1989 modification # 11

THE STATE OF SOUTH CAROLINA
BEFORE THE DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

IN RE: UNITED STATES DEPARTMENT OF ENERGY
AIKEN, ALLENDALE, AND BARNWELL COUNTIES

AMENDMENT TO SETTLEMENT AGREEMENT
87-27-SW

WHEREAS, on May 1, 1987, Settlement Agreement 87-27-SW between the South Carolina Department of Health and Environmental Control ("DHEC") and the United States Department of Energy ("DOE"), SC1890008989, became effective; and

WHEREAS, item two (2) of said Settlement Agreement required DOE to submit a revised Part B Permit Application for F and H Area Seepage Basins to include corrections to the deficiencies as described in DHEC's November 21, 1985, Notice of Deficiencies ("NOD") and as further described in the Settlement Agreement and its attachment on or before April 15, 1988; and

WHEREAS, an extensive amount of ground-water assessment, data collection, and data interpretation was necessary to develop the Part B permit application for F and H Areas Seepage Basins; and

WHEREAS, on April 15, 1988, DOE submitted a revised Part B Permit Application for the operation of F and H Areas Seepage Basins; and

WHEREAS, review by DHEC personnel determined the revised Part B Permit Application to be improved but still incomplete in regard to the ground-water information as shown by the attached Notice of Deficiencies dated August 16, 1988, which specifies ground-water deficiencies [R.61-79.270.14(c)] relating to hazardous constituents defined by the Resource Conservation and Recovery Act (RCRA) and deficiencies relating to

other non-hazardous constituents; and

WHEREAS, on August 16, 1988, DHEC denied DOE an operating permit for the F and H Area Seepage Basins; and

WHEREAS, interim status for the F and H Area Seepage Basins terminated on November 8, 1988.

CONCLUSIONS OF LAW

DHEC has concluded that DOE has violated Section 44-56-130 of the 1976 South Carolina Code of Laws, as amended, for failure to submit a revised Part B Permit Application for F and H Area Seepage Basins correcting the deficiencies as described in DHEC's November 21, 1985, NOD and in Settlement Agreement 87-27-SW and its Attachment. This submission was required by Item two (2) of Settlement Agreement 87-27-SW and its Attachment.

AGREEMENT

WHEREAS, without trial or adjudication of any issue of fact or law, the parties have agreed to the following settlement agreement, thereby resolving disputes set forth as described above, without this Settlement Agreement constituting an admission by DOE in respect to any such issue(s) of fact or law alleged herein or through their attorneys and authorized officials;

NOW, THEREFORE, in the spirit of mutual cooperation between DHEC and DOE and consistent with the Memorandum of Agreement (MOA) between DOE and DHEC dated April 8, 1985, amended May 5, 1988, DOE will perform the following:

1) On or before June 15, 1989, January 15, 1990, and July 15, 1990,

submit status reports on the preparation of the Post-Closure Part B Permit Application for the F and H Area Seepage Basins.

2) On or before December 3, 1990, submit to DHEC a Post-Closure Part B Permit Application for the F and H Area Seepage Basins addressing the deficiencies as described in DHEC's August 10, 1988, NOD which is attached to this Agreement. DHEC's August 10, 1988, NOD includes deficiencies relating to hazardous constituents in the ground water as defined by RCRA as well as concerns and deficiencies relating to ground-water contamination by other constituents e.g., nitrate, radionuclides, as defined by the South Carolina Pollution Control Act (PCA). DOE agrees to address the hazardous constituents pursuant to RCRA. Further DOE agrees to address the non-hazardous constituents pursuant to the PCA or the MOA, as appropriate, to include a proposed course of action with justification. In its review of said Part B Permit Application DHEC shall give consideration to DOE's technical and economic feasibility demonstration(s).

IT IS FURTHER AGREED THAT, consistent with the MOA:

(a) DOE shall be permitted to exceed the time schedule set forth in this Agreement only to the extent that the delay is caused by reasons entirely beyond the control of DOE or the control of any entity controlled by or under common control of DOE. In any event, the burden of establishing a basis for an extension shall be exclusively on DOE.

(b) If DOE determines it may fail to achieve any deadline set forth in this Agreement, DOE shall submit a written report by messenger or certified mail to DHEC. Such report shall be submitted at least five (5)

Department shall promptly initiate action to obtain compliance with both this Agreement and/or the aforesaid Act.

