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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)
)
GEORGIA POWER COMPANY, et al.) Docket Nos. 50-424 (OL)
) 50-425 (OL)
(Vogtle Electric Generating Plant,)
Units 1 and 2))

APPLICANTS' REPLY TO INTERVENORS' RESPONSE
TO APPLICANTS' MOTION FOR
SUMMARY DISPOSITION OF CONTENTION 7

I. INTRODUCTION

On July 15, 1985, Applicants submitted to the Board "Applicants' Motion for Summary Disposition of Joint Intervenor's Contention 7 (Ground-water)" and "Applicants' Statement of Material Facts As to Which There Is No Genuine Issue to Be Heard Regarding Joint Intervenor's Contention 7 (Ground-water)." Applicants supported their motion with the "Affidavit of Thomas W. Crosby, Clifford R. Farrell, and L. R. West" (Affidavit of Crosby et al.) and the "Affidavit of D. S.

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Jagannathan, Stephen S. Cereghino, and Mark L. Mayer" (Affidavit of Jagannathan et al.).

On August 9, 1985, Joint Intervenors late filed "Intervenors' Response to Applicants' Motion for Summary Disposition of Contention 7" (hereinafter "Intervenors' Response"). Joint Intervenors did not support their response by countering affidavit or otherwise, but instead purported to recount comments of Mr. William F. Lawless. Joint Intervenors also submitted "Intervenors' Statement of Material Facts Relating to Contention 7," which repeated nearly verbatim Mr. Lawless' comments. Joint Intervenors' amended their response without the Board's leave on August 21, 1985,^{1/} but still did not provide any evidentiary support for their response as required by the Commission's Rules of Practice.

On August 26, 1985, Applicants filed "Applicants' Motion to Strike, and in the Alternative for Leave to Reply to, Intervenors' Response to Applicants' Motion for Summary Disposition of Joint Intervenors' Contention 7." Although the Board has not yet ruled on Applicants' motion for leave to reply, Applicants now submit their reply for the Board's consideration in accordance with the Appeal Boards's recent guidance in Louisiana Power & Light Co. (Waterford Steam Electric Station,

^{1/} Joint Intervenors had requested permission to file an amendment, if necessary, by August 20.

Unit 3), Docket No. 50-382, ASLAB Order dated February 13, 1985. In support of this reply Applicants also submit "Geotechnical Verification Work -- Report of Results" (Aug. 1985) (Exhibit A hereto), the Affidavit of Thomas W. Crosby and Lewis R. West (authenticating and sponsoring Exhibit A), and the Affidavit of Walter R. Ferris.^{2/}

As discussed in Applicants' Motion to Strike, previously submitted to the Board, 10 C.F.R. § 2.749(b) precludes Joint Intervenors from relying on mere allegations or denials in opposing a properly supported motion for summary disposition. Instead, Joint Intervenors are required, under the Commission's Rules of Practice, to proffer countering evidentiary material or explain in an affidavit why it is impractical to do so. Joint Intervenors have done neither.

If the Board decides not to strike Joint Intervenors' Response, Applicants submit that the Board should still assign no weight to mere allegations or denials in that response. Such statements in Intervenors' Response are not evidence and cannot be used to rebut averments in the affidavits supporting Applicants' motion. The Board should also disregard any statements that are irrelevant, speculative, or inadmissible lay opinion.

^{2/} Applicants also attach as Exhibits B through G, documents or relevant portions thereof cited in Intervenors' Response. These documents are provided so that the Board may judge for itself the accuracy of Mr. Lawless' comments.

Even if such statements had been submitted in an affidavit, they would be entitled to no weight. See 10 C.F.R. § 2.749(b) (requiring that affidavits set forth such facts as would be admissible in evidence and show affirmatively that the affiant is competent to testify to the matters stated therein).

In this regard, Mr. Lawless is not competent to testify to many of the comments he makes. Intervenor's Response does not indicate that Mr. Lawless has the requisite personal knowledge of the matters he recounts or that he believes them to be correct. Moreover, Mr. Lawless is not a geologist or hydrogeologist. See Intervenor's Campaign for a Prosperous Georgia and Georgians Against Nuclear Energy Response to Applicants' Third Set of Interrogatories and Request for Production (Feb. 6, 1985) at 6-7 (Response to interrogatory G-4). His deposition testimony establishes his lack of qualifications to testify concerning these subjects. Mr. Lawless has never studied geology, and has studied hydrology only as part of another course he took at Louisiana State University. Deposition of William Lawless (March 26, 1985) at 55-56 (hereinafter referred to as "Lawless Deposition"). It is evident from his deposition that Mr. Lawless does not know how to calculate ground-water travel time. Id. at 57-62. Nor does Mr. Lawless' experience as an employee at the Savannah River Plant qualify him as an expert on ground-water. Mr. Lawless' experience pertained generally to waste management, not specifically to hydrogeology.

Mr. Lawless was responsible for directing long-term research on waste-management, but engaged in no research himself. Id. at 31-35. Mr. Lawless is therefore not an expert on ground-water and is not competent to give opinion testimony.

In addition, many of Mr. Lawless' comments do not relate to Plant Vogtle, but instead address the Savannah River Plant (SRP). Although Mr. Lawless apparently assumes that statements and events pertaining to SRP are applicable to VEGP, Mr. Lawless never demonstrates their applicability. Moreover, he ignores or dismisses Applicants' analysis distinguishing Plant Vogtle from SRP. The SRP reservation is over 300 square miles, and its geology and hydrogeology vary significantly in different areas of the reservation. Affidavit of Crosby et al., ¶¶ 62-64. SRP operations and practices are very different from those at VEGP. In the absence of any demonstrated applicability to VEGP, comments relating to SRP are irrelevant.

