11/9/82

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	Docket Nos. STN 50-528
ARIZONA PUBLIC SERVICE	)	STN 50-520
COMPANY, et al.	)	STN 50-530
	)	
(Palo Verde Nuclear Generating	)	
Station, Units 1, 2, and 3)	)	
	)	

JOINT APPLICANTS' RESPONSE TO PETITION TO INTERVENE OF WEST VALLEY AGRICULTURAL PROTECTION COUNCIL, INC.

VOLUME ONE OF THREE

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JOINT APPLICANTS' RESPONSE TO PETITION TO INTERVENE OF WEST VALLEY AGRICULTURAL PROTECTION COUNCIL, INC.

INTRODUCTION

On October 26, 1982, joint applicants Arizona Public Service Company, Salt River Project Agricultural Improvement and Power District, El Paso Electric Company, Southern California Edison Company, Public Service Company of New Mexico and Southern California Public Power Authority ("Joint Applicants") received a complete copy of the West Valley Agricultural Protection Council, Inc. ("West Valley") Petition to Intervene ("Petition") dated October 14, 1982.

In addition to requesting permission to intervene, West Valley requests that the Board (1) admit each of its proposed contentions; (2) prepare a revised or supplemental Environmental Impact Statement; (3) reopen the record and hold a hearing on its proposed contentions; (4) supplement the record by incorporating therein the reports submitted with the Petition; (5) deny the Joint Applicants' request for an extension of the construction permit for Palo Verde Unit 1; (6) revoke construction permits for Palo Verde Units 2 and 3; (7) deny operating license for PVNGS; and, (8) grant such other relief as the Board finds necessary and appropriate.

The West Valley petition comes eight years after joint applicants filed their applications for construction permits;[1/] more than seven years after the NRC issued the Final Environmental Statement related to construction of Palo Verde Units 1, 2 and 3;[2/] six years after the NRC issued its Initial Decision on the construction permit for the PVNGS;[3/] two and one-half years after the Joint Applicants filed with the Commission an Application for operating licenses for PVNGS Units 1, 2 and 3;[4/] two and one-half

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1/ 39 Fed Reg. 37527, October 22, 1974.

2/ 40 Fed Reg. 44199, September 25, 1975.

3/ LBP-76-21, 3 NRC 662, May 24, 1976.

4/ 45 Fed Reg. 46941, July 11, 1980.

years after issuance of the "Notice of Opportunity for Hearing" in connection with the Application;[5] and one year after issuance of the Draft Environmental Statement related to the operation of the Palo Verde Units.[6] Publication in the Federal Register, of course, constitutes actual notice to all persons. 44 U.S.C.A. §1508 (1968); Jersey Central Power and Light Co. (Oyster Creek Nuclear Generating Station) LBP-77-58, 6 NRC 500 (1977); See also, New England Power and Light Co. (NEP Units 1 and 2) LBP-78-18, 7 NRC 932 (1978).

The Notice of Opportunity for Hearing required that Petition for Leave to Intervene be filed by August 11, 1980. The NRC Staff issued its Draft Environmental Statement related to the Application for Operating Licenses in October, 1981, and its Final Environmental Statement in February, 1982. Because of a filing by Patricia Lee Hourihan of a timely Petition for Leave to Intervene and a request for hearing, an evidentiary hearing covering twelve days was held during the months of April, May and June, 1982. The record was closed by the Board on June 25, 1982, and the parties to the proceedings subsequently filed proposed Findings of Fact and Conclusions of Law in the form of

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[5] 45 Fed Reg. 46941, July 11, 1980.

[6] 46 Fed Reg. 55170, November 1, 1981.

proposed Initial Decisions. An Initial Decision by the Board is pending.

West Valley alleges that its grossly untimely petition should be granted because it is purportedly based on recently acquired "new information" and because West Valley allegedly had been relying upon erroneous or misleading information from the NRC Staff. West Valley urges that the "new information" and its previous reliance on allegedly "erroneous or misleading information" satisfies the good cause requirement of 10 CFR § 2.714(a)(1). West Valley further contends that it satisfies the "balancing test" called for by § 2.714(a)(1).

For the reasons set forth hereafter, Joint Applicants respectfully submit (1) there is a total lack of good cause for West Valley's failure to file on time; (2) West Valley fails to satisfy virtually all of the specific criteria established by § 2.714(a)(1); and, (3) many of the contentions and factual assertions advanced by West Valley are in error and are based on misunderstandings or misuse of the evidence previously presented to the NRC.

SUMMARY OF ARGUMENTS

I. There is no legal basis for the tardiness of the West Valley Petition in view of the extensive public record addressing the issues raised by the West Valley Petition beginning with the 1974 Environmental Report and

. . . . .

the 1975 Final Environmental Statement for construction of PVNGS Units 1, 2 and 3.

II. Alleged reliance by West Valley on the NRC Staff reports and representations does not provide a legal basis for the untimely filing.

III. Other available means exist for protection of the Petitioner's interest and reopening of the record is neither required nor justified.

IV. Petitioner's participation will not assist in developing a sound record.

V. Petitioner's interests will be adequately protected by existing parties.

VI. Petitioner's participation will delay the proceedings greatly.

VII. Reopening of the record is unnecessary and unjustified since the issues are not of major significance and there is no genuine unresolved issue of fact.

VIII. The "Worst Case" standard which Petitioner seeks to apply is incorrect. The "Rule of Reason" standard is the applicable standard. The conservatisms incorporated in Joint Applicants' salt drift are more than sufficient to meet reasonably anticipated variations in TDS concentrations and meteorological conditions.

IX. Petitioner's request for revocation of the construction permits for Units 2 and 3 is improperly brought

. . . . .

in this proceeding, as is the request that the Board refuse to extend the construction permit on Unit 1.

X. The salt drift monitoring program which Joint Applicants have already committed to is a more suitable and effective method than is reopening of the record for resolving uncertainties concerning salt drift in Joint Applicants' ER or in the NRC findings and orders.

XI. The possible geographical area of salt drift, even under Petitioner's view, includes very little cultivated land and the limited possible crop exposure does not justify either reopening the record or the relief sought by Petitioners.

XII. The evaluations and criticisms by Petitioner's consultants are based upon misunderstandings and misinterpretation of the evidence which was presented to the NRC and on misunderstandings of how the plant will be operated.

ARGUMENT NO. I

I-A. THE QUESTIONS RAISED BY WEST VALLEY ARE NOT "NEW" AND HAVE BEEN THOROUGHLY ANALYZED IN THE PUBLIC RECORD

West Valley contends that it has only recently acquired "new information" and that this revelatory acquisition should sweep away the fact that for more than seven years the members who now comprise West Valley sat idly by and let the proceedings continue without intervention. In fact, West Valley's petition and supporting papers make it

apparent that Petitioner has not really acquired any new information, but rather seeks to suggest different conclusions than were drawn by the NRC Staff and the Applicants. As is discussed in detail in Argument XII, infra, most of the conclusions and contentions suggested by Petitioner are the result of misunderstanding or misinterpetation of the NRC factual record concerning salt drift.

In any event Petitioner has not cited nor identified any "new" information -- the most that it has asserted is that it were not aware of "old" information. Salt depositions from cooling towers drift and their effects on agricultural products are not new issues created first and only for Palo Verde. Even a cursory examination of the references cited by Petitioner's consultant Mulchi in his Curriculum Vitae Coverage, reveals that a number of papers and symposiums on these subjects were published or conducted as long ago as 1972. Since that time the number of such papers and events seem to have been on a steadily increasing trend. Thus, in light of Petitioner's own supporting papers, it is indeed hard to find any new information on which Petitioner relies that was not available when the notice of hearing in this proceeding was published in 1980 or when the DES-OL was published with notice seeking comments from the public.

It is apparent that Petitioner has attempted to state its case in a manner that would invite inferences

that salt drift depositions and their impacts have received only brief, superficial consideration in the Palo Verde proceedings. This is not the case with respect to cooling tower drift.[7] The record in this proceeding on cooling tower drift and its impacts is indeed extensive. In order to give some concept of the depth and scope of analyses and review of this issue by the Applicants, the NRC Staff and the ASLB, relevant excerpts of ER-CP, FES-CP, including comments on this subject by the Department of Interior, the testimony given at the construction permit hearing, the ASLB Initial Decision, the ER-OL and tie FES-OL are reproduced and attached hereto as Appendix I.

A review of this record reveals some very pertinent information. First, it shows a detailed description and explanation of the FOG computer model, the inputs into the model, and the then existing knowledge of impacts of salt depositions on the ecology of interest. It also shows that to the extent the NRC Staff was unsatisfied with the computer code description, it independently asked for additional information. It is also clear from the FES-CP that the NRC Staff made its own independent assessment of drift

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[7] Petitioners' consultant Davis' report includes criticism that drift from the spray ponds (also sometimes called "ultimate heat sinks") and from the evaporation ponds was not considered. These criticisms stem from a lack of information and erroneous assumptions used by Mr. Davis as explained in Argument No. XII, infra.

emissions and prescribed monitoring requirements in addition to the program proposed by Applicants. The transcript of the ASLB hearing at the construction permit stage is of interest because it demonstrates that the ASLB took a special interest in the salt disposition issues and exacted the commitment of the Applicants to an expanded monitoring program. The ASLB Initial Decision further reveals its consideration of cooling tower salt drift and its conclusion that the uncertainties related thereto should not deter construction of Palo Verde. Excerpts from the DES-CP for Palo Verde Units 4 and 5 are also included in Appendix I, because they also show the NRC Staff's continued interest in this issue, and its concern on the adequacy of the monitoring program. The ER-OL and FES-OL demonstrate that the effects of the changes in plant design have been fully analyzed and again the fact that the NRC Staff conducted its own independent review. From all of this it is not even arguable that salt drift and its impacts have not been thoroughly examined throughout this proceeding.

It must be added that the Petitioner's members cannot claim surprise or excuse for lack of knowledge about the salt issues. Most, if not all, of the members have farm acreage in the Buckeye Irrigation District (BID) and are members of that organization. The attorney for BID, John Schaper, submitted comments on the DES-CP and made a limited appearance before the ASLB in the construction permit

hearings. He again made a limited appearance at the operating license hearings on April 28, 1982, and returned to testify as a witness on April 30th. A review of his comments and testimony demonstrates his expertise in water matters and the rights and interests of BID and its members. Yet, at no time has Mr. Schaper expressed any interest in salt depositions from the Palo Verde cooling towers. In light of his statements and testimony, it is clear that the NRC's environmental statements received a qualified review by the qualified attorney representing the majority of Petitioners' members in this proceeding.

Filed with this response as Appendix 1 is a verbatim excerpt of much of the material concerning salt drift and the possible effect of salt drift from: (1) Environmental Report - Construction Permit Stage; (2) Environmental Report - Operating License Stage; (3) Final Environmental Statement - Construction Permit Stage; (4) Final Environmental Statement - Operating License Stage; (5) Draft Environmental Statement - Units 4 and 5 Construction Permit Stage; (6) Hearing Transcript - Construction Permit Stage; (7) Initial Decision - Construction Permit Stage.[8/]

[8/] Footnotes from the referenced material have been deleted.

I-B. FAILURE TO BE AWARE OF THE MATTERS WHICH ARE OF PUBLIC RECORD DOES NOT EXCUSE THE DELAY IN SEEKING INTERVENTION.

The beguiling circuity of West Valley's argument is apparent. Every tardy would-be intervenor is going to have "new information" -- almost by definition. As a matter of fact, it is probable that the more tardy the intervention the more likely that some nugget of wisdom may be uncovered, which has surfaced only since the proceedings were closed. The fact that West Valley only recently retained experts to prepare reports obviously makes the information "new" to petitioners, even if to no other party. Under the foggy logic urged by West Valley, any party could demand intervention on the basis that it has "new information" merely by delaying the preparation of its information until long past the expiration of the intervention deadline. Such a position is palpably untenable and is merely short-hand for: "We're late, but here's our research and because we're late the information is new (at least to us) and we must therefore be allowed to intervene." That dizzying notion cannot be countenanced.

In Puget Sound Power and Light Co. (Skagit Nuclear Power Project, Units 1 and 2), ALAB-552, 10 NRC 1 (1979), the Appeal Board flatly rejected an argument similar to West Valley's "new information" argument. In that case, the Board noted that although the Petitioners were fully aware of the proposed construction in their vicinity, they did not

have at their disposal sufficient information on which to base an independent evaluation of the facility's potential impact on their interests. Rather than make their own endeavor to acquire such information, they chose instead to rely upon the information expressed by the NRC Staff to the effect that impacts would be insignificant. A few years later, Petitioners began to doubt such information and sought to intervene.

The Board summarily rejected intervention, charitably noting "several difficulties" with Petitioners' reasoning, and explaining that the NRC does not purport to guarantee the correctness of its ultimate conclusions. Id. at 9. Thus, although petitioners in Skagit had "newly available information," (Id. at 4), the Board was unpersuaded that that could provide the basis for intervention.

Similarly, in South Carolina Electric & Gas Co. (Virgil C. Summer Nuclear Station, Unit 1), LBP-81-11, 13 NRC 420 (1981), the Licensing Board considered a petition to intervene where one of the major reasons proffered for the failure to timely petition was that Petitioners' members had "only recently educated themselves" with regard to the proposed nuclear station. Id. at 422. The Board summarily disposed of that argument by noting that the petitioners had not demonstrated that it had exercised due diligence with regard to its rights and potential interest in the proceed-

ing. Id. at 423. Petitioners in the instant case have likewise offered no evidence of diligence in determining their rights or interests during the time when they could have timely intervened in this proceeding.

The truth of the matter is that West Valley's members have known for more than seven years that proceedings were being conducted which would eventually result in the commercial operation of a nuclear power plant. Any of the individuals who now comprise West Valley could have taken the time to read the information which was contained in the ER-CP and the ES-CP seven years ago. If they had they could then have decided whether they wished to attempt to inter- then or at any point up to August 11, 1980. Now it apparently appears to them that perhaps they should have become involved earlier. In Puget Sound Power and Light Co. (Skagit Nuclear Power Project, Units 1 and 2), LBP-79-16, 9 NRC 711, 714 (1979), Petitioners had also argued that their late filing had been precipitated by language in the available documents to the effect that the expected impacts upon Petitioners would be "insignificant" or "trivial" and that based upon such information they decided not to intervene. The Board rejected that argument with the following analysis:

> "When it evidently was clear from the beginning that the proposed nuclear power plant along the Skagit River at

> least touched upon or involved the interests of the petitioners, it appears that the petitioners accepted the risk of not seeking to intervene when they should not have taken such risk. When at one time they felt their interests were not being impaired, the petitioners did not seek to intervene, and then as time passed and they became persuaded that their interests were being jeopardized, they changed their mind about intervention and moved to intervene -- within a week of three years and five months late. Poor judgment or imprudence in the first place is not good cause for late filing." (Emphasis added.)

The information contained in the public record on the issues of salt drift and the possible effect of salt drift is extensive and is certainly sufficiently clear to have allowed Petitioner to make the same decision several years ago that it chooses to make now. Under the guidelines established by the Skagit and Summer decisions Petitioner's claim of "new information" does not excuse its waiting to seek intervention until after the hearing process was concluded.

ARGUMENT NO. II

ALLEGED ERRONEOUS STATEMENTS AND FAILURES TO DISCLOSE BY THE NRC STAFF DO NOT CONSTITUTE GOOD CAUSE FOR THE UNTIMELY FILING

The second major argument advanced by West Valley to support its untimely Petition is that "the NRC Staff . . . furnished the public with erroneous or misleading information on matters of basic fact and that West Valley's reliance on this information prompted its previous inac-

tion." West Valley cites as legal precedent Puget Sound Power and Light Company, (Skagit Nuclear Power Project, Units 1 and 2), ALAB-559, 10 NRC 162 (1979). In that case the Appeal Board quoted from its earlier decision in the Skagit proceeding wherein it considered a Petitioner's argument that it had relied on the opinions of the Department of the Interior and the NRC Staff that the aquatic and socioeconomic effects of the Skagit Project would be insufficient and consequently had failed to file a timely petition to intervene. The Appeal Board stated in the earlier decision:

> Neither the NRC nor Interior purported to guarantee the correctness of their ultimate conclusions regarding impact upon the tribes. And our examination of the relevant jurisprudence discloses no basis upon which such a warranty might be implied as a matter of law. Thus, it is not enough for the tribes simply to assert that they were lulled into a false sense of security by the appraisals of impact given them by Interior or reflected in the FES prepared by the NRC staff. What the tribes must additionally establish is that, whether because of inadequate investigation on the part of the Federal agency or for some other reason, they were furnished erroneous information on matters of basic fact and that it was reliance upon that information which prompted their own inaction prior to June 1978. Puget Sound Power and Light Company, (Skagit Nuclear Power Project, Units 1 and 2), ALAB-552, 10 NRC 1, 9 (1979) (footnote omitted).

The Appeal Board went on in that case to explain what the Petitioner had to do in order to assert that it relied on an erroneous statement of material fact:

> [I]n the instance of an assured reliance on an erroneous statement of material fact, the memorandum should specify (1) where that statement appeared; and (2) when, and through what source, the tribes first learned that the statement was likely or possibly in error. If the claim is that there was a failure on the part of a Federal agency to disclose to the tribes a germane fact which either was or should have been known to that agency, the memorandum should similarly specify (1) the nature of that fact; and (2) when, and through what source, the fact first came to the tribes' attention. Id. at 10 n.20.

While West Valley asserts that its members "had been repeatedly informed and had understood that PVNGS posed no environmental threat to their farms," (Memo of Law at 8) the fact is that none of the affidavits of the West Valley members refers to any direct communications with the NRC Staff. Rather, each affiant states that he and most other farmers in the area supported the construction of PVNGS for many years based in part on their "understanding of the lack of concern about environmental harm from the PVNGS in the EIS." See, e.g., Affidavit of Jackie A. Meck, dated October 13, 1982, paragraph 3. It is not even clear which environmental impact statement is being referred to in these affidavits. At the time that petitions to intervene were due in August, 1980, the most recent statement available was

the FES-CP.[9/] West Valley, however, refers to the FES-OL and the consultants' reports accompanying the Petition indicate that there is a "substantial likelihood" that information contained in the "EIS" is in error (Memo of Law at 8). West Valley goes on to argue that such reports indicate that "the EIS vastly understated the amounts of salt emitted . . . and was incorrect in dismissing prior salt deposition studies as 'invalid'." Id. The only environmental impact statement which discusses the applicability of prior salt deposition studies is the FES-CP. See FES-CP at 5-18. It appears, therefore, that the alleged erroneous statements relied on by West Valley members must be contained in the FES-CP.

As to the contention that the EIS generally understates the amount of salt emitted, the FES-CP emphasized: "It is important . . . to realize that drift model predictions may differ by a factor of 10 with observed values." FES-CP at 3-25. If West Valley's members wish now to rely on statements in the environmental statements as the basis for their tardiness, they must also be held to recognize that seven years ago the salt drift predictions given in the FES-CP were openly acknowledged to be reasonable approximations based on available technical data, not precise predic-

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9/ The DES-OL was published in October, 1981, and the FES-OL was published in February, 1982.

tions. There is simply no basis for West Valley to contend at this late date that it only recently became aware of the possibility[10/] that the predictions of salt emissions will turn out to be lower than the actual emissions and to use such claim as an explanation for its untimeliness.

West Valley's allegation that "the EIS" was incorrect in dismissing prior salt deposition studies such as at Chalk Point is totally inconsistent with the conclusions contained in the Mulchi Report.[11/] That report specifically admits that "the Chalk Point study can only be used as a general source of information rather directly comparable." (Mulchi Report at 13) (emphasis added). This is obviously true for the Pittsburg Plant as well since no agricultural crops were even grown adjacent to the plant. Id. at 15. Finally, the report by Mulchi badly misrepresents the FES-CP when he states that "the environmental impact statement . . . concludes that all prior studies of such deposition are inapplicable here." Id. at 9. What the FES-CP really states is that "[t]he unique leaf morphology of many desert plants . . . coupled with the low humidity and sparse rainfall characteristic of the PVNGS region invalidates the use

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10/ As noted earlier, West Valley refers to a "substantial likelihood" that the predictions on salt emissions are understated.

11/ Charles L. Mulchi, Review of the Environmental Impact of the Palo Verde Station on Agriculture (the "Mulchi Report").

of coastal salt water cooling tower studies for comparison purposes." FES-CP at 5-18 (emphasis added).

In view of West Valley's failure to point out any salt deposition studies directly applicable to PVNGS which were available in 1975 when the FES-CP was published, there is simply no basis for the allegation that the NRC Staff's conclusion respecting the use of other salt deposition studies is incorrect nor for the legal argument that the farmers were lulled into a false sense of security by inaccurate or misleading statements.

As to West Valley's general statement that the Staff was incorrect in concluding that it does not expect impacts from salt-drift deposition (Memo of Law at 8), it suffices to note that West Valley has not done any site-specific studies of salt drift from PVNGS or offered any studies on the effects of salt deposition on the types of crops grown by the West Valley members. For example, with respect to cotton, which the Mulchi Report states is the most abundant crop grown in the region, it is stated that "[c]otton is listed as tolerant to soil salinity; however, its response to foliar applied salts has not been examined." (Mulchi Report at 12). In the absence of any site-specific studies, or at least reference to other specific technical support for questioning the NRC Staff's conclusions, West Valley has hardly established that the Staff's conclusion with respect to the impacts of salt drift is incorrect.

