

**POLICY ISSUE**  
(Notation Vote)

July 6, 2007

SECY-07-0112

FOR: The Commissioners

FROM: Luis A. Reyes  
Executive Director for Operations /RA/

SUBJECT: STAFF EVALUATION AND PROPOSED REVISION TO THE PUBLIC RADIATION SAFETY SIGNIFICANCE DETERMINATION PROCESS TO ADDRESS RADIOACTIVE LIQUID SPILLS AND LEAKS

PURPOSE:

To request Commission approval of changes to the significance determination process (SDP). Staff is providing an evaluation on the need to revise the existing SDP for public radiation safety, as directed by the Commission in COMSECY-06-0023. This paper also addresses a recommendation from the Liquid Radioactive Release Lessons Learned Task Force Final Report to revise the Public Radiation Safety SDP to better address the range of events that can occur, including unplanned, unmonitored releases or spills of radioactive liquids.

BACKGROUND:

In May 2006, Region III completed an inspection at Braidwood of an estimated 6.25 million gallons of radioactive liquid which had leaked during several events over a number of years from the vacuum breakers along the circulating water blowdown line. The primary radioactive isotope released was tritium. The Region III inspection report documented a White finding and three violations which addressed several performance deficiencies in licensee performance in response to these leaks. The White finding and violations included the licensee's failure to perform adequate, timely radiological evaluations, which impacted the ability to assess the environmental impact from the releases and mitigate the releases. The licensee also failed to

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assess the potential public impact and did not adequately control licensed material. The inspection concluded that the radiation dose to the public was negligible (much less than 1 mrem). Nonetheless, the multiple failures to adequately evaluate the radiological hazards and assess the environmental impact were determined to be a White finding when evaluated using the Public Radiation Safety SDP. A copy of the current SDP is provided as Enclosure 1.

Additionally, in August 2005, Indian Point Unit 2 discovered a relatively small leak in the spent fuel pool. Indication of leakage from the Unit 1 spent fuel pool was also later identified. Region I completed a special inspection of the licensee's actions to address these leaks about the same time as the Braidwood inspections were completed. Region I found that the Indian Point licensee took prompt action and initiated extensive efforts to characterize the nature and source of the ground contamination and performed a radiological assessment. As a result of the licensee's timely and comprehensive response, the staff did not identify any significant licensee performance deficiencies. Similar to the Braidwood event, the estimated radiation dose to the public at Indian Point due to the leakage was negligible.

Prior to issuing the final Braidwood Inspection Report the staff documented the basis for the White finding in COMSECY-06-0023, dated April 25, 2006 (ADAMS Accession No. ML061390183). In the staff requirements memorandum (SRM) for COMSECY-06-0023, dated May 18, 2006, the Commission approved issuing the White finding for Braidwood, while at the same time directing the staff to make clear the insignificance of the potential public health and safety effects of the radioactive liquid leakage (ADAMS Accession No. ML061380645). The Commission also directed the staff to clearly explain why the current SDP leads to a White finding despite the lack of direct safety significance of the actual spills. The Commission further directed the staff to engage stakeholders to update the SDP to ensure it is consistent with the Reactor Oversight Process (ROP) program goals, including a risk-informed approach to radiation protection, and to make a recommendation to the Commission to either maintain the current SDP or to change it with appropriate justification. The Commission also directed the staff to update the ROP and SDP guidance documents to make them consistent with the NRC's current strategic plan goal of openness.

#### DISCUSSION:

The staff has worked with internal and external stakeholders and has received feedback on various aspects of the SDP to improve its effectiveness and efficiency. The scope of the review consisted of an evaluation of: (1) the current criteria for a White finding to ensure consistency with risk-informed goals of the ROP; (2) the entry conditions into the radioactive effluent release program branch of the SDP flowchart for spills and leaks; and (3) the SDP to ensure it reflects the strategic plan goal of openness.