Finally, almost all of Mr. Lawless' comments are vague and conclusory. Applicants made a vast amount of information and data available to Joint Intervenor during discovery, most of which is also contained in the FSAR, PSAR, OL-ER, CP-ER, and Applicants' "Ground-water Supplement." Mr. Lawless' comments make readily apparent that he has examined little if any of this data. His comments are seldom factual or specific, and the few references he cites are mischaracterized and non-supportive. These comments, which are for the most part

denials and disparagement devoid of substance, do not raise a genuine issue of material fact that would warrant denial of Applicants' motion.

II. Mr. Lawless' Comments Are Unsupported,
Inaccurate, Irrelevant, and Immaterial

A. Mr. Lawless' General Comments

Mr. Lawless' analysis begins with a number of general comments. First, Mr. Lawless states that the fees for preparing the affidavits should be provided, as well as the "groundwater management plan costs." Mr. Lawless, however, cites no authority for this proposition, and does not explain why these fees and costs are required to be included in Applicants' affidavits. They are not. This sort of information is never included in affidavits or in direct testimony. Applicants' motion and affidavit present a sufficient, prima facie case, and if Joint Intervenors wish to attack that case, it is Joint Intervenors' responsibility under the Commission's Rules of Practice to aver specific contradicting or discrediting facts. See 10 C.F.R. § 2.749(b).

Mr. Lawless' second general comment is that "the 1971 groundwater chemical analyses should be updated." This comment does not address Applicants' motion or affidavits, and its relevance is obscure. Of greater concern, however, is Joint Intervenors' failure to mention the facts they learned during

discovery. In response to Joint Intervenor's interrogatories, Applicants informed Joint Intervenor that chemical analyses had been performed at various times between 1977 and 1982 at a number of wells. Applicants' Response to Intervenor's First Set of Interrogatories and Request for Production of Documents (Nov. 29, 1984) at 34-35. Applicants produced these analyses for inspection and copying. Applicants' Response to Intervenor's Third Set of Interrogatories and Request for Production of Documents (Feb. 13, 1985) at 39.

Mr. Lawless also remarks in his second comment that "[i]t has been found that Sr-90 contamination in the VEGP . . . area, likely due to SRP releases, is significant," and he cites the FES without page number. There is, however, no such finding in the FES. Mr. Lawless provides no basis for his allegation, and Applicants are aware of none.

Mr. Lawless' third general comment is that statistical inference has not been used with the ground-water data collected at VEGP. Mr. Lawless, however, does not specify what data he believes should have been treated statistically, what sort of analysis should have been performed, or what such analysis would have shown. Furthermore, there is no requirement that Applicants perform a statistical analysis, nor is such approach customary for the type of data upon which Applicants relied. Mr. Lawless remarks that the lack of such treatment "may obscure" flaws in Applicants' conclusions. This remark is

speculative. Applicants' data were made available to Joint Intervenors, yet as further discussed below, Joint Intervenors and Mr. Lawless provide no evidence of any flaws in the conclusions drawn by Applicants from that data.

Mr. Lawless' fourth general comment is that Applicants have failed to address the effect of settlement on the impermeability of the marl. Mr. Lawless remarks:

The sinking of the VEGP facility, sitting directly atop the marl, represents plastic deformation or fracture of the marl and may defeat the marl as well as by differential downward flow rates of the grouted wells underlying the facility.

This remark is unintelligible. "Plastic deformation" by definition is deformation that occurs without fracture, and the phrase "differential downward flow rate of grouted wells" is meaningless. Moreover, Mr. Lawless provides no evidence or support for his comment, and makes no attempt to address (or even acknowledge) the data and information in the FSAR and PSAR concerning settlement. FSAR, § 2.5.4; PSAR, App. 2C.

The unintelligibility of and lack of support for Mr. Lawless' comment aside, Mr. Lawless' comment regarding settlement is an attempt to interject a new issue at the eleventh hour. Joint Intervenors' raising this matter now for the first time does not warrant denial of Applicants' motion. Applicants' motion and affidavits present a direct, prima facie case. That alone makes Applicants' motion sufficient. Applicants also

addressed all allegations which Joint Intervenors raised during discovery or elsewhere in their pleadings. During discovery, Applicants asked Joint Intervenors and Mr. Lawless to describe any basis they might have to believe the marl was not an effective aquiclude. Neither Joint Intervenors nor Mr. Lawless ever mentioned a concern about settlement. CPG/GANE's Response to Applicants' First Set of Interrogatories and Request for Production of Documents (Dec. 5, 1984) (answers to interrogatories 7-22 to 7-27 on unnumbered pages 8-9); Intervenors Campaign for a Prosperous Georgia and Georgians Against Nuclear Energy Response to Applicants' Third Set of Interrogatories and Request for Production (Feb. 6, 1985) at 5 (answer to interrogatories 7-57 and 7-58); Lawless Deposition at 85-88.

Although there are more than sufficient grounds to disregard Mr. Lawless' comment on settlement, Applicants have nevertheless chosen to respond substantively. As the Affidavit of Walter R. Ferris demonstrates, Applicants' investigation of the marl did not cease with site excavation. Applicants have monitored settlement, which is now effectively complete. The combined weight of the compacted backfill and the powerblock structures has resulted in a net settlement of less than an inch in the powerblock area. The marl is a firm, preconsolidated, calcareous claystone easily capable of absorbing this small amount of settlement without fracturing. Moreover, the marl is not subject to fracturing through failure of

the lower sands. As shown in Section 2.5.4 of the FSAR, the lower sands have physical strength and elastic physical properties essentially the same or greater than the overlying marl. Therefore, settlement is absorbed elastically in the marl and lower sands, not by brittle failure of the marl as Mr. Lawless intimates. Accordingly, settlement has had and will have no effect on the permeability of the marl. Affidavit of Walter R. Ferris, ¶¶ 3-8.

