sampling procedures, missing Cadweld inspection records, and uncertified Cadweld inspectors at Waterford 3 project were the major issues.

The applicant, in a response dated September 18, 1984 (W3B84-0485) from J. M. Cain (LP&C) to Darrell G. Eisenhut (NRC) has provided revised information on this issue. The applicant has compiled all of the J. A. Jones Cadweld data into computer data processing format. The Cadweld data has been broken down by building or structural element and Cadweld operators as well as testing program type.

Sorting of this computerized data can be performed on various parameters such as by the Cadweld operators and by building or structural element.

Information provided for each entry on a specific Cadweld provides information on the following characteristics relative to the splice.

- Date the Cadweld was made
- ID number of Cadwelder
- Cadweld number
- Bar size
- Bar position (horizontal or vertical)
- Replacement splice ID for visual reject, if rejected
- Replacement splice ID for production test, if randomly selected for testing
- Tension test result, if tested
- Building where Cadweld is located
- Concrete placement number where Cadweld is located
- Cadwelder qualification and requalification dates
- Visual rejects, if any
- Production and sister tests, if selected

During the week of October 22, 1984, the NRC staff reviewed the volumes associated with the entire computer generated data at the Waterford 3 site for compliance with Regulatory Guide 1.10 and the EBASCO specification, LOU-1564.479, both of which address the technical requirements related to Cadweld testing and inspection.

The applicant, as a result of the review effort, identified three additional minor discrepancies which previously had not been identified. These discrepancies were:

- Replacement splice ID's for three production tests and five visual rejects are not shown on the Daily Cadweld Inspection Report, but with the color coding system used and the preplacement checklist, there is every reason to believe the splices were made and included in the concrete placement.

- Results of one sister splice test (the test data document) could not be located, however, the actual test values had been previously transferred onto test summary sheet so that the tensile strength is known to be acceptable.

- At four locations, welder requalification tests cannot be located, but the records indicate the subsequent 15 splices made by the operator resulted in no visual rejects, thus demonstrating good operator performance.

The NRC staff review and evaluation resulted in the following conclusions:

1. The compiled computer printout data for J. A. Jones construction work on Waterford 3 project Cadweld splices indicated that nearly 3,900 splices were made in the basemat with 81 tensile tests performed, and there were no failures to meet design criteria. Those criteria are that each test splice must carry 125% of the minimum guaranteed steel yield strength (75,000 psi in this case) and the average of any 15 tests must carry 100% of the minimum guaranteed ultimate tensile strength (90,000 psi in this case). The average strength of tested Cadwelds for the basemat is 95,504 psi. In the common foundation structure (CFS) over 2,100 splices were made with 95 tensile tests, and there were no failures to meet design criteria. The average strength of tested Cadwelds is 98,267 psi. In the

fuel handling building (FHB) structure approximately 630 splices were made with 29 tensile tests of which two failed to meet a strength of 125% of the steel yield strength. The average strength of all tested Cadwelds in this structure is 97,886 psi. In the reactor auxiliary building (RAB) structure over 1,800 splices were made with 94 tensile tests, and there were no failures to meet the design criteria. The average strength of tested Cadweld is 101,020 psi. In the reactor containment building (RCB) structure about 6,110 splices were made with 297 tensile tests. There were four failures in the tests. The average strength of the tested Cadwelds is 98,400 psi.

2. For the entire project, over 14,500 splices were made by J. A. Jones of which 586 Cadwelds were tested with six failures to meet 125% of the yield strength of the steel. The average strength of the tested Cadwelds is 98,215 psi. The staff reviewed the test records and results and concluded that except for six failures (<1% failures), each of the tensile tests performed on the Cadwelds met the required minimum yield tensile strength of 75,000 psi (1.25fy = 1.25 x 60 ksi). Additionally, the average of 15 consecutive tensile tests met the requirement of carrying the minimum ultimate steel stress of 90 ksi. This indicated good control was exercised during plant construction.

3. The NRC staff found some minor discrepancies on overall Cadweld splice sampling frequency. However, the visual inspection rate generally met EBASCO specification LOU-1564.479 and the requirements of Regulatory Guide 1.10.