Certainly West Valley has fallen far short of establishing that its members were furnished "erroneous information on matters of basic fact."

Finally, West Valley alludes to "other errors" allegedly committed by the NRC Staff. Under the Appeal Board's ruling in the Skagit proceeding, the burden is on West Valley to identify specific statements of error. Puget Sound Power and Light Company. ALAB-552, 10 NRC at 10. It is not incumbent on Joint Applicants to wade through the reports attached to West Valley's Petition and attempt to identify any such statements.

West Valley's third and last "good cause" argument is that the NRC Staff "failed to consider or disclose a whole series of facts which, if disclosed, might have induced West Valley to seek intervention at an earlier time." (Memorandum of Law at 9.) West Valley again relys on the Appeal Board's decision in the Skagit proceeding for the proposition that such failure can constitute good cause. (Id.) Little time need be spent in discussing the five allegations respecting facts which were not disclosed.

First, West Valley's unfounded allegation that cooling water salinity may be significantly higher than average values is completely discounted by the extensive testimony and evidence on the cooling water source and chemistry presented during the recent hearings. (See Argument XII(1)(A).) The discussion in Argument XII also demon-

strates that the cooling water salinity assumed in the drift analysis is 25% higher than the expected average concentration. The very conservative concentration assumed in the drift analysis, coupled with regular maintenance, would also serve to compensate for potential deterioration in cooling tower performance.

As to field studies on the effects of salt deposition on agriculture, it was not necessary for the NRC Staff to discuss the few studies commissioned by other utilities and referred to by West Valley, or the specific findings of those studies. By West Valley's own admission, the Chalk Point studies are not "directly comparable" to PVNGS because "the Palo Verde environment is totally different from the environment in which the Chalk Point Studies were conducted." Mulchi Report at 13. For the same reason, the Vienna studies are not directly comparable to PVNGS. As to the Pittsburgh plant, as noted previously, no agricultural crops were even grown adjacent to such plant. (Id. at 15.) What was considered and disclosed by the NRC Staff were the material facts relating to PVNGS respecting the known effects of salt deposition on vegetation. (See FES-CP §5.5.) By such consideration and disclosure the Staff fully met its obligations under the National Environmental Policy Act.

Finally, the substantial study of alternative cooling tower arrangements conducted at the construction permit stage and reported in the FES-CP in Section 9.2

dispels any notion that these matters were not properly considered at that time. It is not necessary for an applicant to reconsider alternative system designs at the operating license stage, or for the NRC Staff to reevaluate such matters. See 10 CFR §51.21; Cleveland Electric Illuminating Company, et al. (Perry Nuclear Power Plant, Units 1 & 2), LBP-81-24, 14 NRC 175, 229 (1981); Cincinnati Gas and Electric Company, et al. (William H. Zimmer Nuclear Station), LBP-80-24, 12 NRC 231, 235 (1980); Detroit Edison Company, et al. (Enrico Fermi Atomic Power Plant, Unit 2), LBP-79-1, 9 NRC 73, 86 (1979).

In summary, West Valley has not established that the NRC Staff furnished the public with any erroneous information or failed to consider or disclose material facts. Accordingly, the second and third reasons given for its tardiness fails to establish good cause for the late filing.

ARGUMENT NO. III

THE MEMBERS OF WEST VALLEY HAVE OTHER MEANS AVAILABLE TO PROTECT THEIR INTEREST

In its memorandum, West Valley alleges that "there are no means -- short of full participation in NRC proceedings with all of the procedural rights of a party -- which will protect West Valley's interests." (Memo of Law at 11). Joint Applicants submit, however, that there are at least two means available to West Valley's members to protect their interest which do not require full participation by

West Valley. Neither of these means was discussed by West Valley.

First, it is evident from West Valley's Petition that its members are concerned that salt emissions from PVNGS will have adverse effects on agricultural crops grown by them and that the productivity of their lands will be reduced. (Petition at 12-14.) For the reasons set forth in Argument No. XI it seems highly unlikely that there is any significant risk to most of the cultivated land owned by West Valley members. Nevertheless, in a legal sense, West Valley's contentions amount to allegations that salt emissions will invade the members' interest in the exclusive possession of their lands and/or interfere with the use and enjoyment of their lands. Such allegations, if well founded, would state claims for trespass and private nuisance, respectively. See William L. Prosser, Law of Torts § 89 (1971). Thus, if any of West Valley's members' crops or lands do sustain damage at some time in the future due to salt drift from PVNGS, the members can institute an action either for equitable relief or at law to recover for their damages at that time.

An Arizona state court would clearly have jurisdiction to hear such allegations. See, e.g. Spur Industries Inc. v. Del E. Webb Development Co., 108 Ariz. 178, 404 P.2d 700 (1972); Marshall v. Consumers Power Company, 65 Mich. App. 237, 237 N.W.2d 266 (1975) (a state court has jurisdic-

tion to hear allegations that a proposed nuclear plant would constitute a private and/or public nuisance and, if a nuisance is found to exist, to order the owner of the plant to establish measures to abate the nuisance). The availability of a state court action provides West Valley's members with an alternative means of protecting their interest. See Jersey Central Power & Light Company (Oyster Creek Nuclear Generating Station), LBP-77-58, 6 NRC 500, 512-13 (1977) (an untimely petitioner for intervention who may institute a proceeding for injunctive relief based on concerns similar to those which the petitioner wishes to raise before the Commission has an alternative means of protecting his interests).

Second, as more extensively discussed in Argument No. X, infra, Joint Applicants have committed to monitor salt drift. If the results of such monitoring indicate that damage is occurring or may occur at sometime in the future, the NRC Staff may institute a proceeding under Section 2.202 of the Commission's rules to modify, suspend or revoke the operating licenses. West Valley also has the right under Section 2.206 to petition the Director of Nuclear Reactor Regulation to institute such a proceeding. See Jersey Central Power & Light Company, 6 NRC at 513. The words of the licensing board in the Oyster Creek proceeding apply here as well: "Thus the effect of a denial of the late petition will only be to require Petitioners to await the outcome of

the monitoring . . . programs before requiring Licensee to embark on a contested licensing proceeding which in the end may prove entirely unnecessary." Id.

Access to state court and the right to petition under Section 2.206 of the Commission's regulations offer to West Valley two alternative means of protecting the interest of its members. Both procedures provide ample opportunity for petitioners to obtain prompt and effective relief without the delay and other adverse consequences which would necessarily flow from intervention at this time.

ARGUMENT NO. IV

PETITIONERS PARTICIPATION WILL NOT ASSIST IN DEVELOPING A SOUND RECORD.

The next factor which the Board should consider in ruling on West Valley's petition is the extent to which the Petitioner's participation may reasonably be expected to assist in developing a sound record. 10 CFR 2.714(a)(1)(iii). For the same reasons articulated in Argument No. V, infra, this is largely moot since the record which petitioners urge they can assist in developing has been closed since June 25, 1982. Nevertheless, out of an abundance of caution, and because the issue can be summarily disposed of in any event, the Applicants feel constrained to briefly address this factor.

It is, of course, fundamental, that not just any contribution to a record will suffice as justification for

intervention. South Carolina Electric and Gas Co. (Virgil C. Summer Nuclear Station, Unit 1) ALAB-642, 13 NRC 881 (1981). Rather, the petitioners must demonstrate that they are in a position to offer a "significant contribution." Houston Lighting and Power Co. (Allens Creek Nuclear Generating Station, Unit 1) ALAB-671, 15 NRC 508 (1982). Manifestly, West Valley has not met its burden. Indeed, as discussed below, West Valley tacitly acknowledges that its ability to contribute to reexamination of the issues raised in its petition is minimal.

In Puget Sound Power and Light Co. (Skagit Nuclear Power Project, Units 1 and 2) LBP-79-16, 9 NRC 711 (1979), the Licensing Board stated that it was not moved to permit intervention where the reasonable outlook for intervention would be simply to allow someone to speculate about the possibilities or to provide only limited factual observations. Id. at 718. Subsequently, on appeal, the Appeals Board confirmed the ruling and noted:

> Past experience teaches that predictions on the ability or a prospective late intervenor to make a substantial contribution to the development of a sound record often rests upon little more than rank speculation. And, so it is here. . . . But it is wholly conjectural whether they will be able, either through expert testimony or the results of studies said now to be underway, to improve materially upon the record already adduced on the environmental effects of plant construction and opera-

> tions. . . . it seems highly unlikely that the tribes [petitioners] are as yet in a position to supply any hard evidence bearing upon their hypothesis. . . . Puget Sound Power and Light Co. (Skagit Nuclear Power Project, Units 1 and 2) ALAB-559, 10 N.R.C. 162, 171 (1979). (Emphasis added).

Similarly, in the instant case, West Valley offers no "hard evidence" bearing on its hypothesis. Rather, like petitioners in Skagit, it offers mere speculation about a number of general "possibilities" and the admonition to do further studies. For example, Dr. Davis' report summarizes his findings by conceding:

> [T]he reasons enumerated in this report, additional study of the possible effects of salt deposition on crops near the Palo Verde Station is in order so that, should it be significant, proper measures could be undertaken to reduce salt emissions during critical periods. (Emphasis added.) Davis Report at 1.

Dr. Davis later states that predictions from the salt dispersion model utilized at Palo Verde should be considered as very rough estimates and that salt deposition is "possibly under predicted." (Davis Report at 15). Finally, Dr. Davis opines: "In order to gather information on which informed discussion can be based the monitoring of salt deposition to crop lands around the plant should be seriously considered" (Davis Report at 16), and further that "it appears that further detailed study and consideration of salt deposition and its effects on crops around the Palo

Verde Station is warranted (Davis Report at 17). If Dr. Davis had taken the time to even briefly review the public record he would have found, as discussed in Argument No. X, infra, that a salt drift monitoring program is already contemplated and that his suggestion about the value of specific operational monitoring has been apparent to both the joint applicants and the NRC staff for years.

Dr. Mulchi's report is similarly more akin to speculative hypothesis than "hard evidence." Instead of providing anything definitive, Dr. Mulchi merely notes that "the effects of salt deposition on the leaves of high-value crops such as melons, lettuce and grapes is generally unknown. Studies to determine the response of these high-valued crops to foliar applied salts should have been conducted. . . ." (Mulchi Report at 11). Dr. Mulchi concludes his report with the observation that "Detailed Studies should be conducted to identify those crops which will be impacted the greatest by foliar deposition under the full range of salt deposition rates expected for Palo Verde." (Mulchi Report at 19).

Dr. Golay's report adds to the speculation and soothsayings. After detailing his perceived deficiencies in the already-developed record, Dr. Golay admits that "the degree to which these ommissions constitute serious inadequacies in the assessments embodied in the ES's [Environ-

mental Statements] remains to be established." (Golay Report at 2) (Emphasis added)

Quite obviously, Petitioner is not in a position to present "any hard evidence" itself regarding its ability to develop the record or it presumably would have done so. West Valley's contribution to the matter has already reached its potential. The contribution consisted of suggesting possible questions (apparently without thoroughly reviewing the record first) rather than providing any additional significant factual data. Joint Applicants respectfully submit that such an approach is not the type of participation which justifies or necessitates intervention.

ARGUMENT NO. V

WEST VALLEY'S INTEREST WILL BE ADEQUATELY PROTECTED

In considering the fourth factor from Section 2.714(a)(1), it should be kept in mind that the hearing in this proceeding has been completed and the record closed. The proceeding is now at the stage where the Board is preparing its initial decision. Further hearings or filings by the parties in advance of such decision are not anticipated. Under such circumstances, the fourth factor has little, if any, application to consideration of West Valley's Petition.

Nonetheless, even at this late stage of the proceeding, West Valley's interest will be adequately protected by the monitoring program and the continuing enforcement

powers of the NRC. The obvious concern of the West Valley members is that salt emissions from PVNGS could adversely affect the productivity of their lands. As is discussed in Argument No. X, Joint Applicants have already committed to monitor salt deposition, and the NRC will be kept informed of the results of such monitoring. Apart from any action that West Valley may wish to initiate as a result of such monitoring, the NRC Staff, if conditions warrant, also may institute a proceeding under Section 2.202 of the Commission's regulations to modify, suspend or revoke the operating licenses. West Valley's interest will thus be adequately protected by the monitoring program and by the NRC Staff without the necessity of intervention.

ARGUMENT NO. VI

WEST VALLEY'S PARTICIPATION WILL BROADEN THE ISSUES AND DELAY THE PROCEEDING

West Valley concedes that the grant of its Petition would delay the proceeding and indeed it would. As noted previously, the parties are currently awaiting an initial decision from the Board. Assuming such decision is issued within the next month, allowance for appellate review could easily consume the time remaining before the August 1, 1982, scheduled fuel loading for PVNGS Unit 1. If West Valley's Petition were granted, and further hearings were held in this proceeding, the result would be a delay in the issuance of a final decision of many months beyond the

scheduled fuel loading date. By Joint Applicants' estimation, pre-trial preparation, including a determination as to what contentions should be admitted, discovery, motions for summary disposition, including answers to such motions and rulings thereon, and preparation of written testimony, alone would consume six months. The conduct of the hearing, the filing of proposed findings of fact, including responses thereto, and the preparation and issuance of an initial decision would require an additional five to six months. The appeal process could also require six months. The result is that if a ruling granting intervention were made in January, 1983, it may not be until the summer of 1984 before an initial decision is issued and the appeal process is completed.[12/]

In Long Island Lighting Company (Jamesport Nuclear Power Station, Units 1 and 2), ALAB-292, 2 NRC 631 (1975), the Appeal Board focused on the significance of delay: "Undeniably, the delay factor is a particularly significant one; indeed -- barring the most compelling countervailing

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12/ West Valley suggests, in order to reduce the impacts of delay and assure that each PVNGS unit begins operation on schedule, that the Commission may require "only limited modifications on PVI and order that more complex and time consuming changes be reserved for PV2 and 3." Memorandum of Law at 14. Although a procedure similar to that mentioned by West Valley might serve to lessen the impacts of delay. West Valley did not offer to exclude Unit 1 from any reopened proceeding. As noted herein, a reopened proceeding alone, without regard to the time required to make modifications, could take until the summer of 1984.

circumstances -- an inexcusably tardy petition would (as it should) stand little chance of success if its grant would likely occasion an alteration in hearing schedules." Id. at 651 (emphasis added, footnote omitted). What the Appeal Board there said carries greater force where, as here, the hearing has already been held and the record closed. In any event, the arguments advanced by West Valley fall far short of establishing "the most compelling countervailing circumstances."

West Valley's attempt to mitigate the impact of delay by pinning the responsibility on APS and the NRC Staff does not withstand scrutiny. As noted in Argument No. I West Valley had ample notice of this proceeding and of the substantive aspects of salt emissions and salt deposition effects. It obviously chose for its own reasons, as opposed to those suggested now, not to become involved in a timely manner. Furthermore, West Valley has not made a convincing showing that the issues it wishes to raise are significant. The allegation of potentially devastating consequences (Memo. of Law at 15) made by West Valley rests entirely on the reports of its consultants. Those reports, as discussed in detail in Argument No. XII, infra, contain significant shortcomings and do not support West Valley's concern over salt drift and its effects. To the extent that uncertainties respecting salt drift and its effects exist, they are much more effectively resolved through the planned

monitoring program proposed by Joint Applicants and discussed in Argument No. X, infra then by a reopened proceeding.

ARGUMENT NO. VII

REOPENING OF THE RECORD IS NOT NECESSARY AND SUMMARY DISPOSITION IS APPROPRIATE

Should the Board deny the petition to intervene as applicants submit it should, there is no need even to consider West Valley's request to reopen the record since such requests are proper only if made by a party to the proceeding.

However, even if the Board concludes that West Valley should be permitted to intervene, a hearing on West Valley's contentions need be held only if the Board further finds that West Valley has met what the Appeal Board has characterized in several cases as the "heavy burden" imposed on the proponent of a motion to reopen. See Metropolitan Edison Company, et al. (Three Mile Island Nuclear Station, Unit No. 2), ALAB-486, 8 NRC 9, 21 (1978); Kansas Gas and Electric Company, et al. (Wolf Creek Generating Station, Unit No. 1), ALAB-462, 7 NRC 320, 338 (1978). In a trilogy of decisions arising from the Vermont Yankee operating license proceeding, ALAB-124, ALAB-126 and ALAB-138,[13/] the

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13/ Vermont Yankee Nuclear Power Corporation (Vermont Yankee Nuclear Power Station), ALAB-124, RAI-73-5 358 (1973); id., ALAB-126, RAI-73-6 393 (1973); id., ALAB-138, RAI-73-7 520 (1973).

Appeal Board set forth the principles which govern the consideration of a motion to reopen the record which is filed prior to the issuance of an initial decision. These principles were summarized in ALAB-138 as follows:

> During the proceeding on remand, some confusion appears to have arisen concerning the receipt of evidence in connection with consideration of a motion to reopen the record. Much of the problem may have been semantic, for it centered on possible distinctions among several terms such as the "record," the "evidentiary record," and the "hearing record."
>
> This confusion can largely be swept away by careful analysis of precisely what a licensing board must decide when confronted with a motion to "reopen the record" which, like the one filed here, seeks a further evidentiary hearing on new issues not previously considered. First, as we have indicated earlier (see ALAB-124, RAI-73-5 at 364-65), the board must consider: (1) the timeliness of the motion, i.e., whether the issues sought to be presented could have been raised at an earlier stage, such as prior to the close of the hearing; and (2) the significance or gravity of those issues. A board need not grant a motion to reopen which raises matters which, even though timely presented, are not of "major significance to plant safety" (ALAB-124, RAI-73-5 at 365). By the same token, however, a matter may be of such gravity that the motion to reopen should be granted notwithstanding that it might have been presented earlier (ALAB-124, RAI-73-5 at 365, fn. 10; see also ALAB-126, RAI-73-6 at 394).

> If these questions are resolved in the movant's favor, the Board must then proceed to consider whether one or more of the issues requires the receipt of further evidence for its resolution. If not, there is obviously no need to reopen the record for an additional evidentiary hearing. As is always the case, such a hearing need not be held unless there is a triable issue of fact.
>
> In other words, to justify the granting of a motion to reopen the moving papers must be strong enough, in the light of any opposing filings, to avoid summary disposition. Thus, even though a matter is timely raised and involves significant safety considerations, no reopening of the evidentiary hearing will be required if the affidavits submitted in response to the motion demonstrate that there is no genuine unresolved issue of fact, i.e., if the undisputed facts establish that the apparently significant safety issue does not exist, has been resolved, or for some other reason will have no effect upon the outcome of the licensing proceeding.

RAI-73-7 at 523 (footnotes omitted). The Appeal Board has consistently applied these principles to motions to reopen, see Metropolitan Edison Company, 8 NRC at 21, and has specifically noted that they apply to the reopening of a record on an environmental issue. See Kansas Gas and Electric Company, 7 NRC at 338; Georgia Power Company (Alvin W. Vogtle Nuclear Plant, Units 1 and 2), ALAB-291, 2 NRC 404, 409 n.6 (1975).

With respect to timeliness of the request, the standard from Vermont Yankee is "whether the issues sought

to be presented could have been raised at an earlier stage." RAI-73-7 at 523. Although considered by the Appeal Board in Vermont Yankee in the context of a motion to reopen filed by a party to the proceeding, there are even stronger reasons why the same timeliness standard should apply to a petitioner seeking both to intervene and to have the hearing record reopened. Where, as is the case here, the proponent of a motion to reopen attempts to have new evidence accepted, it must demonstrate that the "new" evidence was unavailable before the hearing closed. Northern States Power Company, et al. (Tyronne Energy Park, Unit 1), ALAB-464, 7 NRC 372, 374 n.4 (1978).

The position taken by West Valley is, of course, that its members "received their first indication that salt drift from nuclear generating facilities could potentially affect agricultural production in late spring 1982." (Memo of Law at 4). West Valley claims that it could not have been expected to be aware of potential problems of salt drift at an earlier time because the environmental impact statements and environmental reports related to PVNGS fail to mention any effects on agricultural crops from salt drift and representatives of Arizona Public Service Company failed to mention any such effects in meetings with West Valley members. Petition at 3. As covered in Argument No. I, supra, and as reflected by Appendix I, the NRC record is replete with detailed information respecting salt drift and

its predicted effects (or lack thereof), including its effects on agricultural crops. For example, the ER-CP provides figures showing expected offsite solids deposition patterns. ER-CP Figures 5.1-15, 5.1-17, 5.1-19, identifies the amount of cultivated acreage subject to offsite deposition, see id. at 5.4-1 to 5.4-4, and discusses the effects of salt deposition on cultivated vegetation, id. at 5.4-6 to 5.4-7. Similarly, the FES-CP states that "about 5500 offsite acres will receive between 25 and 125 pounds [of dissolved salts] per acre per year, and 22,000 acres between 11 and 25," FES-CP at 3-21, that "[i]t is important . . . to realize that at the present state of the art, drift model predictions may differ by a factor of 10 with observed values," id. at 3-25, that "airborne salts, when directly applied to plant seeds or the foliage, . . . may have adverse effects," id. at 5-17, and that salts would be deposited on cultivated vegetation, id. at 5-18, Table 5.8. Furthermore, Figure 3.7 of the FES-CP shows the range over which such salt depositions would occur. The foregoing illustrations are only a few examples of the extensive information on salt drift and the effects of salt deposition on cultivated plants which is contained in the reports which West Valley criticizes for supposedly failing "to mention any affects [sic] on agricultural crops from salt drift." (Petition at 3).