This conclusion has been confirmed by post-settlement investigation. During this summer, Applicants conducted further core drilling and in-situ permeability testing of the marl, observation well installation, and laboratory testing including measurement of the marl permeability. This investigation is documented in Exhibit A.

The core drilling demonstrated a lack of voids, altered zones, or fractures, and verified that the marl is a fine-grained, competent and firm material without secondary openings. The in-situ permeability tests measured no water inflow. The laboratory tests showed the marl permeability to be consistently very low to practically impermeable, ranging from 1.4×10^{-6} to 5.0×10^{-9} cm/sec. The additional observation wells installed in the marl are providing data consistent with previous observations. Exhibit A at 3-4.

Mr. Lawless' fifth and last general comment is that "[t]here appear to be numerous flaws in the affidavits provided

by Bechtel geologists and engineers." This comment is vague, conclusory, and unexplained. Scrutiny of Mr. Lawless' specific comments relating to the Affidavit of Crosby et al., discussed below, demonstrates that there is no basis for Mr. Lawless' characterization.

B. Mr. Lawless' Comments on the
Affidavit of Jagannathan et al.

Mr. Lawless next proceeds to comment on the Affidavit of Jagannathan et al. He first states, "Long term operational processes contribute to radionuclide and hazardous chemical migration not only through the accidental equipment failure pathway but also through continuous, minor but neglected leaks that accumulate and eventually become significant in total impact." The relevance of this remark is not apparent. Mr. Lawless provides no basis for his assumptions that there might be continuous minor leaks or that such leakage would be neglected; nor does he claim that such leakage would produce a more significant impact than Applicants' tank rupture analysis. It would not. Applicants' analysis is a worst-case analysis. Mr. Lawless' first comment on the Affidavit of Jagannathan et al. is irrelevant.

Mr. Lawless' second comment on the Jagannathan Affidavit suggests that Applicants' demonstrated (and undisputed) compliance with the applicable regulatory standards for constructing tanks and systems containing radioactive liquid is

insufficient, absent provision of operating experience. In the same vein, Mr. Lawless' third comment asserts that "[c]ompany and industry experience with RHT/WECHT containment, and refueling water and reactor makeup water tanks should be provided. . . ."

The Appeal Board has held, however, that in the absence of a showing by intervenors that the Commission's regulations are inadequate to protect the public health and safety, an applicant satisfies its burden of persuasion by demonstrating compliance with applicable Commission regulations; and an applicant's compliance with the pertinent Regulatory Guides evidences compliance with those regulations. Maine Yankee Atomic Power Co. (Maine Yankee Atomic Power Station), ALAB-161, 6 A.E.C. 1003, 1008 (1973); Petition for Emergency and Remedial Action, CLI-78-6, 7 N.R.C. 400, 406-07 (1978). Mr. Lawless does not dispute Applicants' compliance with applicable standards, and he cites no evidence or facts to suggest that the standards are inadequate. Mr. Lawless' comment is therefore tantamount to a totally unsupported attack on the Commission's rules.

In Mr. Lawless' second comment on the Jagannathan Affidavit, Mr. Lawless also disparages the affiants' statement that the Commission's standards are stringent. He characterizes this statement as "only an assertion," but offers no facts or evidence contradicting that assertion. Similarly, in his

fourth comment on the Jagannathan Affidavit, he disparages the affiants' statement that even if a fracture did traverse the entire thickness of the auxiliary building wall, flow through such fracture would not necessarily be outward. See Affidavit of Jagannathan et al., ¶¶ 7-8. Mr. Lawless characterizes this statement as "speculative and opinionated."^{3/}

These statements, however, are not mere assertions and speculation. Rather, they are averments and the expert opinion of qualified experts, including Dr. Jagannathan -- a civil and structural engineer with twenty years' experience. The affiants' expert opinions are entitled to weight.

C. Mr. Lawless' Comments on Applicants' Statement of Material Facts

Mr. Lawless characterizes Applicants' Statement of Material Facts as "a legal disputation, not a technical analysis." The Statement of Material Facts, however, is not meant to be a technical analysis. The technical analysis supporting Applicants' motion is contained in Applicants' supporting affidavits. The Statement of Material Facts is a legal pleading prepared and signed by counsel.

^{3/} Mr. Lawless suggests that if a crack is at the bottom of the auxiliary building wall and the air pressure is maintained, no influx "may" result. Mr. Lawless does not explain, however, how the pressure in the auxiliary building (which is atmospheric) is going to counteract the approximately 45 foot hydraulic head at the bottom of the auxiliary building (the base of the auxiliary building is at elevation 119 and the top of the water table aquifer is at elevation 165 approximately). See Affidavit of Jagannathan et al., ¶¶ 7, 15.

Mr. Lawless' first comment on the Statement of Material Facts is a denial that Applicants have extensively explored the geology and hydrology at Plant Vogtle. This exploration is described in the Affidavit of Crosby et al., ¶¶ 14-20. The description clearly demonstrates the comprehensiveness of the exploration.

Mr. Lawless next refers to paragraphs 2 and 3 of the Statement of Material Facts and asserts, "Applicants admit the geology and hydrology under the blue marl is uncertain." Applicants made no such admission. The only uncertainty mentioned by Applicants is whether the Ellenton Formation exists at VEGP between the Cretaceous and Tertiary aquifers. Ellenton beds have not been positively identified beneath the VEGP site. This one point, however, is irrelevant, because Applicants have conservatively assumed that the Tertiary and Cretaceous aquifers are hydraulically connected, and have placed no reliance on the Ellenton Formation as an additional aquiclude. See Affidavit of Crosby et al., ¶ 21.