THE SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

DATE: June 14, 1989 BY: Michael D. Jarrett
Columbia, South Carolina Michael D. Jarrett, Commissioner
WE CONSENT:

UNITED STATES DEPARTMENT OF ENERGY

P. W. Kasper, Manager DATE: June 13, 1989

W. E. Bergholz, Chief Counsel DATE: June 9, 1989

THE SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

Hartsill W. Truesdale DATE: 6/14/89
Hartsill W. Truesdale, P.E., Chief
Bureau of Solid and Hazardous
Waste Management

Sam McCutcheon DATE: 6/14/89
Approved by: Legal Office

working days prior to the deadline anticipated to be missed and shall include the following:

(1) An explanation for the anticipated failure to meet the deadline;

(2) The measures taken and to be taken by DOE to minimize the delay;

(3) The timetable by which those measures will be implemented which will not be beyond the period of time reasonably necessary for completion of those activities on an expedited schedule calculated to minimize the delay.

(4) Any documentation relevant to (a) and (b).

(c) DHEC will respond in writing within five (5) working days to any report by DOE pursuant to Paragraphs (a) and (b) of this Section by indication whether DHEC approves DOE's proposed date or time period for completion of the delayed activities. DHEC's written approval will be deemed to be incorporated into the Settlement Agreement. If DHEC does not so approve, DHEC will so state in writing, and also state the date by which, or the time period within which, DOE shall achieve the tasks as to which the deadline applied, which written response shall be deemed to be incorporated into this Settlement Agreement.

IT IS FURTHER AGREED that failure to meet deadline established herein for submission of the Part B Application as specified in the Agreement requirement above shall be deemed a violation of the Agreement and/or the Hazardous Waste Management Act. Upon ascertaining any such violation, the

flow rate is 45 ft./yr.; and c) On page IV.E.10-14, SRP stated that ground water in the semi-confined aquifer flows west-northwest at 100 ft/yr. Contours on Figure E.3-1 show flow to the northwest, and on page IV.E.5-24 the flow rate is described as being 300 ft./yr. These discrepancies should be corrected. In addition, not only did the hydrologic properties used in the ACL demonstration vary from those in the main text, the units of measurement were different, making comparison of the various texts difficult and lengthy due to the many conversions that were required.

7) The text of the ACL section indicates that the hydrologic properties used in the ACL demonstration were obtained from wells other than the POC and assessment well systems in F-Area. As the geology and hydrogeology in the region is quite variable, site specific data must be used.

8) Aquifer properties were determined from the Point of Compliance (POC) wells using rising head slug tests. The results and data from these tests were provided in Appendix E-2 of the application. In addition results from lab permeability testing was included and referenced the testing methodology from "U.S. Army Engineer Manual EM 1110-2-1906". The procedures specified in the manual should be fully described or a copy of the manual should be included in the application as an appendix.

9) Potentiometric maps were provided for each hydrologic unit of the uppermost aquifer as defined in the permit application, however, the maps did not include a reference to the date on which the data was obtained. Also, ground-water contours on Figure E.3-1C are inconsistent with tabulated data.

10) Water elevation data from certain wells, namely FSB-94D and 95D, was reportedly not obtainable because the level of the water was below the standpipes. This problem, along with the absence of water quality data, is reportedly due to the fact that the well will not yield sufficient water. The problem of POC wells not capable of yielding enough water for monitoring purposes will be addressed further in comment 17 below. Also, water level data from the new assessment wells FSB-102, 104, 105, 107, 110 and 111 should have been available and used in preparing the maps.

11) Lithologic data available from the new assessment wells should be added to the isopach and structure contour maps. In addition, for these maps to be of any real benefit they should be drafted at the same scale as the potentiometric and water quality maps.

12) The ground-water modeling discussed in Section IV.E.5 of the permit application reportedly is inaccurate due to erroneous assumptions made regarding the vertical flow relationships between the Congaree and Williamsburg Formations. As this model is referenced extensively throughout the Part-B permit application, including the ACL demonstration, much higher quality control and assurances should be expected. An oversight of this proportion brings question to the overall quality and validity of the work. In addition, as the model results are used throughout the text a copy of the report should have been included in the application as an appendix so that it may be fully evaluated.

[270.14(c)(4)] The application failed to fully describe the plume(s) of contamination. Examples of problems with the plume description include, but may not be limited to, the following:

13) Review of the previous permit application and interim status ground-water quality assessment reports determined that the full horizontal and vertical extent of ground-water contamination has not yet been determined. Definition of the extent of contamination has previously been based on surface geophysical surveys, data from old wells of questionable construction, and surface water analyses for radionuclides and nitrate, supported by only sparse RCRA monitoring wells. As a result SRP has installed fourteen new assessment wells downgradient from the basins. The purpose of these wells was to substantiate previous interpretations about the extent and severity of contamination. Due to physical constraints associated with installing the wells and the short period of time available for completing the work, no data for the hazardous, non hazardous and radioactive constituents present in the plumes of contamination was available for inclusion in the permit application. Therefore, the application does not fully define the extent and severity of ground-water contamination. A complete characterization of the contaminant plume is essential to developing and evaluating ACL's.