The reports discussed above are only two of the documents in the public domain relating to PVNGS which discuss salt drift from PVNGS and its potential impacts on agricultural crops. See discussion in Argument No. I, supra and Appendix I, infra. These two reports were both available to West Valley's members in 1975. It is simply untrue for West Valley to claim that it could not have been expected to be aware of the potential impact of salt drift on agricultural crops until the spring of 1982. Such lack of awareness could occur only if the members of West Valley chose not to read the reports which were made part of the public record over seven years ago.

Based on the foregoing, it is readily apparent that West Valley's request to reopen is not only untimely, but also that the untimeliness is without any cause, much less good cause. When faced with a similar situation, the Appeal Board stated:

> [T]he proponent of a motion to reopen bears a heavy burden. The motion normally must be timely presented and addressed to a significant issue. . . . In the case of a motion which is untimely without good cause, the movant has an even greater burden; he must demonstrate not merely that the issue is significant but, as well, that the matter is of such gravity that the public interest demands its further exploration. See Vermont Yankee Nuclear Power Corp. (Vermont Yankee Nuclear Power Station), ALAB-138, 6 AEC 520, 523 (1973); id., ALAB-167, 6 AEC 1151-52 (1973). Metropolitan Edison Company, 8 NRC at 21-22 (emphasis added).

Tested under such standard, it is submitted that the contentions proposed by West Valley do not warrant reopening the record. Even assuming that West Valley's view of the amount of offsite salt deposition and the impacts of such deposition is correct, the amount of agricultural land sustaining a measurable loss in productivity is limited. (See Argument No. XI, infra.) The agricultural land which could be affected is only a small portion of the 27,340 acres apparently owned by the West Valley members filing affidavits.[14/] Based on this assessment alone, the potential impact is insignificant and certainly not worthy of a reopened hearing.

Second, although West Valley claims in its contentions that the amount of salt deposition has been inadequately assessed and understated, and that the environmental impacts of salt deposition are inadequately assessed and will reduce the productivity of the lands of West Valley's members, the basis for such contentions, which derive entirely from the three West Valley consultants' reports, are demonstrated to be substantially unfounded by the critiques of such reports contained in Argument No. XII, infra. Whatever significance would otherwise be assigned to the proposed contentions is severely diminished by the presence of

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14/ See Attachment to Affidavit of Jackie A. Meck, dated October 13, 1982.

erroneous statements of fact in the reports of West Valley's consultants. When the consultants' mistaken and uninformed criticisms are stripped away what remains are allegations of uncertainties or gaps in knowledge respecting both the drift analysis and environmental impacts. The monitoring program committed to by Joint Applicants is a more effective means of resolving any such uncertainties and filling any such gaps than a protracted hearing which could yield little or no more information than that already present in the record.

Finally, it is obvious that the interest which West Valley claims will be affected if operating licenses are issued is the economic interest of its members. In view of the small number of acres which, even under West Valley's view, may experience a measurable loss in productivity as a result of the impacts of salt drift (See Argument No. XI, infra), it also becomes obvious that this interest is the private interest of relatively few individuals. Accordingly, there is no basis for concluding that the issues which West Valley is attempting to raise demand further exploration in the public interest. West Valley's private interest can be amply protected by other means. (See discussion in Argument No. III, supra.) This is not to say that the public interest does not impact the Board's consideration of West Valley's request to reopen. Indeed it does, for there is a public interest in seeing the administrative process come to a close. This point was arti-

culated by Mr. Justice Jackson more than thirty years ago in Interstate Commerce Commission v. Jersey City, 322 U.S. 503 (1944):

> One of the grounds of resistance to administrative orders throughout federal experience with the administrative process has been the claims of private litigants to be entitled to rehearings to bring the record up to date and meanwhile to stall the enforcement of the administrative order. Administrative consideration of evidence -- particularly where the evidence is taken by an examiner, his report submitted to the parties, and a hearing held on their exceptions to it -- always creates a gap between the time the record is closed and the time the administrative decision is promulgated. This is especially true if the issues are difficult, the evidence intricate, and the consideration of the case deliberate and careful. If upon the coming down of the order litigants might demand rehearings as a matter of law because some new circumstance has arisen, some new trend has been observed, or some new fact discovered, there would be little hope that the administrative process could ever be consummated in an order that would not be subject to reopening.

Id. at 514. Joint Applicants submit that West Valley's request to reopen is not only untimely, but also seeks to raise issues that are not significant. The request should be denied.

ARGUMENT NO. VIII

WEST VALLEY'S "WORST CASE" ANALYSIS SHOULD BE REJECTED UNDER NEPA'S "RULE OF REASON"

In connection with the contentions proposed in its Petition, West Valley argues that due to alleged inadequacies in the analysis of salt drift and the effects of salt deposition in the environmental reports and environmental impact statements related to PVNGS, "worst case" analyses of such drift and its effect are required. (Petition at 10, 18.) West Valley even goes so far as to argue that the EIS should be revised because the NRC Staff improperly failed to include a worst case analysis. (Id. at 18.) What West Valley advocates must be rejected for it is at odds with the applicable legal standard respecting the Commission's consideration of environmental impacts.

The determination of environmental impacts is a requirement imposed under the National Environmental Policy Act ("NEPA"). The Appeal Board has on several occasions addressed the legal standard applicable to the evaluation of environmental impacts. In Consolidated Edison Company of New York (Indian Point Station, Unit No. 2), ALAB-188, RAI-74-4 323 (1974), the Appeal Board stated:

> NEPA does not require the use of the most conservative assumptions in evaluating environmental impacts. In the absence of any such requirement, such assumptions should not be used, for they most surely would distort the

> finely tuned and systematic balancing which is performed.

Id. at 358 (emphasis added). The Appeal Board went on to state that a "rule of reason" is the applicable standard under NEPA. Id. In Public Service Company of Oklahoma et al. (Black Fox Station, Units 1 and 2), ALAB-573, 10 NRC 775 (1979), the Appeal Board rejected an argument made by intervenors that the rule of reason approach applies to the evaluation of alternatives, but not to the remainder of the NEPA evaluation. The Appeal Board held, based on applicable case law, that "this [rule of reason] standard is now well accepted." Id. at 779.

As stated by the Court of Appeals: "Section 102(2)(C)(i) of NEPA requires a 'detailed statement' on 'the environmental impact of the proposed action.' That language requires description of reasonably foreseeable effects. A 'rule of reason' is used to ascertain those effects anticipated." Carolina Environmental Study Group v. United States, 510 F.2d 796, 798 (D.C. Cir. 1975) (emphasis added). See Natural Resources Defense Council v. Morton, 458 F.2d 827, 831 (D.C. Cir. 1972).

Under the rule of reason, "worst case" or "most conservative" assumptions are to be avoided. Thus, in Delmarva Power and Light Company (Summit Power Station, Units 1 and 2), LBP-75-43, 2 NRC 215 (1975), the licensing

board, in addressing the potential impact of entrainment of striped bass by operation of the facility, stated:

> We find that both the Staff's and Maryland's modeling work have generated what appears to be somewhat conservative, but reasonable, ranges of estimated average potential annual losses to the fishery. . . . (We find that the Staff's 'Case C' approach would violate the 'Rule of Reason' approach, i.e., that it would unnecessarily lock us into an evaluation based on the 'most conservative assumption' possible -- an evaluation not required by NEPA. . . .)

Id. at 238 (citation omitted, emphasis in original). Joint Applicants submit that a "worst case" analysis would be inappropriate for purposes of analyzing the amount of salt drift and its impacts. The applicable standard is the one that has uniformly been applied by the courts and the Commisson's tribunals -- a "rule of reason". West Valley's attempt to advance a worst case standard strongly suggests that petitioner is either unfamiliar with the proper standard of evaluation or is trying to create a standard which might cast doubt on the substantial evidentary record which has already been compiled under the appropriate standard.

ARGUMENT NO. IX

WEST VALLEY'S REQUEST FOR DENIAL OF THE APPLICATION FOR EXTENSION OF THE UNIT 1 CONSTRUCTION PERMIT AND REVOCATION OF THE CONSTRUCTION PERMITS FOR UNITS 2 AND 3 IS IMPROPER

Among the remedies sought by West Valley is the denial of Joint Applicants' application for an extension of

the PVNGS Unit 1 construction permit or the inclusion of a condition in the extension requiring a solution to the salt deposition problems raised by West Valley. (Petition at 20.) West Valley's request should be denied because it is: (1) moot, (2) presented to the wrong forum, and (3) based on issues which are irrelevant to the construction permit extension application.

First, and perhaps most important, by Order dated November 4, 1982, the Commission issued an order extending the PVNGS Unit 1 construction permit to August 31, 1983. West Valley's request, therefore, is moot as to Unit 1.

Second, a licensing board presiding over an operating license proceeding does not have general jurisdiction over the already authorized construction of a plant for which an operating license application is pending. See Consumers Power Company (Midland Plant, Units 1 & 2), 15 NRC 1101, 1103 (1982). This Board was designated to preside over the operating license proceeding for PVNGS, not a construction permit extension proceeding. West Valley's request, therefore, is outside the scope of this operating license proceeding.

Finally, the only contentions proposed by West Valley in its Petition concern salt drift and the effects of salt deposition. These proposed contentions have nothing to do with the reasons cited by Joint Applicants as justification for their request for extension of the PVNGS Unit 1

construction permit. Contentions which do not arise from the reasons assigned by an applicant in justification of the request for a construction permit extension are inadmissible in a construction permit extension proceeding. Northern Indiana Public Service Company (Bailly Generating Station, Nuclear 1), ALAB-619, 12 NRC 558, 568 (1980).

For each of the foregoing reasons, West Valley's request should be denied.

West Valley further requests in its Petition that the construction permits for PVNGS Units 1 and 2 be revoked or amended to include a condition requiring Joint Applicants to solve the salt deposition problems raised by West Valley. (Petition at 20.) By this request West Valley seeks a remedy that this Board is not authorized to give.

> A licensing board for an operating license proceeding, such as the one involved here, is limited to resolving matters that are raised therein as legitimate contentions by the parties or by the board sua sponte, 10 CFR 2.760a; Consolidated Edison Company of New York (Indian Point, Units 1, 2 & 3), ALAB-319, 3 NRC 188, 190 (1976). Pursuant to that mandate, a board can authorize or refuse to authorize the issuance of an operating license. It does not, however, have jurisdiction over the already authorized ongoing construction of the plant for which an operating license application is pending, and it cannot suspend such previously issued permit. Consumers Power Company, 15 NRC at 1103.

Under the foregoing principle, West Valley's request that the construction permits for Units 2 and 3 be revoked is

beyond the scope of this proceeding and the relief sought exceeds the jurisdiction of the Board.

ARGUMENT NO. X

A SALT DRIFT MONITORING PROGRAM PROVIDES A MORE SUITABLE AND EFFECTIVE METHOD THAN REOPENING THE RECORD FOR RESOLVING UNCERTAINTIES AND PROTECTING AGRICULTURAL INTERESTS.

Petitioner's consultants urge that an effective monitoring program be instituted to evaluate the impacts, if any, of salt depositions from cooling tower drift. [Davis Report, pp. 2, 16-17; Golay Report, pp. 15-16.] They also complain that this subject was not addressed in the FES-OL or ER-OL.

Applicants concur that such a monitoring program should be conducted and have committed explicitly to do so C.P. Hearing Transcript, pp. 846-47.] The scope of the monitoring program is outlined in Appendix II hereto.

The implementation of this program will go farther in meeting the concerns of agricultural interests expressed in the petition and the consultants' reports than can possibly be achieved by reopening the record. The basic arguments presented by the Petitioner's consultants stem from asserted uncertainties in modelling and estimating impacts. Reopening the record will not resolve those uncertainties. But an effective monitoring program can.

Moreover, it is fortuitous that the Palo Verde units will be placed in operation sequentially. As a con-

sequence, if there are any gross errors in the modelling or in the estimates of off-site effects, they should be detected promptly after Unit 1 starts full power operation and before Unit 2 reaches that stage. Even more monitoring information will become available before Unit 3 is placed into operation. Since operation of Unit 1 alone can produce only one-third of the emissions that will result from operation of three units, the risk of any adverse environmental impacts will be reduced by two-thirds.

The results of an effective monitoring program can also be beneficial in assessing the most cost-effective corrective action, if any such action is required -- a matter which should be of concern to agricultural interests since they also require electric power and must pay their fair share therefor.

Even if the monitoring program committed to by Applicants and outlined in Appendix II is not considered by Petitioners or their consultants to be adequate or effective, intervention and reopening the record is neither necessary nor suitable at this time to deal with the scope and details of the program. The operational Environmental Protection Plan is still in its formative stage, and the environmental technical specifications have not yet been drafted. If Petitioner or its consultants have any concerns respecting the scope or details of the program, there is ample time to bring them to the attention of the Appli-

cants and/or the NRC Staff. If any such concerns are not resolved to Petitioner's satisfaction, they will still have the right to seek relief under Section 2.206 of NRC's regulations. In any event, Applicants commit to faithfully consider any monitoring suggestions Petitioners may choose to offer at this time or any later date.

In this connection, it is obvious that Applicants have very real, economic incentives to conduct a demonstrably effective monitoring program. As pointed out in Argument No. III, supra, Petitioner's members have adequate remedies at law to obtain either injunctive relief or damages for any provable harm. So long as Applicants are exposed to the risk that such remedies are available, there is a very real incentive to minimize such risk and to conduct an effective program, perform requisite maintenance, and take appropriate corrective action promptly.

In the final analysis, however, the only method of resolving acknowledged uncertainties in the predictions of effects of operation of the Palo Verde units is to permit Unit 1 to operate. Reopening the record will not achieve this goal.

. . . . .

ARGUMENT XI

THE POSSIBLE GEOGRAPHIC AREA OF SALT DRIFT, EVEN UNDER PETITIONERS' VIEW, INCLUDES VERY LITTLE CULTIVATED LAND AND THE LIMITED POSSIBLE CROP EXPOSURE DOES NOT JUSTIFY EITHER REOPENING THE RECORD OR THE RELIEF SOUGHT BY PETITIONERS.

On page 11 of his report Dr. Davis presents a comparison of the salt drift estimated for PVNGS compared to that predicted for the Vienna Station scaled to PVNGS conditions. Davis' Exhibit 5 compares the maximum deposition predicted at various distances from the cooling towers for the two cases. Argument XII of this response deals with errors Dr. Davis made in interpreting the PVNGS deposition predictions. This argument addresses the consequences, in terms of the amount of cropland potentially affected by salt drift, if the predictions made for the Vienna Station are scaled up and applied to PVNGS. The results of this exercise are presented together with the methodolgy used.

It should be initially stated that Applicants do not agree with the Petitioner's use of scaled up Vienna Unit 9 values as being more appropriate for PVNGS than the drift deposition predictions presented in ER-OL Section 5.1.4 and concurred with by the NRC in FES-OL Section 5.5.1. Although some of the deficiencies that Davis claimed existed in the FOG model used by the Joint Applicants (Davis Report, p. 11-13) may be eliminated to Davis' satisfaction by use of a model developed by Davis himself, the differences in site meteorology could certainly result in different deposition

patterns even if all other factors are identical for the two stations. However, even Petitioner's own assumptions do not provide a reasonable basis for claiming that significant harm to agricultural crops will result from operation of PVNGS.

Figure 11-1 contained within Appendix II is a November 3, 1982 aerial photograph of the PVNGS site vicinity superimposed with distance rings (0.5, 1, 2, 3, 4, and 5 mile radii from the cooling towers) and scaled-up Vienna Unit 9 salt deposition contours (1000, 500, 100, 50, 25, 10 and 5 lbs/acre/year). The PVNGS site boundary and crop areas are also indicated. Figure 11-2 contained within Appendix II is a graphical representation of the data on Figure 11-1. As discussed below, based on the Petitioner's own data, these figures demonstrate that less than 700 acres of cropland are subject to drift deposition rates of 5 lbs/acre/year or greater and none of this land is subject to rates above 25 lbs/acre/year, which is less than the deposition rates which even Petitioner alleges are necessary to cause harm to vegetation.

The deposition contours were developed in the following manner:

> The values in Table A-5 (found in Davis' Reference 5, see Davis Report, p. 4) for annual salt deposition from the Vienna Unit 9 round mechanical draft cooling tower were scaled up to PVNGS conditions based on the ratio of the total pounds of salt emitted by the two

stations. It should be noted that the 15,000 ppm total dissolved solids presented in ER-OL Section 3.4 and used in the PVNGS salt emission calculation is greater than the 12,000 ppm TDS circulating water quality expected (see discussion in Argument XII.1.A).

The kg/ha/month values in Table A-5 were converted to lbs/acre/year to be consistent with data previously presented by the Applicants, particularly in ER-OL Figures 5.1-2, 5.1-3, and 5.1-4.

The distances to various salt deposition levels (e.g., 500 lbs/acre/year) were calculated based on linear interpolation between the scaled-up values at two known points for each of the 16 compass directions.

The scaled up values were plotted along the 16 compass directions using the center of the PVNGS Unit 2 cooling towers as the origin point. The salt drift isopleths were then constructed by contouring a smooth curve among the 16 locations for a particular depositon level.

Figures 11-1 and 11-2 clearly demonstrate that a very small amount of agricultural land is subject to salt deposition levels or potential impacts that are expected to be measurable. The NRC staff in Regulatory Guide 4.11 suggests a value of 17 lbs/acre/year as a threshold for possibly initiating offsite measurement programs. On page 10 of Dr. Mulchi's report, he states that "corn yields were reduced from 5% to 10% by salt deposition as low as 2.0 lbs/acre/week, whereas soybean yields were unaffected by such a low deposition rate." A report prepared for the

Maryland Power Plant Siting Commission on Vienna Unit 9 (Davis Report, p. 4, Reference 5) states on page I-5 that deposition levels of 5.4 to 14 lbs/acre/month could cause small, possibly undetectable reductions in yields for such crops as corn and soybeans. To maximize the conservativeness of this argument, the extremely low deposition value of 5 lbs/acre/year, compared to the 17 to 168 lbs/acre/year levels discussed above, is used as a significant level.

The 5 lb/acre/year value is assumed to be a very conservative lower limit at which drift impacts could potentially be detected in vegetation, including agricultural crops. This value is not intended to suggest that damage will or is even likely to occur at this low deposition level. Damage to particular crops from specific deposition levels can only be established through scientific investigation such as the proposed PVNGS monitoring program discussed in Argument X.

Based on the scaled-up Vienna values as shown in Figures 11-1 and 11-2, the maximum salt deposition at the site boundary is 100 lbs/acre/year, which occurs at the western border about 0.5 miles from the center of the Unit 2 cooling towers. The nearest agricultural land is located 1.3 miles northwest of the Unit 2 cooling towers and 0.5 miles from the northwest corner of the PVNGS site in an area subject to between 10 and 25 lbs/acre/year of salt deposition. The assumed significant level of 5 lbs/acre/year

occurs between 2.3 and 3.9 miles from the center of the Unit 2 cooling towers depending on the direction. The total acres of agricultural land at various deposition levels are shown below:

Salt Drift Deposition Level	Approximate Amount of Agricultural Land
5-10 lbs/acre/year	600 acres
10-25 lbs/acre/year	80 acres
greater than 25 lbs/acre/year	0 acres

Thus, it can be seen that less than 700 acres of agricultural land are within the area subject to drift deposition greater than the very low value of 5 lbs/acre/year based on the Petitioners' suggested calculations. There is no agricultural land located in areas subject to the 65 to 168 lbs/acre/year drift levels at which the Petitioners claim that damage to crops and other vegetation would occur. In fact, the nearest agricultural land is predicted to receive salt deposition between 3 and 17 times lower than values stated by the Petitioners' own consultants to cause vegetative damage.

Therefore, by the Petitioner's own data, there is very little cropland within an area where drift impacts could possibly be measured and no cropland within an area subject to drift deposition levels cited by the Petitioner as known to cause harm. This conclusion shows there is no

reasonable basis for the Petitioner's claim that salt deposition from PVNGS will occur at levels sufficient to cause harm to surrounding agricultural crops.

ARGUMENT NO. XII

PETITIONER'S COUNSULTANTS CRITICISMS ARE BASED ON MISUNDERSTANDING OF THE NRC RECORD.

Petitioner's consultants have made a number of impermissible and erroneous assumptions that have caused them to reach incorrect or unsupportable conclusions. Beyond the failure to consider the full construction permit record, discussed in Argument No. I, supra, the consultants have misstated the quality of makeup water and of cooling water. Further, they have misrepresented the operating characteristics of the cooling towers, the spray ponds, and the evaporation ponds. They have also misapplied the results of studies conducted at other sites and at least one of them has grossly miscalculated salt emissions and depositions. As a result of these errors, the consultants' conclusions -- and therefore the proposed basis for reopening the record -- are inaccurate and misleading.