4. Qualification and requalification records of Cadweld operator were clearly documented by qualification dates and the test results. Only in four cases were the Cadweld operator's requalification records missing. In our evaluation we consider that a missing record is a documentation problem and has no impact on the overall quality of the installed Cadweld

splices since we examined the subsequent work records for the operator and found no visual rejects in the next 15 splices, indicating acceptable work.

5. Identification and status of Cadweld splices were documentated by Daily Cadweld Inspection Reports, Cadweld maps, and by a concrete preplacement checklist. Based on our review of computer data and the associated records the staff believes that no significant number of splices could have been omitted or were not accounted for in the concrete placements.

6. Three minor discrepancies, mentioned previously, that had not already been identified in NRC-W3-6234 were found from applicant's review of the computer data base information. The applicant will document and dispositioned these additional discrepancies in a supplement to NRC-W3-6234. We believe these minor discrepancies have no impact on the quality of the Cadweld splices and the staff is aware of how these issues will be addressed.

The Task force notes that there were some additional numbers of Cadwelds made at the Waterford 3 project by EBASCO after J. A. Jones had completed their major construction effort and left the site. These were not been included in the allegations or the summary data assembled for NRC-W3-6234. For instance, in the common basemat, there were several construction blockouts left in the concrete to facilitate other later construction such as cable pulling through embedded conduit. Two blockouts for example , one in Placement 11B and one in Placement 19, of the basemat were closed in March and May of 1984. Each of these necessitated approximately 30 Cadwelds to be made on #11 horizontal reinforcing steel by EBASCO. A review by the NRC staff of the records associated with the above mentioned Cadwelds indicated the criteria had been met. These Cadwelds should be recognized as those in addition to those addressed in the allegations and the Harstead reports.

Based on the staff's complete review of the applicant's computerized J. A. Jones Cadweld splice data and the findings listed above, it is concluded that the installation, inspection, and testing of Cadweld splices which were performed at Waterford 3 project met the project specification requirements and the NRC regulatory requirements. Minor discrepancies and deviations existed in the documentation of records but will not impair the quality of the installed Cadweld splices. The NRC staff concludes that the Cadweld splices are capable of achieving their intended function and the structures will sustain the design loads. Issue 11 is considered resolved.

REFERENCES:

1. Letter from D. G. Eisenhut, NRC to Mr. J. M. Cain, LP&L dated June 13, 1984.

2. Letter from J. M. Cain, LP&L to D. G. Eisenhut, NRC dated September 18, 1984.

3. NRC-W3-6234, Nonconformance Report on Cadwelds, dated May 16, 1983.

4. EBASCO specification LOU-1564.479, R3, February 7, 1984, "Mechanical Splicing of Concrete Reinforcing Steel.

5. J. A. Jones Procedure, WSITP-4, R11, "Cadweld Inspection and Test Procedure."

6. Regulatory Guide 1.10, "Mechanical (Cadweld) Splices in Reinforcing Bars of Category I Concrete Structures," January 2, 1973.

7. LP&L Pre-Licensing Assessment Issue No. 11; Volumes 1-4, dated September 18, 1984.

Document Name:

SSER ISSUE 12

Requestor's ID:

CATHY

Author's Name:

SHEWMAKER

Document Comments:

MAIN STEAMLINE FRAMING RESTRAINTS

Draft 1
December 4, 1984

SSER

ISSUE 12: MAIN STEAMLINE FRAMING RESTRAINTS

As a result of the Task Force's review of the facts and circumstances related to Allegation A-30 it was found that while the drawings of the main steamline framing restraints above elevation +46.0 were consistent with the as-built drawings, there appeared to be missing inspection reports and documentation relative to bolted connections. The applicant was asked to provide the results of such an inspection to the Task Force.

The applicant in a letter dated September 4, 1984 (W3B84-0480A) from J. M. Cain (LP&L) to D. G. Eisenhut (NRR) responded with the results.