14) The maps provided as figures E.3-1D, 1E, and 1F did not provide a delineation of the extent of hazardous constituents in the ground water. The maps included data for nitrate, tritium, sodium, pH and specific conductance which should provide an indication of gross contamination, however, these parameters are not necessarily representative of the extent of the hazardous constituents. Also, the maps included patterned areas that are assumed to be the hazardous plumes, however, the basis for these delineations was not provided. In addition to indicator parameters and constituents that show areas of gross contamination, the extent of the hazardous constituents should be illustrated.

15) The extent of contamination in each hydrologic unit should be illustrated in cross-sectional form.

16) Analytical results from the new POC wells FSB-90 and 91 located downgradient from Basin 2, and assessment well FSB-107, indicate that a previously undetected plume of contamination exists. Additional ground-water quality assessment wells will be needed to determine the horizontal and vertical extent and severity of contamination, and to fully characterize the hazardous constituents in the plume.

17) Results of the POC "Appendix IX" analyses identified several previously unidentified hazardous constituents. As these constituents will have an impact on surface water quality at the POE, immediate efforts are needed to determine their extent and severity.

18) Cyanide was detected in ground water, but SRP stated that it formed during sample distillation and was not believed to be in the waste. The waste analysis in Section C did not include cyanide.

19) Tables of ground-water monitoring results presented to document the extent of contamination contain two potentially misleading characteristics. First, inconsistent units are occasionally used for a single constituent. For example, while reviewing the results of tritium analyses, concentrations in some wells are shown in units of picocuries per liter, while results from an adjacent well may be shown in picocuries per milliliter, a thousand-fold increase in concentration that may be overlooked if one does not read carefully or if one does not have technical training. Second, ground-water monitoring results are shown for some constituents as less than a certain concentration. Some of the concentrations shown are far above "PQLs" (Practical Quantitation Limits).

[270.14(c)(5)] The permit application failed to include an adequate description of the ground-water monitoring requirements of 264.97. Examples where additional information and/or clarification is needed include, but may not be limited to, the following:

20) The point of compliance (POC) well system should be capable of monitoring quality immediately downgradient of the regulated units. As indicated in the permit application, wells FSB-94D and 95D do not yield sufficient water for collecting ground-water samples. Therefore, the existing POC well system is inadequate. The two wells in question should be replaced as soon as technically feasible. Efforts must be made to insure that the position and depth of the screened intervals is sufficient to yield enough water for collecting ground-water samples.

21) SRP proposed a "Cumulative Sums" statistical method to determine whether upgradient and downgradient ground-water quality differ. Since ACLs are not recommended and corrective action will be required trend analysis technics may be more appropriate. Under 264.100, corrective action continues until ground-water quality achieves concentration limits for 12 consecutive quarters after the compliance period ends.

22) Results of recent analyses for the "Appendix IX" hazardous constituents identified several constituents which are not currently included in the ground water protection standard. SRP has proposed that several of these constituents will be monitored during routine sampling, however, the constituents will not be added to the ground-water protection standard until enough data is available to calculate background values. Section 264.9 requires that any constituent identified during these analyses be incorporated into the ground-water protection standard. Until background values can be determined the permit application should assume a background value equal to the method detection limit (MDL) or the recommended practical quantitation limit (PQL) as shown below. Also, results of analyses are reported as "less than" some value. Values for some compounds are far above PQLs for that method.

Constituent	Conc. Limit	Basis	Frequency
Arsenic	50 ug/l	MCL	Quarterly
Barium	1.0 mg/l	MCL	Quarterly
Bis (2-ethylhexyl) phthalate	20 ug/l	PQL*	Annually

Cadmium	10 ug/l	MCL	Quarterly
Carbon disulfide	5 ug/l	PQL*	Annually
Cyanide	40 ug/l	PQL*	Quarterly
Dimethyl phthalate	5 ug/l	PQL*	Annually
Di-n-octyl phthalate	30 ug/l	PQL*	Annually
Mercury	2 ug/l	MCL	Quarterly
Methyl ethyl ketone	10 ug/l	PQL*	Annually
Thallium	400 ug/l	PQL*	Quarterly
Trichloroethene	1 ug/l	PQL*	Annually
Trichlorofluoromethane	10 ug/l	PQL*	Annually
Vanadium	80 ug/l	PQL*	Quarterly
Lead	50 ug/l	MCL	Quarterly
Chromium	50 ug/l	MCL	Quarterly
Selenium	10 ug/l	MCL	Quarterly
Nickel	50 ug/l	PQL*	Quarterly
Antimony	300 ug/l	PQL*	Quarterly
Toluene	2 ug/l	PQL*	Annually
Chlorobenzene	2 ug/l	PQL*	Annually
1,1-Dichloroethane	1 ug/l	PQL*	Annually
Benzene	2 ug/l	PQL*	Annually
Methylene chloride	5 ug/l	PQL*	Annually

* PQL: Practical quantitation limit, Appendix IX, Part 261. Equivalent to background water quality.