#### Consistency With Risk-Informed ROP Goals

The staff evaluated the current threshold for a White finding to ensure consistency with the risk-informed goals of the ROP and other cornerstones of safety. When the ROP was first developed, it was recognized that probabilistic risk assessment techniques could not generally be applied to the ROP cornerstones of physical security, emergency preparedness, and radiation safety. Therefore, to establish the thresholds for categorizing the significance of findings, expert panels were formed during the ROP development in the late 1990's to define

those thresholds. In part, these panels were guided by what the expected agency response should be for various types of licensee performance deficiencies. These same principles applied to the current evaluation of the Public Radiation Safety SDP. The staff determined that the radioactive effluent release program branch of the current SDP (Enclosure 1) is consistent with a risk-informed approach. As the likelihood increases for a licensee performance deficiency to lead to a significant radiation dose to the public, the SDP significance outcome increases, thereby raising the color of the finding. Currently, the radioactive effluent release program branch of the SDP assigns a White finding to a performance deficiency where the licensee fails to collect data and assess the dose, or where the as low as reasonably achievable (ALARA) dose values in Appendix I to 10 CFR Part 50 are exceeded (e.g., 3 mrem total body dose from liquid effluents). The staff considers each of these events to present a public radiation issue of low to moderate significance.

The staff's evaluation concluded that a failure to evaluate the radiological hazards of a more than minor release of radioactive material is a substantial failure to implement the radioactive effluent release program. One premise of the ROP is that a single White finding is followed by an increased level of NRC engagement in the form of increased inspection (Supplemental Inspection Procedure 95001), which is the lowest level of increased interaction above the baseline inspection program with a licensee. Inspection Procedure 95001 is estimated to result in between 16 and 40 hours of additional inspection. A substantial failure to implement the radiological effluent release program which results in the failure to identify the event, assess the dose consequences, and the impact to the environment (such as occurred at Braidwood) represents a deficiency in licensee performance of enough significance to warrant additional followup inspection above the baseline program to independently review and evaluate licensee corrective actions. Therefore, the staff concluded that such a deficiency in licensee performance warrants the increased inspection effort associated with a White finding.

The staff concluded that the radioactive effluent release program branch of the SDP should be revised to specifically include spills and leaks under this program by adding a new criterion for a substantial failure to implement the radioactive effluent release program (Enclosure 3). The criteria for a failure to implement the program is a loss of effluent controls to an extent such that: (1) a substantial potential existed for exceeding the public ALARA dose criteria, but fortuitous events prevented the dose from exceeding ALARA thresholds; or (2) the licensee was negligent in identifying and evaluating the event. A finding for spills and leaks would be evaluated in a similar manner to planned effluent discharges, such that a failure to implement the program would encompass a finding for a failure to assess dose. The significance of this event would be classified as low significance (White finding).

The staff also evaluated the potential for confusion associated with the "Impaired Ability to Assess Dose" loop in the radioactive effluent release program branch of the SDP (Enclosure 1). The staff's evaluation concluded that the loop created confusion for many stakeholders, including licensees and inspectors. The staff, with stakeholder input, also recommends removing the distinction between a licensee having an impaired ability to assess dose and failing to assess dose (Enclosure 3).

### Evaluation for Spills and Leaks

The staff evaluated the clarity of the entry conditions into the two branches (radioactive effluent release program branch and radioactive environmental monitoring program branch) of the Public Radiation Safety SDP (Enclosure 1). During the staff's assessment of the Braidwood event, it appeared that both of these branches of the SDP would apply. The staff concluded that the current Public Radiation Safety SDP should be modified: (1) to clarify entry into the radioactive effluent release program branch of the current SDP; and (2) to determine a threshold to address spills and leaks.

The staff evaluated the radioactive environmental monitoring program branch of the Public Radiation Safety SDP (Enclosure 1) and found that the criteria for a White finding is not consistent with the risk-informed goals of the ROP. The staff concluded that the radioactive environmental monitoring program branch would be better aligned with the risk-informed goals of the ROP by reducing the significance of a licensee's failure to assess the environmental impacts to very low significance (Green finding). This recommendation is based on the consideration that the radioactive effluent release program is functioning properly, and has prevented significant public dose. Thus, the radioactive environmental monitoring program is a verification process, and findings that are greater than very low significance would be captured by the radioactive effluent release program branch. The staff recommends modifying the radioactive environmental monitoring program branch of the SDP as shown in Enclosure 3.