Mr. Lawless' third comment refers to paragraphs 4-6 of Applicants' Statement of Material Facts. Mr. Lawless claims that Applicants are basing their conclusion that the marl is 70 feet thick, confines the Tertiary/Cretaceous aquifers, and is impermeable, on a nonstatistical treatment of inadequate data. Mr. Lawless claims that Applicants' conclusion is based primarily on data from 22 exploratory holes. Mr. Lawless, however,

makes no attempt to perform a statistical analysis of the data himself or to explain what such analysis would show.

As previously discussed, Applicants are not required to perform a statistical analysis. Moreover, Mr. Lawless' description of the basis for Applicants' conclusion is a distortion of the facts. Applicants based their conclusion about the extent and effectiveness of the marl as an aquiclude on data from over 200 exploratory holes, and not just on the 80 in-situ permeability measurements that were made at different intervals in 22 of these holes. In addition to the in-situ permeability measurements, this data includes the results of laboratory tests, extensive drilling, coring, Standard Penetration Testing, undisturbed sampling, visual inspection, and monitoring the hydraulic head potential between the water table and confined aquifers. Affidavit of Crosby et al., ¶¶ 19, 26-34; Exhibit A at 4-19. Mr. Lawless' comments do not reflect any consideration or review of the extensive and reliable data base derived by the Applicants by these different means, which data was made available to Joint Intervenor.

With respect to the 22 holes in which in-situ permeability tests were performed, Mr. Lawless remarks, "Three of these holes drew water and three others were discounted, thereby increasing the uncertainty of the explorative data. . . ." As the Affidavit of Crosby et al. makes clear, the measurements that were discounted in three of the 22 holes were due to

leakage around the packers isolating the intervals of the marl being tested. The inflow that was detected in two of the other holes was in near surface, weathered marl. Id., ¶ 28. Furthermore, as Exhibit A demonstrates, an additional 15 in-situ permeability tests of the marl have recently been performed, none of which resulted in measurable water inflow, and these results have been confirmed by laboratory measurements of marl permeability. Exhibit A at 8-10 and Table 2.

Mr. Lawless' fourth comment refers to paragraph 7 of Applicants' Statement of Material Facts. Mr. Lawless claims that Applicants have based their assertion that the marl is continuous on data from only one well series. Paragraph 7 of Applicants' Statement of Material Facts, however, states, "The continuity of the marl has been demonstrated by drilling and coring, by visual inspection of cored samples, by inspection of the marl surface during site excavation, by inspection of marl outcrops along the Savannah River, and by comparison of water levels in observation wells open to the water table aquifer with those observed in wells open to the confined aquifer immediately below the marl." Paragraphs 29-34 of the Affidavit of Crosby et al. are cited, and describe this exploration. Furthermore, the data from well series 42, which monitored differences in hydraulic head across the marl, have been and are still being supplemented and confirmed by a number of additional wells whose location and dispersion are shown in Figure 1 of Exhibit A.

Mr. Lawless' fifth comment refers to paragraphs 8-9 of Applicants' Statement of Material Facts. Mr. Lawless claims Applicants' statement that VEGP is on an interfluvial underlain by the blue bluff marl is flawed because Applicants have not statistically treated their data. Again, there is no such requirement, and a statistical treatment is not customary for data of the type relied upon by Applicants. Mr. Lawless does not identify the specific data to which he is referring, and does not explain what sort of statistical analysis should be performed. Mr. Lawless himself makes no attempt to analyze the extensive data on which Applicants' conclusion is based. Moreover, Mr. Lawless has stated that he does not dispute the existence of the marl beneath the VEGP site (Lawless Deposition at 84), and the existence and extent of the interfluvial is visually observable. See Affidavit of Crosby et al., Figure 6.

Mr. Lawless' sixth comment refers to paragraphs 10-13 of Applicants' Statement of Material Facts, paragraphs which in turn refer to the Affidavit of Jagannathan et al. Mr. Lawless repeats the comments previously discussed -- that operating experience of tank systems should be presented and that the affiants' opinion should be ignored. Mr. Lawless still neither disputes Applicants' compliance with applicable NRC standards nor provides any factual basis discrediting those standards. Applicants' reply, stated on pages 11-12 above, remains the same.

Mr. Lawless also remarks that Applicants address only radioactive waste releases and have left out all reference to hazardous chemical releases. Applicants do not know what hazardous chemicals Mr. Lawless believes might be released to the ground-water at VEGP or the manner in which Mr. Lawless speculates such a release might occur. Mr. Lawless provides no evidence or factual basis in support of the alleged possibility. More to the point, however, is the Board's ruling admitting this contention. The Board discerned the gravamen of the contention to be that "an accidental spill of radioactive water on the site could result in radioactive contamination of the shallow, and possibly the deeper, aquifers under Plant Vogtle. . . ." LBP-84-35, 20 N.R.C. 887, 900 (1984) (emphasis added). This possibility was the concern stated in the basis for Contention 7, and it is the issue Applicants have addressed. Mr. Lawless' comment is thus irrelevant.

Mr. Lawless' next comment refers to paragraphs 14 and 17 of Applicants' Statement of Material Facts. Mr. Lawless refers to Applicants' conclusion that an accidental spill at VEGP would not migrate across the marl. Mr. Lawless remarks "rhetoric is not an efficacious barrier to the migration of radioactive or hazardous wastes." The marl, however, is such a barrier -- as demonstrated by extensive exploration and testing. Applicants' conclusion is not just rhetoric, but is supported by affiants' averment and expert opinion based on the extensive

exploration described in their affidavit. Mr. Lawless provides no evidence and makes no factual assertions contradicting the conclusion.