It was indicated that the material and initial installation for the main steamline framing restraints was provided by American Bridge. On March 29, 1983 prior to the initiation of the Task Force, the applicant had reported a significant construction deficiency (SCD No. 78) to the NRC to address the evaluation and control of deficiencies related to all American Bridge work at the site. At that time EBASCO and Tompkins-Beckwith were working on this steel on related construction activities so that a decision was made to delay any work associated with SCD No. 78 until the work in that area was completed. As a result, the Quality Assurance Installation Review Group (QAIRG) noted a need for reinspection of the steam generator framing. As EBASCO and Tompkins-Beckwith completed work which included the rework of some connections originally made by American Bridge, the inspection and documentation was completed. What was not identified and tracked for inspection were those connections which remained in their original condition as installed by American Bridge.

Based on this information the applicant initiated a nonconformance report, NCR W3-7736, to address these omitted connections from the reinspection outlined by SCD No. 78. LP&L then had the inspection performed using the same procedures used for SCD No. 78. Of the 12,000 bolts this activity addressed about 850 were replaced with about 500 of those being replaced because the bolt material identification could not be established.

Additionally, the applicant reviewed the scope of the American Bridge work to assure that no other areas which should receive reinspection had been omitted from SCD No. 78. It was found that with the items identified for the steam generator-main steam framing all items had been included so that now the full scope of the American Bridge work had received reinspection.

Also the documentation associated with the rework of connections done by EBASCO and Tompkins-Beckwith was reviewed against the field conditions to be certain all deficiencies were corrected and as-builts were reflected in the drawings.

The NRC Task Force reviewed inspection documentation performed by EBASCO on the main steam restraints. The NRC staff randomly selected bolted connections (16) from installation drawings to determine if reinspection by EBASCO was performed. All connections examined contained adequate inspection documentation. The NRC visually examined the connections in the field to verify that inspections had been performed on the documentation indicated. Work appeared to be complete. No discrepancies were noted during the inspection. The applicant had noted that coatings had not yet been put on the new bolts but is not a constraint on fuel load or power operation.

The Task Force concludes that Issue No. 12 has been adequately addressed. This issue is considered closed.

Document Name:

SSER ISSUE 14

Requestor's ID:

CATHY

Author's Name:

SHEWMAKER

Document Comments:

J.A. JONES SPEED LETTERS AND EIRs

ISSUE 14: J. A. JONES SPEED LETTERS AND EIRs

The basis of this concern arose from the Task Force efforts to address the assertions contained in Allegation A-132. This allegation was that, the J. A. Jones Company had used a form of communication called "speed letters" to report information that should have been reported in deficiency notices (DNs) and possibly in nonconformance reports (NCRs). The Task Force in its review found several items that could affect plant safety during a review of sample documents. A request was made of the applicant who had already initiated a review in this area to complete the effort and resolve any safety issues which arise from the effort.

The applicant responded to this issue in a letter dated September 4, 1984 (W3B84-0480A) from J. M. Cain (LP&L) to D. G. Eisenhut (NRR). The applicant has addressed this issue relative to the J. A. Jones Construction Company as well as other subcontractors on the Waterford 3 project in order to address any generic concern.

Prior to the formation of the NRC Task Force in March of 1984, the applicant had EBASCO working on the records review of J. A. Jones Company and it was determined that all civil engineering related speed letters and engineering information request (EIRs) should be reviewed by EBASCO site engineering.

This effort began in January of 1984. Some 2,100 documents were reviewed and 271 were identified as conveying design changes without proper documentation. Each of these instances was then pursued further and 104 were found

to have other documentation within the formal QA program such as a field change request, design change notice, a nonconformance report or a specification which addressed the issue. The remaining 167 were subjected to engineering review and analysis and have been assessed as being acceptable without any needed hardware changes.

The NRC Task Force reviewed a sample of 17 of the 271 items with nearly a 50/50 split between those indicated by the applicant as having adequate documentation and those assessed as having inadequate or no documentation and therefore necessitated further engineering evaluation. Many of these EIRs reviwed requested information for cutting and splicing of reinforcing steel. Some of the EIRs had supporting documentation such as a field change request (FCR). Those EIRs that had no supporting documentation were evaluated by EBASCO engineering and found to be acceptable as-is. EIRs reviewed by the Task ·ce indicated that the changes made were all within standard industry practice.

