ENCLOSURE

March 3, 1989

Mr. L. Ruth
Technical Assistance Management Branch
Mail Stop 11H22
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

LETTER REVIEW OF ODCM REVISION 10 FOR THE HOPE CREEK GENERATING STATION - SIM-30-89

Dear Mr. Ruth:

Attached is the final Letter Report containing EG&G Idaho's evaluation of the Offsite Dose Calculation Manual (ODCM) updated through Revision 10 for the Hope Creek Generating Station.

This Letter Report is being transmitted under the provisions of Project 5 of FIN D6034, "Review of Radiological Issues." A draft of this Letter Report was provided earlier for NRC review and comments and found to be acceptable.

Yours very truly,

F B Simpson

F. B. Simpson
Nuclear Sciences

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Attachment:
As stated

cc: W. Meinke, NRC
G. L. Jones, DOE-ID

EG&G Idaho, Inc. P.O. Box 1625 Idaho Falls, ID 83415

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EVALUATION OF HOPE CREEK ODCM UPDATED THROUGH REVISION 10 - SIM-30-89

Public Service Electric and Gas Co. (PSE&G), the Licensee for Hope Creek Generating Station (Hope Creek) transmitted a complete ODCM for Hope Creek, updated through Revision 10, to the NRC with a letter from S. E. Miltenberger (PSE&G) to Document Control Desk (NRC) with a letter dated January 6, 1989. Revision 10 of the ODCM was submitted in response to a letter from G. W. Rivenbark (NRC) to S. E. Miltenberger (PSE&G) dated June 28, 1988. This letter requested that PSE&G address the points raised in the Conclusions section of the Technical Evaluation Report (TER), EGG-PHY-7897, which consisted of a review of the complete Hope Creek ODCM, updated through Revision 8.

Between the time of the review of Revision 8 and the submittal of Revision 10, the Licensee submitted ODCM Revision 9, dated September, 1988 with the semi-annual Radioactive Effluent Release Report for Hope Creek for the first six months of 1988. Revision 9 included changes in environmental monitoring locations and the format for reporting environmental monitoring locations, revised maps, and changes in the data used to determine liquid effluent monotor setpoints. These changes in data effected a change from using ANSI Standards to using historical releasees of radionuclides in liquid effluents as the basis for calculating default setpoints for liquid effluent monitors.

Changes made by Revision 10 concerned only the points raised in the Conclusions of the review TER referenced above. An attachment to the Licensee's transmittal letter dated January 6, 1989 contained discussions of all concerns raised in the TER and described the response by PSE&G. Most of the concerns were addressed in a manner consistent with the recommendations in the TER. Copies of the Conclusions section of the TER and the Licensee's responses are attached for convenient reference. All responses that did not address the concerns as recommended are discussed below, using the Licensee's identification of the responses.

TER Part 4 - Major Discrepancies, Item 4: It was requested that the seasonal correction factor ($SF_p = 0.5$) used in Equation 2.11 of the ODCM be "adjusted to agree with the fraction of the quarter when the 0.5 factor is applicable."

The Licensee did not implement this recommendation. The response stated, concerning the current use of the correction factor, "This correction factor was considered adequate in discussions with the Nuclear Regulatory Commission (NRC). This average dose was considered to be within the errors of the dose calculation methods provided in NUREG-0133 and Reg. Guide 1.109."

The acceptability of the Licensee's response appears to depend on the previous agreement with the NRC referred to above and involves interpretation of 10 CFR 50, Appendix I, Section IV.A. This section indicates that the quarterly exposure is to be "calculated on the same basis as design objective exposure," which is reasonably interpreted to mean that the seasonal correction factor should be re-evaluated if the calculation period is a quarter instead of a year. As the calculation is now made, the doses will be too high during the November-April period and too low during the May-October period, but should be approximately correct for the year.

TER Part 4 - Additional Discrepancies, Item 3: It was requested that the definition of the term CTBD in ODCM Sections 1.4.1 and 1.4.2 be changed from "..release period" to "..reporting period."

Using the methodologies described in NUREG-0133 and Regulatory Guide 1.21 as the basis, the Licensee states, "It is our interpretation the dilution flow during a liquid release's release period is reported, not the dilution flow over the entire reporting period." The Licensee's interpretation is the usual one. The Licensee also states, "As well, the dose calculations under this definition would be grossly underestimated and the volume of dilution water reported grossly overestimated." This statement appears to be the result of a misunderstanding as to what was recommended.

The reason for the request that the definition of the term CTBD be changed from ".. release period" to ".. reporting period" was to have dose calculations done in such a way that the NRC could independently check the reported calculated doses. Such an independent calculation could also be made if the Licensee reported the radionuclide concentration, waste flow, and dilution flow for each release.

The data reported in the Licensee's semi-annual radioactive effluent release reports is, however, sufficient to enable the NRC to perform dose calculations that would give approximately the same doses calculated by the Licensee, if dilution flows were approximately the same for all releases.

TER Part 4 - Additional Discrepancies, Item 5: In response to the recommendation that historic plant average radionuclide distributions be used to determine default setpoints for the gaseous effluent monitors, the Licensee stated that since the plant has been operating at full power only since December 1986 and fuel has been clean (Dose Equivalent Iodine [DEI] = 2E-5 μCi/cc) there is not enough historic data for it to be better than the ANSI Standard that is now used.

TER Part 4 - Additional Discrepancies, Item 7: The Licensee explained the omission of the child-vegetation pathway from Table 2-3, thereby satisfying the objection indicated in the review. The statement, ".. and the child age group is controlling for the vegetation pathway." has been removed from Section 2.5.1 in Revision 10 of the Hope Creek ODCM. However, Section 2.5.1 should be revised to require inclusion of doses to the controlling age group by all existing pathways, and consequently the inhalation pathway for the infant age group should be added to Table 2-3.