### Strategic Plan Openness Goal

The Public Radiation Safety SDP was developed in 2000 when public confidence was a strategic plan goal. Enclosure 2 is an excerpt from the SDP basis document which provides background on the staff's consideration of public confidence when the SDP was initially developed. The strategic plan goal of public confidence was revised by the agency with the goal of openness in 2004, which encompasses public confidence. The staff believes that to support the goal of openness within the Public Radiation Safety SDP, the public should have open access to information to conclude that a licensee is implementing adequate programs to identify events, take prompt corrective actions, and assess the dose consequences resulting from spills or leaks. The staff's proposed changes to the SDP support the strategic plan goal of openness. In addition, the staff has updated all ROP and SDP guidance documents to ensure consistency with this NRC goal.

### Stakeholder Involvement

Consistent with ROP change guidelines, the staff has held numerous public meetings with external and internal stakeholders to discuss radioactive liquid spills and leaks and one public meeting on November 1, 2006, to specifically discuss the Public Radiation Safety SDP. During these meetings, the staff discussed the proposal that the Public Radiation Safety SDP should include criteria for a White finding for a substantial failure to implement the radioactive effluent release program. Stakeholders generally agreed with the staff's proposal that such a finding represented a significant deficiency in licensee performance that warranted additional inspection above the baseline program, commensurate with a White finding.

SCHEDULE:

The staff plans to revise the SDP by the end of the current calendar year.

RECOMMENDATIONS:

The staff recommends the Commission approve the following changes to the Public Radiation Safety SDP.

1. A White finding in the radioactive effluent release program branch of the Public Radiation Safety SDP for a substantial failure to implement the radiological effluent release program is consistent with the risk-informed approach of the ROP. This represents a finding indicative of a significant deficiency in licensee performance, and warrants the additional inspection above the baseline program commensurate with a White finding to independently verify licensee corrective actions.
2. The radioactive effluent release program branch and radioactive environmental monitoring program branch will remain in the SDP; and the radioactive effluent release program branch will be modified to specifically include spills and leaks as unplanned effluent releases.
3. The criteria for a White finding should be removed from the radioactive environmental monitoring program branch, since the significance of a performance deficiency identified by this branch will be evaluated by the effluent release program branch.

RESOURCES:

Resources required (0.3 FTE) to revise the SDP are currently budgeted for fiscal year 2007.

COORDINATION:

This paper has been reviewed by the Office of General Counsel and has no legal objection. The Office of the Chief Financial Officer has reviewed this paper for resource implications. Resources for fiscal year 2007 have been budgeted for this effort.

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Enclosures:

1. Excerpt from Inspection Manual Chapter 0609, Appendix D, "Public Radiation Safety Significance Determination Process", October 16, 2006
2. Excerpt from Inspection Manual Chapter 0308, Attachment 3, Appendix D, "Technical Basis for Public Radiation Safety Significance Determination Process", June 25, 2004
3. Draft Public Radiation Safety Significance Determination Process Flowchart

**Excerpt from Inspection Manual Chapter 0609, Appendix D  
Public Radiation Safety Significance Determination Process**

I. RADIOACTIVE EFFLUENT RELEASE PROGRAM

A. Objective

This branch of the logic diagram focuses on the licensee's routine (i.e., non-accident) radioactive effluent release program. It assesses the licensee's ability to monitor and maintain radioactive effluents ALARA (i.e., the design dose objectives contained in Appendix I to 10 CFR Part 50 and 10 CFR 20.1301(d)). Being able to assess dose from radioactive effluents and maintain radiation doses to a member of the public within Appendix I design objectives is the success criterion.

B. Basis

The regulatory basis for requiring radiological effluent monitoring programs is given in General Design Criterion 60, "Control of releases of radioactive materials to the environment," of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, "Licensing of Production and Utilization Facilities." Criterion 60 requires a licensee to provide for a means to control the release of radioactive materials in gaseous and liquid effluents during normal reactor operation, including anticipated operational occurrences. An additional requirement is in Section IV.B.1 of Appendix I to 10 CFR Part 50. This section requires a licensee to provide data on the quantities of radioactive material released in liquid and gaseous effluents to assure that such releases are within the ALARA design objectives. This data, pursuant to 10 CFR 50.36a, is reported to the NRC annually. There is also a requirement in 10 CFR 20.1301(d), that requires power reactors to comply with the U.S. Environmental Protection Agency's environmental radiation standards in 40 CFR Part 190.