Joint Applicants have so far identified the following errors:

Error Group 1. Cooling Water Quality

Part A - Cooling Tower Makeup and Circulating Water

Each of the Petitioner's consultants has argued as a part of their "worst case" thesis[15/] that the salinity in the cooling water makeup might or could increase and therefore the salt depositions from the cooling tower drift might or could be greater than predicted. In the main, this argument is based upon the speculative and unsupported assumption that the TDS concentrations in the wastewater effluent from the 91st Avenue Plant will increase or that on-site well water will be used in the cooling tower makeup. Thus, Dr. Davis speculates that "if 15 concentration cycles are allowed and the makeup water salinity should increase to higher levels due to fluctuations in the Phoenix effluent or due to use of well water," the salinity in the drift could be higher than predicted. [Davis Report, p. 13, lines 24-27].

Similarly, Dr. Golay speculates that "the salinity would also increase because of possible increases in salinity of the makeup water which is available under contract, and because of the use of makeup water from backup-source on-site wells -- which is more saline than is the water

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15/ The impropriety of a "worst case" analyses in performing environmental impact assessments is set forth in Argument VIII, supra.

which is provided to the PVNGS under contract from the City of Phoenix." [Golay Report, p. 14, lines 9-14].

Dr. Mulchi speculates even more dramatically about a "worst-case scenario where the tower salinities reach 25,000 to 30,000 ppm." [Mulchi Report, p. 16, lines 21, 22]. No straightforward explanation is given by Dr. Mulchi for his worst case scenario, but he does refer to (i) his experience with plants using brackish tidal waters (i.e., Chalk Point) for cooling and (ii) a presumed increase in salinity of Phoenix wastewater to 2400 ppm based on some data from Buckeye Irrigation Company records. [Mulchi Report, p. 17].

Wholly apart from the question whether the record in this proceeding should be reopened to entertain such speculative arguments, it can be demonstrated that the bases for the speculations have no support in the record and are in fact contrary to the record evidence.

First, the argument that fluctuations in salinity in wastewater could result in higher salinity in the drift than predicted ignores JA Exhibits U (Revised) and CC. If Petitioner's consultants had considered the evidence in the record, they would have learned that the monitoring of the wastewater effluent from June 1976 to July 1980 showed fluctuations in TDS concentrations from a low of about 650 ppm to a high of about 1040 ppm, with an average concentration in the 800-850 ppm range. Thus, the prediction of

salinity at 15,000 ppm in drift at 15 cycles of concentration is reasonable if the highest observed values were used. If average values were used (as permissible under the "rule of reason"), the concentrations at 15 cycles would be approximately 12,000 ppm, or 20% less.

But even the average value of 12,000 ppm may be too conservative since it is based solely on the salinity of influent to the Water Reclamation Facility (WRF) and ignores any reduction in salinity resulting from treatment in the WRF. [See JA Exhibit U (revised)].

Second, there is no evidence which would permit use of comparisons of Palo Verde to plants using brackish tidal waters. Obviously, the salinity of tidal waters will fluctuate daily and seasonally. In contrast, however, the influent to the 91st Avenue Plant is derived from runoff surface water collected, mixed and stored behind six dams on the Salt and Verde Rivers and from 442 wells operated by the Salt River Project and the six Multi-Cities that send their wastewater to the 91st Avenue Plant. It is not surprising then that the record in this proceeding shows relatively small fluctuations in the salinity or the effluent received from the 91st Avenue Plant.

Third, there is no basis for assuming under any circumstances that there will be an inadequate supply of effluent which would necessitate operation at greater than 15 cycles of concentration or use of "backup" sources. In

fact, practically the entire evidentiary record accumulated in the hearings conducted last Spring focused precisely on this point. The record shows that until 2005-2010 water supplies will be sufficient and no exchanges of effluent for Central Arizona Project (CAP) water will be required. It also shows that by 2005-2010 there will be a very large amount of effluent available for exchange in excess of the needs for Palo Verde.

Fourth, there is no basis in the record to assume, as Dr. Mulchi has done, that the salinity of groundwater in the Buckeye Irrigation District is the proper gauge of the salinity of the effluent from the 91st Avenue Plant. JA Exhibit U (revised) is the best evidence on that issue. Moreover, the record is replete with testimony that the salinity of groundwater that finds its way to the 91st Avenue Plant is on the average about 1000 ppm. [Steiner, Tr. 785; JA Exhibit Q, p. 62]. The record is also clear that the groundwater in the Buckeye Irrigation District is of much lower quality [JA Exhibit JJ], but no such water will be used at Palo Verde.

Fifth, there is no basis for the speculation by each of the consultants that on-site well water may be used as a backup source of cooling water. The facts in the record are to the contrary. [Affidavit of Van Brunt attached]. Apparently, the consultants' speculation on the use of on-site wells is based on allegations found in the several af-

fidavits of members of West Valley Agricultural Protection Council, Inc. But, as the attached affidavit of Hudgins shows, such allegations are simply not true. Further, the speculated backup source of on-site groundwater is limited by the Groundwater Management Act to the quantity of grandfathered water rights. As Intervenor's Exhibit XXXII shows, such rights have been determined preliminarily by the Arizona Department of Water Resources (ADWR) to be only about 5,200 acre-feet per year. After deduction from this amount of the 1,600 acre-feet per year of water required for potable and other purposes, the maximum amount available for condenser cooling would only be about 3,600 acre-feet, or less than 6% of the total annual cooling water makeup. Finally, before on-site water could be used for condenser cooling, NRC review would be required for both safety and environmental considerations.

Part B - Spray Pond Water

Davis asserts in his report that the spray pond system used during shutdown is ". . . expected to emit about the same amount of drift as the cooling towers. . ." and ". . . may produce salt deposition exceeding that from a unit's cooling towers." [Davis Report, p. 8, lines 8-9, p. 15, lines 25-26]. This assertion by Dr. Davis is totally incorrect and is unjustifiable. Presumably the assertion is based on the fact that the liquid drift loss from the spray ponds (27 GPM) is essentially the same as the liquid drift

loss from the cooling towers (26 GPM). However, as ignored by Dr. Davis, the quantity of salt carried by the spray pond drift is determined by the salinity of the drift water. As indicated in JA exhibit X, Table 3.4-4, the total dissolved solids of the essential spray pond system water during normal operation is 357 ppm, which at 27 GPM results in a calculated salt emission of 116 pounds per day. This value can be compared with that shown in Exhibit 2 of Dr. Davis' report of 14,040 pounds of salt per day for all three units, or 4680 pounds of salt per day per unit. The salt emission rate, therefore, for the essential spray pond is approximately 2 1/2 percent (116/4680) of that carried from the towers. Thus, spray pond drift deposition could not approach, much less exceed, cooling tower drift deposition.

Part C - Evaporation Pond Water

Davis incorrectly asserts that the Joint Applicants failed to consider salt deposition from evaporation ponds. As stated by Davis

> "[a]nother potentially large source of salt is dust blow-off from the evaporation ponds. These are expected to be large dry beds of salt." [Davis Report, p. 8 lines 15-17]

He later concludes that in addition to the cooling towers as sources of salt deposition

> ". . . there are other sources. Principal among these are the large evaporation ponds." [Id., p. 15 lines 18, 19]

In fact, table 3.3 1 of Joint Applicants' Exhibit X shows the average total flow rate of waste water from three units to the evaporation pond will average 2800 gal/min on an annual basis. Further,

> "[i]t is anticipated that the total area of ponds developed at any time will be covered with water continuously. Thus, it appears unlikely that any material in the evaporation ponds could become airborne." Joint Applicants Exhibit X, Section 5.3.1, p. 5.3-1].

Thus the evaporation ponds will remain wet and not create a dust blow-off condition contributing to off-site salt deposition.

Joint Applicants have also described plans to add an additional 420 acres of evaporation ponds (for a total of 670 acres) to retain blowdown [See JA Exhibit X, Section 3.6.3.1]. Suffice it to say the Joint Applicants would surely not be planning to add additional capacity if the initial pond acreage were expected to be dry.

Error Group 2. Drift Deposition

Part A - Comparison of Drift Deposition Patterns

Davis asserts that the FOG model may underpredict salt deposition by a "factor of more than a hundred at 0.3 miles." [Davis Report p. 11, lines 34] This assertion is based on a comparison of the Palo Verde results with results of another study made by Davis using a different model for the proposed Vienna Plant. In Exhibit 5, attached to Davis' report, salt deposition at Vienna of 1600 pounds per acre-

year is compared to a value at Palo Verde of 12 pounds per acre-year, both at 0.3 miles from the towers. The comparison is both improper and misleading. Davis' Exhibit 7, a copy of Joint Applicants' Exhibit X, Figure 5.1-4, shows the value of 12 to occur at the northeast corner of the site boundary, which is 1.6, 1.8, and 2.1 miles from the Unit 1, 2, and 3 cooling towers respectively (Joint Applicants' Exhibit X, Figure 3.1-4), not 0.3 miles as stated by Dr. Davis.

Thus an accurate treatment of the offsite Palo Verde salt deposition values in the consultant's Exhibit 5 would show a blank entry at 0.3 and at 1 mile; a value of 12 at 2 miles (versus the 40 shown for Vienna); and the remaining entries of 5 pounds per acre-year for succeeding distances. Table 12-1 is a corrected version of Davis' Exhibit 5. On this basis, the difference in the predictions for offsite deposition rates shrinks from a factor of "more than a hundred" to a factor of perhaps three at a distance of 2 miles, and decreasing thereafter. This maximum factor of three difference in the offsite deposition predictions lies within the expected range of uncertainty for such models at the present state of the art, particularly in light of significant differences in the climatology for the two sites. In any event, a factor of three at a radius of 2 miles and a factor of less than two at all greater radii of interest is a far cry from the asserted factor of 100.

TABLE 12-1

CORRECTED EXHIBIT 5

DISTANCE FROM TOWERS (miles)	OFFSITE SALT DEPOSITION (lbs/acre-year) Palo Verde		Vienna
	Corrected	As Presented In The Petition	
0.3	---(1)	12	1600
1	---(1)	5	60
2	12	5	40
3	5	5	12
4	5	5	7
5	5	5	7
6	5	5	7

1. Onsite deposition only

Part B - "Low Deposition Rate"

Dr. Mulchi relates that in his Chalk Point investigation "[c]orn yields were reduced from 5 to 10% by salt deposition as low as 2.0 lbs Ac^{-1} wk^{-1}, whereas soybean yields were unaffected by such a low deposition rate." [Mulchi Report p. 10, lines 5-7] This converts to over 100 pounds per acre per year and is eight times the maximum deposition predicted by Joint Applicants Exhibit X Figure 5.1-4 at the northeast site boundary (and over 2 times greater than that scaled by Dr. Davis at the same distance).

Part C - Mulchi's Miscalculations

Dr. Mulchi's conclusion that "it is certainly possible to have salt deposition rates in the range of 2-4 pounds per acre per week" [Mulchi Report, p. 16] is based first upon erroneous calculations that are shrouded in mystery. His errors in such calculations are then compounded by assumptions shown to be false respecting increases in the salinity of the influent to the circulating water system. [Error Group 1, Part A, Supra].

The erroneous conclusion apparentIy stems from a miscalculation of information from Davis' Report. Thus, Dr. Mulchi recites:

> "From Dr. Davis's report, it would appear that 2.66 million pounds of salt will be deposited annually within a 4.0 mile radius of the cooling towers and that large quantities of the remaining 75% of the salt emitted from the plant

> will be deposited from 4-6 miles and beyond." [Mulchi Report, p. 16].

Apparently, from the base 2.66 million pounds of salt emissions per year Dr. Mulchi derived the amount of annual salt deposition in a 4.0 mile radius (32,153.6 acres) to be 82.73 pounds/acre, which divided by 52 would average about 1.6 pounds/acre/week. He then doubled this amount on the basis of assumptions which have been shown to be impermissible [see Argument VIII, supra] and concluded that depositions in the amount of 2-4 pounds/week were possible.

There are two glaring errors in Mulchi's initial calculations. First, the Davis Report does not state that "75% of the salt emitted by the plant will be deposited 4-6 miles and beyond." On the contrary, the Davis Report (page 8) explicitly states

> ". . . 25% of the salt emitted annually is deposited within six miles of the cooling tower. The remaining 75% is deposited beyond six miles. . . ." [Emphasis added].

Second, Mulchi's statement that 2.66 million pounds of salt will be deposited within 4.0 miles is both mystifying as to the source and grossly inaccurate. Mulchi and Davis both agree that the total predicted annual salt emissions are 5.1 million pounds. [Mulchi Report, page 8; Davis Report, Exhibit 2[16/]]. If one were to rely on the Davis Report, as

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16/ Exhibit 2 to the Davis Report states a salt budget for Palo Verde at 14,040 pounds/day which is equal to 5,124,600 pounds per year.

Mulchi purported to do, then 25% of the 5.1 million pounds would be deposited within 6 miles of the cooling towers. This would amount annually to about 1,275,000 pounds over 72,345.6 acres -- not 2.66 million pounds over 32,153.6 acres as Mulchi initially stated.

Thus, if Mulchi had correctly applied the Davis data, the salt depositions in the six mile radius would have been about 17.62 pounds per acre per year, or 0.34 pounds per acre per week. This amount is approximately 1/10 of the amount of salt depositions which Mulchi asserts could result in a 5-10% reduction in corn yields.

Part D - Wind Blown Drift

Golay asserts that wind effects on the cooling tower were not adequately addressed by the Applicants since

> "[t]he drift performance predictions cited in the ES-OL are those evaluated by the cooling tower vendor at the design point." [Golay Report, p. 11, lines 16-18].

These wind effects include strong winds blowing droplets off the exposed surface of the water distribution canal.

It should be noted, as shown on Joint Applicants' Exhibit X, Figure 3.4-8, that there is a windwall around the outer perimeter of the distribution canal to minimize wind effects on the exposed water surface.

Additionally, Golay acknowledges with respect to this drift phenomena that

> "[t]he droplets produced would typically enter the atmosphere in the region between the cooling tower plume and the downwind wake. Due to their typically large size (of the order of mm in diameter) and near-ground point of release, these droplets would be expected to strike the ground relatively near to the point of release (less than 1 km from release.)," [Golay Report, p. 13, lines 3-9].

Therefore, even assuming Golay's assertions about this drift to be correct, it can have no impact on cultivated areas since no cultivated areas are within 1 km of the cooling towers.

Part E - Spray Pond Emissions

On Page 30 of his report Dr. Golay misrepresents the drift emissions from the spray pond by ignoring the correct value for total dissolved solids in the essential spray pond water supply presented in Table 3.4-4 of the ER-OL. As that table indicates, the total dissolved solids concentration in that water supply system is 357 ppm during normal operation. The 27 gpm drift rate correctly quoted from the ER-OL Figure 3.3-1 would thus produce 116 pounds of salt in drift per day, or over a six month period about 21,170 pounds.

Under the ER-CP assumption of circulating water concentration in the cooling tower circuit of 15,000 ppm assumed by the consultants, 5.1 million pounds of salt would be emitted over the course of a year by all three units operating 100 percent of the time. If each of the units

were to be shut down for two months in a year as postulated by Dr. Golay, the cooling towers would emit 10/12 of the full operational drift of 5.1 million pounds or 4.26 million pounds per year. Thus, a correct calculation of salt drift from the essential spray ponds using the information presented in the ER-OL indicates that under Dr. Golay's hypothesized operating condition the drift from the essential spray pond represents approximately 0.5 percent of the total salt emitted by the cooling towers, an insigificant contribution, rather than the "roughly one-ninth of the total salt drift" asserted by Dr. Golay.

On page 30 of his report, Dr. Golay correctly states that "[t]he spray ponds would routinely be operated only during refueling shutdown periods." However, Dr. Golay does not extend this logic to consider that the drift from the essential spray pond would reduce the estimate of total salt discharged from the site, which currently assumes the cooling towers to operate 100 percent of the time. Thus the asserted failure to consider the contribution of drift from the essential spray ponds has in fact resulted in a more conservative estimate of off-site salt deposition than would have been the case had the contribution from these spray ponds been explicitly considered as they are expected to operate.

Part F - Applicability of Off-Site Data

Section IV of Dr. Mulchi's report (pp. 9-12) provides a discussion of "Experience with the Effects of Salt Deposition on Other Crops," and Section V (pp. 13-19) reviews the "Application of These Studies to Palo Verde." Dr. Mulchi specifically states

> "Since the Palo Verde environment is totally different from the environment in which the Chalk Point studies were conducted, the results obtained in the Chalk Point study can only be used as a general source of information rather than directly comparable. [Mulchi Report p. 13, lines 2-6].

Dr. Mulchi then proceeds to discuss how the similar range of circulating water salinity and the occurrence of drought periods at Chalk Point could lead to a situation of comparable injury to vegetation at PVNGS. In light of his opening statement as quoted above and since Dr. Mulchi emphasizes the necessity for site specific data:

> "Therefore, depending on such factors as the intensity of salt deposition, sensitivity of the crops, length of time between rain events, relative humidity conditions during the predawn hours, etc., a situation could exist that a low amount of salt deposition in a dry environment could cause comparable injury to plants growing under higher salt deposition rates in more humid environment," [Mulchi Report, p. 14, lines 18-25]

it appears that he concurs with the view of the Joint Applicants, the NRC (FES-CP p. 1-3 and p. 5-18), and Dr. Davis

(p. 16) who quoted the NRC's conclusion (FES-CP p. 5-18), that coastal saltwater cooling tower impact data have very limited applicability at PVNGS.

On this basis it does not seem reasonable nor consistent to apply deposition injury levels at Chalk Point to PVNGS. Yet this is just what Dr. Mulchi does when he states

> ". . . it is certainly possible to have salt deposition rates in the rage of 2-4 lbs Ac^{-1} wk^{-1}, where corn yields were reduced by 5-10%, or under the dry conditions at PV, at an accumulate level over many weeks sufficient to cause similar crop damage." [Mulchi Report, p. 16, lines 17-21].

The inapplicability of Chalk Point and other coastal data to PVNGS emphasizes the need for a site specific monitoring program to accurately identify specific impacts to vegetation. The program of the Joint Applicants is discussed in Argument X.

Error Group 3. Deposition Impacts

Part A - Generalized Crop Impacts

Dr. Mulchi states:

> "Based on my experience with saline aerosol effects on crops, the extreme quantities of salts which will be emitted from the nine cooling towers and other sources at Palo Verde over time will, in my judgment, cause damage to some of the crops grown in the region." [Mulchi Report, p. 19, lines 6-10].

Joint Applicants submit that such speculation is totally without foundation and Dr. Mulchi's judgment should be afforded no consideration. His experience with aerosol crop damage of corn, soybeans, and tobacco [see Mulchi Report, p. 9, line 19] is irrelevant as the local crops are cotton, sugar beets, alfalfa, barley, and wheat [see JA Exhibit X, Section 5.2]. His reference to "extreme" quantities of salt is again grossly misleading as discussed in Error Group 1 Part A and Error Group 2 Part C, supra.

Part B - Cotton Impacts

Dr. Mulchi asserts that cotton's

> "response to foliar applied salts has not been examined." [Mulchi Report, p. 12, lines 8, 9]

This is incorrect. ER-CP Section 5.4.2.2 describes the effect of salt deposition on indigenous and cultivated vegetation, including a reference to Mulchi's own work on the effects of salt spray on corn and soybean crops.[17/] As the ER-CP indicates, neither crop, however, is grown in the region of the site largely due to their low salinity tolerance. This same section of the ER-CP also states: "Cotton, the most commonly grown crop near the site, has been re-

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17/ Mulchi, C.L. and Armbruster, J.A., "Effects of Salt Sprays on the Yield and Nutritional Balance of Corn (Zea mays, L.) and Soybeans (Glycine max, L.)." Paper presented at Cooling Tower Environment-1974 Symposium, Univ. of Maryland, College Park, Maryland, March 5, 1974 [cited as Reference 22, ER-CP Section 5.4.3, p. 5.4-17].

ported to suffer appreciable reductions in yield when irrigated with a sprinkler system in Arizona using water with an average salt content of 3000 parts per million. (Reference 35)." Reference 35 (given on page 5.4-18 of the ER-CP) is Busch, C.D. and Turner, F.T. Jr., "Sprinkling Cotton With Saline Water," Progressive Agriculture in Arizona, 17:27-28, 1965. It should be noted that this irrigation with saline water which produced "appreciable reductions in yield" corresponds to an application of over 8000 pounds of salt per acre foot of water applied to the crop.

Part C - Pittsburg Plant Impacts

Dr. Mulchi discusses a visit he made to the Pittsburg Station of Pacific Gas & Electric Company (PG&E) and states:

> "The salinity of the cooling tower water (500 ppm) was much lower than the values shown for Palo Verde and the Pittsburg plant is a much smaller power plant than is proposed for the Palo Verde Station. However, the environments near the two power plants for the period April through December appear similar. I observed extensive vegetation damage on a wide range of native plants frowing near the power plant. (There were no agricultural crops growing adjacent to the Pittsburg plant.)" [Mulchi Report, p. 15, lines 12-20]

Information provided by PG&E, for whom Dr. Mulchi served as a consultant during 1979-1980, as well as our understanding of the nature of proper scientific investigation, cast significant doubt on the credibility of Dr. Mulchi's asser-

tions. The following paragraphs address operations at the Pittsburg Station, the circumstances of Dr. Mulchi's visit, and the appropriateness of drawing correct scientific conclusions based on extremely limited data.