TER Part 4 - Additional Discrepancies, Item 9: It was recommended that the words "Hope Creek" be replaced by "Salem" in the second paragraph of Section 3.2. Instead, "Salem" was replaced by "Hope Creek." This leaves the total dose discussion with no mention of how the dose contribution from Salem is to be accounted for.

TER Part 4 - Additional Discrepancies, Item 13: The Licensee will contact the NRC to get a reference document before changing the phosphorus bioaccumulation factor for saltwater invertebrates, as required by agreements with the NRC.

TER Part 4 - Additional Discrepancies, Item 18: The Licensee added I-133 to all pages and checked several dose factors in Table 2-4, as requested. Nearly all of the factors were corrected or determined to be correct as they appear in the ODCM. The Licensee stated that those corrected in the ODCM were determined to be correct in the computer program actually used for the calculation of doses. The Licensee's correction and verification of values appears correct except in the case of the dose factors for Ce-141 via the vegetation pathway to a child. These dose factors for Ce-141 should be re-checked, since some of the terms used in the Licensee's response are for Ce-144 instead of Ce-141.

TER Part 4 - Additional Discrepancies, Items 19 and 20: The Licensee either explained the use of parameters questioned in these two items or discussed the complete replacement of data. Table A-1, containing MPC values and expected releases of liquid effluents, has been extensively revised since ODCM Revision 8. The estimate of radionuclides released that is included in Revision 10 is based on historical releases (1987 releases) instead of calculated values from the FSAR which were used in Revision 8.

The MPC values are directly from Appendix B of 10 CFR 20, with the default value of 3.0E-06 used for radionuclides not included in 10 CFR 20. In response to a question in the review TER, the Licensee states that they conservatively use the smaller of the soluble and insoluble concentration limits from Table II in Appendix B of 10 CFR 20 when calculating setpoints for the liquid effluent monitors.

Minor discrepancies seem to exist between the releases reported in the semiannual effluent release reports for 1987 and the tabulation of these releases in Table A-1, (i.e., The Table A-1 value for Sr-89 is about 2/3 of the amount reported in the semiannual reports, and Ce-143 and Ce-144 are shown as releases in the table but not in the semiannual reports.) These minor discrepancies might be due to updates of analysis or use of recent effluent releases. (Note. The identification of some radionuclides reported to be in the liquid effluent by the semiannual reports and included in ODCM Table A-1 should be verified; e.g., Tc-100, Hg-203, and Ba-139.)

TER Part 4 - Additional Discrepancies, Item 21: This item noted the absence of Co-58 and Co-60 from Table B-1. These radionuclides were added to the Table B-1 in Revision 9, but the table was apparently inadvertently omitted from Revision 10.

TER Part 4 - Additional Discrepancies, Item 23: The Licensee corrected the values of Xe-135 and Xe-135m noted as being erroneous in Table C-1, but did not correct the value of N_{eff} for Kr-88.

TER Part 4 - Additional Discrepancies, Item 24: The Licensee added tritium to the definition of Q_i on page D-3 for the equation on page D-2, as requested. However, this change will cause problems by giving a calculated dose as much as 10^{14} times the dose due to I-131. Tritium releases should therefore be accounted for in a separate part of the equation on page D-2.

TER Part 4 - Additional Discrepancies, Item 26: This item questioned whether the air monitors identified in Table E-1 of ODCM Revision 10 satisfy the requirements of Technical Specification Table 3.12-1. In Revision 9, the Licensee removed two air monitor locations and added three.

The Licensee's response to the questions raised in the review of Revision 8 reasons that the present locations (5S1 - 1.0 mi E, 5D1 - 3.5 mi E, and 16E1 - 4.1 mi NNW) fulfill the requirements of Technical Specification Table 3.12-1 because of the isolation of the site. (The site is surrounded by United States Wetlands and the Delaware River.) The nearest resident is 3.4 miles east of the site, and there is an air sampler in that vicinity as well as one at the site boundary in the same direction. Another sampler is across the Delaware River at about the same distance as the nearest residences in that direction. Although these sampler locations seem to be located so as to indicate possible exposures to members of the public, they may not satisfy the technical specification requirement that three samplers be located "close to the site", depending on the definition of "close." It seems that sampling locations should be added to fulfill the requirements of Technical Specification Table 3.12-1, or the table should be changed to permit the samplers to be located in the vicinities of the nearest residences instead of close to the site.

TER Part 4 - Additional Discrepancies, Item 27: This item concerns the locations at which sampling is done to detect water-related contamination. The Licensee either identified locations as satisfying the requirements of Technical Specification Table 3.12-1 or explained that samples were not taken because no such samples exist; i.e., there are no downstream drinking water sources or crops irrigated from the water in which liquid wastes have been discharged. It would be instructive to have this information included in the ODCM.

TER Part 4 - Suggestions, Item 1: This suggestion concerned changes of various symbols used in the ODCM. In Revision 10 of the ODCM, C_i is used for concentrations and Ci for curies, thereby eliminating the confusion of using Ci for both meanings as was done in Revision 8. The Licensee notes that most of the othor symbols questioned were adapted directly from the Addendum to NUREG-0133, and states that these are considered satisfactory with slight changes in definitions.

Of the questions raised in the review TER only the problems discussed under "Major Discrepancies, Item 4" and "Additional Discrepancies, Item 26" above may require significant additional changes. The first of these concerns the use of a seasonal correction factor (SF_p) of 0.5 in the grass-cow-milk dose pathway equations for quarterly doses, and the second concerns locations of air monitoring stations. Some other items above recommend changes that should be made, but would not require significant effort to accomplish.