With respect to paragraph 15 of Applicants' Statement of Material Facts, Mr. Lawless baldly asserts the applicability of Savannah River Plant (SRP) experience to Plant Vogtle. Mr. Lawless, however, provides no factual support for his assertion, other than to remark that Applicants have made statements similar to statements made by SRP. Mr. Lawless refers to ERDA 1537, which he characterizes as an assertion that the marl is present under SRP and would prevent downward migration of contaminants. Mr. Lawless contrasts this statement with the recently-discovered contamination of the Cretaceous aquifer at the SRP A/M area. The statement in ERDA 1537 to which Mr. Lawless appears to be referring -- the statement which he quotes on page 9 of Intervenor's Response -- however, does not address the A/M area where clay aquicludes are discontinuous. That statement addresses only the H area, where clay aquicludes are present and where contamination of the confined aquifer has not occurred. ERDA, "EIS: Waste Management Operations, Savannah River Plant," ERDA-1537 (1977) at II-152 (attached as Exhibit B). Mr. Lawless mischaracterizes the statements made at SRP, ignores Applicants' analyses of the SRP experience (Affidavit of Crosby et al., ¶¶ 60-72), and ignores Applicants' extensive exploration of the VEGP site.

With respect to paragraph 16 of Applicants' Statement of Material Facts, Mr. Lawless claims that the statement regarding the efficacy of the tremie method is an "advertisement and not a scientific or engineering statement." Applicants' statement, however, is supported by explanation, averment, and expert opinion. Affidavit of Crosby et al., ¶ 72. Again, Mr. Lawless provides no evidence or facts disputing the efficacy of the tremie method. Furthermore, Mr. Lawless' deposition reveals that he is not familiar with methods of sealing wells. Lawless Deposition at 123.

With respect to paragraph 18 of Applicants' Statement of Material Facts, Mr. Lawless claims that Applicants' data do not agree with Applicants' statement regarding the direction of ground-water flow. He provides no explanation, however. This unexplained and unsupported claim warrants no response.

In his comment on paragraph 19 of Applicants' Statement of Facts, Mr. Lawless argues that because some unidentified, calculated ground-water travel time estimate at SRP proved to be four times too slow, Applicants' 350-year travel time estimate (for the 3400 foot flow-path from the powerblock to Mathes Pond) and the NRC's 15-year estimate (for the 550-foot flow path through the backfill) should be presumed to suffer the same infirmity. This argument is fallacious. Mr. Lawless does not demonstrate the applicability of the SRP experience to the VEGP estimates -- i.e. discuss how the travel time was

calculated, why the SRP travel time was in error, and how the error supposedly applies to VEGP. Moreover, the SRP experience is not in fact applicable. Although Mr. Lawless provided no reference, Applicants have located a discussion of the circumstances. What Mr. Lawless conveniently fails to mention is the fact that erosion of an effluent stream due to 25 years of plant cooling water discharges and storm runoff had shortened by about 900 to 1000 feet a 1700-foot flow path from a waste burial ground area to the stream outcrop. Savannah River Laboratory, "Annual Summary of Burial Ground Gridwell Assays - 1980," DPST-81-643 (Oct. 10, 1981) at 2 (attached as Exhibit C); Savannah River Laboratory, "Numerical Modeling of Groundwater Flow at the Savannah River Plant," DPST-1638 (Aug. 1983) at 10 (attached as Exhibit D).

Mr. Lawless' comment on paragraph 20 of Applicants' Statement of Material Facts is not substantive and warrants no response.

D. Mr. Lawless' Comments on the Affidavit of Crosby et al.

Mr. Lawless notes with disfavor that the affiants Crosby et al. do not hold doctorate degrees and suggests that "more qualified" geologists might have arrived at different conclusions. The irony of this unwarranted innuendo is that Mr. Lawless himself professes to be an expert on ground-water, yet has virtually no formal education or practical experience in the

field. Messrs. Crosby, Farrell, and West are experienced geologists and hydrogeologists and are clearly competent to give opinion testimony in their fields. Messrs. Crosby, Farrell, and West are also individuals who have been intimately involved with and are personally knowledgeable of the VEGP site exploration and site hydrogeology. They are, therefore, competent to testify to the factual matters on the requisite basis of "personal knowledge." Applicants chose them as affiants for these reasons.

Mr. Lawless' first specific comment on the Affidavit of Crosby et al. relates to paragraphs 14-18 of the affidavit. Mr. Lawless asserts that the affiants do not attest to the closure of exploratory holes. To the contrary, the closure of exploratory holes is discussed in paragraphs 69-72 of the Affidavit, which information Mr. Lawless ignores. Mr. Lawless asserts that most of the exploration was done in 1971, especially the water chemical analysis. As previously discussed at pages 6-7, supra, Applicants have performed more recent water chemical analyses, as Joint Intervenors well know. Similarly, Applicants' investigation of the geology and hydrology has continued since the initial site exploration in 1971. Affidavit of Crosby et al., ¶¶ 17-20. Mr. Lawless asserts that no closure information is provided on coring of the marl. Coring, however, is done in exploratory holes, the closure of which is discussed. Finally, Mr. Lawless attempts to create an

inconsistency between the Affidavit of Crosby et al. and Applicants' Statement of Material Facts by referring to the 24 observation wells that have monitored the Tertiary aquifer and to what he misleadingly describes as the "22 exploration wells" listed in the Statement of Material Facts. Applicants' Statement of Material Facts, however, does not list "22 exploration wells," but instead states that permeability measurements were made in 22 exploratory holes. See Applicants' Statement of Material Facts, ¶ 6. There is no inconsistency.

Mr. Lawless' next comment refers to paragraphs 19-20 of the Affidavit and suggests that 200 exploratory holes into the marl and the eighty permeability measurements in 22 of those holes were insufficient. The location of these holes is shown in Figures 3 and 4 of the Affidavit. A number of the holes are south of the plant, contradicting Mr. Lawless' assertion that there has been no marl mapping in this direction. The number and pattern of the holes is deemed adequate by Applicants' experts, and Mr. Lawless' unexplained lay opinion is entitled to little weight.