23) In addition to the constituents discussed in comment 22 above, the analyses indicated the presence of several phthalate compounds, including Bis 2-ethylhexyl phthalate, in some of the new wells, and in the lab blank, at concentrations somewhat above the method detection limit. While most of these hits may be attributed to leaching of the PVC well components, several analyses recorded Bis 2-ethylhexyl phthalate at concentrations ranging from just above the detection limit to 690 ppb. It does not seem likely that concentrations of this order can be accounted to leaching; but rather may be an indication of either poor quality PVC, or true ground-water quality. Therefore, SRP should investigate methods to better identify and mitigate the source for these organics. SRP should better identify the source for these organics, and in the mean time, add them to the ground-water protection standard and monitoring program. Until such time as background concentrations can be derived, the maximum concentration limits should be defined as either the method detection limit (MDL) or practical quantitation limit (PQL).

24) The calculation of the rate of ground-water flow during the compliance period should be as accurate as possible. The text on page V.E.11-26 suggests using an approximate effective porosity instead of the values provided elsewhere in the text (Section E.5).

25) Many of the wells show signs of grout contamination. Page IV.E.11-31 of the text implies that the problem is temporary and will correct itself. As the grout may effect the analyses for other constituents, the wells should be continued to be developed. If the wells cannot yield representative samples replacement may be required.

26) During recent site inspections at SRP, and in review of the sampling and analysis plan, several problems concerning the manner that ground-water elevation are measured and water quality samples are collected, have been identified. The following comments identify the observed problems and provide recommendations for correcting the problems:

a) The sampling and analysis plan does not specify the order in which particular samples are collected. The text of the application includes a list of the types of samples collected and the relative order by which they are taken, however, based on field observations, this order is not followed and in fact the organic samples are usually collected last instead of first as the text of the permit suggests. Also, it was observed that samples for volatile organic analysis are being collected the same time the Freon filtration system was in use.

b) The portable generator which is used to supply electricity to sampling equipment is kept in close proximity to the wells during sampling. Due to the potential for cross contamination, the generator should be placed at a maximum possible distance from the wells during sample acquisition.

c) The use of non-domestic PVC components in the construction of sampling ports on the wells has been identified to SRP as a problem on several occasions. SRP has purposed to conduct a leach test of the non-domestic parts to determine if the valves are a possible source for interference. Due to the presence of various phthalates in the "Appendix IX" analyses, the leach testing should be modified to include analysis for these constituents in addition to metals.

d) The sampling and analysis plan does not specify that a slow flow rate well be used during acquisition of samples for analysis of organics. During a recent site inspection, the high rate of flow resulted in extremely aerated TOX samples. As similar results may likely occur during acquisition of other organics samples, this problem must be corrected and appropriate protocol incorporated into the sampling and analyses plan. SRP is currently adding pipe extensions to the existing sampling ports to help alleviate this problem.

e) Proper preservation of ground-water samples should be verified in the field by measuring the sample pH.

[270.14(c)(8)] The permit application failed to include sufficient information, supporting data, and analyses to establish a corrective action program. Examples where additional information and/or clarification include, but may not be limited to the following:

27) In lieu of corrective action the permit application included demonstrations for alternate concentration limits (ACL's) for the following constituents:

Constituent	ACL
Barium	8.96 mg/L
Cadmium	0.07 mg/L
Copper	0.16 mg/L
Nickel	0.07 mg/L
Mercury	0.0023 mg/L
Zinc	4.42 mg/L
Lead	1.38 mg/L

Based on data provided in the permit application pertaining to the concentration of hazardous constituents in surface water, an incomplete identification of the uppermost aquifer, and the fact that the plumes of contamination have not yet been fully characterized nor has the extent been fully defined, the requested ACL's should not be approved. In addition, for an ACL to be approved the requirements of R.61-68, Water Classification and Standards, under the State Pollution Control Act, must be met. At this time due to the toxic, mobile and persistent nature of the hazardous, non-hazardous and radioactive constituents present in the ground-water a ground-water mixing zone cannot be approved. Specific comments regarding the ACL and mixing zone requests follows:

a) The regulations pertaining to ground-water mixing zones require that the contaminant plumes are already discharging, or will discharge to surface waters. The radionuclide data indicates that ground-water contaminated with tritium and radium in the Congaree is not currently discharging. The discharge point for this portion of the aquifer, Upper Three Runs Creek, is more than a mile from the basins. This distance is considered excessive with regards to the intent of the requirement, and is therefore unacceptable. In addition, due to pumpage from the Black Creek along this flow path there is potential for these constituents to migrate downward into the deeper Black Creek.