This review was performed by T. E. Young.

4. CONCLUSIONS

The Licensee's ODCM, including all revisions through Revision 8, for the Hope Creek Generating Station was reviewed. It was determined that the ODCM uses methods that are, in general, consistent with the guidelines of NUREG-0133. However, it is recommended that another revision to the ODCM be submitted to address and correct the numerous discrepancies identified in the review.

The following are considered to be major discrepancies:

- In Section 1.4.2 and Appendix B, salt water bioaccumulation factors must be used instead of fresh water factors in the calculation of the total body default term.

- In Sections 1.5 and 2.6 it is not stated that the dose projections will take into account effluent releases expected in the next 31 days.

- I-133 is missing throughout Table 2-4 and is not mentioned in Section 2.5.1.

- In Equation 2.11 in Section 2.5.1, use of the SF_p correction factor of 0.5 for milk and vegetation is correct only for the annual dose calculation. The value of 0.5 is not correct for a quarterly dose calculation. The SF_p factor for the quarterly dose calculations must be adjusted to agree with that fraction of the quarter that these exposure pathways are applicable.

The following are additional discrepancies:

- In Section 1.2, 10 CFR 30 should be changed to 10 CFR 20.

- In Section 1.2.1, the background term must be in the same units as the setpoint, i.e., μCi/ml, instead of cpm.

- In Sections 1.4.1 and 1.4.2, the definition of term CTBD must have "release period" replaced with "calculation period" to state the flowrate is averaged over the entire calculational period.

- In Section 2.2.1, the units of "SP" and "bkg" should be μCi/s.

- In Section 2.2.2, the radionuclide distribution should be based on historic plant averages instead of data from the ANSI Standard.

- In Section 2.4.2, the definition of M_{eff}, the value should be 8.1E3 (as calculated in Appendix C) instead of 8.1E2.

- In Section 2.5.1, the last paragraph identifies the Child-Vegetation pathway as the limiting pathway for the child which is inconsistent with the information in Table 2-3.

- In Section 2.5.2, the RI-131 value is 1.67E12 whereas Table 2-4 lists the value as 1.05E12.

- In Section 3.2, the wording of the second paragraph is confusing. It appears that words "Hope Creek" should be replaced with "Salem".

- In Table 2-1 there are several values that are different from those presented in Rev. 6. It can not be determined which values are the correct values.

- In Table 1-2 there are a few values that have been changed from those listed in Rev. 6. The value for Y-91m for bone has been changed to 5.72E+2 from 5.72E-2, and C-14 for the GI-LLI has been changed to 2.90E+5 from 2.90E+3. It is not clear which value is correct.

- In Table 1-3, the value for I for saltwater invertebrates should be 2.5E+01 instead of 2.5E+02.

- In Table 1-3, the phosphorus bioaccumulation factor of 3.0E+04 for saltwater invertebrates could be replaced with 6.0E+02.

- Figures 2-1 and 2-2 reference Figures 4.1-2 and 4.1-3. Should these references be to Figure 2-2 and Figure 2-1, respectively?

- A simplified diagram illustrating the solid waste treatment system is not included in the ODCM.

- In Table 2-1, the units of Mi and Ni should be mrad/yr per $\mu Ci/m^3$. Also the Mi value for Xe-133 should be 3.53E+02 instead of 3.35E+02.

- Table 2-2 references Table 3.1-1. This reference should be changed to be Table 2.1-1. The units of Ci should be $\mu Ci/cm^3$ and the units of Mi should be mrad/yr per $\mu Ci/m^3$.

- Table 2-4 must have I-133 included in all pages of the table to be consistent with Technical Specification 3.11.2.3. Within Table 2-4 there are several values that need to be checked for correctness. The nuclides and organs are identified in the following list:

  Teen Inhalation: Ag-110m lung, Te-125m lung
  Child Inhalation: Rb-86 liver
  Infant Inhalation: Fe-59 lung
  Adult Cow-Milk: Rb-86 all organs, Zr-95 all organs, Nb-95 all organs.
  Teen Cow-Milk: I-131 all organs, Ba-140 liver, Ce-141 all organs
  Child Cow-Milk: Y-91 all organs
  Child Vegetation: Ce-141 all organs.

- In Table A-1, the MPC values for P-32 and Cr-51 should be 2E-5 and 2E-3, respectively. In Table A-1 under the expected activity released column, the values for Rh-106 through Ba-139 are incorrect.

- In Table A-4 the Na-24 MPC value should be 2E-4. In addition the expected activities released for Sr-92 and Nb-95 are much larger than those used in Rev. 6. Are those values listed in Rev. 8 the correct values?

- Table B-1 does not include values for Co-60 and Co-58 which are required according to the text of Appendix B.

- On page C-3, the table referenced should be Table C-1 instead of B-1. Also on pages C-3 and C-4 the term D_x should be D_g.

- Table C-1 has incorrect M_{eff} and N_{eff} values for Xe-135, Xe-135m and Kr-88.

- On page D-3 the definition of Qi must include H-3.

- Table E-1 of the ODCM does not include 43 direct radiation stations as required in the Technical Specifications as locations 10F2 and 10G1 are listed twice.

- Table 2.3 of the ODCM states the highest X/Q and D/Q are 0.5 miles N and 4.9 miles W, respectively. These locations are not included in the airborne sampling program listed in Table E-1.

- Table E-1 does not include any drinking water locations nor food product sample stations for crops grown with water affected by the liquid effluents which are required by Table 3.12.1-1 of the Technical Specifications. If these pathways do not exist, then the Technical Specifications should be modified.

- Figures E-1 and E-2 are illegible.