Mr. Lawless' comment on paragraphs 21-24 of the Affidavit regarding settlement is discussed at pages 8-10 above.

In his comment on paragraph 25 of the Affidavit, Mr. Lawless contrasts a statement by the affiants with two statements made by SRP officials -- ERDA 1537 at II-152 (Exhibit B) and Letter from the Director, Dupont Savannah River Laboratory, to

the Manager of the Savannah River Plant (Sept. 29, 1976) at 8 (Exhibit E hereto). Mr. Lawless remarks that the statements by the SRP officials proved wrong, thereby implying that affiants' statement is also wrong. As previously discussed, however, ERDA 1537 referred to the H area (where no contamination of the Cretaceous aquifer has been found), not the A/M area where such contamination occurred; and the 1976 letter related to the proposal evaluated in ERDA - 1537, the addition of high level radioactive waste storage tanks in the F/H area. The SRP statements remain correct for the areas they addressed. Furthermore, the affiants' statement is based on Applicants' and affiants' extensive investigation of the hydrogeology at VEGP, and not on any investigations conducted at, or analogy to, the SRP site. Mr. Lawless presents no opposing evidence or facts.

In his comment on paragraph 26, Mr. Lawless takes issue with Applicants' categorization of the marl lithology as a basis for determining permeability. He ignores, however, the considerable number of in-situ permeability tests performed by Applicants. Affidavit of Crosby et al., ¶ 28. Furthermore, as previously noted, these tests have now been supplemented not only by additional in-situ permeability tests, but by laboratory measurements as well, and the effective impermeability of the marl was confirmed. Exhibit A at 8-10 and Table 2.

Mr. Lawless' next comment refers to paragraphs 27-30 of the Affidavit. Mr. Lawless inaccurately states that only twenty-two exploratory holes were made into the marl. Over two hundred such holes were drilled. Permeability tests were conducted in 80 intervals in 22 of these holes. Affidavit of Crosby et al., ¶¶ 19-20. Mr. Lawless remarks that there was "measurable water intake" in six of the 22 holes. In three of the holes, however, the inflow was due to leakage around the packers; and the inflow in two of the other holes was in near-surface, weathered marl. Affidavit of Crosby et al., ¶ 28. Mr. Lawless characterizes this as a failure rate of more than 25%; but as already noted, there were several measurements in many of the 22 holes -- 80 measurements in all. Even ignoring the fact that only those tests where packer leakage occurred constituted test failure, there was not a 25% failure rate. Moreover, these measurements have been supplemented by 15 more in-situ permeability tests, none of which detected any measurable water inflow, and by laboratory measurements, and the effective impermeability of the marl was confirmed.

In the very same comment, after criticizing Applicants for not having drilled enough exploratory holes, Mr. Lawless proceeds to criticize the extent of the drilling as compromising the integrity of the marl. Mr. Lawless' arguments are inconsistent. Nevertheless, Applicants refer the Board to paragraphs 69-72 of the Affidavit of Crosby et al., describing

Applicants' use of the tremie method of grouting exploratory holes to ensure the integrity of the marl.

In his next comment, referring to paragraph 31 of the affidavit, Mr. Lawless asserts that the higher [hydraulic] head in the unconfined aquifer "implies that openings between the two aquifers will likely result in downward contamination flow path exacerbated by the gravitational potential of the contaminants." The marked difference in hydraulic head, however, indicates that the marl is an extensive barrier without significant through-going openings, such as fractures or solution cavities. In addition, the statement that the effect of the head differential would be "exacerbated by the gravitational potential of contaminants" reveals Mr. Lawless' unfamiliarity with the field of hydrogeology. If Mr. Lawless is referring to the gravitational potential of the ground-water, that potential is an element of hydraulic head -- a very basic fact. Mr. Lawless might also be referring to the density differences between water and the isotopes that comprise possible contaminants. If so, while theoretically this difference would add to the total energy potential, the addition would be insignificant when compared to the large, total hydraulic head.

Mr. Lawless also comments on Figures 9 and 10 in the Affidavit of Crosby et al., discussed in paragraph 31 of the Affidavit. Mr. Lawless claims that Figure 9 is at odds with the affiants' conclusions. Figure 9, however, clearly shows that

ground-water flow from the power block area is northwest, to Mathes Pond. Mr. Lawless claims that Figure 10 is inconsistent with the direction of Tuscaloosa (Cretaceous) aquifer water movement shown in Chapter F of the L Reactor EIS. Figure 10, however, shows the direction of ground-water flow in the Tertiary, not Cretaceous, aquifer. Mr. Lawless also states that the affiants "admit the possibility of through-going openings." This is a mischaracterization of the affidavit. See Affidavit of Crosby et al., ¶ 31.

With respect to paragraphs 32-34 of the Affidavit, Mr. Lawless states that "[t]he only quantifiable through-the-marl head differential data into any location apparently comes from well series 42 data dated 1971." Mr. Lawless is wrong for several reasons. First, the Affidavit of Crosby et al. states that the contours shown in Figures 9 and 10 of the Affidavit (mapping the hydraulic head of the water-table and Tertiary aquifers respectively) were based on measurements in observation wells in December 1984. Affidavit of Crosby et al., ¶ 31. Secondly, Applicants have supplemented and are still supplementing their data with measurements in a number of dispersed observation wells. Exhibit A, Figure 1.

Mr. Lawless also states that the head differential data obtained from well series 42 appear to be "confounded because of measurable water flow within the impermeable marl." Again, Mr. Lawless reveals his unfamiliarity with the subject matter.

Both aquifers and aquicludes are saturated units (Affidavit of Crosby et al., ¶ 4), and the marl does have a finite, though extremely small, hydraulic conductivity (id., ¶ 26; Exhibit A, Table 2). When an observation well is constructed in the marl, water will slowly seep into the well from pores in the interval of the marl exposed (or vice versa) until the water level in the well equals the hydrostatic pore pressure in the interval. This fact does not imply that a significant amount of water is transmitted across the marl under ordinary hydraulic gradients, or that the flow-path of ground-water in the water-table aquifer is through the marl rather than in the direction of least resistance -- laterally to Mathes Pond.