The mixing zone regulations specify that, upon discharging, surface water standards must not be contravened. In order to make this demonstration modeling based on site specific data from F-Area, assuming Upper Three Runs Creek as the discharge area, would be needed.

b) Conclusions regarding the impacts of some contaminants on aquatic life and surface water quality are inconsistent with field data. Heavy metals have been detected in surface water in concentrations exceeding Ambient Water Quality Standards. Some downstream concentrations in surface water below contaminated aquifer discharge zones are greater than upstream concentrations. Vegetation has been killed and mercury levels in fish tissue are at or above Food and Drug Administration action levels. Yet SRP concludes that hazardous constituents from the basins are not affecting the environment. Questionable use of statistics, the use of qualifying adjectives ("generally", "significant", etc.) and less than objective evaluation methods tend to minimize SRP's credibility regarding conclusions on the environmental impact of the basins.

c) SRP stated that the uppermost aquifer has little or no potential for being an underground source of drinking water. The uppermost aquifer is a Class II aquifer (potential source of drinking water) under EPA's National Ground Water Protection Strategy and is classified as GB under the State Water Classification, and must receive a stringent level of protection.

d) Cadmium, nickel, lead and mercury have been found in elevated concentrations in surface water below discharge zones for contaminated aquifers or in fish tissues. These heavy metals tend to accumulate in creek sediments, where they may impact aquatic life. Sediment analyses for these metals are not included in the application.

e) Under R.61-68, the contaminants or combination of contaminants subject to mixing zones can not be dangerously toxic, mobile, or persistent. Considering the half lives of tritium (12.3 years) and radium (1,622 years) and the high mobility of these radionuclides in ground-water these qualification are not currently met, nor are they likely to be.

f) Little or no information was provided in the seep line study (included as Attachment E.10-3) to support the appropriateness of the location and number of samples taken. The report states that the sample locations were determined based on screening of specific conductance data, however, this data was not provided. To demonstrate that the contaminated ground-water discharges are not exceeding acceptable criteria, a degree of certainty must be evidenced as to the appropriateness of the surface water sampling locations. The specific conductance screening data (and any other pertinent data), location maps and methodologies should have been provided.

g) The F-Area ACL demonstration identifies Four Mile Creek as the Point of Exposure (POE), i.e, the first location that any possible receptor may be exposed to hazardous constituents. Therefore, all statistical evaluations, used to determine the effects of the discharge on surface water quality, were calculated using water quality data from Four Mile Creek. Because contaminated ground-water is first discharging to the wetlands adjacent to the Creek, identified as the "seep line" in the permit application, the surface water assimilation statistics do not accurately reflect the impact of plume discharge at the first point any possible receptor may be exposed. The POE would have to include the seep line, and the water quality within the seep areas would have to be evaluated to determine whether significant impact is occurring. As the water within these wetland areas is

supplied predominately by ground-water discharge, which is contaminated, it is questionable whether those areas are capable of assimilating the hazardous constituents to a level protective of health and environment. One example, cadmium, is present in the seep area four times above standard.

h) SRP stated that there was no statistically significant difference between the upstream and downstream contaminant concentrations. It should be noted that statistics should not be used to justify contamination of surface water above concentrations protective of the environment.

i) It is not clear exactly what methods were employed to estimate the concentration used in the statistical evaluations in cases where background values were reported as below a given method detection limit. However, there appears to be some discrepancy between the statistical evaluations discussed in the main text and the ACL demonstration section of the application. In the ACL section, statistical comparisons of upstream and downstream cadmium were reportedly not performed because all background values were reported as less than the detection limit.

j) Chapter 6 of the ACL demonstration provides detailed surface water quality data and user information for the Savannah River. As the first points of possible receptor contact are the wetlands adjacent to Four Mile Creek, and Four Mile Creek, this chapter should detail the possible impacts to surface water users (fauna, flora) in these areas.

k) With regard to possible terrestrial impact by discharging ground water (Section 10.1.3 of the ACL Demonstration), it is stated that upon closure the non-hazardous components should quickly return to ambient levels. What is the basis for this statement?

l) Endangered species are located on the SRP property. SRP stated that hazardous constituents from the basin do not threaten these species, but they did not state how the movement of wildlife is controlled to prevent exposure. Under 270.3, coordination with the U.S. Fish and Wildlife

Service is recommended for permits that may involve endangered species. It is recommended that a copy of the draft permit be routed to the USFWS for coordination and review. There are 5 federal endangered species at SRP, 7 State-listed endangered species, 7 State-listed threatened species and 38 State-listed species of concern. On page 10-13, SRP stated that the existing contamination does not threaten the Federally-listed endangered species, but SRP cannot control the movement of some of these species, especially the birds, and therefore cannot assure their protection.