II. SDP DETERMINATION PROCESS

Is there a finding in the licensee's radiological effluent monitoring program that is contrary to NRC regulations or the licensee's Technical Specifications (TS), Offsite Dose Calculation Manual (ODCM), or procedures? If yes, was the licensee able to assess the dose from the release of radioactive effluent and what is the dose impact (as calculated by the licensee) of the event? If there was no radiological release associated with the event (no dose impact to a member of the public) then there is minimal "risk" and the SDP classifies it as GREEN. The licensee is responsible to resolve the finding. The NRC will periodically inspect the effectiveness of the licensee's corrective action program.

If the licensee failed to have any data in which to assess the dose (i.e., no monitor data, no independent sample data, no actual release sample data, etc.), then the finding would be WHITE. This would be a rare situation. Usually the licensee has enough plant data (i.e., from tank volumes and periodic sample analysis of the radioactive material in the tank) to be able to reconstruct a source term and calculate a bounding dose from the unmonitored release.

If the event resulted in an effluent release of radioactive material that, based on the methodology in the licensee's ODCM, exceeded the dose values in Appendix I to 10 CFR Part 50 and/or 10 CFR 20.1301(d) but is less than 0.1 rem, the SDP classifies the event as WHITE.

NOTE: The licensee has a Performance Indicator (PI) in this area that uses dose values equal to the quarterly dose values given in the TS or the ODCM. This SDP is not to be used to "double count" the PI. If a situation results in which the dose exceeds Appendix I values because of multiple effluent releases which exceeded the PI threshold it should not automatically be assessed as a degraded cornerstone. The SDP is to be used to assess the significance of a finding on an action or event by the licensee which was contrary to NRC regulations, the licensee's TS, ODCM, or procedures.

If the event resulted in effluent release of radioactive material that, based on the methodology in the licensee's ODCM, exceeded the annual public dose limit in 10 CFR Part 20 of 0.1 rem but is less than 0.5 rem, the SDP classifies the event as YELLOW.

If the event resulted in effluent release of radioactive material that, based on the methodology in the licensee's ODCM, exceeded 0.5 rem, the SDP classifies the event as RED.

### III. RADIOACTIVE ENVIRONMENTAL MONITORING PROGRAM

#### A. Objective

This branch of the logic diagram focuses on the licensee's ability to operate an effective radioactive environmental monitoring program.

#### B. Basis

The regulatory basis for requiring radiological environmental monitoring programs is given in General Design Criterion 64, "Monitoring Radioactivity Releases," of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, "Licensing of Production and Utilization Facilities." Criterion 64 requires a licensee to provide for a means for monitoring the plant environs for radioactivity that may be released during normal operations, including anticipated operational occurrences, and from postulated accidents. An additional requirement is in Section IV.B.3 of Appendix I to 10 CFR Part 50. This section requires that the monitoring program identify changes in the use of unrestricted areas (e.g., for agricultural purposes) to permit modifications in the monitoring program for evaluating doses to individuals from principal pathways of exposure.