Dr. Mulchi has not presented a complete picture of operations at the Pittsburg Station or of his visit to the station. The cooling system consists of two 13-cell Marley rectangular mechanical draft cooling towers. The circulating water flow is 186,000 ppm and the towers are normally operated with a concentration factor of 1.5-2. The drift guarantee rate is 0.004 percent. Makeup for the cooling tower system is obtained from Suisun Bay (upper San Francisco Bay) which, being a tidal estuary, has variable water quality. This situation is similar to the variable makeup water quality at the Chalk Point Station that Dr. Mulchi is apparently very familiar with. Salinity in Suisun Bay normally ranges from a few hundred up to 5000-6000 ppm. Based on a concentration factor of 2, the salinity of the circulating water could range up to 12,000 ppm. Thus, the salinity of the circulating water may be over 20 times greater than the 500 ppm reported by Dr. Mulchi.

Dr. Mulchi visited the Pittsburg Station on August 15, 1980 accompanied by Ms. Lin Bowie, biologist With PG&E, and Mr. William Davilla, botanist with Biosystems Analysis (another consultant to PG&E). Their notes and recollections of this trip indicate that it was a short,

rather cursory visit made during a salt drift study for PG&E's proposed Montezuma power plant. Dr. Mulchi's own memorandum report, dated August 25, 1980, of the trip also referred to the visit as a "brief tour." Dr. Mulchi's memorandum report also stated that "some plant species showed no salt injury whereas others exhibited extensive injury." He did not specify species except for pickleweed, which showed "no symptoms of salt injury." According to Ms. Bowie and Mr. Davilla, observations of damage to vegetation were limited to those possible from a moving car plus a brief walk in the immediate vicinity of the cooling towers.

The area around the cooling towers is developed and consists largely of circulating water canals, a parking area, and a laydown area used during construction of the cooling towers. Ms. Bowie stated that the area inspected by Dr. Mulchi on foot was no more than a couple of hundred yards from the cooling towers. The vegetation in this area is limited due to the site development and is primarily pickleweed, salt grass, salt bush (Atriplex), and sea spinach. Atriplex is a weedy species that enters developed areas while other plants are salt tolerant native species. Ms. Bowie and Mr. Davilla observed salt damage on Atriplex and sea spinach within the immediate cooling tower vicinity (approximately 600 feet). Thus, Dr. Mulchi's observation of extensive damage to a wide range of native vegetation was

found by two other biologists to be limited to two species in an area very close to the cooling towers.

In evaluating the degree of injury to vegetation near the cooling towers, an investigator would logically want to know the amount of drift being deposited in the area. Although such data would have been available from PG&E, Dr. Mulchi, as consultant to PG&E through Biosystem Analysis, Inc., failed to consider this information in his 1980 analysis. PG&E measured a drift deposition rate of 100 lbs/acre/mo 1200 feet downwind in November 1977. Drift deposition data would also have been available from a study conducted by Pacific Northwest Laboratories and Environmental Systems Corporation in June 1980, two months prior to Dr. Mulchi's site visit. Data from this study showed drift deposition rates of 5,200 lbs/acre/mo at 650 feet downwind and 650 lbs/acre/mo at 1470 feet downwind.

These deposition levels are far in excess of levels that are expected to occur on offsite areas near PVNGS and should have been considered by Dr. Mulchi when he attempted to apply data from the Pittsburg Station to PVNGS.

Dr. Mulchi also apparently did not consider several other factors which could have contributed to any salt damage that he may have observed. The Pittsburg Station is located about one-quarter of a mile from a tidally influenced bay and some vegetation could have been salt stressed by a natural condition such as a severe coastal

storm. In addition, the mechanical draft cooling tower system was installed as a replacement for a spray canal system and has been operating only since July 1977. Some of the damage observed by Dr. Mulchi could have been on vegetation that had not fully recovered from previous higher levels of salt deposition from spray canal operation. Dr. Mulchi's visit took place late in the dry season. Mr. Davilla suggests that some species may naturally become necrotic at the end of the dry season, so that some observed damage may be due to natural response as well as salt drift.

In his memorandum report, Dr. Mulchi also comments on changes in vegetation at that time of the year (mid-August). With respect to native species that grew in the barley test plot for the Montezuma studies, Dr. Mulchi states that ". . . some of these wild species, which came up in the plot after treatments were initiated, exhibited vegetative symptoms indicative of salt injury, especially those in the 100 and 200 lbs/acre/month salt treatment plots. However, there was no conclusive evidence that these annual species suffered premature death as a result of the salt treatments. In fact, due to the particular time of the year, most of the few remaining species found at the site were rapidly approaching the end of their natural growth cycles and were flowering. Most plants were in initial stages of natural senescence."

As stated earlier, Dr. Mulchi's visit to Pittsburg Station was undertaken during a potential salt drift impact study for the proposed Montezuma Station. Controlled levels of salt spray were applied to test plots at the proposed plant site which is in the same general vicinity as the Pittsburg Station over a growing season. As reported in Dr. Mulchi's August 25, 1980 memorandum, any damage to vegetation was at salt deposition levels of 100-200 lbs/acre/month, which are levels that will be confined onsite, close to the towers at PVNGS.

Thus, Dr. Mulchi made a statement about the cause of salt damage to vegetation at the Pittsburg Station based on incomplete data on plant operations and very limited observations. This type of approach is not representative of sound scientific investigation and can certainly result in misleading or erroneous conclusions.

Error Group 4 - Alternative Cooling System Design

Petitioner requested that this Board consider a dry cooling tower design as relief for its hypothesized cooling tower drift impact [Petition pp. 16-17, contention VI.D]. It would be improper for this Board to do so now as the record of the construction permit hearing specifically addressed this option. Dry cooling towers are not feasible at the PVNGS site [See CP transcript p. 809, line 14 - p. 810, line 23; and Arizona Public Service Co., et al. (PVNGS Units 1, 2, and 3), LBP-76-21, 3 NRC 662, 693 (1976)]. It

was also established that round mechanical cooling towers had a lesser off-site drift impact than the rectangular towers [see CP transcript p. 788, lines 2-30; p. 1037, lines 15-22; and Arizona Public Service Co., 3 NRC at 682]. Nevertheless, Golay asserts that the Joint Applicants did not adequately consider wet/dry cooling alternatives as indicated by the statements

> ". . . the more feasible alternative of dry cooling used to supplement an array of wet cooling towers is not considered." (Golay Report, p. 20, lines 31-33)

and further

> "[b]y failing to consider use of dry baseload cooling, the analysis of the ES-CP ignores the situation in which wet/dry cooling is most attractive economically, and is marginally most effective in reducing drift and water consumption effects." (Id., p. 22, lines 36-38 and p. 23, lines 1, 2).

The Joint Applicants have not ignored wet/dry cooling alternatives. The evaluation of alternatives to the cooling towers is presented in ER-CP Section 10.1 and FES-CP Section 9.2. A wet/dry cooling tower alternative with a 2.45 dry to wet face area ratio was evaluated and shown to result in reduced water consumption and drift deposition. Nevertheless, wet cooling towers were selected based upon the engineering, economic and environmental factors discussed in the ER-CP. The Petitioner (and Dr. Golay) have ignored the fact that the evaluation and selection of the wet tower

design at the CP stage was made with knowledge of performance projections showing substantially greater drift loss from the wet tower (FES-CP, Table 9.3) than was later projected at the OL stage (Staff Exhibit 1, Section 5.5.1.1). Dr. Golay further comments

> "[b]y failing to consider the alternative of base load dry cooling in assistance to wet cooling. . . ., the ES-OL neglects an important and possibly economically justifiable, means of significantly reducing water consumption and drift-related environmental effects." (Golay Report, p. 23, lines 41-46).

It should be noted there is no requirement to propose and analyze alternatives to design concepts previously determined to have acceptable environmental impacts.

The Joint Applicants see no benefit to be gained from additional hearings and evidence. The record clearly shows the Joint Applicants have conservatively evaluated feasible alternative cooling systems.

Error Group 5 - Inherent Conservatisms

Part A - Operation

The drift analyses contained in JA Exhibit X, Section 5.4 and in Staff Exhibit 1, Section 5.5 have assumed 12 month operation of all three units. These analyses assume no lessening of drift as a result of refueling periods. Further, these analyses assumed operation at 100% of rated power. At lower power levels, not only is drift lessened, the plume rise is diminished. A lower plume rise leads to a

lessened transport of drift and dry drift particles. Off-site impacts thus are reduced proportionately more than than the percentage of power reduction.

Part B - Water Quality

As noted in Group 1, Part A, supra, circulating water system drift impacts were based upon a TDS value well above expected levels. The use of design limit performance data for the water reclamation plan, rather than average performance, has introduced a conservative factor of approximately 10-20 percent.

Part C - Drift Droplet Distribution

As Petitioner has noted [See Davis Report, Exhibit 6] the Palo Verde drift analysis used a size distribution that was somewhat skewed toward smaller particles as large particles (above 182 microns in diameter) were not incorporated in the analysis. Larger particles are heavier. Heavier particles will settle out of a plume more rapidly. Thus, the PVNGS analysis conservatively overestimated off-site impacts by neglecting the close-in (onsite) deposition of the large particles.

CONCLUSION

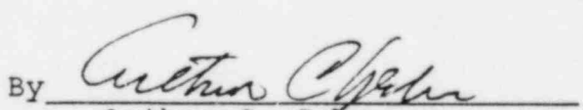
For both factual and legal reasons, there is no basis for allowing Petitioner to intervene in this proceeding. The extensive public factual record on salt drift and its potential effects destroys Petitioner's argument of "new information" without the necessity of further analysis.

In addition, Petitioner fails to satisfy the balancing test specified by Section 2.714(a)(1) by a wide margin.

Of perhaps more practical significance, however, is the fact that the Monitoring Program is the only reasonable solution to Petitioner's concerns. As noted in Argument No. XI, there is less than 700 acres of cultivated land even under the view of Petitioner's consultants that could be significantly effected. The limited economic interests of Petitioner, taken together with the lack of any factual support for Petitioner's speculation about "possibilities" weighs strongly against reopening the proceedings at this late date, and strongly in favor of reliance on the Monitoring Program.

For all of the foregoing reasons, Joint Applicants respectfully request that the Board deny the Petition to Intervene or, if the Petition is granted, that it be disposed of summarily without further proceedings.

SNELL & WILMER

By 

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
ARIZONA PUBLIC SERVICE	)	
COMPANY, et al.	)	Docket Nos. STN 50-528
	)	STN 50-529
(Palo Verde Nuclear	)	STN 50-530
Generating Station,	)	
Units 1, 2 and 3)	)	
	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of "Joint Applicants' Response to Petition to Intervene of West Valley Agricultural Protection Council, Inc." have been served upon the following listed persons by deposit in the United States mail, properly addressed and with postage prepaid, this 9th day of November, 1982.

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	Docket Nos. STN 50-528
ARIZONA PUBLIC SERVICE	)	STN 50-520
COMPANY, et al.	)	STN 50-530
	)	
(Palo Verde Nuclear Generating	)	
Station, Units 1, 2, and 3)	)	
	)	

JOINT APPLICANTS' RESPONSE TO PETITION TO INTERVENE OF WEST VALLEY AGRICULTURAL PROTECTION COUNCIL, INC.

VOLUME TWO OF THREE

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NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	Docket Nos. STN 50-528
ARIZONA PUBLIC SERVICE COMPANY,	)	STN 50-529
et al.,	)	STN 50-530
	)	
(Palo Verde Nuclear Generating	)	
Station, Units 1, 2, and 3)	)	
	)	

JOINT APPLICANTS' RESPONSE TO PETITION TO INTERVENE OF WEST VALLEY AGRICULTURAL PROTECTION COUNCIL, INC.

VOLUME TWO OF THREE

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VOLUME TWO

INTRODUCTION TO APPENDIX I

INTRODUCTION

This appendix consists of verbatim excerpts from the key PVNGS licensing documents, hearing transcript, and construction permit initial decision relating to the matter of salt deposition. Excerpts were taken from the following documents: (1) Environmental Report - Construction Permit Stage; (2) Environmental Report - Operating License Stage; (3) Final Environmental Statement - Construction Permit Stage; (4) Draft Environmental Statement - Units 4 and 5, Construction Permit Stage; (5) Draft and Final Environmental Statements - Operating License Stage; (6) Hearing Transcript - Construction Permit Stage; (7) Initial Decision - Construction Permit Stage.

The material duplicated generally concerns salt drift from PVNGS and its known effects. The specific subjects covered by the material include:

(1) The concentration of dissolved solids in the PVNGS condenser cooling water;

(2) Condenser cooling water drift from the cooling towers;

(3) The amount of salt deposition on the ground resulting from such drift; and

. . . . .

(4) The environmental effects of such salt deposition on ecological systems.

The material presented here contains most, but not necessarily all, of the discussion of these subjects in the referenced documents. Figures and tables referenced in the quoted material have not been duplicated. Furthermore, a substantial body of information on other subjects relevant to the consideration of salt drift which is contained in such documents has not been duplicated for the sake of brevity. For example, the detailed consideration of cooling system alternatives reported in Section 10.1 of the Environmental Report - Construction Permit Stage and Section 9.2 of the Final Environmental Statement - Construction Permit Stage has not been included. Also, not included is the extensive list of references considered by Joint Applicants in preparation of those portions of the Environmental Report - Construction Permit Stage relating to salt drift and its effects. (See ER-CP at 5.1-28 to 5.1-35, 5.4-15 to 5.4-19.)

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1. ENVIRONMENTAL REPORT - CONSTRUCTION PERMIT STAGE*

* * *

5.1.5.3 Solids Discharged from Cooling System

In the operation of the heat dissipation system, dissolved solids tend to concentrate in the circulating water through evaporation of large quantities of water. Solids will be held at a constant concentration level by the blowdown of a portion of the circulating water to the blowdown treatment facility for recycling. The system is simultaneously replenished by water from the reservoir. This makeup water rate will equal the water loss rate incurred through evaporation, drift and blowdown.

The drift, small liquid droplets that become entrained in the exiting air flow, is carried upward by the plume. These liquid droplets, having a solids concentration equal to that of the circulating water and of the blowdown, are subsequently dispersed into the atmosphere and are deposited downwind of the source. The emission, atmospheric transport, and deposition of dissolved solids from cooling

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* The calculations and figures contained in the Environmental Report - Construction Permit Stage, and in the Final Environmental Statement - Construction Permit Stage (See No. 3, infra) reflect data utilizing rectangular cooling towers. Subsequent to the preparation of these documents, it was decided to convert to round cooling towers. The conversion is expected to result in substantially less off site deposition than was anticipated utilizing rectangular towers. (See e.g., finding No. 85, Initial Decision - Construction).

towers have been investigated to estimate annual deposition patterns.

5.1.5.3.1 Deposition Patterns

The dissolved solids deposition routine within the NUS Corporation computer code FOG (refer to section 6.1.3.2.4) was used to predict the solids deposition patterns for the cooling towers. These analyses were based upon Gila Bend meterological data as discussed in section 2.6.2. The isopleths in figures 5.1-14 through 5.1-19 give the drift deposition rates in terms of pounds of solids per acre-year.

The concentration of the drift material was assumed to be at the same level as in the circulating water. These values are given in table 3.6-1 where the total dissolved solids are approximately 14,500 parts per million. For this concentration level, the solids emission rate for the cooling tower system will be about 48 million pounds per year. This is based upon a drift loss rate of 0.04 percent of the 620,000 gallons per minute circulating water flowrate for each unit's cooling system. The composition of the deposited material will be the same as that given in table 3.6-1.

To evaluate the environmental effects associated with solids deposition, they were separated into deposition as dry particles, droplets, and total. Figure 5.1-14 shows the onsite/nearsite solids deposition patterns deposited as

dry particles from the cooling tower system. Figure 5.1-15 shows the offsite solids deposition patterns. Figures 5.1-16 and 5.1-17 show the deposition patterns for solids deposited in droplet form for onsite/nearsite and offsite areas, respectively. Finally, the total solids deposition patterns, including solid materials deposited as dry particles as well as in droplet form, are shown in figure 5.1-18 for onsite/nearsite areas, and in figure 5.1-19 for offsite areas.

* * *

5.4.2 Effects of Cooling Tower Drift

After approximately 15 cycles of concentration, the circulating water will contain roughly one-third the salt content of sea water. The salt will be primarily sodium chloride with substantial amounts of magnesium and calcium chlorides and sulfates (table 3.6-1). Less than 0.1 percent by weight of the solids will be biocides and heavy metals. Drift from the cooling towers will be controlled to 0.04 percent loss of the circulating water flow (section 5.1).

The predicted distribution and amounts of drift from the cooling towers are shown in figures 5.1-14 through 5.1-19. The model employed to determine these distributions is presented in section 6.1.3.

Table 5.4-1 indicates the estimated number of acres beyond the site boundary receiving 50 pounds per acre

per year or more of droplet and total (wet and dry) salt deposition by the cooling towers. The highest offsite deposition of wet salt, 100 to 500 pounds per acre per year, is predicated to fall on only 70 acres of land, 30 acres of which are creosotebush plain and 40 acres of which are saltbush plain. The total area to receive droplet deposition in excess of 50 pounds per acre per year is 2,160 acres. Approximately 6 percent of this area (130 acres) is cultivated. Almost 70 percent of the wet salt will fall on creosotebush plains.

The highest offsite predicted total (wet and dry) deposition is also 100 to 500 pounds per acre per year. This is predicted to fall on 5,610 acres, approximately 60 percent of which is creosotebush plain. Less than 15 percent will be deposited on cultivated areas.

Over the 40-year design lift of PVNGS, the maximum possible cumulative deposition is calculated to be 20,000 pounds per acre for the 5,610 acres receiving the highest deposition rates, and 4,000 pounds per acre for the 21,360 acres receiving 50 to 100 pounds per acre per year.

A total of 26,970 acres offsite is predicted to receive a total of 50 pounds per acre per year, or more. More than one-half of this area will be creosotebush plain; less than 15 percent will be cultivated land.

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* * *

Predicted levels of salt drift deposition from the cooling towers are low compared to existing conditions. Therefore, adverse environmental impacts on soil, groundwater, surface water, wildlife, and domestic animals in the region of the site are predicted to be negligible, while the potential adverse effects on vegetation due to foliar deposition are expected to be low.

To evaluate actual cooling tower drift effects, information on the salt concentration in the ambient atmosphere and the existing sodium and chlorine concentrations in the vegetation of the area will be obtained prior to and during operation of the cooling towers (section 6.2.5).

* * *

Considering both long and short term effects, the cooling tower drift, which will be controlled at 0.04 percent loss of the circulating water, appears unlikely to have substantial adverse effects on nearby soil and irrigation water, since the incremental increase over the existing high salinities are predicted to be low. A recent state-of-the-art report on seawater cooling towers, which presents mathematical formulas for calculating incremental increases in irrigation water and soil salinity, is in general agreement with this conclusion.[6]

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5.4.2.2 Effect on Indigenous and Cultivated Vegetation

There is substantial evidence that salt can be injurious to vegetation.[7] Plants can obtain salt through the root system, stomata (pores), and openings caused by leaf or twig injury.[8] Soluble salts can produce harmful effects to plants by * increasing the salt content of the soil solution; * increasing the degree of saturation of the exchange materials in the soil with exchangeable sodium; * foliar accumulation of airborne salt.[9,10,11]

Many different methods have been developed to assess the degree of salt tolerance of plants, including survival ability, absolute and relative yields,[12] and for ornamental crops, general appearance.[13] The probable effect of salt drift from cooling towers on soil salinity and alkalinity is considered negligible (section 5.4.2.1). Among the more salt sensitive species will probably be cultivated plants growing where salt is periodically leached from the soil by irrigation water.

The native plant species show a wide range of tolerances to soil salinity with several classified as highly salt tolerant. Foliar absorption, however, appears to be a more serious potential concern.[6, 14]

The amount of damage due to the accumulation of airborne salt on or within leaf and twig tissue is related to biotic factors such as the type of plant, degree of maturity, and foliar diseases; and to abiotic factors such

as the degree of deposition and the moisture present on the leaf surface.

* * *

Although most crop plants exhibit a medium salt tolerance, and may be termed glycophytes, those grown within a 10-mile radius of the site are among the more salt tolerant. These include cotton, sugar, beets, wheat, barley, and alfalfa, with alfalfa being the least salt tolerant.[20, 21] Few ornamental plants, other than native species, are grown in the site region.

The tolerance of a given plant species is also related to its stage of maturation. Some species which are very salt tolerant during the later stages of growth are quite sensitive to high salinity during germination (e.g., sugar beets). Other species such as cotton have high salt tolerances during all stages of growth or, as typified by corn, are more sensitive during later stages of maturation.[22] Foliar injury due to disease or insect damage may also increase the degree of foliar uptake of salts.

5.4.2.2.2 Abiotic Factors

* * *

The amount of soluble salt entering the plant tissue versus total salt buildup on the leaves has biological significance. With low levels of rainfall in the site region (section 2.6) a detectable buildup on the foliage would be expected. However, the low humidities and infre-

quent occurrence of dew in the region of the site would reduce the magnitude of the potential salt effects on the surrounding vegetation. Dew very rarely occurs during most of the year, including the major growing season for warm season crops. However, some dew may occur during the winter months.