The following are not discrepancies in the ODCM, but are suggestions that should be brought to the attention of the Licensee:

- It is recommended that use of Ci be limited to the accepted use as the unit for curie and that another symbol be used for concentrations throughout the document. Also the use of the terms c and C should be reviewed to determine if better terms could be used to avoid confusion, e.g., see Equation 1.1.

- In Section 1.2.1 the definition for Ci should state that it is the diluted concentration.

- On pages C-2 and C-3 the meaning of "ds" is not clear in the definition of the terms fi and Mi.

- A low level alarm setpoint should be considered for the liquid effluent monitor.

- For consistency with the requirements of Technical Specification 4.11.2.5.1, it should be stated in the ODCM that the dose projection for anticipated gaseous releases is only required when the ventilation exhaust treatment system is not being utilized.

ATTACHMENT 1

PER PART 4 - MAJOR DISCREPANCIES

ITEM 1.

It was stated that in Section 1.4.2 and Appendix B, salt water bioaccumulation factors must be used instead of fresh water factors in the calculation of the total body default term.

Revision 9 (7/29/87) reanalyzed Section 1.4.2 and Appendix B of the ODCM and the saltwater bioaccumulation factors were used in the calculation of the total body default term.

ITEM 2.

It was noted that Hope Creek ODCM Sections 1.5 and 2.6 did not state dose projections will take into account effluent releases expected in the next 31 days.

The requirement of the 31 day dose projection is described in NUREG-0133, page 19, second paragraph; ".. the licensee must project the cumulative liquid effluent releases over the ensuing 31 days." It is our interpretation that we need to predict what the dose due to liquid and gaseous effluents will be over the next 31 days. However, NUREG-0133 does not provide an equation as to how this prediction should be performed.

Hope Creek ODCM Equations 1.9, 1.10, 2.17, 2.18 and 2.19 were developed as our best means to predict the next 31 day dose. These equations take the total dose to date in a calender quarter and divide by the number of days to date in the current calender quarter. The result is an average dose per day for liquid and gaseous releases. This average dose per day number is multiplied times 31 days. This number is our prediction of what the total dose at the end of the next 31 days will be.

ITEM 3.

It was noted the I-133 dose conversion factors were missing throughout Table 2-4 and is not mentioned in Section 2.5.1.

Revision 10 of the Hope Creek ODCM now includes I-133 in Sections 2.3.2 and 2.5.1. and Table 2-4 all pathways.

The dose conversion factors listed in the ODCM are used in the Effluent Management Software (EMS) computer program at Hope Creek. The EMS program is used for effluent release permits and generating the semi-annual report. A check was made to see if the I-133 dose conversion factors were inadvertently omitted from the EMS code. The I-133 dose conversion factors were in the program. So, while the ODCM did not list the dose conversion factor the factors were available and being used in the EMS program.

ITEM 4.

It was requested that the 'SFp' seasonal correction factor (0.5) used in Equation 2.11 of the ODCM be "adjusted to agree with that fraction of a quarter when the 0.5 factor is applicable."

The purpose of the SFp factor is to adjust for that half of the year when milch animals are provided feed from stored vegetation. During this half of a year (November thru April) the milch animals do not graze. So as not to grossly overestimate the dose from the possible release of radioiodines and particulates during this non-grazing time period, the average dose is calculated. The SFp factor provides the means for an average dose for the grass-cow-milk and vegetation pathways throughout the year.

This correction factor was considered adequate in discussions with the Nuclear Regulatory Commission. This average dose was considered to be within the errors of the dose calculation methods provided in NUREG-0133 and Reg. Guide 1.109.

We feel the SFp correction factor is adequate and that no adjustment is necessary to Equations 2.11 and 2.12 of the Hope Creek ODCM.

TER PART A - ADDITIONAL DISCREPANCIES

ITEM 1

It was noted in Section 1.2, 10 CFR 30 should be changed to 10 CFR 20.

This correction had been made in Revision 9 of the Hope Creek ODCM.

ITEM 2

It was noted in Section 1.2.1 the background term must be in the same units as the setpoint (uCi/ml instead of cpm).

In Revision 10 of the ODCM the "bkg" term has been corrected to uCi/ml.

ITEM 3.

The definition of the term CTBD in [illegible]ns 1.4.1 and 1.4.2 was requested to be changed from "..rele[illegible]period" to "..calculation period" to state the flowrate is averaged over the entire calculational period.

NUREG-0133 describes the equivalent (dilution flow)

ITEM 3 (cont'd)

as "the near field average dilution factor during any liquid effluent release." Reg. Guide 1.21 reporting requirements define the term as the "Average stream flow during periods of release.." (note: we consider our stream flow as the cooling tower not the Delaware River). The determination of the average dilution flow is calculated over the time of the release or release period. So, the term calculation period and release period has the same meaning.

Based on our interpretation of NuReg-0133, Reg. Guide 1.21 the use of the term "release period" is appropriate as currently written.

ITEM 4.

It was noted the units of "Sp" and "bkg" in Section 2.2.1 should be uCi/s.

The correct terms for the calculation of the gaseous alarm setpoint is uCi/cc. This is based on the unit analysis of the terms in Equation 2.3 (Section 2.2.1). The units for "Sp" are correct. The units for "bkg" were incorrect and have been corrected from cpm to uCi/cc in Revision 10 of the ODCM.

ITEM 5.

It was noted in Section 2.2.2 the radionuclide distribution used for default dose calculations should be based on historic plant averages instead of data from an ANSI Standard.

It is agreed that the radionuclide distribution should be based on plant operating history. However, Hope Creek Station has been operating at full power since December of 1986. Thus it is a new plant with no history.