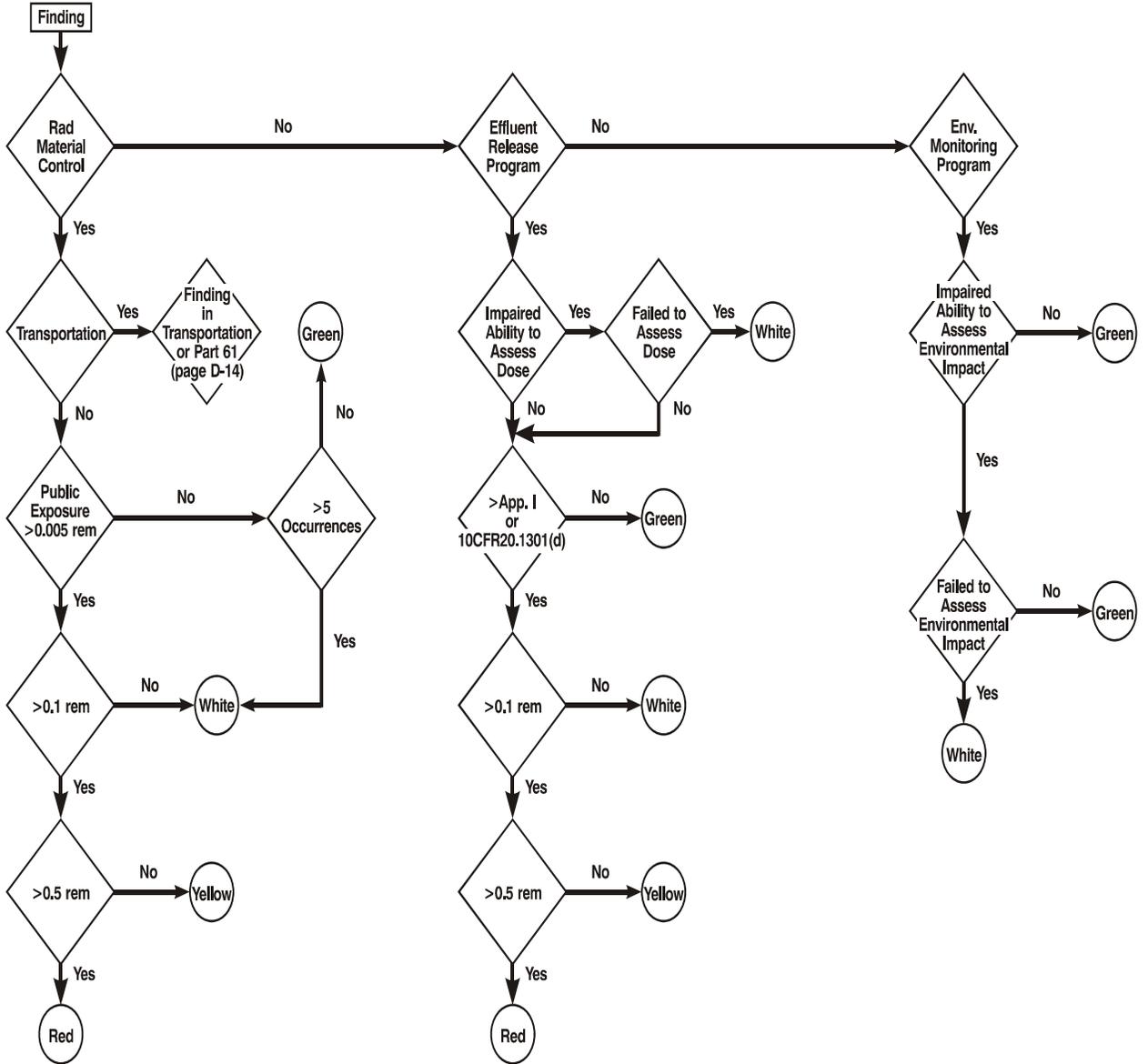
Radiological environmental monitoring is important both for normal operations, as well as in the event of an accident. During normal operations, environmental monitoring verifies the effectiveness of the plant systems used for controlling the release of radioactive effluents. It also is used to check that the levels of radioactive material in the environment do not exceed the projected values used to license the plant. For an accident, the program provides an additional means to estimate the dose to members of the public.

#### IV. SDP DETERMINATION PROCESS

Is there a finding in the licensee's radiological environmental monitoring program that is contrary to NRC regulations or the licensee's Technical Specifications (TS), Offsite Dose Calculation Manual (ODCM), or procedures? If yes, the question is; did it impair the licensee's ability to assess the impact of its radiological effluents on the environment? This means that a few of the environmental sampling stations were not operable or that not all the required environmental samples were collected or analyzed. Even though the licensee was missing data, an assessment of the environmental impact was still able to be done. For this case, the risk significance is GREEN.

The more significant finding is where the licensee failed to assess the environmental impact from its radioactive effluents. To answer the question with a yes means that the licensee's overall program is degraded. It does not mean that a few environmental samples over the course of a year were not taken, or improperly analyzed. A failure in one or two parts of the licensee's program is not sufficient to reach a WHITE significance determination. A failure to evaluate a required pathway (i.e., no valid data to be able to assess the environmental impact for that pathway) would result in a YES answer to the decision diamond and result in a WHITE risk significance finding. This is a high threshold to reach. Historically, inspection findings have documented that samples are missed, or a land use census was not performed, or the air samplers were broken for extended periods of time or they were not in the correct location. Overall, these findings have resulted in lost data, but not a complete failure to be able to assess the impact on the environment from that pathway, therefore a GREEN risk significance finding is typical for environmental monitoring programs.