m) Section 10.1.3 of the ACL Demonstration suggests that the seep areas are not significant in terms of impact since they are not unique and are small in area. While the potential for impacts to terrestrial wildlife maybe small because of the size of the seeps in relationship to the size of the SRP facility, there are no measures in place to restrict terrestrial contact. Therefore, the endangered species identified in the permit application could become exposed to contaminants in the seep areas. Furthermore, the fact that wildlife may be capable of abandoning a habitat, due to stressed conditions, for a more suitable environment is not a valid reason for discounting the impacts of continued unabated discharge.

n) Data presented in Chapter 8 of the ACL Demonstration indicates that cadmium, lead, arsenic and copper are above EPA surface water criteria, and that cadmium, chromium, copper, nickel, arsenic, and nitrate (among others) are present in higher concentrations downstream from F-Area than upstream. Cadmium and nickel can be carcinogenic to animals.

In addition, Mercury contents, above the 1.0 ug/g limit, in fish tissue samples from Cassels Pond and at a location upstream of the C-Reactor discharge are 4.86 ug/g and 1.38 ug/g respectively. The presence of hazardous constituents in excess of accepted health criteria is not protective of health and the environment.

o) Copper is present in concentrations that may be harmful to plants. There is a large area of visibly stressed vegetation in the area where the water table plume discharges. SRP stated that the vegetation stress "does not appear" to be related to the presence of hazardous constituents. Appearance is not an objective indicator of the source of the vegetation stress.

p) The ACL demonstration relies heavily on referenced SRP internal memoranda for technical evaluations and interpretation of data and potential impacts. As these evaluations and interpretations were used extensively on setting the proposed ACL concentrations the information should have been more thoroughly described in the text and included in the appendix of the document. In general, material incorporated by reference should be restricted to articles published in professional journals and documents that are either readily obtainable or are already part of the public record.

q) On page 4 of the Seep Line Study (Attachment E.1Ø-3) SRP describes how the territory between the basins and Four Mile Creek can not be released for unrestricted use until nitrate concentrations have been reduced substantially, which is estimated to take at least a decade after closure of the basins. It is obvious from this statement that the nitrate discharging to the seep areas creates an environmental problem, however, no reference is made regarding the concentrations and effects of the radionuclides that are also present in the seep and creek. This information is essential to the State Mixing Zone demonstration.

r) In describing the possible causes for stressed vegetation within the seep areas (page 4, Attachment E.1Ø-3), the affects of the hazardous metals are discounted due to their relative low concentrations and in light of the possible affects that the high conductivity, the high sodium, nitrate, and aluminum concentrations, and the flooding of previous dry areas by discharge from the basins. Several inconsistencies are present in this argument; first, it is not clear what direct impact "high conductivity" would have as this is used only as an indication of the relative abundance of free ions, not a measure of toxicity; second, elsewhere in the text of the permit -

w) Section 1.2 (Uppermost Aquifer and Mixing Zone) of the ACL demonstration points out that identification of the lower confining layer is clearly essential to the proper definition of the uppermost aquifer. This identification has not been adequately demonstrated.

x) Phenol and antimony were identified during the "Appendix VIII" analyses, however, these constituents were not subsequently monitored and were not included in development of ACL's. Also, several constituents were reportedly not included in the ACL demonstrations because they were not persistent, however, it does not appear that all of the constituents (for example antimony) were monitored subsequent to detection during the "Appendix VIII" analyses.

y) Section 4.1.3 of the ACL demonstration discusses contaminant transport and the fate of contaminated ground water. The second paragraph of this section concludes that the occurrence of sodium, tritium, and nitrate in the Congaree is the result of discontinuities in the "Green Clay". In the following paragraph a prediction is made that the hazardous constituents in the shallow portion of the aquifer will discharge to Four Mile Creek before it can enter the Congaree. It is further stated that this prediction is made without consideration of the discontinuities in the "Green Clay". Any model which does not adequately address site hydrologic conditions, especially downward leakage, should not be used in assessing the potential for contamination to reach deeper units.

z) Statements and/or rationalizations are made throughout the ACL section of the permit application which seem to be technically unfounded and inconsistent with the approach, described in the regulations and guidance, to be followed in demonstrating that proposed ACL's are protective of health and the environment. Examples of some of these passages include, but are not limited to, the following:

1) "Natural geologic and atmospheric sources undoubtedly contribute a significant portion of many of these constituents...", page 8-7;

x) Antimony, Bis (2-ethylhexyl) phthalate, and Di-n-octyl phthalate were identified during the "Appendix VIII and IX" analyses, however, these constituents were not subsequently monitored and were not included in development of ACL's. Also, several constituents were reportedly not included in the ACL demonstrations because they were not persistent, however, it does not appear that all of the constituents (for example antimony) were monitored subsequent to detection during the "Appendix VIII" analyses.