To date the operation of Hope Creek has been excellent. The current Dose Equivalent Iodine (DEI) levels in reactor water has averaging 2E-5 uCi/ml. This means fuel integrity is excellent with very small amounts of fission products being produced and thus released. So, to date there is still no historic radionuclide distribution to fall back because no identifiable noble gases have been detected.

ITEM 6.

It was noted in Section 2.4.2 the value of M_{eff} should be 8.1E3 (as determined in Appendix C) instead of 8.1E2.

Revision 10 of the Hope Creek ODCM has mde this correction.

ITEM 7.

It was questioned as to why Table 2-3 does not identify the child-vegetation pathway as discussed in section 2.5.1, last paragraph.

The last paragraph of section 2.5.1 states; "For evaluating the maximum exposed individual, the infant age group is controlling for the milk pathway and the child age group is controlling for the vegetation pathway. Only the controlling age group and pathway as identified in Table 2-3 need be evaluated for compliance with Technical Specification 3.11.2.3."

In Table 2-3 the pathways listed for radioiodines and particulates are the infant-milk and ground pathway for an unrestricted area (residence/dairy) and the child-inhalation pathway at the site boundary.

These locations and pathways are taken from the Environmental Statement for Hope Creek Generating Station, Feb. 1974, Table 5.5 (from U.S. Atomic Energy Commission). This report considered the maximum exposed individual for the unrestricted area to be the infant-milk pathway from a cow grazing location 4.8 miles NNE of the vent. Since there are no vegetation nor cow-milk pathways near the SITE BOUNDARY, the maximum exposed individual at the SITE BOUNDARY would be the child-inhalation pathway.

In summary, the child-vegetation pathway is not included in Table 2-3 because it is not the limiting dose pathway for Hope Creek's site boundary or unrestricted area. The limiting pathways are the child-inhalation at the site boundary and infant-milk for the unrestricted area. There are no vegetation nor milk pathways at the site boundary. The statement; ".. and the child age group is controlling for the vegetation pathway." has been removed from Section 2.5.1 in Revision 10 of the Hope Creek ODCM.

ITEM 8.

It was noted in Section 2.5.2 the RI-131 value is 1.67E12 whereas Table 2-4 lists the value as 1.05E12.

Revision 10 of the Hope Creek ODCM corrected the value in Section 2.5.2 to 1.05E12.

ITEM 9.

It was noted in Section 3.2 of the Hope Creek ODCM the words "Hope Creek" should substitute the word "Salem".

Revision 10 of the Hope Creek ODCM makes this correction.

ITEM 10

It was noted that in Hope Creek ODCM Revision 8 Table 1-1 there are several values that are different from those presented in Revision 6. It was also stated that there was no determination of which values are correct.

Table 1-1 of the ODCM provides a listing of default alarm setpoints for the liquid radwaste monitors. These default alarm setpoints are based on historical radionuclide release information. At the time of Revision 6 of the ODCM there was no historical information available because Hope Creek was not operational. By Revision 8 there was historical information and data changed information in Table 1-1. It was also noted that in Revision 6 there were typo errors on correct monitor reference numbers which were corrected by Revision 8.

ITEM 11

It was noted in Table 1-2 that a few values had been changed from those listed in Revision 6. The values of Y-91m for bone and C-14 for the GI-LLI were specifically mentioned.

The above mentioned numbers were incorrect in Revision 6 and were corrected in Revision 8 of the Hope Creek ODCM.

ITEM 12

It was noted in Table 1-3 of the ODCM the value for I should be 2.5E+01 instead of 2.5E+02.

Table 1-3 of the ODCM lists the bioaccumulation factors used in dose calculations. In Revision 9 of the Hope Creek ODCM lists the bioaccumulation factors for iodine as 1.0E+01 for fish and 5.0E+01 for invertebrates. The next isotope listed is Cs (cesium) with bioaccumulation factors of 4.0E+01 for fish and 2.5E+01 for invertebrates. All of these numbers are from Regulatory Guide 1.109 Table A-1 and were reviewed and determined to be correct. No change is required to the Hope Creek ODCM.

ITEM 13

It was noted in ODCM Table 1-3 the phosphorous bioaccumulation factor of 3.0E+04 for salt water invertebrates could be replaced with 6.0E+02.

It is our understanding that verbal communications between PG&G and the NRC justified the change in the bioaccumulation factor. However, based on agreements with the NRC and PSE&G we would need a reference document to justify the change. In the near future we will be in contact with the NRC to get the needed references. Meanwhile no change has been made in Revision 10 of the ODCM.

ITEM 14.

There was some confusion caused by references in Figures 2-1 and 2-2. These figures referenced Figures 4.1-2 and 4.1-3.

Since there does not exist any Figures 4.1-2 and 4.1-3 these references have been removed in Revision 10 of the ODCM.

ITEM 15.

It was noted a simplified diagram of the solid waste treatment system was not provided.

In Revision 10 of the Hope Creek ODCM a simplified diagram of the solid waste treatment system is provided as Figure 1-2.

ITEM 16.

It was noted in Table 2-1 of the ODCM the units of M_i and N_i should be mrad/yr per uCi/m^3 and the value for Xe-133 should be 3.51E+02 not 3.35E+02.

The units of Table 2-1 for M_i were corrected from mrad per uCi/m^3 to mrad/yr per uCi/m_3. The units for N_i did not need to be corrected as they were mrad/yr per uCi/m_3 in Revision 9 of the ODCM.

The value for Xe-133 was corrected from 3.35E+02 and 3.53E+02 in Revision 10 of the ODCM.

ITEM 17.

It was noted Table 2-2 references of Table 3.1-1 should be to changed to Table 2-1. It was also noted the units of M_i and C_i should be changed to mrad/yr per uCi/m^3 and uCi/cm_3 respectively.

The references and the unit corrections have been corrected in Revision 10 of the Hope Creek ODCM.