# PUBLIC RADIATION SAFETY



**Excerpt from Inspection Manual Chapter 0308, Attachment 3, Appendix D**  
**Technical Basis for Public Radiation Safety Significance Determination Process**

The Public Radiation Safety cornerstone is made up of four program areas which have a potential to impact the public; Radioactive Material Control, Radioactive Effluent Release, Radioactive Environmental Monitoring, and Transportation/Part 61. The Public Radiation Safety SDP is used to assess the risk associated with findings in these areas. The findings are the result of NRC inspections or are licensee self-identified in accordance with plant corrective action programs. The Public Radiation Safety SDP is designed to assess risk for routine plant operation, it does not assess accident conditions. This SDP is used in conjunction with NRC Inspection Procedure 71122, Public Radiation Safety.

The SDP was developed to assess the risk of licensee non-compliance with regulatory requirements and licensee programs and procedures established to ensure compliance with regulatory requirements. Regulatory requirements, values, and limits were used to define risk thresholds (i.e., Green, White, Yellow, and Red) for this cornerstone.

In addition to the regulatory requirements, this cornerstone contains a "public confidence" factor that is used to define the significance of a finding. It was recognized by the NRC and stakeholders that a licensee's control of its radioactive material is a significant issue for members of the public; even when very low levels of radioactive material are involved. Because of this, the Public Radiation Safety SDP was developed with a "public confidence" factor which provides for a higher level of significance than would be warranted based solely on the risk from exposure to the radioactive material.

1 Radioactive Effluent Release Program

This branch of the SDP focuses on the licensee's radioactive effluent release program. It evaluates the significance of findings related to the release of radioactive gaseous and liquid effluents.

10 CFR Part 20, Standards for Protection Against Radiation contains radiation dose limits to members of the public from the release of radioactive gaseous and liquid effluents. Licensees are required to comply with these limits. In addition to the requirements of 10 CFR Part 20, for power reactors there are requirements to maintain radioactive effluents ALARA. These requirements are contained in 10 CFR 50.34a, 10 CFR 50.36a, General Design Criteria 60 of Appendix A to 10 CFR Part 50, 40 CFR Part 190, and Appendix I to 10 CFR Part 50. These regulatory requirements specify the identification of the radioactive effluent design objectives (i.e., radiation dose), and the means to be employed, for keeping levels of radioactive material in effluents ALARA during normal reactor operation, including anticipated operational occurrences.

To evaluate the significance of a finding in this portion of the SDP, the calculated dose from the effluent release must be known. As the dose to a member of the public from the radioactive effluent increases, so does the significance. A Green significance is given to those findings which involved an effluent release in which the licensee had an impaired ability to assess dose which resulted in doses to members of the public which are less than the values in Appendix I

to 10 CFR Part 50 and 10 CFR 20.1301(d) (40 CFR Part 190). The basis for the Green finding is that no regulatory limits were exceeded.

A White significance is given to those findings which involved an effluent release in which the calculated dose to a member of the public is greater than the values in Appendix I to 10 CFR Part 50 and/or 10 CFR 20.1301(d) but less than 0.1 rem. The basis for the White finding is that regulatory requirements related to maintaining radioactive effluents ALARA were exceeded, but still below the 10 CFR 20.1301 annual public dose limit of 0.1 rem.

A Yellow significance is given to those findings which involved an effluent release in which the calculated dose to a member of the public is greater than 0.1 rem but less than 0.5 rem. The basis for the Yellow finding is that the 10 CFR 20.1301 annual public dose limit of 0.1 rem was exceeded. This represents a violation of a regulatory safety standard.

A Red significance is given to those findings which involved an effluent release in which the calculated dose to a member of the public is greater than 0.5 rem. The basis for the Red finding is that the 10 CFR 20.1301 annual public dose limit of 0.1 rem is exceeded by a substantial margin. The value of 0.5 rem was chosen because it represents the upper limit that 10 CFR Part 20 would allow, based on specific authorization, for a limited time basis. However, without prior NRC authorization, the dose represents a violation of a regulatory safety standard.