5.4.2.2.3 Case Studies

Very little information is available on the effects of aerosol salt spray on vegetation, particularly for the arid South-Southwest.[8, 24, 25, 26]

The minimum longterm average level of background airborne salt concentrations needed to affect the distribution of vegetation in eastern coastal areas is approximately 10 micrograms per cubic meter per month. Acute injury to deciduous vegetation (generally salt sensitive) may result if airborne levels exceed 100 micrograms per cubic meter for several hours.[27]

Most of the information available on salt damage to vegetation involves soil salinity and its subsequent effects on plant growth. The actual amount of salt deposition necessary to cause foliar injury to specific species of plants probably has little relation to the amounts determined by most techniques that have been used,[6] although new ones are currently being developed.[25] Correlations relating different methods of measuring salt concentration and deposition are also unclear,[6] although the relationship between

air concentration and ground deposition has been discussed.[29]

* * *

Ongoing studies on the effects of cooling tower salt drift on vegetation include those at the Chalk Point power plant in Maryland,[22, 30, 31] the Bacliff plant near Houston, Texas, and at the Forked River Nuclear power plant in New Jersey.[27] In the Forked River study, it has been reported that the short term peak near-ground air concentration of salt from the natural draft cooling tower is 10 micrograms per cubic meter. This is a factor of six below the lower concentration which causes visible damage to principal indigenous species. No significant incremental effects due to tower salt were predicted.[29]

However, differences in climatic conditions and the surrounding vegetation, as well as cooling tower type and amount of salt drift, must be taken into consideration before proper comparative evaluations can be made among the ongoing studies. For example, in New Jersey the humidity is much higher (and thus the likelihood of salt entering the leaf is much greater) than in the arid Southwest, but the leaves are periodically washed off by rainfall. In Phoenix, humidity is very low and dew is quite uncommon, but several months may pass before any rain falls.

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10.1.4.5.4 Solids Discharged from Cooling System

In the operation of an evaporative type of cooling system, dissolved solids tend to concentrate in the circulating water. The concentration of solids is held at a constant level by the blowing down of a portion of the circulating water to the blowdown treatment facility. The circulating water system is simultaneously replenished by water from the reserv r. This makeup water rate will equal the water loss rate incurred through evaporation, drift, and blowdown.

The drift is carried upward by the vapor plume. These liquid droplets, having a solids concentration equal to that of the circulating water, are subsequently dispersed by atmospheric turbulence and deposited downwind of the source. The emission, atmospheric transport, and deposition of dissolved solids from the alternative cooling systems have been investigated to estimate annual deposition patterns.

10.1.4.5.4.1 Deposition Patterns

The dissolved solids deposition routine within the computer code FOG (see section 6.1.3.2.4) was used to predict the solids deposition patterns for each of the alternative cooling systems. These analyses were based upon Gila Bend meteorological data as discussed in section 2.6.2. The isopleths presented for these evaporative cooling systems give the drift deposition rates in terms of pounds

of solids per acre-year based upon 15 cycles of concentration. The concentration of the drift material was assumed to be identical to that in the circulating water and blowdown. These values are given in table 3.6-1 where the total dissolved solids are approximately 14,500 parts per million. For this concentration level, the solids emission rate for each of the alternative cooling systems will be 48 million pounds per year, based upon a drift loss of 0.04 percent of the 620,000 gallons per minute circulating water flow for each unit cooling system. The composition of the deposited material will be the same as that given in table 3.6-1.

Onsite and offsite solids deposition patterns were evaluated for each of the four alternative systems. To evaluate the environmental effects upon terrestrial ecology, deposition was separated into solids deposited as dry particles, solids deposited as droplets, and total solids deposition (dry particles and droplets). Thus, there are six isopleth drawings of solids deposition for each cooling system considered. The figures presented for solids deposition are summarized in table 10.1-7.

* * *

The drift is primarily composed of sodium chloride with substantial amounts of magnesium and calcium salts (table 3.6-1). There is considerable evidence that salt can be injurious to organisms, although many factors must be taken into consideration to determine the level of potential

impact (section 5.4). In the following discussion, cooling tower drift is used synonymously with salt drift. Less than 0.1 percent of the drift (by weight) will be comprised of biocides and heavy metals; consequently, the level of their potential impact is predicted to be low.

Total offsite solids deposition (dry particle and droplet) for the four alternative cooling systems are shown in the following figures: 5.1-19, 10.1-14, 10.1-20 and 10.1-26. The amount and distribution of offsite droplet deposition of the four alternatives are shown in figures 5.1-17, 10.1-12, 10.1-18 and 10.1-24. The amount of droplet deposition is shown separately because of its greater biological significance than the dry particle deposition (section 5.4). By overlaying these figures onto figure 2.7-4 (a vegetational map of the Palo Verde Hills region), data on the estimated number of acres receiving greater than or equal to 50 pounds per acre-year of droplet and total salt deposition were calculated according to vegetational type (table 10.1-8).

For the reasons discussed in section 5.4, levels less than 50 pounds per acre-year would not have a substantial effect on the biota of the region. Most of the plants in the region (both cultivated and native) are adapted to fairly saline conditions. If one assumes that none of the salt is leached out of the soil and all remains in the top 6 to 7 inches, the maximum total salt that can accumulate in

40 years would be approximately 0.1 percent of the total weight of one acre per furrow slice of soil. This amount would not be expected to significantly change the electrical conductivity of the soil (see reference 2 for weight of 1 acre per furrow slice of soil).

* * *

The highest total offsite deposition rates would occur with the round mechanical draft cooling system, the only alternative in which maximum total deposition rates exceed 500 pounds per acre-year. Using this system, 130 acres of saltbush plains, 30 acres of creosotebush plains, and 30 acres mesquite wash, would receive 500 to 1000 pounds per acre-year. These deposition rates are much higher than those of the first two alternatives, and environmental changes might be expected using the round mechanical draft cooling system.

Total offsite deposition rates of the chosen alternative, the rectangular mechanical draft cooling tower system, are substantially higher than those of the fan-assisted natural draft and wet-dry mechanical draft cooling tower systems, but lower than those of the round mechanical draft cooling system. Offsite droplet deposition for the chosen alternative has the highest amount (100 to 500 pounds per acres per year) of the alternatives considered. However, this amount is predicted to fall on only 70 acres, 30 of which are creosotebush plains and 40 of

which are saltbush plains. The droplet deposition of the chosen alternative at 50 to 100 pounds per acre is predicted to fall on less cultivated land (130 acres) as compared to that of the round mechanical draft cooling system (340 acres). No substantial environmental changes are expected with the chosen system. The potential detrimental and beneficial impacts in operating this system are discussed in section 5.4.

10.1.4.5.5

* * *

Drift from the PVNGS cooling system will result in the deposition of solids both onsite and offsite. Due to the low humidity and low rainfall in the area, the deposited salts may accumulate in the soils and increase soil salinity. As discussed in section 5.4, increases in soil salinity due to the operation of the PVNGS cooling system will be small compared to the salt load increases attributable to irrigation. While it is possible that salt deposition could bring about some vegetational and wildlife habitat changes, the likelihood of change in successional patterns is judged to be very low.

5.4 EFFECTS OF CHEMICAL AND BIOCIDE DISCHARGES

RESPONSES TO AEC QUESTIONS

Palo Verde Nuclear Generating Station

Question 5:

Under what weather conditions would the atmospheric concentration of salts due to drift be a maximum, and what is an extreme value of this concentration?

Response:

The NUS-FOG computer code was used to predict the airborne concentrations of salt particles resulting from the evaporation of the drift droplets released from the mechanical draft cooling towers. The predicted concentrations are mean values within a layer of the atmosphere from the ground surface to a height of 3 meters. Three years of hourly surface meteorological data from the Gila Bend, Arizona, FAA station were used in the analysis. The maximum predicted offsite hourly concentration of salt particles is 3150 ug/m^3 at a location on the site boundary immediately to the west of the cooling towers for Unit 3 (see ER figure 2.1-2). This maximum airborne concentration occurred with the Gila Bend meteorological data observed at 0500 MST November 25, 1950; these data are listed in table S1-5.4.5-1.

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Table S1-5.4.5-1

REPORTED METEOROLOGICAL DATA AT
GILA BEND, ARIZONA, FAA STATION ON
0500 MST, NOVEMBER 25, 1950

Dry-bulb temperature, °F	54
Wet-bulb temperature, °F	41
Relative humidity, percent	27
Wind speed, knots	9
Wind direction	ESE
Pasquill stability class (a)	E
Horizontal visibility, miles	30

Climatological parameters used for extrapolating the surface meteorological data in the vertical are:

Relative humidity: -5%/1000 m

Wind speed: $U_z = U_{10}(z/10)^{0.16663}$

where: U_z is speed at height z, and U_{10} is observed speed at height of 10 m.

Temperature: 0.0F/1000 ft

a. Hilsmeier, W. F. and Gifford, F. A., Jr., "Graphs for Estimating Atmospheric Dispersion," USAEC ORO 545 (1962).

The cooling towers for the three units at PVNGS release a total of 1.5 lb of salt per second within the drift. At the top of the towers, initial concentration of salt in the effluent is 7440 ug/m^3. This is compared with the maximum calculated value of 3150 ug/m^3 at the site boundary. The observed wind speed listed in table S1-5.4.5-1 of 9 knots during this hour indicates a downwash condition leading to higher groundlevel concentrations of the effluents at small downwind distances. However, this wind speed is not so large as to produce an excessive rate

of dilution of the plume with ambient air during the downwash condition. The observed relative humidity of 27% permits evaporation of the drift droplets to salt particles.

The "E" stability class (slightly stable) indicates a reduced potential for dispersion of the plume with the atmosphere.

Question 6:

Calculate atmospheric concentrations and sizes of particles resulting from drift droplets which evaporate to dryness before reaching the ground. Various distances out to 10 miles should be considered and maximum values and long-term averages might be considered in this analysis.

Response:

The NUS-FOG computer program was used to calculate the rise, release, and fall of drift droplets, using hourly observed meteorological data from Gila Bend, Arizona.

The drift droplets released from the mechanical draft cooling towers, depending on the ambient meteorological conditions, will be

1 deposited on the ground with little or no change in size

2 deposited on the ground after evaporating to small saline droplets; and

3 deposited on the ground as salt particles after all the water in the original droplets has evaporated.

. . . . .

The calculated trajectory and evaporation of a drift droplet depends upon the concentration of salt in the emitted droplets, the rise and dispersion of the effluent plume, and the ambient meteorological conditions (relative humidity, temperature and wind speed) existing near the droplet as it falls toward the ground. Given a sufficient fall time, and an ambient relative humidity below 50%, a droplet is calculated to evaporate to a dry salt particle, using the following relationship:[1]

$$r_{salt} = r_o \, (p_w C / p_d)^{1/3}$$

where

r_{salt} = salt particle radius, cm

r_o = initial droplet radius, cm

p_w = density of initial droplet, gm/cm^3

p_d = density of dry salt particle, 2.165 gm/cm^3

C = initial concentration of salt in droplet, fraction 0.0145, dimensionless.

The characteristics of the drift released from the mechanical draft cooling towers are presented in table S1-5.4.6-1. Included within this table is the mean mass size distribution of the salt drift particles within the lowest 3 meters of the atmosphere as calculated with the NUS-FOG code. It is calculated that, on an annual average, 87% of the released drift droplets evaporate to a salt particle before reaching the ground. The relative proportion between the size groups in the mass size distribution of the salt

particles is very similar to that for the emitted drift droplets. This indicates that during occurrences of low ambient relative humidity, the likelihood of drift droplets to evaporate to a particle is independent of the initial size of the droplets.

Calculations are made of the airborne concentrations of dry salt particles from the drift within a 3-meter deep layer based at the ground surface. The predicted mean annual airborne salt concentrations in ug/m^3 around the PVNGS are presented in figure Sl-5.4.6-1. The maximum predicted annual mean concentration offsite is 50 ug/m3 on the site boundary in a direction east-southeast from the cooling towers.

Although it has not been possible to calculate directly at this time, the maximum 24-hour airborne concentration (c_{24}) has been estimated on a preliminary basis from the predicted maximum hourly concentration (C_1) (see response to question 5 of section 5.4) using the results of field studies of stack effluents at TVA sites. The indicated conversion is $C_{24} = C_1/6.3$. The resulting estimated 24-hour maximum value is 500 ug/m^3 at the site boundary. These concentrations will decrease rapidly with downwind distance. For example, at 200 meters beyond the site boundary, the estimated concentrations are reduced to 70% of the maximum value, and at 600 meters they are 25%. The

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crosswind dimension of the particulate plume at these distances is estimated to be on the order of 300 meters.

REFERENCES

1. Hosler, C., Pena, Jr. and Pena, R., "Determination of Salt Deposition Rates from Drift from Evaporative Cooling Towers," Department of Meteorology, Pennsylvania State University, 1972.

2. Norris, W.B., TVA, Air Quality Control, Muscle Shoals, Alabama, personal communication to M. Coffey, NUS Corporation, September 19-20, 1974.

2. ENVIRONMENTAL REPORT - OPERATING LICENSE STAGE

5.1.4.4 Solids Discharge from the Cooling System

5.1.4.4.1 Dissolved Solids Deposition

To evaluate the environmental impacts associated with dissolved solids in the cooling tower drift, the predicted deposition was separated into deposition as dry drift particles, as droplets, and as total. Deposition is based upon a 100% capacity factor for Units 1, 2, and 3 and corresponds to data presented in table 3.4-1 and figure 3.4-3. Figure 5.1-2 displays isopleths of the predicted annual solids deposition for dry particles that remain after the water completely evaporates from the drift droplets. Predictions of the annual solids deposited in droplet form are presented in figure 5.1-3. The predicted total annual solids deposition patterns -- solid materials deposited as dry particles and in droplet form -- are shown in figure 5.1-4.

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5.1.4.4.2 Airborne Concentration of Dry Drift Particles

Figure 5.1-5 presents isopleths of the predicted annual mean airborne concentrations of dry drift particles. The maximum calculated values at the site boundary were 51 ug/m^3 and approximately 1 ug/m^3 for 24-hour and annual time periods, respectively.

The maximum 24-hour airborne dry drift concentration of 51 g/m^3 was calculated at the site boundary north-

east of the towers. This concentration decreased with downwind distance. For example, at 1 mile beyond the site boundary, the estimated concentrations are reduced to approximately 47 percent of the maximum value, at 2 miles they are approximately 22 percent, and at 3 miles they are approximately 20 percent.

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3.6.2 Drift

Each cooling tower will discharge to the atmosphere approximately 62 gpm of the circulating cooling water as a mist called "drift." This drift will contain about 8 pounds of dissolved salts plus some suspended solids. The expected drift composition is shown in Columns 5 and 6 of Table 3.1. Other materials will be present in the drift, including heavy metals and organic chemicals. These are shown in Table 3.5.

The distance to which drift droplets are dispersed before they reach the ground depends in part upon their size distribution. Table 3.6 indicates the predicted size distribution as calculated by the applicant (ER, Supp. 1, S1-5.4.6-1) and by the staff. Ground deposition of the drift, as given in the ER, is reproduced as Figure 3.6 for onsite areas and Figure 3.7 for offsite areas. Within each isopleth, the amount of drift predicted to reach the ground is greater than or equal to the volume shown in pounds per acre per year. About 5500 offsite acres will receive between 25 and 125 pounds per acre per year, and 22,000 acres between 11 and 25. The staff's calculations suggest that the maximum depositions will be somewhat lower than those calculated by the applicant, but not to a significant

extent. Using other droplet size distribution data,[6] it is possible to obtain values which are generally in better agreement with those of the applicant, although they will show higher deposition rates in the near vicinity of the tower bases.

It is important, when considering the results of such calculations, to realize that at the present state of the art, drift model predictions may differ by a factor of 10 with observed values. Thus, predicted values can serve only as indications, not rigorous determinations. Furthermore, the applicant does not yet have the manufacturer's tower specifications; therefore, both the amount and the size distribution of the drift are speculative; the provisional value used by the applicant in drift calculations (0.01%) is that usually guaranteed by contemporary manufacturers of freshwater cooling towers (0.01%). Salt or brackish water towers have even lower guaranteed drift rates (about 0.005%).

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3.6.5 Evaporation Ponds

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Since substantial areas of the pond will probably be dry, there is some possibility that dessicated waste materials of small particle sizes, principally salts, may be carried by the wind as dust.

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5.3 EFFECTS OF OPERATION OF THE HEAT-DISSIPATION SYSTEM

5.3.2 Atmospheric

The nine cooling towers of the PVNGS will inject a total of about 6.4×10^8 pounds of water as vapor and $2/3 \times 10^6$ pounds of "drift" (liquid spray) into the atmosphere each day. The drift will contain dissolved and suspended solids amounting to about 0.3×10^5 pounds per day.

* * *

The drift droplets will generally fall from the plume and, depending on drop size, reach the ground at varying distances from the tower. Very small droplets (less than 10 microns in diameter) behave more like gases than liquids and could be dispersed over very large areas. At low humidities the droplets may evaporate, leaving particles of dust in the air. The applicant and staff evaluations of the vapor and drift effects follow.

* * *

Assuming a set of drift droplet and particle sizes, the applicant calculated the air and ground distribution of drift. The results indicate that about 65 tons of salt (calculated on a dry basis) per day will be dispersed to the atmosphere by the towers. The source is diffuse, however, and probably would not be observable as would a hypothetical dry smoke plume, although the amount dispersed would constitute a potentially large source of atmospheric contaminants.

The applicant's calculations indicate that as the plumes leave the cooling towers, they would initially contain 7440 mg/m^3 of solids. Under these conditions, the maximum predicted offsite hourly concentration of air-suspended solids at a point on the western site boundary could be as much as 3150 mg/m^3; however, Table 5.1, which includes a staff estimate of the mean annual airborne particulate concentrations and is partially based on a graphic depiction of plume dispersion (Fig. 3.8), indicates that the mean annual values are considerably lower than the maximum predicted values, and decrease rapidly with distance.

Table 5.1. Estimated Concentractions of Airborne Particulates Emitted from the Station Cooling Tower Systems

Location	Concentration (mg/m^3)
Cooling tower mouth[a]	1860
Site boundary[b]	788
Site boundary[c]	12
Two-mile radius[d]	2.5
Eight-mile radius[d]	1.1
Ten-mile radius[d]	0.25

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a Applicant estimate; maximum instantaneous value.

b Applicant estimate; maximum predicted offsite hourly concentration.

c Applicant estimate; annual maximum 24-hr value.

d Staff estimate; mean annual value.

Further information on particulate distribution is not available; however, staff calculations indicate that about 27% of the total solids will not have settled within 10 miles of the towers. It is not possible to estimate the precise extent to which this emission will cause a deterioration of sensible air quality; however, it is the opinion of the staff that air clarity and visibility will be decreased to some extent in the near vicinity of the station.

5.3.3 Terrestrial

Salts contained in the cooling tower drift will be deposited on the ground and on vegetation where some impacts may result. These are discussed in Section 5.5.

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5.5 NONRADIOLOGICAL EFFECTS ON ECOLOGICAL SYSTEMS

5.5.2 Terrestrial

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Salt Deposition

As discussed previously, the circulating cooling water will be concentrated approximately 15 times in the cooling tower system. This water, containing roughly one-third the salt concentration of sea water, will be discharged to the atmosphere and will ultimately be deposited on the ground; the amounts expected to be deposited are shown in Figures 3.6 and 3.7 for onsite and offsite areas, respectively. The salt will be primarily sodium chloride with lesser amounts of magnesium and calcium chlorides and various

sulfates. Also contained will be some biocides, other chemicals, and heavy metals, but impacts, if any, that could result from their deposition would be very small due to their small concentrations in the drift.

Soils. The applicant has calculated that soils in the PVNGS region presently contain approximately 2900 to 4300 lb of salt/acre in the top six inches (ER, Sec. Sl-5.1-11). During the projected 40-year life-span of the station, over 5,000 lb of salt per acre could be deposited on up to 5600 offsite acres and over 1000 lb of salt per acre on up to 22,000 offsite acres. Since precipitation and subsequent leaching of salts from the upper soil layers is low in the site region, the staff expects a large proportion of deposited salts to remain in the upper soil levels. This accumulation, especially of sodium salts, may cause some soil particle dispersion which would result in a lower rate of water penetration and movement through the soil profile.[27, 28]

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Vegetation. Table 5.8 shows the acreages of five vegetational communities expected to receive from 50 to 500 lb/acre/yr of drift salts; shown is deposition of drift salts in the wet form, as in drift itself (droplet deposition), and the sum of this plus the dry powder which will be left over after water evaporates from the drift droplets (total deposition). Very little information is available in

the literature on the effects of aerosol salt applied to soils associated with vegetation, or on the vegetation itself, particularly for the arid southwest.[32, 33] Salts applied directly to the soil may adversely affect vegetation in at least three diverse ways: (1) increase the osmotic potential, thereby making it more difficult for roots to withdraw water from the soil, (2) specific ions contained therein may inhibit plant nutrition, and (3) some specific ions may produce toxic effects.[34, 35] Airborne salts, when directly applied to plant seeds or the foliage, also may have adverse effects.[36] These effects are known to be different for various species and at different life stages within species[37-40] and are briefly discussed below.