To address the generic question related to how other subcontractors handled items in their specific construction specialty area the applicant undertook a minimum 10% sampling program of each subcontractor's information requests (IR). This involved 14 other subcontractors as well as 5 separate disciplines in the EBASCO construction organization. LP&L has provided summaries and tabular data of the results of nearly 24,000 of these types of documents in the response to this issue. At the outset of the 10% sampling program the applicant set forth guidelines for the execution of the sampling program. First, the 10% was selected on a random basis. Second, the reviewer could not review a

document which dealt with an issue he had previously worked on and would proceed to review the next numbered item if such an instance arose. Third, if the total number of information requests issued by any subcontractor was 50 or less a complete review was done instead of the 10% sample. Fourth, if any instances of design control violations were found in the samples, the sample size was increased by 10% with further expansion of the sample as deemed appropriate.

Of the total of 19 entities reviewed, 12 had no items identified which violated the plant's design control procedures. There were a total of 4 where the sample size was expanded with 2 of these going to a 100% review. Two of the remaining 3 had 100% sample because the total number of documents was less than 50. The last entity had 10% of the items reviewed with 5% of those requiring evaluation. In total, out of the nearly 24,000 information request documents, of which more than 3,000 were reviewed, about 5% were identified as violating the design control procedures. Engineering evaluation of these resulted in only 2 items requiring rework of American Bridge work, which was one of the subcontractors who was subjected to 100% review of information request type documents.

The Task Force sampled 4 of the 19 entities and reviewed some 60 of the documents in order to verify that the documents had been properly reviewed and evaluated by EBASCO engineering. The review of the information requests indicated that those which appeared to be design changes were in fact evaluated and dispositioned by EBASCO engineering. The Task Force also review sample information requests which were not considered to be design changes and it was noted many of these were not safety-related items. No items were found improperly dispositioned.

Based on the extensive review the Task Force has concluded Issue 14 has been fully resolved.

Document Name:
ISSUE 15

Requestor's ID:
MARLENE

Author's Name:
SHEWMAKER

Document Comments:
WELDING OF D MATERIAL IN CONTAINMENT

SSER

Draft 1
December 4, 1984

ISSUE 15: WELDING OF "D" MATERIAL IN CONTAINMENT

The basis for the NRC concerns and questions contained in Issue 15 resulted from the Task Force review of Allegation A-259. It was alleged that steel material known as "Class D" material used by Chicago Bridge and Iron (CB&I) in the fabrication of certain non-pressure bearing structural components inside the containment building was not welded with traceable weld rod and the welds were not traceable to a specific welder.

The Task Force reviewed the welding of "D" level material for containment attachments. The containment spray system structural component welds were chosen for specific detailed review. Sample welds on the containment spray piping supports were checked for weld rod traceability and welder identification and certification. The applicant was unable to produce the documentation sought for the staff review.

The Task Force requested the applicant to (1) locate the documentation and verify the adequacy of the information, or (2) perform a material analysis and NDE work, or (3) rework the welds.

The applicant, in a response dated September 14, 1984 (W3B84-0481) from J. M. Cain (LP&L) to D. G. Eisenhut (NRR), provided information relative to this issue.

The licensee determined that the specific containment spray system items reviewed by the Task Force with exception of two cases consisted of temporary supports which have been abandoned. An analysis of the two cases was performed

by the applicant which demonstrated that the containment spray piping is adequately supported without assuming any contribution by the two struts attached to "D" level material. The permanent containment spray system structural component supports were welded by Tompkins-Beckwith and are fully documented.

To assess this issue, the Task Force reviewed the containment spray drawings for the scope of work performed by CBI and Tompkins-Beckwith. The drawings specify that Tompkins-Beckwith weld the containment spray piping component supports to "B" level material clips which were welded by CB&I to the containment vessel. The welding performed by Tompkins-Beckwith is documented on weld records which include welder, filler material, and inspection results. This resolves the Task Force's concern with welding containment spray system structural components.