## 2 Radiological Environmental Monitoring Program

This portion of the cornerstone evaluates the significance of findings related to the radiological environmental monitoring program. The significance is related to the licensee's ability to perform sampling and analysis of environmental media for the presence of licensed radioactive material released in gaseous and liquid effluents.

The regulatory basis for requiring radiological environmental monitoring is contained in General Design Criteria 64 of Appendix A to 10 CFR Part 50, and Section IV.B of Appendix I to 10 CFR Part 50.

To evaluate the significance of a finding in this portion of the SDP, the licensee's ability to assess the impact of its radioactive effluent releases on the environment surrounding the plant must be known.

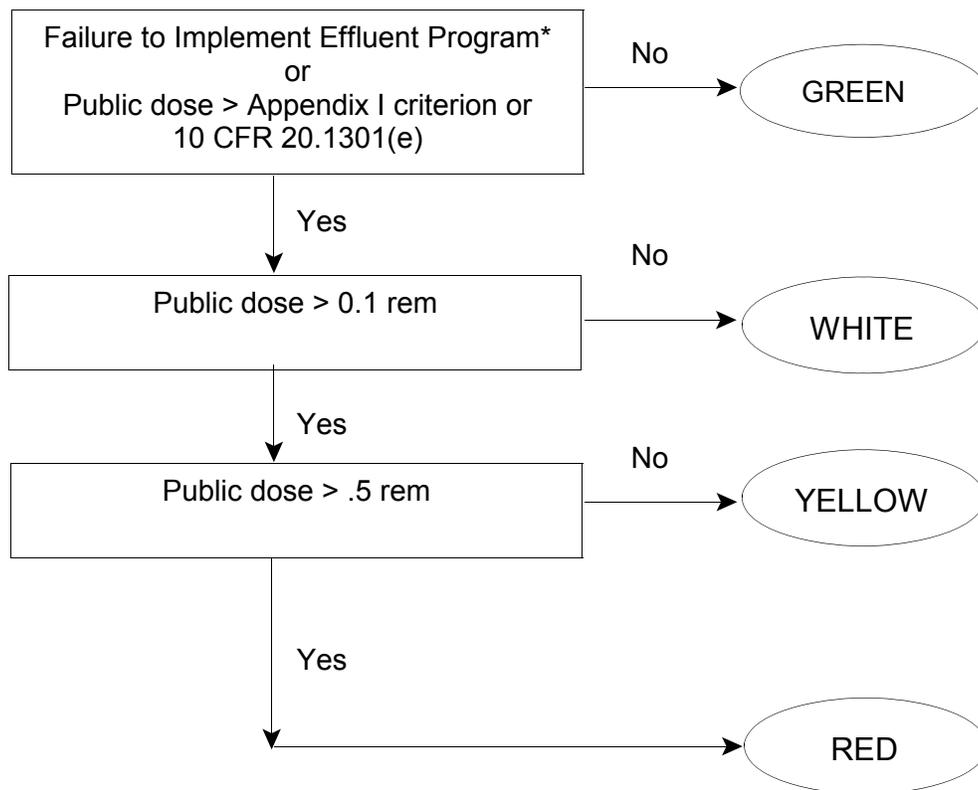
A finding of Green significance typically involves situations where environmental sampling stations are not operable and/or where required environmental samples were not collected and/or analyzed as a result of the licensee not following its procedures or because of some error. However, although the licensee was missing required environmental sample data, the licensee was still able to perform and report a reasonable assessment of the environmental impacts.

The more significant White finding occurs when a licensee failed to assess the environmental impact for a dose pathway from its radioactive effluent releases. This failure is linked to the licensee's failure to obtain an adequate number of environmental samples to make an assessment, or the samples were improperly analyzed so that the data is not usable. A White finding is given for the failure to assess the environmental impact from radioactive effluent releases for a pathway because it is contrary to a regulatory requirements.

There are no findings of significance greater than White in this portion of the SDP.

# Public Radiation Safety Significance Determination Process Flowchart

## Draft Radioactive Effluent Release Program Branch



\* Failure to implement Effluent Program is defined in the text of the SDP.

# DRAFT Radioactive Environmental Monitoring Program Branch