With respect to paragraph 35 of the Affidavit, Mr. Lawless again asserts that Figure 9 is inconsistent with the affiants' conclusions regarding the direction of ground-water flow. As previously discussed at page 26 above, it is not.

Mr. Lawless' comments with respect to paragraphs 36-38 are for the most part abstract and irrelevant. Mr. Lawless does remark that "recharge is not shown nor are the water divides," presumably referring to the affiants' description of the interfluve. The entire interfluve, however, is a recharge area -- an area in which water from precipitation enters the ground-water system. The streams and pond bordering the interfluve are discharge areas, areas where water discharges from the ground-water system into the streams. With respect to the

water-table aquifer, a "water divide" is simply the locus of highest levels away from which ground-water flows. A specific location of the water divide is not pin-pointed on Figure 9 of the Affidavit, but it is readily apparent that the divide is south of the power block area, trending southwest-northeast between the 160-foot water-table contour lines. Mr. Lawless is simply tossing out terms, and his remark has no substance. Mr. Lawless also suggests that the fact that ground-water always discharges from the interfluvium into Mathes Pond is "simplistic and fortuitous." However, as Figure 9 of the Affidavit indicates, the elevation of the water table aquifer at the center of the interfluvium is over 160 feet above mean sea level, the elevation of Mathes Pond is about 110 feet, and water flows downgradient.

With respect to paragraphs 39-40 of the Affidavit, Mr. Lawless repeats comments previously discussed at pages 11-13 and 18 above.

With respect to paragraphs 41-43 and paragraph 44, Mr. Lawless repeats the comment concerning "miscalculated" travel time at SRP.^{4/} As already discussed at pages 20-21 above, this

^{4/} In addition to DP-1638 (Exhibit D discussed at page 21 above), Mr. Lawless also cites an unpublished paper he authored entitled W.F. Lawless, "Savannah River Plant: Hazardous and Radioactive" in support of his contention that SRP models underestimated ground-water travel time. Joint Intervenor, did not provide Applicants with a copy of this document during discovery, despite Applicants' document requests. Applicants have therefore been unable to review Mr. Lawless' paper and cannot address it.

comment is misleading and inapplicable to VEGP. Mr. Lawless also states that the affiants have not "validated" Darcy's Law. Darcy's law, however, is basic and empirical, as any textbook on ground-water shows.

In the same vein, Mr. Lawless attempts to discredit the affiants' calculated ground-water velocity by mischaracterizing other SRP statements. In his comment on paragraph 45 of the Affidavit, Mr. Lawless states, "SRP calculated 32 feet/yr through a sand lens with a hydraulic conductivity of 7.4 gpd/ft² (DPST-83-829, Vol. 1, p. 3-24) but noted tracer tests for some locations yielded the much higher velocity of 180 fpy (DP 1638) in some areas of SRP." Applicants have reviewed DP 1638 (Exhibit D) and can find no reference to a 180 fpy velocity measured by tracer tests. Page 3-24 of DPST-83-329, however, which addresses ground-water flow in the separations (F and H) areas, states:

Using an overall average gradient for the water table of 0.018 ft/ft, a hydraulic conductivity for the clayey sand unit of 1.0 gpd/ft² . . . and an effective porosity of 20%, the velocity through the Barnwell material is calculated to be

$$V = \frac{IK}{E} = \frac{365 \text{ days/yr} \times 0.018 \text{ ft/ft} \times 0.13 \text{ ft/day}}{0.20} \\ = 4.3 \text{ ft/yr}$$

If a sand lens with a hydraulic conductivity of 7.4 gpd/ft² . . . existed for the entire flow path, the velocity would be 32 feet/yr. A series of tracer dilution tests and tracer injection detection tests yielded velocities ranging from 2.3 to 69 ft/yr.

Dupont Savannah River Laboratory, "Technical Summary of Ground-water Quality Protection Program at Savannah River Plant," DPST-83-829, Vol. 1 at 3-24 (Dec. 1983)(Exhibit F hereto) (emphasis added). The measured ground-water velocities at SRP were contrasted with a velocity based on a hypothetical permeability, not with a velocity calculated on the basis of actual permeability measurements as was done at VEGP. Furthermore, the use of an average gradient to compute an average velocity is not inconsistent with varying actual velocities at points along the flow path with different hydraulic gradients; nor does the fact that ground-water velocity may vary over a flow-path compromise a travel time based on average velocity.

With respect to paragraph 46, Lawless repeats his comment that hazardous chemicals or the synergistic effect of radionuclides and hazardous chemicals are not considered. Aside from the lack of any factual basis for the comment, these matters exceed the scope of Contention 7. See discussion at page 18 above.

With respect to Mr. Lawless' comment on paragraph 47, Applicants have carefully reviewed DPST-83-829, and can find no support for Lawless' assertion that "Strontium-90 travel time in ground-water transport at SRP has been found to be much quicker than anticipated, significantly quicker than the strontium-90 rates of decay, dispersion or adsorption. . . ." Mr. Lawless also cites his paper entitled "The Savannah River

Plant: Hazardous and Radioactive." Since Joint Intervenors failed to provide Applicants with this paper despite Applicants' document requests, Applicants have been unable to determine whether this second citation provides any support.

With respect to paragraphs 48-49 of the Affidavit, Mr. Lawless comments that K_d (equilibrium distribution) coefficients vary. The affiants, however, chose K_d values for each of the significant radionuclides from the low end of the reported range of values, and the affiants' calculations are therefore conservative. Affidavit of Crosby et al., ¶ 50. Moreover, actual laboratory measurements of the K_d coefficients of backfill samples have shown that the K_d coefficients are in fact about an order of magnitude greater. Exhibit A, Appendix C.