With regard to weld material traceability the applicant has indicated that although unique weld material traceability cannot be obtained for welding "D" level material, the CB&I QA program required that all welding material used by CB&I be certified material. Also it was indicated that welder identification for individual welds is not available for field welds since the CB&I program did not require process control records for welding "D" level material. However, all welders used by CB&I on this project were qualified in accordance with ASME Section IX.

The Task Force found that in its review of the records that in the areas where CB&I welded "D" level material, the records validate the applicant's statement that all weld material used by CB&I was certified material and all CB&I welders on this project were qualified.

The applicant also indicated that the CB&I QA Manual required that the site welding/QA supervisor inspect the fit-up, welding in progress and finished welds on all classes of work.

The Task Force reviewed the CB&I instructions to determine the applicable welding procedure specification (WPS) for welding the "D" level material. For the applications involved, WPS-E7018/71-2426, Revision 2, was specified for the welding. This procedure specifies that E7018 electrode shall be used for all welding. The procedure was qualified for the material types and thicknesses specified for the "D" level material.

Additionally the project files showed that 25 weld material heat control numbers for E7018 electrode were issued to the site and 13 weld material heat control numbers for E7018 electrode were issued to the shop for this project. All 38 weld material heat control numbers for E7018 electrode were reviewed and found to be certified. All welders employed on site by CB&I for this project were given a welder symbol and their qualification records placed in the project file for welders. The project file consisted of 101 welders and each welder was qualified for welding the specified welds for "D" level material. This satisfactorily resolved the issue concerning the use of certified material and qualified welders by CB&I for welding "D" level material.

The applicant also took a sample (greater than 10%) of welds for visual inspection based on review of all the welds to "D" level material. The polar crane girder assembly and the maintenance hatch supports were identified as the significant structural applications and from these a sample of 405 welds was

selected to be inspected and documented in NCR W3-7792. On the basis of the satisfactory results of the sample inspection, the licensee stated that all CB&I "D" level material welds are considered satisfactory and may be used as is.

The visual inspection of welds was reviewed by the Task Force under Issue No. 6 and has been satisfactorily resolved.

The Task Force has concluded that the applicant has fully resolved this issue.

Document Name:

WATERFORD/1

Requestor's ID:

CATHY

Author's Name:

SHEWMAKER

Document Comments:

ISSUE 19: CONDUITS

SSER

DRAFT 2
December 18, 1984

ISSUE 19: WATER FILLED CONDUIT IN BASEMAT

The basis for the NRC question contained in Issue No. 19 resulted from the field walkdown inspection conducted by the NRC staff. It was observed during May of 1984 that a 4-inch diameter riser for the groundwater monitoring piezometers was filled with water above the level of the basemat. This indicated leakage into a penetration (conduit) in the basemat apparently from groundwater. These facts were noted in Allegation A-139. The NRC staff requested a systematic review be made for all conduits penetrating the basemat structure.

The applicant, in responses dated August 10, 1984 (W3B84-0467) and November 21, 1984 (W3B84-0817) from J. M. Cain (IP&L) to D. G. Eisenhut (NRC) has provided the response to this issue.

During May of 1984, EBASCO personnel completed a walkdown of the entire basemat and identified 83 conduits. At that time 29 indicated wetness due to seepage and 12 were found which had indications of previous leakage. Originally these conduits were sealed with a silicone foam. The work completed by EBASCO also resulted in a recommendation that, for those conduits identified with current leakage or some evidence of previous leakage, the existing silicone foam should be completely removed and replaced with a light density silicone elastomer. This new material was selected on the basis of tests conducted on 4-inch thick plugs of the material providing a fire rated hydrostatic seal for 20 psi. For application to the subject conduits in the basemat where the computed worst case hydrostatic pressure could reach about 23 psi if water were standing at a grade elevation of +17.5 feet, EBASCO will utilize a 6-inch plug of the light density silicone elastomer as the seal.

The 4-inch diameter piezometer riser or standpipe will be grouted with cement grout under pressure over the entire 12-foot thickness of the basemat and valved off at the top.