While the specific timing of impacts is difficult to predict, there is a high probability that during the operational phase of the PVNGS, some desert annuals with their seed reserves in the upper levels of the soil will germinate less frequently as a consequence of salt buildup in the soil. Eventually, salt deposition in the 100-to-500 lb/acre/year isopleth (about 5610 offsite acres) will inhibit virtually all annual seed germination by the creation of osmotic pressures which will prohibit water uptake. For a similar reason, seed germination by nonhalophytic perennial species, such as creosote bush[40] and burrobush,[37] will also decline and cease. Concurrently halophytic species such as saltbush, which can germinate and become established in

high salinity soils,[38] will probably increase in numbers and invade much of the land formerly occupied by creosote bush.[41] Because of the small amount of cultivated land (260 acres) within the 100-500 lb/acre/year deposition isopleth, and the large volumes of applied irrigation water used in local agriculture, salt buildup in the soil due to PVNGS operation is not expected to have a serious effect on agriculture in the site vicinity.

Foliar accumulation of airborne salt on leaf surfaces can cause leaf damage (e.g., necrotic lesions). The staff is unaware of any studies which assess the impact of foliar salt application on desert scrub vegetation. The unique leaf morphology of many desert plants (i.e., thick leaves, heavy cuticle, stomatal distribution, etc.) coupled with the low humidity and sparse rainfall characteristic of the PVNGS region invalidates the use of coastal salt water cooling tower studies for comparison purposes. That the applicant will monitor for offsite damage to vegetation due to salt deposition and evaluate and transmit such information to the staff.

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3.6.2 Drift

Each cooling tower will discharge to the atmosphere approximately 1.6 L/s (26 gal/min) of the circulating cooling water as a mist called "drift." The drift will contain 1.4 kg/min (3.1 lb/min) of dissolved salts in addition to some suspended solids, heavy metals, and organic chemicals. The expected drift composition is shown in Table 3.3.

The distance to which drift droplets are dispersed before reaching the ground is dependent upon their size distribution and meteorological conditions. Table 3.4 indicates the predicted size distribution as calculated by the applicant. The applicant's predicted ground deposition of the drift is illustrated in Figure 3.3 for onsite areas and in Figure 3.4 for offsite areas for Units 4 and 5. Within each isopleth, the amount of drift predicted to reach the ground is greater than or equal to the amount shown in pounds per acre per year. About 3100 ha (7700 acres) offsite will receive greater than 1.1×10^{-4} kg/m^2/yr (4 lb/acre/yr), and 31,160 ha (77,000 acres) offsite will receive less than 1.1×10^{-4} kg/m^2/yr but greater than 5.5×10^{-5} kg/m^2/yr (2 lb/acre/yr). Figures 3.5 and 3.6 illustrate the deposition rates for all five units. About 3000 ha (7400 acres) offsite will receive less than 1.4×10^{-3} kg/m^2/yr

(50 lb/acre/yr) but greater than 2.75×10^{-4} kg/m^2/yr (10 lb/acre/yr) from all five units; 44,000 ha (110,000 acres) offsite will receive less than 2.75×10^{-4} kg/m^2/yr (10 lb/acre/yr) from the five units.

At the present state of the art, drift model predictions may differ by a factor of 10 from observed values. Consequently, predicted values can serve only as indications, not rigorous determinations.

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3.6.5 Evaporation Ponds

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Since substantial areas of the pond will probably be dry, it is possible that some dessicated waste materials of small particle sizes, principally salts, may be carried by the wind as dust. However, the degree of aeolian dispersal cannot be estimated due to the unavailability of specific information concerning what fraction of the area dedicated to evaporation ponds will be used in the time frame of the plant lifetime, and what specific meteorological conditions will exist at various times.

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5.3 EFFECTS OF OPERATION OF THE HEAT-DISSIPATION SYSTEM

5.3.1 Terrestrial

Salts contained in the cooling tower drift will be deposited on the ground and on vegetation where some impacts may result. These are discussed in Section 5.5.1.1.

The health aspects of cooling tower dispersion of purified sewage efflient discussed in Section 5.6.1.3 specifically refers to human beings; however, the staff believes that the conclusions reached there are also applicable to fauna in the area. No impacts to fauna are expected (see Sec. 5.5.1.1).

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5.5 NONRADIOLOGICAL EFFECTS ON ECOLOGICAL SYSTEMS

5.5.1 Terrestrial

5.5.1.1 Station

Salt Deposition

As discussed previously, the circulating cooling water will be concentrated approximately 15 times in the cooling tower system prior to blowdown. About 0.0044% of this water (the vendor's guarantee), containing roughly 40% of the electrolyte concentration of sea water, will be discharged to the atmosphere as cooling tower drift and will ultimately be deposited on the ground; the amounts expected to be deposited are shown in Figures 3.3 and 3.5 for onsite areas, and Figures 3.4 and 3.6 for offsite areas. The drift solids will be primarily sodium and chloride ions with lesser amounts of magnesium, calcium, sulfate, and nitrate. Also contained will be some biocides, other chemicals, and heavy metals; however, impacts, if any, that could result from their deposition would be very small due to their small concentrations in the drift.

Soils. The staff has calculated that the soils in the PVNGS-4&5 region contain approximately 2500 to 4800 kg/ha (2250 to 4300 lb/acre) of salt in the top 15 cm (6 inches). This estimate is based upon the following:

1. Soil conductivities range from 4 to 8 mmho/cm, according to Soil Conservation Service surveys of the Palo Verde Hills area,

2. Water content of the soil averages 37.5% of soil water saturation, and

3. Average soil bulk density is 1700 kg/m3 (4.5 million lb/acre-ft).[17]

Using Figure 7 from Richards,[18] soil conductivity can be converted to an estimated concentration of salts in the soil.

During the projected 30-year life span of the station, an additional 340 to 1700 kg/ha (300 to 1500 lb/acre) from all five units could be deposited on more than 2500 ha (6100 acres) of offsite land (Table 5.11). Presumably, Units 4 and 5 will contribute 40% of this salt deposition. Since precipitation and subsequent leaching of salts from the upper soil layers is low in the site region, the staff expects a large proportion of deposited salts to remain in the upper soil levels for an indeterminate time period. This accumulation, especially of sodium salts, may cause some soil particle dispersion which would result in a lower rate of water penetration and movement through the soil profile.[18] This accumulation of salts would result in

soil electrical conductivities ranging from about 4 to 11 mmho/cm.

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Vegetation. Table 5.11 shows the acreages of five vegetational communities expected to receive from 11 to a maximum of 56 kg/ha/yr (10 to 50 lb/acre/yr) of drift salts. Little information is available in the literature on the effects of aerosol salt applied to soils associated with vegetation, or on the vegetation itself, particularly for the arid southwest. Salts deposited on the soil may adversely affect vegetation in at least three ways: (1) the salts may increase the osmotic potential, thereby making it more difficult for roots to withdraw water from the soil, (2) specific ions contained therein may inhibit plant nutrition, and (3) some specific ions may produce toxic effects.[21, 22]

Over the approximately 30-year estimated lifetime of PVNGS, up to 1700 kg/ha (1500 lb/acre) of salt may be deposited on as many as 2500 ha (6100 acres) of offsite land covered by native vegetation. The accumulation of salt in the surface layers of the soils could lead to inhibition of germination of the seeds and growth of seedlings of the nonhalophytic species. Established perennials should not be markedly affected because their roots extend well below the surface soils in which salts would accumulate. Halophytic species such as saltbush, which can germinate and become

established in high salinity soils, may increase in numbers and invade land occupied by creosote bush. At the highest possible estimated salinities (ca. 11 mmho/cm), neither saltbush nor the two dominant nonhalophytes (creosote bush and bur sage) grow readily, but both survive.[23]

Salt buildup in the soil due to operation of PVNGS Units 1-5 is not expected to have a serious effect on agriculture in the site vicinity because of the small amount of cultivated land (6 ha or 16 acres) within the 11-56 kg/ha/yr deposition isopleths. The tolerance of cotton (the main crop in the region) to the maximum salinities that may occur, considered with the large amounts of water applied for ditch irrigation in the region suggest to the staff that the cotton crop will not be noticeably affected by the deposition of salts.

Accumulation of airborne salt on leaf surfaces can cause leaf damage (e.g., necrotic lesions).[24-26] The staff is unaware of any studies which assess the impact of foliar salt application on desert scrub vegetation. The unique leaf morphology (i.e., thick leaves, heavy cuticle, stomatal distribution, etc.) and function of many desert plants, coupled with the low humidity and sparse rainfall characteristic of the PVNGS-4&5 region, invalidates the use of coastal salt water cooling tower studies for comparison purposes. The applicant will monitor for offsite damage to vegetation due

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to salt deposition and evaluate and transmit such information to the staff.

5. DRAFT AND FINAL ENVIRONMENTAL STATEMENTS - OPERATING LICENSE STAGE (October, 1982 and February, 1982)

4.2.6.2 Cooling Tower Drift

Each cooling tower will discharge about 1.6 x 10^{-3} m^3/s (26 gpm) of circulating water to the atmosphere as drift. The drift will be produced at a rate of 0.8 kg/s (1 x 10^2 lb/min) (total for all three units) of dissolved salts, plus minor amounts of suspended solids, heavy metals, and organic chemicals. The applicant's prediction of concentrations of constituents in blowdown and drift are given in Table 3.6-1 of the ER-OL. The staff considers those estimates to be reasonable.

* * *

5.4.1 Fog and Drift

Although the effluents from the station's cooling towers will have atmospheric impacts (such as fogging due to the visible plume, wetting and salt deposition due to drift, visible plumes aloft), the staff believes that operation of these towers will produce no appreciable offsite impacts, and the impacts that may occur will be less than those predicted in the FES-CP (Section 5.3.2). This conclusion is based primarily on more recent observations of atmospheric impacts at power plants with mechanical draft cooling towers (MDCTs) and on the changes in the location and design of the PVNGS towers (from rectangular to circular MDCTs).

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The relocation of the cooling towers to positions much closer to the power blocks than originally proposed will help reduce offsite impacts of cooling tower plumes, fogging, and drift deposition. (The shortest distance between one of the cooling towers and the station boundary (along Wintersburg Road) for the rectangular MDCTs originally proposed was about 120 m (400 ft) (FES-CP, Figure 2.3, Appendix A); for the new design, the shortest distance is 500 m (1600 ft) (figure 4.1). Observations of impacts at operating power plants indicate that fogging and drift effects are limited to areas less than 1 km (0.6 mi) from the towers (Hanna 1975 and 1978, Champion, Carson, and Englesson). The primary offsite effect will be the esthetic impact of visible plumes in the air.

* * *

Drift studies at operating MDCTs show that almost all drift droplets that reach the ground do so within a few hundred meters of the towers (Hanna 1975 and 1978, Champion, Carson, Englesson). With the change in design of cooling towers, the drift rate is expected to be only 0.0044 percent of the circulating water flow (ER-OL, Table 3.4-1) rather than the 0.01 percent calculated for the FES-CP. The staff's analysis of predicted drift deposition impacts is discussed in Section 5.5.1.1 of this statement.

Based on the above evaluations, the staff concludes that the change in design and in the location of the sta-

tion's cooling towers will result in no appreciable offsite impacts due to fogging and will result in drift deposition rates that will be less than those predicted in the FES-CP.

* * *

5.5.1.1 Station Drift Deposition

As described in Sections 4.2.6.2 and 5.4.1 of this statement, drift deposition is predicted to be less than that estimated in the FES-CP (Sections 5.3.3 and 5.5.2). The maximum offsite deposition rate is now estimated to be 13.4 kg/ha (12 lb/acre) of solids per year, primarily concentrated salts. The staff has calculated that the soils in the PVNGS region contain about 2500 to 4800 kg/ha (2250 to 4300 lb/acre) of salt in the top 15 cm (6 in.). Even if all solids from offsite drift deposition accumulated in desert soils over the lifetime of PVNGS, soil salinity would not be altered sufficiently to impact biota (NUREG-0522). Thus, the staff does not expect impacts from salt-drift deposition.

6. HEARING TRANSCRIPT -- CONSTRUCTION PERMIT STAGE (Docket Nos. 50-528, 50-529, 50-530).

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1. Witness Carson: February 24, 1976, p. 492:

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However, because the guranteed (sic) drift rate could be much lower, either one third or one half that of the type specified, for the state of the art, drift eliminators are incorporated in the Palo Verde site, it is my opinion, based on the limited data I have available to me at the moment, that the offsite drift rates and onsite drift rates, fog deposition would be less than that described in the FES, primarily because of the change in the gross drift rate.

2. Witness Vaslow: February 27, 1976, pp. 1047-48:

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The effect of the round cooling tower is to put the plume higher above the ground, and this allows a larger area for the drift to disperse.

It would be spread over a larger area.

However -- and also, the new cooling towers have a considerable lower total amount of drift.

However, in certain small areas where the drift has been quite low from the old system, drift is now slightly higher. For instance, perhaps at a distance of

three miles from -- starting at three miles from the site where the drift level was previously perhaps 2-1/2 pounds per acre per year, it has now gone up to perhaps 4 pounds per acre per year.

This is now in the southwest direction, so there will be areas at a considerable distance, in the southwest sector only, where the drift rate, drift deposition has gone up slightly, in this case from 2-1/2 to 4 pounds per acre per year.

This was a low rate at the start, and it is still a low rate, so I have -- well, this would be more Dr. Green's field to assess this, but in most other places, particularly where the drift rate is high, the drift rate is now drift -- drift deposition rate is now down very considerably.

In most cases, it is down a minimum of a factor of 1 over 2.4. And in most other places it is down considerably lower than that, but there are a few places where the drift deposition has gone up slightly.

3. Witness Goldman: February 26, 1976, pp. 788-89:

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The analyses were performed and results forwarded to Bechtel. The parameters of the towers generally resulted in a substantially lowered impact in terms of off-site deposition of solids, and in terms of reduced concentrations in air, due to a combination of changes.

One, a lower drift rate. And the other a much greater degree of plume rise due to the difference in configuration of these towers and the towers earlier analyzed.

As a result we provided the information to Bechtel which resulted, from our analysis that indicated that the impact of these towers was certainly no greater and significantly less in some respects tha that which we had provided in the environmental report, and that as a result, our judgment was these would certainly be acceptable.

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4. Witness Bland: February 26, 1976, p. 839:

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There has been, perhaps, quite a bit of literature developed with respect to cooling tower salt. Once we got all this information in, we began to evaluate with the isopleths what kinds of impacts would be expected for the various biota.

This included a range from micro organisms up to game mammals.

DR. STOBER [questioning Witness Bland]: Do you consider that your study was in sufficient detail and of a comprehensive nature that it constitutes a baseline that you can compare potential effects after the effects?

WITNESS BLAND: I think it was sufficient in order to predict the potential environmental impact.

. . . . .

I believe prior to operation, it will be necessary to obtain some more baseline studies at the site. And that has been suggested, and it is stated in the environmental report as a preoperation monitoring program.

7. INITIAL DECISION - CONSTRUCTION PERMIT STAGE

* * *

63. The FES covers in detail the environmental impact of the construction and operation of the facility. It contains a detailed description of the site and the plant, with a discussion of the impact of site preparation and plant construction. In addition, the FES deals with the environmental effects of plant operation, discusses the environmental monitoring program and assesses the environmental effects of accidents. The FES contains a detailed evaluation of the proposed action, including consideration of the need for power, the adverse environmental effects which cannot be avoided, the relationship between local short-term uses of man's environment and maintenance and enhancement of long-term productivity, and irreversible and irretrievable commitments of resources. It further contains a review of alternative energy sources and sites, of plant design alternatives, and finally provides a cost-benefit analysis. The FSFES contains a re-evaluation of two major areas: transmission lines, and the need for power, which was necessitated by the change in ownership from TG&E to SCE Company. The FES and FSFES contain summaries of the Staff's evaluations and concludes after weighing the environmental, economic, technical and other benefits of the Palo Verde Nuclear Generating Facility against environmental and other costs, and considering available alternatives, that the

action called for under NEPA and Appendix D to 10 CFR Part 50 is the issuance of construction permits for the plant subject to certain conditions for protection of the environment (FSFES, pp. iii-iv).

64. The Board finds that on the basis of the FES and FSFES, as supplemented by the testimony and evidence presented in this proceeding, the Staff has made an adequate and comprehensive review and evaluation of the environmental impact resulting from plant construction and operation. Also, the FES sets forth an adequate evaluation of the various alternatives to the proposed action. Further, the Board has independently considered the environmental impact of the proposed action, and the Board hereby agrees with, incorporates by reference and adopts the Staff's evaluations in the FES and FSFES, except where the Staff's evaluations are in conflict with the findings in this Initial Decision.

* * *

81. Ecological effects of plant operations related to consumptive use of water in the cooling system may be observed in the following areas. The riparian habitats along the Salt and Gila Rivers downstream from the 91st Avenue STP are expected to temporarily decline to 1974 levels in approximately 1987 when maximum effluent diversion first occurs (FES, § 5.5.1.1; App. Ex. 23; Tr., pp. 877, 1021). This will result in some reduction of nesting habitat for whitewing doves (Tr., pp. 1027-29). Salt dis-

persed into the atmosphere by the cooling towers (approximately 65 tons per day, dry weight) and deposited near the site may modify floral and faunal species composition on some acreage near the facility. The degree of impact is presently not predictable (Tr., pp. 840-41). The record supports a finding that these effects will be temporary and/or localized and are expected to be minimal (ER, § 5.4.2; § 5.7.1; FES, § 5.5).

* * *

83. Atmospheric effects of operation of the heat dissipation system will result from emission of water as vapor and "drift" and associated dissolved and suspended solids (FES, § 5.3.2). Little or no impact from fog will occur, however, sensible air quality (clarity and visibility) is expected to decrease to some extent in the vicinity of the plant (FES, § 5.3.2). The Board finds these environmental effects minimal and acceptable.

* * *

85. Analysis of the public health and environmental impacts of the heat dissipation system by Applicants and Staff predicted no potential for public health impact (Staff Ex. 7 & 16; Tr., pp. 481-85, 488-95, 815-17). The selection of circular cooling towers by the Applicants will, in most cases, further reduce the dispersion characteristics from those calculated in the FES to amounts not exceeding one-half of such calculated values (TR., pp. 1036-37). The

Board finds that operation of the Palo Verde cooling system will have no significant effects upon public health and safety, and the potential environmental effects will be acceptable.

H. Alternative Cooling Systems

114. The Applicants (ER, § 10.1) and Staff (FES § 9.2) assumed the use of rectangular mechanical draft-cooling tower systems for purposes of environmental Impact analysis until shortly before the Evidentiary Hearing. At that time, however, Applicants announced selection of the circular mechanical draft-cooling tower system (App. Ex. 14-17 and 29-31). The Staff has analyzed a comparison of the social and environmental impacts of the alternative cooling systems (FES, Table 9.3) and compared the monetized cost summaries (FES, Table 9.4). The analysis showed that in an arid climate such as Palo Verde dry-cooling towers, fan-assisted natural draft-cooling towers and a natural draft-cooling system are not feasible, primarily because of local temperatures and humidities (FES, § 9.2.4, § 9.2.5 and § 9.2.6). The wet-dry mechanical draft-cooling system was also analyzed and found not to be a viable alternative to the referenced system by reasons of uncertainties due to technological innovation and cost. The Staff concluded that the circular mechanical draft-cooling towers were an acceptable alternative to the Applicants' referenced rectangular mechanical draft towers (FES § 2.2.1 and § 9.2.2). On

the basis of extensive testimony at the Evidentiary Hearings regarding the Applicants' subsequent selection of circular towers, the Staff has concluded and the Board concurs that, in terms of environmental impact, the operating parameters realized with the circular towers are equal to or better than those for the rectangular towers (Tr., pp. 428-429, 481-486, 489, 779-790, 793-800, 807-809, 813-815, 818-819, 824, 830, 960-966, 983-987 and 1036-1049; App. Ex. 14-17 and 29-31).

V. Cost-Benefit Analysis

119. The Board finds that the environmental, economic, technical and other costs resulting from construction and operation of the Palo Verde facility are mainly:

* * *

d. Chemical deposition, principally salt from operation of the cooling towers, will occur on the site and to a lesser degree on the land surrounding the site and may alter salt sensitive flora and fauna.

E. Contaminants in Cooling Water

144. The sewage effluent used for cooling the facility will contain radioactive Iodine-131, human pathogens, heavy metals and organo-chlorine compounds based on current analyses at the 91st Avenue STP. The Board accepts the calculations of both the Applicant and Staff which indicate that the use of sewage effluent in the cool-

ing system will not constitute a threat to health and safety or cause significant environmental degradation. However, due to the nature of sewage as a complex waste, the volume to be consumed annually, and the tendency for new and potentially detrimental pollutants to appear in sewage, it is only prudent to monitor the cooling water quality during construction and throughout the operational life of Palo Verde. This will insure that the discharge of hazardous materials and substances in the cooling tower drift will not exceed air-quality limitations. In addition monitoring will provide the information necessary for early detection and correction of onsite cooling water treatment procedures in the event that significant amounts of hazardous materials or substances appear. Monitoring will provide the data base necessary for determination of the ecological effects of cooling tower drift on the environment surrounding the facility.

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	Docket Nos. STN 50-528
ARIZONA PUBLIC SERVICE	)	STN 50-520
COMPANY, et al.	)	STN 50-530
	)	
(Palo Verde Nuclear Generating	)	
Station, Units 1, 2, and 3)	)	
	)	

JOINT APPLICANTS' RESPONSE TO PETITION TO INTERVENE OF WEST VALLEY AGRICULTURAL PROTECTION COUNCIL, INC.

VOLUME THREE OF THREE

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JOINT APPLICANTS' RESPONSE TO PETITION TO INTERVENE OF WEST VALLEY AGRICULTURAL PROTECTION COUNCIL, INC.