ITEM 18.

It was noted that Table 2-4 needed I-133 included in all pages to be consistent with Technical Specification 3.11.2.3.

As noted in ITEM 3 above, these additions have been made in Revision 10 of the Hope Creek ODCM.

It also was noted that some dose conversion factors within Table 2-4 of the Hope Creek ODCM needed to be checked for correctness. The noted values were recalculated using NuReg-0133 and Reg Guide 1.109 and compiled below. There were some discrepancies

ITEM 18 (cont'd)

between the ODCM and the correct values. The latest revision of the ODCM reflects the corrections to these discrepancies. The results of the comparison is below:

Equation 1 for inhalation pathway dose conversion factors

P = K(BR) DFA = 1E6 * BR * DFA (ref. NuReg-0133 p. 25)

where:
P = dose rate conversion factor
K = unit conversion = 1E6 pCi/uCi
BR = breathing rate of group from R.G. 1.109 Table E-5
DFA = dose factor from Reg. Guide 1.109 Table E-7 to E-10

PATHWAY: Inhalation

Path	Isotope	BR	DFA	P	ODCM #
Teen-lung	Ag-110m	8000	8.44E-04	6.75E6	6.75E6
Teen-lung	Te-125m	8000	6.70E-05	5.36E5	5.36E5
Child-liver	Rb-86	3700	5.36E-05	1.98E5	1.98E5
Infant-lung	Fe-59	1400	7.25E-04	1.01E6	1.02E6

Based on our calculations the numbers in the ODCM are correct and do not need to be changed.

Equation 2 for cow-milk (food) dose conversion factors:

$$P = K\, r\, \frac{Q\,(U)}{Y\,(\lambda_i + \lambda_w)}\, F\, DFL\, [e^{(\lambda_i - t f)}]$$ (ref. NuReg-0133, p. 26)

where:

P = dose rate conversion factor
K = unit conversion = 1E6 pCi/uCi
Q = cow's consumption rate from R.G. 1.109 Table E-3 =50
U = food consumption rate from R.G. 1.109 Table E-3
Y = agricultural productivity from R.G. 1.109 Table E-15
= 0.7 for grass-cow-milk-man pathway
F = stable element coefficients from R.G. 1.109 Table E-1
r = fraction of deposited activity retained on crops
= 1 for iodines, 0.2 for others from R.G. 1.109 Table E-15
DFL = maximum organ ingestion dose factor from Table E-11 to E-14
λ_i = decay constant for radionuclide of concern (sec^{-1})
λ_w = decay constant for removal of activity from leak and plant surfaces by weathering = 5.73E-7 sec^{-1}
t = transport time from pasture to cow, milk, person from Table E-15 = 1.73E5 secs

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With all the constants multiplied the above equation for isotopes other than radio-iodines reduces to:

$$P = \frac{1.43E7 * (U) * F * DFL * e^{-(i*1.73E5)}}{(i + 5.73E-7)} \quad \text{(Equation 3)}$$

The above equations were then utilized to calculate the dose factors for the isotopes, pathways and organs listed in the NRC review:

PATHWAY: Grass-Cow-milk

Organ	Isotope	i	F	U	DFL	P	ODCM #
Adult-Liver	Rb-86	4.30E-7	3.0E-2	310	2.11E-5	2.59E9	1.35E5
Adult-T.Body	Rb-86	4.30E-7	3.0E-2	310	9.83E-6	1.21E9	5.90E4
Adult-GI-LLI	Rb-86	4.30E-7	3.0E-2	310	4.16E-6	5.12E8	1.66E4

The conversion factors in the ODCM have been corrected in this revision.

Adult-Bone	Zr-95	1.22E-7	5.0E-6	310	3.04E-8	9.46E2	1.07E3
Adult-Liver	Zr-95	1.22E-7	5.0E-6	310	9.75E-9	3.03E2	3.44E4
Adult-T.Body	Zr-95	1.22E-7	5.0E-6	310	6.60E-9	2.05E2	2.33E4
Adult-Kidney	Zr-95	1.22E-7	5.0E-6	310	1.53E-8	4.76E2	5.24E4
Adult-GI-LLI	Zr-95	1.22E-7	5.0E-6	310	3.09E-5	9.62E5	1.50E5

The conversion factors in the ODCM have been corrected in this revision.

Adult-Bone	Nb-95	2.29E-7	2.5E-6	310	6.22E-9	8.25E4	1.41E4
Adult-Liver	Nb-95	2.29E-7	2.5E-6	310	3.46E-9	4.59E4	7.82E3
Adult-T.Body	Nb-95	2.29E-7	2.5E-6	310	1.86E-9	2.47E4	4.21E3
Adult-Kidney	Nb-95	2.29E-7	2.5E-6	310	3.42E-9	4.54E4	7.74E3
Adult-GI-LLI	Nb-9	2.29E-7	2.5E-6	310	2.10E-5	2.79E8	1.04E5

The conversion factors in the ODCM have been corrected in this revision.

PATHWAY: Grass-Cow-milk (cont'd)

Organ	Isotope	i	F	U	DFL	P	ODCM #
Teen-Bone	Ce-141	2.47E-7	1.0E-4	400	1.33E-8	8.87E3	1.99E4
Teen-Liver	Ce-141	2.47E-7	1.0E-4	400	8.88E-9	5.92E3	1.35E4
Teen-T.Body	Ce-141	2.47E-7	1.0E-4	400	1.02E-9	6.81E2	1.53E3
Teen-Kidney	Ce-141	2.47E-7	1.0E-4	400	4.18E-9	2.79E3	6.26E3
Teen-GI-LLI	Ce-141	2.47E-7	1.0E-4	400	2.54E-5	1.69E7	1.20E5

ITEM 18 (cont'd)

The conversion factors in the ODCM have been corrected in this revision.