y) Section 4.1.3 of the ACL demonstration discusses contaminant transport and the fate of contaminated ground water. The second paragraph of this section concludes that the occurrence of sodium, tritium, and nitrate in the Congaree is the result of discontinuities in the "Green Clay". In the next paragraph a prediction is made that the hazardous constituents in the shallow portion of the aquifer will discharge to Four Mile Creek before it can enter the Congaree. It is further stated that this prediction is made without consideration of the discontinuities in the "Green Clay". Any model which does not adequately address site hydrologic conditions, especially downward leakage, should not be used in assessing the potential for contamination to reach deeper units.

z) Statements and/or rationalizations are made throughout the ACL section of the permit application which seem to be technically unfounded, self serving and inconsistent with the approach, described in the regulations and guidance, to be followed in demonstrating that proposed ACL's are protective of health and the environment. Examples of some of these passages include, but are not limited to, the following:

1) "...Since the seep areas...are not unique and are small in area...the potential impacts of ground water contaminants on terrestrial wildlife are considered small...", page 10-8;

2) "...Sodium is a mineral nutrient to animals with no direct toxic effects. In fact, salt (NaCL) "licks" are put out in fields for domestic animals...", page 10-9.

3) "...Contaminations of cadmium found in the seep area water do not generally affect crops, and tree species appear to be less sensitive...".

aa) Analysis of aerial photography and results of ground truthing described on page 10-6 and 10-7 of the ACL demonstration indicates stressed and/or dead vegetation downgradient from the seepage basins. While some discussion is provided regarding the cause of the impact, it does not appear that any significant field study or evaluation to determine to what degree that ground-water discharge from the basins is contributing to the vegetation stress.

bb) Little or no data is available on toxicity levels of ACL constituents on native plants and animals. Available data deals predominantly with livestock and domestic animals, and agriculture. However, evaluations, which are documented only in internal memoranda, are made suggesting that the discharge is having no adverse effects on either native vegetation or wildlife. Also, see comment 27 (aa) above.

cc) On page 10-17 of the ACL demonstration SRP states, with regard to lead in the ground-water at the point of discharge, "...chronic effects might be experienced if sensitive organisms remain in creek waters immediately adjacent to seeps...". It should be noted that this is the exact type of exposure that would be anticipated within the seep areas as the seep areas are the first point of exposure.

28) The permit failed to include a corrective action feasibility plan detailing an implementable ground-water remediation program. As the current ground water discharge is exceeding acceptable limits SRP must develop a corrective action program capable of remediating the contaminant plumes. Because the plumes also exceed standards set forth under the Water Classifications and Standards, the remediation system must also address the non-hazardous and radioactive constituents as well. This includes the plume within the Congaree Formation. Due to the technical constraints involved in treating tritiated water, it is anticipated that the corrective action may require some form of re-injection of tritiated water after treatment to -

standards for the other constituents. In addition, due to the complex hydrogeologic conditions of the site, special precautions may be needed to ensure that remediation of either the upper portions of the aquifer or the Congaree do not result in increased contaminant migration downward into the Congaree. The corrective action program must also ensure that hydraulic control of the Congaree plume is maintained.

29) The engineering feasibility plan for corrective action does not include details for intercepting and treating contaminated ground water. SRP states that pumping cannot be conducted due to DOE's ALARA policy designed to minimize exposure to radiation. They also stated that tritium contamination cannot be treated under existing technology. The ALARA policy cannot be used as an excuse not to comply with RCRA regulations.

30) As the proposed ACL cannot be approved, concentration limits for all constituents listed in the ground-water protection standard should be determined from Table 1 of 264.94 or, if not listed in the table, as either the MDL based on SW-846 methodologies, or the EPA recommended PQL. See comment 22 above.

Attachment

SAVANNAH RIVER PLANT (SRP)
SC1 890 008 989
REVISED F-AREA PART-B PERMIT APPLICATION REVIEW
REVIEWED BY HARRY L. MATHIS
AUGUST 10, 1988

Overview

As a result of operation of the three F-Area seepage basins ground-water within the uppermost aquifer has been contaminated by a mixture of hazardous, non-hazardous, and radioactive constituents. Previous review of the F-Area Part-B permit application, and ground-water quality assessment reports, have determined that the full extent and severity of ground-water contamination has not yet been achieved, and that the constituents comprising the contaminant plumes have not yet been fully characterized. In 1987 SRP initiated a final phase to the F-Area ground-water assessment to satisfy the cited deficiencies. This assessment included installation of monitoring wells downgradient of the basins to confirm previous plume delineations that were based primarily on surface geophysics, stream samplings, and tritium and nitrate data. Because of physical constraints in installing the wells and obtaining ground-water samples, no new assessment data was available from the new wells in time for incorporation into the revised application. At approximately the same time SRP installed a new point of compliance (POC) well system which did provide some additional information toward characterizing the contaminant plume, however, data from these wells also identified additional constituents and a new plume for which no assessment has been conducted.