VOLUME THREE OF THREE

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VOLUME THREE

STATE OF ARIZONA)
) ss.
County of Maricopa)

AFFIDAVIT OF EDWIN E. VAN BRUNT, JR.

I, Edwin E. Van Brunt, Jr., having been duly sworn on oath affirm and attest as follows:

1. I am Vice President, Nuclear Projects Management of Arizona Public Service Company (APS) and am responsible for the engineering, design and construction of the Palo Verde Nuclear Generating Station (PVNGS).

2. The three refurbished production wells described in paragraphs 5 through 9 of the accompanying affidavit of Terry Hudgins will be maintained when the Palo Verde units are operational solely for the purposes of supplying potable water for the personnel employed at PVNGS, water for the fire protection system at PVNGS and makeup water for the primary and secondary systems and various auxiliary systems, of the three Palo Verde units, but excluding the circulating water systems of such units. Each of the three has a demonstrated capacity to meet the station requirements for these purposes and one of them will be maintained in standby status only.

3. Except as described in paragraphs 5-8 hereof, there is no direct or indirect connection between such three refurbished production wells and the Water Reclamation

Facility (WRF), the reservoir which receives treated effluent water from the WRF, or the circulating water system. Therefore, there is no way in which untreated water from any of the three refurbished production wells can enter or be discharged from the cooling towers.

4. All water produced by such refurbished production wells is processed in a reverse osmosis system, more particularly described in the FSAR, Section 9.2.4 and ER-OL, Section 3.6.2.3.

5. Water used for potable purposes is treated after use in the on-site sewage treatment plant. [ER-OL, Section 3.3.3].

6. The wastewater effluent from the on-site sewage treatment plant is discharged to the WRF where it is mixed with the wastewater effluent received from the 91st Avenue Sewage Treatment Plant. [ER-OL, Sections 5.4.1 and 3.3.3].

7. The quantity of wastewater effluent discharged from the on-site sewage treatment plant is estimated to be approximately 0.02 MGD, or 16 acre-feet/year when all three Palo Verde units are in operation. [See ER-OL, Section 3.3.3].

8. Clean miscellaneous drains can be diverted to the circulating water system rather than wasting usable drain water to the evaporation pond. The quantity is estimated to be less than 2gpm or less than .003 MGD.

9. This is the only groundwater produced from wells at PVNGS which can or will be used in the Palo Verde cooling towers.

Further affiant sayeth not.

Edwin E. Van Brunt, Jr.

Subscribed and sworn to before me this 9th day of November, 1982.

Notary Public

My commission expires:

March 11, 1986

STATE OF ARIZONA)
) ss.
County of Maricopa)

AFFIDAVIT OF TERRY HUDGINS

I, Terry Hudgins, having been duly sworn, affirm and attest as follows:

1. I am employed by Arizona Public Service Company (APS) as its Water Resources Consultant.

2. In such capacity, I am responsible among other things for administering APS' compliance with the Arizona Groundwater Management Act (ARS § 45-401 et seq.), including the registration of wells, filing of Notices of Intent to Drill, and securing well permits as required.

3. Paragraphs 7 and 8 of all but two of the affidavits attached to the petition filed by the West Valley Agricultural Council, Inc., include allegations by the respective affiants that PVNGS or APS applied for permits to drill 49 new wells during the past summer. Such allegations are simply not true.

4. Neither APS nor PVNGS has applied for permits to drill 49 new production wells during the past summer nor at any other time. The only applications for well permits which have been filed by APS in connection with Palo Verde were those required for 11 temporary, shallow dewatering wells used for a short period in the Spring of 1982 when it was necessary to make repairs to the lining of the Palo Verde

reservoir. All of these 11 dewatering wells were plugged and abandoned on September 17, 1982.

5. At the time the major portion (approximately 2700 acres) of the Palo Verde site was acquired, there were four wells on the property which were used by the previous owner for farm irrigation. In 1976, three of these wells were refurbished, and two of these three are in use today. The third of the refurbished wells is capped and maintained in standby status without a pump. The remaining original well has been sealed and abandoned. [ER-OL, Section 2.4.2].

6. The three refurbished wells are the only wells at Palo Verde that are capable or can be made capable of producing water. These wells are operated and maintained solely for the purposes of supplying the water required for potable uses by personnel working at the site, for fire protection and for makeup water for various plant auxiliary systems, including the spray ponds. The total water requirements for these purposes when all three Palo Verde units are in operation is estimated to be approximately 1.43 MGD, or 1600 acre-feet/year, or about one-fourth of the withdrawal rate during the last few years of irrigation. [See FSAR Sections 2.4.13.2.3].

7. The characteristics of the three refurbished production wells are set forth below:

Location	Depth	Water Level	Casing	Design Flow
TIN R6W 27 cbc	1200	191'	Steel	No pump
TIN R6W 27 ddc	1050	205'	Steel	1400 gpm
TIN R6W 34 abb	1413	222'	Steel	1400 gpm

[See FSAR, Section 9.2.4.2; ER-OL, Section 2.4.2].

8. These three refurbished production wells have been registered with the Arizona Department of Water Resources (ADWR) as required by the Groundwater Management Act.

9. In addition to the three refurbished production wells, there is a total of 103 monitoring wells installed on-site for monitoring changes in groundwater quality and levels or for detection of leakage from the reservoir and evaporation ponds. The conduct of such monitoring activities is required by a groundwater monitoring program established to meet conditions found in NRC construction permits for the Palo Verde units and in the Certificate of Environmental Compatibility issued by the Arizona Power Plant and Transmission Line Siting Committee. The groundwater subject to monitoring includes both the perched water zone created by the farm irrigation of the previous owners and the deeper regional aquifer.

10. The characteristics of such monitoring wells are set forth below:

Quantity	Range of Depths	Casing	Diameter	Purpose	Pumps
11	30'-100'	PVC	2"	Moisture probes	None
92	45'-145'	PVC	2," 3," 4" and 8"	Water levels and Samples	None

11. None of these monitoring wells are capable of producing groundwater for any use whatsoever nor can they be converted to production wells without drilling to greater depths, installation of steel casings, pumps and securing well permits from ADWR.

12. Pursuant to the Groundwater Management Act, a Notice of Intent to Drill must be filed with ADWR prior to commencement of drilling any well. All such notices which are filed are recorded in the Well Registry maintained by ADWR. The requirement to file Notices of Intent to Drill applies equally to those wells for which a permit must be issued ("non-exempt wells") and to those wells for which a permit is not required ("exempt wells"). Additionally, a well driller's report and a well completion report must be subsequentiy filed for every well drilled, exempt and non-exempt. When such reports are filed for wells, the wells are considered completed by DWR and so designated in the Well Registry.

13. Monitoring wells, including the 103 monitoring wells described in paragraphs 9, 10 and 11 hereof, are exempt wells under the Groundwater Management Act and the regulations promulgated thereunder and no permits

therefor are required. (See also McCain, Tr. 2435, June 24, 1982).

14. A check of the Well Registry made by me on September 13, 1982, revealed that it included 38 of the monitoring wells at Palo Verde referred to in paragraphs 9, 10 and 11 hereof, and the 11 dewatering wells referred to in paragraph 4 hereof which have since been plugged and abandoned. All of these wells will be indicated as completed in the Well Registry when the required data is reflected in the computerized Well Registry system.

Further affiant sayeth not.

Terry Hudgins

Subscribed and sworn to before me this 4th day of November, 1982.

Joan A. Wyatt
Notary Public

My commission expires:
March 11, 1986

OUTLINE OF MONITORING PROGRAM

The Applicant has committed to the conduct of a monitoring program to determine what, if any, effects are caused by operation of the cooling towers at Palo Verde.

The monitoring program will be conducted on-site and off-site out to approximately 5 miles from the cooling towers. This 5-mile distance corresponds to the maximum distance beyond which it is generally accepted that total salt deposition is not expected to be significant. For example, see reference 5 cited in Dr. Davis' Memorandum Report.

The monitoring program will conform to those specifications as set forth for salt drift in Table 6.2-5 of the PVNGS ER-CP and shown below.

TABLE 6.2-5 (Partial)

BIOTIC MONITORING PROGRAM FOR PVNGS

Plant System Inducing Change	Predicted Physical Change	Physical Paramaeter To Be Monitored	Biotic Indicator To Be Monitored	Duration and Periodicity of Study	
				Preoperation Period	Operation Period
Drift from cooling tower					
Salt	Foliar deposition of salt	Airborne salt	Salt sensitive plant species	Baseline seasonal date one year prior to operation	Seasonal data until until level of impact determined

The program contemplates the features and considerations described during testimony given before the ASLB during hearings held prior to issuance of the Palo Verde con-

struction permits. (Hearing Transcript, pp. 838-848, February 26, 1976). It is contemplated that further baseline studies and soil sample salinity tests will be conducted to accurately assess the existing environment. An appropriate number of indicator species, including agricultural crops, will be selected to monitor the effects of salt deposition. Particular attention will be devoted to species believed or subsequently found to be salt sensitive.

The monitoring program will consist of airborne salt monitoring using existing continuous low-volume samplers which are a part of the PVNGS environmental radioactivity monitoring program. Filters from these samplers will be analyzed periodically in a laboratory to determine airborne salt deposition. Further, additional monitoring will be conducted at specific locations which include natural desert and agricultural lands within 5 miles of the PVNGS cooling towers and in areas where maximum total salt deposition values are predicted to occur. Vegetation and soil monitoring will be conducted seasonally. This program as described above will be instituted for pre-operational baseline monitoring to determine background airborne salt deposition and salt deposition on vegetation and soils. This program will be continued for two years after commercial operation of PVNGS Unit 3.

N
4 MILES
5 MILES

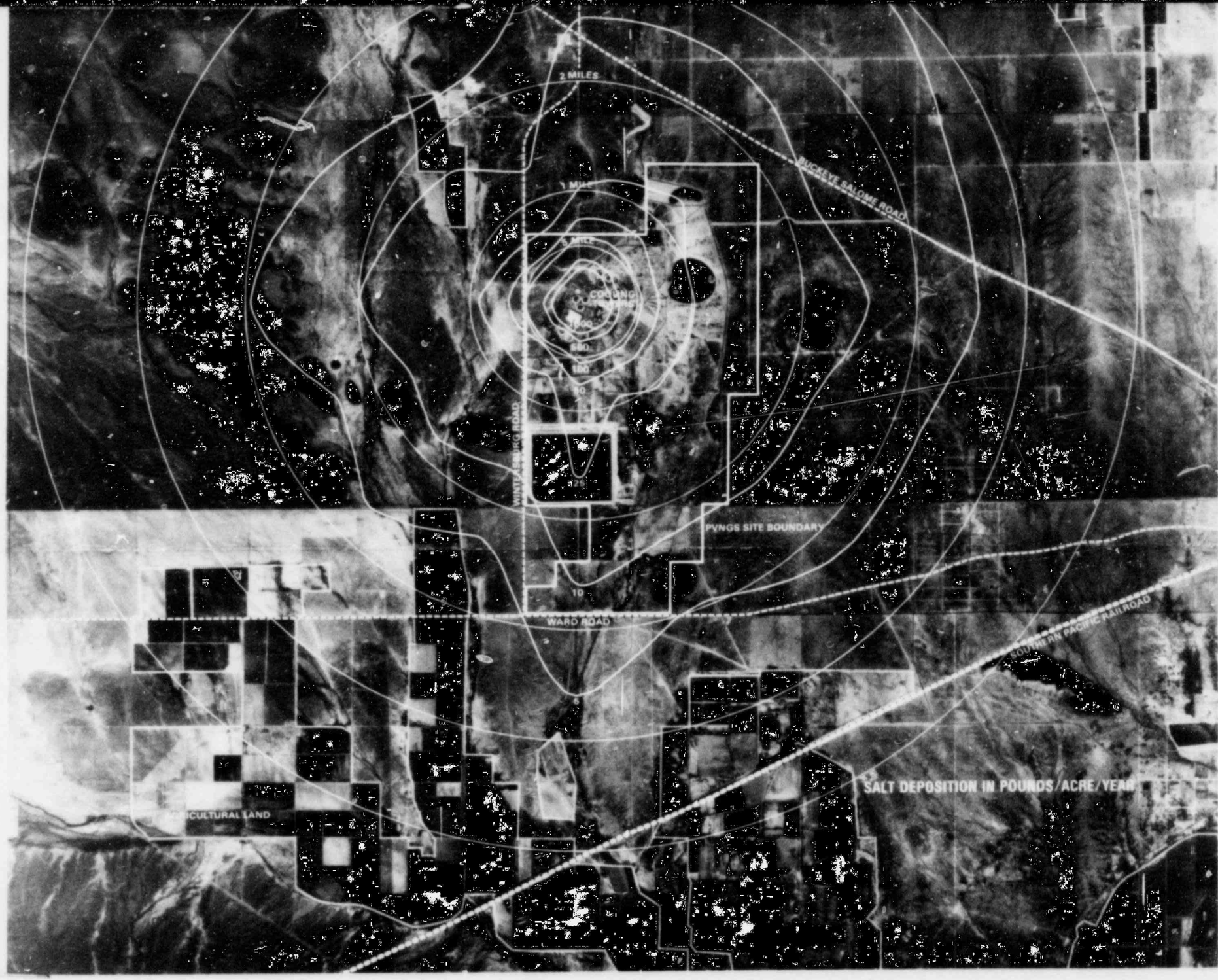
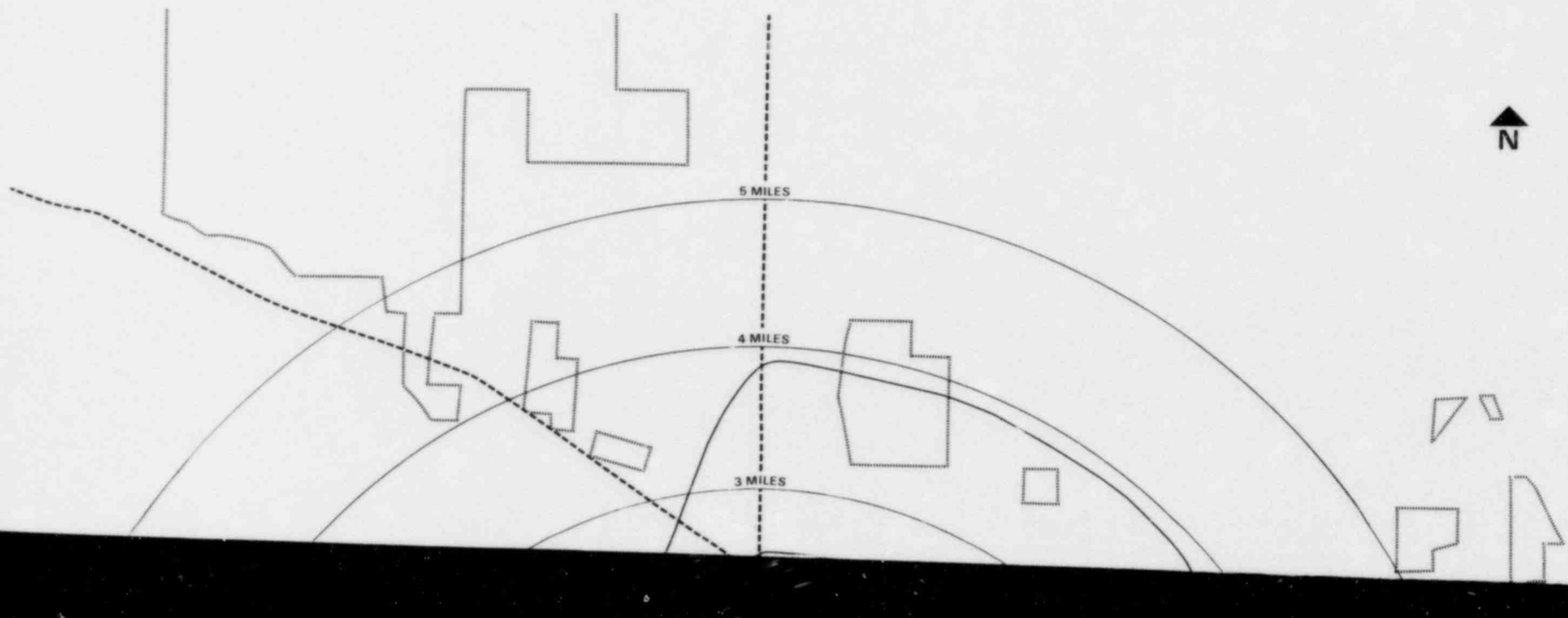

2 MILES
BUCKEYE SALOME ROAD
1 MILE
COOLING
1000
500
100
50
25
10
WINTERSBURG ROAD
PVNGS SITE BOUNDARY
10
WARD ROAD
SOUTHERN PACIFIC RAILROAD
SALT DEPOSITION IN POUNDS/ACRE/YEAR
AGRICULTURAL LAND

Figure 11-1

BUCKEYE SALOME ROAD
PYNOS SITE BOUNDARY
WARD ROAD
WINTERSBURG ROAD
2 MILES
1 MILE
½ MILE
SALT DEPOSITION IN POUNDS/ACRE/YEAR
CULTURAL LAND

Figure 11-1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3 MILES
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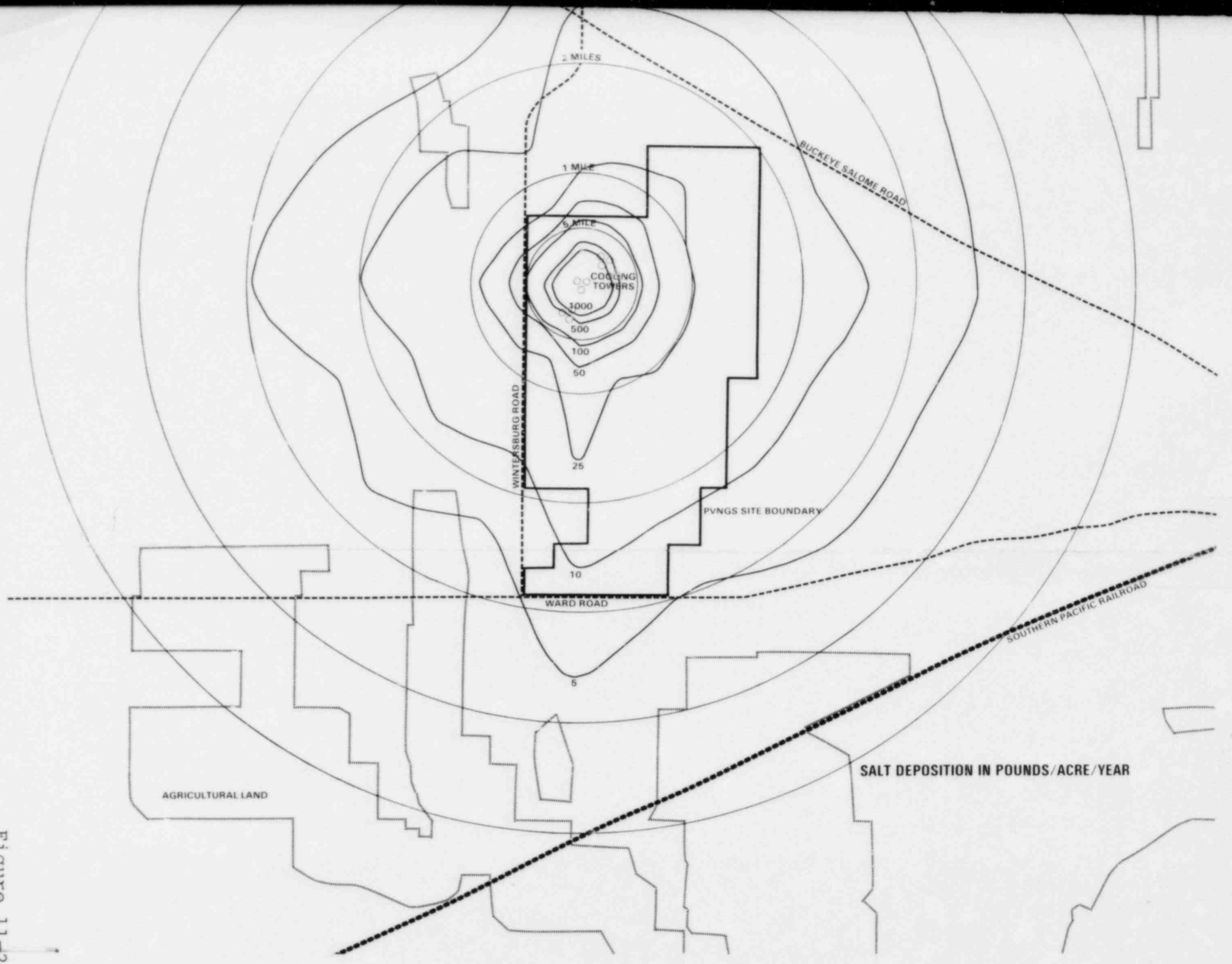
2 MILES
1 MILE
5 MILE
COOLING TOWERS
1000
500
100
50
25
10
5
BUCKEYE SALOME ROAD
WINTERSBURG ROAD
PVNGS SITE BOUNDARY
WARD ROAD
SOUTHERN PACIFIC RAILROAD
AGRICULTURAL LAND
SALT DEPOSITION IN POUNDS/ACRE/YEAR

Figure 11-2