Teen-Liver	Ba-140	6.27E-7	4.0E-4	400	3.48E-8	8.95E4	8.95E4

Based on our calculations the numbers in the ODCM are correct and do not need to be changed.

For radio-iodines the factor 1.43E7 in Equation 3 above becomes 7.14E7 because the factor r = 1.

PATHWAY: Grass-cow-milk

Organ	Isotope	i	F	U	DFL	P	ODCM #
Teen-Bone	I-131	9.97E-7	6.0E-3	400	5.85E-6	5.38E8	5.38E8
Teen-Liver	I-131	9.97E-7	6.0E-3	400	8.19E-6	7.53E8	7.53E8
Teen-T.Body	I-131	9.97E-7	6.0E-3	400	4.40E-6	4.04E8	4.04E8
Teen-Thyroid	I-131	9.97E-7	6.0E-3	400	2.39E-3	2.20E11	2.20E11
Teen-Kidney	I-131	9.97E-7	6.0E-3	400	1.41E-5	1.30E9	1.30E9
Teen-GI-LLI	I-131	9.97E-7	6.0E-3	400	1.62E-6	1.49E8	1.49E8

Based on our calculations the numbers in the ODCM are correct and do not need to be changed.

Child-Bone	Y-91	1.36E-7	1.0E-5	330	6.02E-7	3.91E4	9.14E5
Child-T.Body	Y-91	1.36E-7	1.0E-5	330	1.61E-8	1.04E3	2.44E4
Child-GI-LLI	Y-91	1.36E-7	1.0E-5	330	8.02E-5	5.21E6	1.84E5

The conversion factors in the ODCM have been corrected in this revision.

PATHWAY: Vegetation

Organ	Isotope	i	F	U	DFL	P	ODCM #
Child-Bone	Ce-141	2.47E-7	1.0E-4	520	2.08E-6	1.27E8	1.27E8
Child-Liver	Ce-141	2.47E-7	1.0E-4	520	6.52E-7	3.98E7	3.98E7
Child-T.Body	Ce-141	2.47E-7	1.0E-4	520	1.11E-7	6.78E6	6.78E6
Child-Kidney	Ce-141	2.47E-7	1.0E-4	520	3.61E-7	2.21E7	2.21E7
Child-GI-LLI	Ce-141	2.47E-7	1.0E-4	520	1.74E-4	1.04E10	1.04E10

Based on our calculations the numbers in the ODCM are correct and do not need to be changed.

The dose conversion factors listed in the ODCM are used in the Effluent Management System (EMS) computer program at Hope Creek. The EMS program is used for effluent release permits and

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generating the semi-annual report. A comparison was also done between the correct values calculated below and the EMS values. No discrepancies were found. In other words, the computer program used to determine dose per the ODCM has had the correct dose conversion factors while the Hope Creek ODCM did not.

None of the isotopes with incorrect dose conversion factors above had been released from Hope Creek.

ITEM 19.

It was noted in Table A-1 the MPC values for P-32 and Cr-51 should be 2E-5 and 2E-3 respectively and that the values for Rh-106 and Ba-139 are incorrect.

In Revision 9 of the Hope Creek ODCM (5/17/88) Table A-1 was extensively revised. Revision 8 of the ODCM contained expected release data from the Hope Creek FSAR. Revision 9 used actual release data from 1987. In Revision 9 P-32 and Rh-106 was not included in Table A-1 as these isotopes were not released in 1987. The data for Cr-51 and Ba-139 has been checked and considered correct.

ITEM 20.

It was noted in Table A-4 (typo, should be A-1) the Na-24 MPC value should be 2E-4. As well it was questioned as to whether the values for Sr-92 and Nb-95 were correct.

In order to ensure that no release limits are exceeded the most conservative 10 CFR 20, Appendix B Table II, Col. 2 MPC value for an isotope is used. While it is agreed that Na-24 would be mostly in a soluble state the MPC for insoluble Na-24 is more conservative (2E-4 vs. 2E-5).

In Revision 9 of the Hope Creek ODCM (5/17/88) Table A-1 was extensively revised. Revision 8 of the ODCM contained expected release data from the Hope Creek FSAR. Revision 9 used actual release data from 1987. The data for Sr-92 and Nb-95 in this revision is considered to be correct.

ITEM 21.

It was noted that Table B-1 does not include values for Co-60 and Co-58 which are required in Appendix B.

In Revision 9 of the Hope Creek ODCM (5/17/88) Table B-1 was extensively revised. Revision 8 of the ODCM contained expected release data from the Hope Creek FSAR. Revision 9 used actual

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release data from 1987. Data for Co-58 and Co-60 are included in this revision.

ITEM 22

It was noted on page C-3 the table reference should be Table C-1 instead of B-1. Also, on pages C-3 and C-4 the term D_x should be D_g.

The table reference and the term D_x was corrected to Table C-1 and D_g respectively in Revision 10 of the Hope Creek ODCM.

ITEM 23

It was noted in Table C-1 that the values for Xe-135 and Xe-135m were incorrect.

The values for Xe-135 and Xe-135m have been corrected in Revision 10 of the ODCM.

ITEM 24

It was noted on page D-3 the definition of Q_i must include H-3.

In Revision 10 of the Hope Creek ODCM the definition of Q_i includes the words tritium.

ITEM 25.

It was noted Table E-1 did not include 43 direct radiation stations as required in the Technical Specifications as locations 10F2 and 10G1 are listed twice.

Hope Creek and Salem Stations Unit 1 and 2 share the same site of operations. Due to this the Radiological Environmental Monitoring Program is applicable to both Salem and Hope Creek Station.