With respect to paragraph 50, Mr. Lawless states that the transmitted fraction calculated for tritium cannot be replicated. Mr. Lawless is wrong. Paragraphs 48 and 49 of the affidavit give the following equations:

$$\ln (T.F.) = \frac{-0.693(t)a}{T_{1/2}}$$

where, T.F. = transmitted fraction (ratio)

t = estimated of ground-water travel time (T),

a = adsorption retention factor,

$T_{1/2}$ = radionuclide half-life (T).

The adsorption retention factor, a, (also called retardation factor) is equal to $(1 + p/n K_d)$

where, p = bulk density of the aquifer

n = porosity of the aquifer

K_d = equilibrium distribution coefficient

which is defined as the mass of radionuclide adsorbed per gram of soil divided by the mass of radionuclide dissolved per milliliter of ground-water

The derived value for t, 15 years, is given in paragraph 45.

For tritium, the values of the other factors are given in paragraph 50, and are as follows: $p/n = 4.1$, $K_d = 0$, $a = 1$, $T_{1/2} = 12.1$ years. Applying these values, one obtains.

$$\begin{aligned} T.F. &= e^{\frac{-(0.693)(15)}{12.1} [1 + (4.1 \times 0)]} \\ &= e^{-10.4/12.1} \\ &= .42, \text{ which is the transmitted fraction for tritium stated in paragraph 50} \end{aligned}$$

With respect to paragraph 52, Mr. Lawless claims "SRP found the diminution of Sr-90 concentration with distance from source (about 1500 - 2000 ft.) was almost negligible," and cites the L-Reactor EIS at page F-84. That page (Exhibit G hereto) states in pertinent part:

Strontium, unlike tritium, does not move at the same rate as ground water; its transport is retarded by the clay minerals in the Formation. Thus, it has been emerging into Four Mile Creek from F-Area only since about 1964, and from H-Area since 1959. The amount entering the creek annually is 2 percent of the ground-water load in F-Area and 0.19 percent of the load in H-Area. Under current conditions, F-Area is contributing about 40 times as much strontium to the creek as H-Area because of differing soil retention characteristics. Maximum concentrations of strontium-90 in ground water and emergent seep-lines range up to 0.34 microcurie per liter in F-Area, and 1.8×10^{-3} microcurie per liter in H-Area.

Mr. Lawless' statement is not supported.

Mr. Lawless' comments on paragraphs 52-56 are conclusory, not supported by any evidence, and constitute inadmissible lay opinion.

With respect to paragraphs 57-59 of the Affidavit, Lawless attacks as simplistic the affiants' assertion that ground-water in the confined aquifers discharges into the Savannah River. Mr. Lawless admits data indicate that ground-water flows from the confined aquifers into the Savannah River, but remarks that "contaminant communication" from the Cretaceous aquifer into the river also depends on "different concentration and gravitation gradients plus other physiochemical and hydrogeological factors." Mr. Lawless, however, provides no explanation, reference, or factual basis. In the same vein, Mr. Lawless

remarks that flow reversal "can easily be obtained in the well-head local region with fairly typical industrial withdrawal rate." Mr. Lawless, however, points to no wells in the vicinity of VEGP drawing enough water from the confined aquifers to effect a reversal of flow from the confined aquifers to the river.

With respect to paragraphs 60-61 of the Affidavit, Mr. Lawless observes that contamination has been found in several wells in the A/M Area at SRP. This observation is not inconsistent with the Affidavit. See Affidavit of Crosby et al. ¶ 60.

Also with respect to paragraphs 60-61, Mr. Lawless again argues that the affiants' averments should be disbelieved because SRP has previously made assertions that proved wrong. As previously discussed, however, the SRP statement to which Mr. Lawless refers related to the H-Area, not the A/M Area where contamination of the Cretaceous aquifer occurred; and the affiants' averments concerning the VEGP hydrogeology are not based on any statements by SRP officials, but on Applicants' own extensive site exploration.

Mr. Lawless' comments on paragraphs 62-66 are immaterial.

Mr. Lawless' comment on paragraph 67 is also immaterial. Mr. Lawless states that SRP speculates that the primary pathway for contamination of the Cretaceous aquifer has been through well casings, not through intervening aquifers. The affiants

discussed this hypothesis in paragraphs 68-72 of their affidavit. Mr. Lawless further remarks that even if this hypothesis is correct, contamination through the intervening aquifers [presumably in the A/M area] should occur shortly. As the Affidavit demonstrates, the absence of an effective aquiclude in the A/M Area of SRP does not preclude this possibility in that area. Affidavit of Crosby, et al., ¶ 67.

Finally, with respect to paragraphs 68-72, Mr. Lawless remarks that "[t]he tremie method should be detailed and validation experience provided." The Affidavit, however, describes the tremie method, and the affiants attest to its effectiveness. If Mr. Lawless or Joint Intervenors had any evidence to the contrary, they should have presented it.

IV. Conclusion

For the reasons discussed above, Applicants submit that Intervenor's Response to Applicants' Motion for Summary Disposition of Contention 7 is unsupported, inaccurate, irrelevant, and immaterial, and should be accorded no weight. It raises no genuine issue of material fact that would warrant denial of Applicants' Motion for Summary Disposition of Contention 7.

Respectfully submitted,



George F. Trowbridge, P.C.
Bruce W. Churchill, P.C.
David R. Lewis
SHAW, PITTMAN, POTTS & TROWBRIDGE

James E. Joiner, P.C.
Charles W. Whitney
Kevin C. Greene
Hugh M. Davenport
TROUTMAN, SANDERS, LOCKERMAN
& ASHMORE

Counsel for Applicants

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