Additionally, the applicant examined the possible consequences of seepage from the conduits on plant safety and determined that the flow path was not sufficient to flood the auxiliary building basement even before the initial sealing in late 1983 with the original material. The floor drain and sump pump system were more than adequate to discharge the quantity of water entering during construction, and to collect and control the reduce quantities now observed. The applicant noted, as has been observed by the NRC staff, that currently, (spring and summer of 1984) most of the seepage evaporates before collecting in sufficient quantity to traverse to a floor drain by surface flow.

The applicant will complete the pressure grouting of the 4-inch diameter piezometer riser prior to fuel load whereas the light density silicone elastomer seals in the conduits will be completed as a maintenance item and is not related to fuel loading, but can be completed after that date.

The NRC staff has reviewed this information and based on the facts and commitments made by LP&L finds this issue to be resolved.

Document Name:

ISSUE 20

Requestor's ID:

CATHY

Author's Name:

SHEWMAKER

Document Comments:

QUALIFICATION RECORDS CONSTRUCTION MATERIALS TEST PERSONNEL

SSER

DRAFT 1
December 18, 1984

ISSUE 20: "QUALIFICATION RECORDS OF CONSTRUCTION MATERIALS TEST PERSONNEL"

The Inquiry Team, which functioned as part of the NRC Task Force, identified that certain GEO personnel involved in construction materials testing during the construction of Waterford 3 were qualfied for their jobs on the basis of written statements by others which attested to their training and work experience. The team requested further assurance to support the actual work experience and training referenced in the written statements. This issue was identified in Inspection Report 50-382/84-34.

The applicant responded to this issue in a letter from J. M. Cain (LP&L) to D. G. Eisenhut (NRR), dated October 31, 1984 (W3B84-0807), and then revised and submitted Revision 1 by a letter from J. M. Cain (LP&L) to D. G. Eisenhut (NRR), dated November 21, 1984 (W3B84-0817).

With regard to the disposition of deficiencies defined because of "unqualified" individuals as a result of the applicant's additional study, the Task Force reviewed the applicant's resolution in order to place a status on the work these individuals performed as well as the impact of their work on plant safety. The Task Force had either a status category of acceptable or unacceptable.

The personnel under scrutiny in this instance were those generally disignated as "Level I inspectors." The ANSI N45.2.6-1973 standard to which the applicant was committed requires the following as technical qualification for performance of inspection and testing functions:

"A Level I person shall have experience or training in the performance of the inspections and tests that he is required to perform. He shall be familiar with the tools and equipment to be employed and shall have demonstrated proficiency in their use. He shall be familiar with inspection and measuring equipment calibration and control methods and shall be capable of verifying that the equipment is in proper condition for use."

There were three major areas where GEO Level I personnel doing construction materials testing were involved with part of the quality control efforts. These were in the area of soil backfill placement, reinforcing steel splicing, and concrete construction activities. The applicant selected the "key test" in each of these material categories as the indicator to be used for final judgment regarding the acceptability of the GEO work.

For soil backfill, the in-place field density test was selected as the bottom-line measure of quality. For Cadweld splicing of reinforcing steel the tensile tests were utilized as the bottom-line indicator and for concrete the cylinder compresive tests were utilized. The Task Force, while not in disagreement with this approach, notes that each of these materials had several other in-process tests or inspection activities performed on them prior to these "key tests" which may or may not measure or define a property or characteristic determined by the final "key" testing. The Task Force does, however, conclude that these "key tests" are very relevant to a determination as to whether all the tests were properly run. The applicant has provided a simple, clear, and concise description of the test requirements and test execution. In the case

of the concrete and soils, testing statistical studies were performed by the applicant to ascertain if there were any statistically significant variations in results across a sample of the test results due to personnel. Based on this effort it was determined that the test results were in a narrow band and demonstrated low within-test coefficients of variation. This indicates the tests were uniformly and properly performed. These facts along with the procedures and the industry standards which generally defines the step by step process of the test (ASTM, AASHTO, ETC.) and the fact the GEO did complete training for all personnel prior to assignment to perform the inspection or testing, provides the Task Force the basis for concluding the work performed by these personnel was adequate. The Task Force has concluded that the testing and inspecting results obtained by GEO personnel for the project correctly reflect the materials used and the as-built conditions at Waterford 3 and their work is assessed as being acceptable. Issue 10 is considered to be closed.