Salem Technical Specification Table 3.12.1-1 requires "about 40" TLD stations. Hope Creek Technical Specification Table 3.12.1-1 requires "Forty-three" stations. Currently the ODCM lists 41 stations in Appendix E. There are an additional two TLDs referred to as "site zero" and "site cal" that were not listed in Table E-1. These TLDs are used to calculate the in-transit dose of the TLDs and act as controls.

In Revision 10 of the Hope Creek ODCM these two TLDs are noted in Table E-1 of Appendix E.

ITEM 26.

It was noted Table 2-3 of the ODCM states the highest X/Q and D/Q are 0.5 miles N and 4.9 miles W respectively and that these locations are not included in the airborne sampling program listed on Table E-1.

Technical Specification Table 3.12.1-1, Exposure Pathway 2 requires 5 sampling locations; 3 samples from close to the SITE BOUNDARY in different sectors of a high calculated annual average D/Q, one in the vicinity of a community having a high calculated annual average D/Q and one control station.

Artificial Island (Hope Creeks site) is a man-made peninsula on the east bank of the Delaware River. The Island is characterized mainly by the Delaware River and Bay, extensive United States tidal marshlands and low-lying meadowlands. These lands make up approximately 85% of the land area within five miles of the site.

The 3 sectors close (0.5 miles from vent) to the site boundary with the highest D/Q are: NW, WNW, and SE. All of these directions would require sample locations in the Delaware River. The next 3 highest D/Q sectors are W, N, and SSE. The N position is the only direction which could have a sample location not in the Delaware River. However, this would require locating a sample station with an access road and power lines in the protected marshlands.

Due to the location of Hope Creek Station it is difficult to place air sample stations far enough away (not on site) to obtain a representative sample and still be close to the SITE BOUNDARY. Currently the three air sample stations considered close to the SITE BOUNDARY are 5S1 (1.0 mi. E of vent), 5D1 (3.5 mi E of vent) and 16E1 (4.1 mi. NNW of vent). The nearest community with the largest D/Q is 7.0 miles NE of the site. This community has an air sample location (2F1).

Since we are in compliance with Technical Specifications we feel no revisions to the Hope Creek ODCM are required.

ITEM 27.

It was noted Table E-1 does not include any drinking water locations nor food product sample stations for crops grown with water affected by the liquid effluents. It was also noted that if these pathways did not exist then the Technical Specifications should be modified.

The nearest public water supply is more than 30 miles upstream of the site. We believe the intent of the Technical Specification was to sample drinking water supplies that could be directly effected by a nuclear generating station's liquid effluents.

ITEM 27 (cont'd)

The Delaware River, at our discharge point, is brackish water. There are no direct effects on drinking water supplies. The water supply in and around the site of Salem Units 1 and 2 is well water. In the radiological environmental monitoring program there are 2 well water sample locations - 3D1, 3.5 miles E of vent, and 3E1, 4.1 miles NE of vent. Thus, the well water sample locations fulfill the requirements of Technical Specification, Table 3.12-1.

Due to the brackish water there is no irrigation downstream of Salem Station. There are no crop samples available which use the Delaware River for irrigation.

ITEM 28

It was noted Figures E-1 and E-2 are illegible.

In Revision 9 of the Hope Creek ODCM Figures E-1 and E-2 were updated to be more legible and are included in Revision 10.

TER PART 4 - SUGGESTIONS

ITEM 1.

It was recommended that the use of the term C_i be limited to the accepted use as the unit for curies and that another symbol be used for concentrations throughout the document. It was also recommended the use of the terms c and C should be reviewed to determine if better terms could be used to avoid confusion in some equations.

We agree that the terms 'C_i' (used in all equations section 1 of the ODCM), 'c' and 'C' (Equation 1.1) should be changed to eliminate any confusion. As well, the terms 'f' and 'F' (Equation 1.1) should also be changed. However, the terms 'c','C','f' and 'F' were all adapted directly from the first equation in the addendum of NuReg-0133.

To reduce some of the confusion in the terms used in the equation from NuReg-0133 we redefined the terms c,f and F in the Salem ODCM. We feel, however the term C_i was adequate enough for defining the number of uCi/ml (concentration). To change this term in the ODCM would also require revisions to many procedures which utilize the same terms. It is our opinion that there is need to change the term C_i.

ITEM 2.

It was suggested that the term C_i include the definition of undiluted concentration instead of just concentration.

We have included this suggestion in Revision 8 so that the definition C_i states "the concentration of radionuclide i in the undiluted liquid effluent ...

ITEM 3

It was noted the meaning of "ds" was not clear on pages C-2 and C-3.

The term "ds" was a typographical error and has been removed in Revision 10 of the ODCM.

ITEM 4.

It was recommended that a low level alarm setpoint be considered for the liquid effluent monitors.

All the liquid effluent monitors for Hope Creek station have a "warning" alarm setpoint which is administratively set at 50% of the alarm setpoint. Whereas this is not a required feature for effluent monitors and there is no documented guidelines for a "low level alarm" setpoint the "low level alarm" or warning setpoints are not included in the Hope Creek ODCM.

ITEM 5.

It was recommended the ODCM should state that the dose projection for anticipated gaseous releases is only required when the ventilation exhaust treatment system is not being utilized per Technical Specification 4.11.2.5.2.

The dose projection per the ODCM is performed for each and every gaseous release. This is done because the Effluent Management System computer program used to track gaseous effluents provides the 31-day dose projection calculation automatically. As well, to ensure that Technical Specifications are complied, with the dose calculation is performed regardless if the exhaust treatment is in service or not. While this practice may be overly conservative the calculation is not involved.

We feel no revision is required for the Hope Creek ODCM.