To meet the regulatory requirements under RCRA for a facility impacting ground-water quality, SRP has proposed alternate concentration limits (ACL's) for several hazardous constituents to be used in establishing the ground-water protection standard of 264.92. As operation of the basins has resulted in considerable contamination by nitrate and various radionuclides, predominantly tritium, SRP must concurrently meet the requirements for a State ground-water mixing zone in lieu of corrective action. As the plumes have not yet been fully characterized and defined there is no way to be certain that the most contaminated portions of the plumes are being considered in the ACL demonstration. However, data available at this time does indicate that hazardous metals, (cadmium and mercury), are exceeding established standards and health criteria within the seep area and likely within Four Mile Creek (FMC) (cadmium), and in fish tissue (Mercury) at a pond location several miles downstream from the area of ground-water discharge. Other sources of these constituents exist but the relative contributions are not characterized. Tritium and nitrate data for ground-water which is discharging to surface water also indicate that health standards and criteria are being exceeded. In addition, the presence of these

constituents (tritium and nitrate) in the Congaree hydrologic unit indicates interconnection between the McBean and this unit, and that the plume will continue to discharge into the Congaree and migrate towards Upper Three Runs Creek. The requirements for a State ground-water mixing zone precludes alternative standards for any contaminants or combination of contaminants that are dangerously toxic, mobile, or persistent. Additionally, pursuant to R.61-79.264(b)(1)(IV) and 264(b)(2)(IV), the existing water quality, including other sources of contamination and their cumulative impact on ground water and surface water quality must be considered.

As the full extent and severity of contamination has not yet been determined, a demonstration for ACLs and a mixing zone are considered premature. Considering the information available at this time, which shows the presence of nitrate and tritium in the deeper hydrologic unit, the presence of cadmium, nitrate, and tritium in the seep area (first point of exposure), and the presence of mercury in tissue from fish downstream of F-Area indicates that the alternate concentration limits and mixing zone request are not protective of human health and the environment and should not be granted.

SRP must complete the ground-water quality assessment and develop a remediation program to mitigate known ground-water contamination. It should be noted that several technical constraints exist which may require special consideration in developing corrective action alternatives. These technical constraints include the feasibility of treating nitrate and tritium, and the unique hydrologic properties of the aquifer system. To ensure that the overall water quality of the creek is not adversely effecting health and the environment a re-evaluation of existing discharges and current stream quality is recommended.

Specific Comments and Regulatory Citations

[270.14(c)(1)] The application failed to include a summary of all the ground-water monitoring data obtained during the interim status period. Specific examples where additional information and/or clarification is needed include, but may not be limited to, the following:

1) Ground-water monitoring data collected during 1985 was not included in the permit application.

2) Lithologic logs in detailed text form for all of the ground-water monitoring wells have been submitted to the Department in previous documents. Geophysical, graphic and USCS logs were included in the application; however, the detailed text versions of the logs were omitted.

3) Observations made during recent inspections at SRP indicate that the sampling and analysis plan currently being used by the contract sampling teams is different from the one included in the Part-B permit application. The application should reflect actual methods and protocol being followed during acquisition of ground-water samples.

[270.14(c)(2)] The application failed to fully identify the uppermost aquifer and aquifers hydraulically interconnected beneath the facility property. Examples where additional information and/or clarification is needed include, but may not be limited to, the following:

4) The application identifies the uppermost aquifer to include the Water Table, McBean and Congaree. This contention is supported almost entirely by the occurrence of a vertical head reversal between the Congaree and Williamsburg Formations. However, water level data from well FSB-79A does not support the contention. The application states that the water level data from this well may not be representative as the screened interval likely intersects the two units. As detailed lithologic logs in text form were not included in the application an evaluation of the exact placement of the well screen with regards to the reported confining unit was not possible. In general, the presence of only an upward flow potential is not suitable criteria for defining the base of the uppermost aquifer.

5) Section E.3.4 of the permit application discusses fault control as a potential explanation for observed offsets in stratigraphic units, however, the concept is dropped because sufficient data to either verify or discount fault control is not available. It should be noted that a general lack of data is not a justifiable reason for not considering a possible and plausible interpretation.

6) There appears to be some discrepancies in the rates of ground-water flow reported throughout the permit application. For example: a) On page IV.E.10-4, the ground-water flow direction is stated as southerly in the water table aquifer at a rate of 155 ft./yr. Figure E.3-1A shows southwesterly flow. On page IV.E.5-24, the flow rate is stated as being 36 ft./yr.; b) SRP stated in the application that ground water in the poorly confined aquifer flows slightly east of south at 30 ft./yr. Figure E.3-1B shows flow to the southwest, and on page IV.E.5-24, SRP stated that the