



## U.S. NUCLEAR REGULATORY COMMISSION

# STANDARD REVIEW PLAN

### 2.4.13 ACCIDENTAL RELEASES OF RADIOACTIVE LIQUID EFFLUENTS IN GROUND AND SURFACE WATERS

#### REVIEW RESPONSIBILITIES

**Primary** - Organization responsible for the review of issues related to hydrology

**Secondary** - Organization responsible for review of solid waste and liquid and gaseous effluents

Organization responsible for review of radiation protection

#### I. AREAS OF REVIEW

Chapter 2 of the Standard Review Plan (SRP) discusses the site characteristics that could affect the safe design and siting of a plant. The staff reviews information presented by the applicant for a construction permit (CP), operating license (OL), design certification (DC), early site permit (ESP), or combined license (COL) concerning hydrological setting of the site as they relate to safety-related structures, systems, and components (SSC). This SRP section applies to reviews performed for each of these types of applications. The staff's review and findings are described in the appropriate section of the safety evaluation report (SER).

The hydrogeological characteristics of the site are evaluated in this section of the applicant's safety analysis report (SAR) to describe the effects of accidental releases of radioactive liquid effluents in ground and surface waters on existing uses and known and likely future uses of ground and surface water resources. The source term from a postulated accidental release is reviewed under SRP 11.2 following the guidance provided in Branch Technical Position (BTP) 11-6, "Postulated Radioactive Releases Due to Liquid-containing Tank Failures." The

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### USNRC STANDARD REVIEW PLAN

This Standard Review Plan, NUREG-0800, has been prepared to establish criteria that the U.S. Nuclear Regulatory Commission staff responsible for the review of applications to construct and operate nuclear power plants intends to use in evaluating whether an applicant/licensee meets the NRC's regulations. The Standard Review Plan is not a substitute for the NRC's regulations, and compliance with it is not required. However, an applicant is required to identify differences between the design features, analytical techniques, and procedural measures proposed for its facility and the SRP acceptance criteria and evaluate how the proposed alternatives to the SRP acceptance criteria provide an acceptable method of complying with the NRC regulations.

The standard review plan sections are numbered in accordance with corresponding sections in Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants (LWR Edition)." Not all sections of Regulatory Guide 1.70 have a corresponding review plan section. The SRP sections applicable to a combined license application for a new light-water reactor (LWR) are based on Regulatory Guide 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)."

These documents are made available to the public as part of the NRC's policy to inform the nuclear industry and the general public of regulatory procedures and policies. Individual sections of NUREG-0800 will be revised periodically, as appropriate, to accommodate comments and to reflect new information and experience. Comments may be submitted electronically by email to [NRR\\_SRP@nrc.gov](mailto:NRR_SRP@nrc.gov).

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source term is determined from a postulated release from a single tank outside of containment. Normal and accidental releases are also considered in the applicant's environmental report.

The specific areas of review are as follows:

1. Alternate Conceptual Models: The staff reviews alternate conceptual models of the hydrology at the site that reasonably bound hydrogeological conditions at the site inasmuch as these conditions affect transport of radioactive liquid effluent in the ground and surface water environment. The staff review examines whether the alternate conceptual models present a more realistic representation of the geometry of the hydrologic features and boundary conditions.
2. Pathways: The staff reviews the bounding set of plausible surface and subsurface pathways from potential points of accidental release to determine the critical pathways that may result in the most severe impact on existing uses and known and likely future uses of ground and surface water resources in the vicinity of the site.
3. Characteristics that Affect Transport: The staff reviews the ability of ground and surface water environment with respect to their ability to delay, disperse, dilute, or concentrate accidentally released radioactive liquid effluent during its transport. The staff review includes assessment of scenarios wherein accidental release of radioactive effluents is combined with hydrologic extreme events such as floods or low flows.
4. Consideration of Other Site-Related Evaluation Criteria: The staff review includes assessment of scenarios wherein accidental release of radioactive effluents is combined with potential effects of seismic and non-seismic events (e.g., assessing effects of hydraulic structures located upstream and downstream of the plant in the event of structural or operational failures and the ensuing sudden changes in the regime of flow).
5. Additional Information for 10 CFR Part 52 Applications: Additional information will be presented dependent on the type of application. For a COL application, the additional information is dependent on whether the application references an ESP, a DC, both, or neither. Information requirements are prescribed within the "Contents of Application" sections of the applicable Subparts to 10 CFR Part 52.

#### Review Interfaces

Other SRP sections interface with this section as follows:

1. The proposed radionuclide concentrations assumed for the postulated release from a tank that is to be considered for this evaluation is reviewed under SRP Section 11.2.
2. The staff obtains receptor locations to be analyzed from the organization responsible for the review of radiation protection.
3. The staff provides, to the organization responsible for review of the effectiveness of radwaste systems and to the organization responsible for review of radiation protection, the locations, dilutions, and travel times corresponding to the bounding set of plausible surface and subsurface pathways for radionuclides in the accident scenarios leading to the most adverse contamination.

4. For DC applications and COL applications referencing a DC rule or DC application, review of the site parameters in the Design Control Document (DCD) Tier 1 and Chapter 2 of the DCD Tier 2<sup>1</sup> submitted by the applicant is performed under SRP Section 2.0, "Site Characteristics and Site Parameters." Review of site characteristics and site-related design parameters in ESP applications or in COL applications referencing an ESP is also performed under Section 2.0.

The specific acceptance criteria and review procedures are contained in the referenced SRP sections.

## II. ACCEPTANCE CRITERIA

### Requirements

Acceptance criteria are based on meeting the relevant requirements of the following Commission regulations:

1. 10 CFR Part 100, as it relates to identifying and evaluating hydrological features of the site. The requirements to consider physical site characteristics in site evaluations are specified in 10 CFR 100.10(c) for applications before January 10, 1997, and in 10 CFR 100.20(c) for applications on or after January 10, 1997.
2. 10 CFR 100.23(d) sets forth the criteria to determine the siting factors for plant design bases with respect to seismically induced floods and water waves at the site.
3. 10 CFR Part 50, Appendix A, General Design Criterion (GDC) 2, for CP and OL applications, as it relates to consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated.
4. 10 CFR 52.17(a)(1)(vi), for ESP applications, and 10 CFR 52.79(a)(1)(iii), for COL applications, as they relate to identifying hydrologic site characteristics with appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area and with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated.

### SRP Acceptance Criteria

Specific SRP acceptance criteria acceptable to meet the relevant requirements of the NRC's regulations identified above are as follows for the review described in this SRP section. The SRP is not a substitute for the NRC's regulations, and compliance with it is not required. However, an applicant is required to identify differences between the design features, analytical techniques, and procedural measures proposed for its facility and the SRP acceptance criteria and evaluate how the proposed alternatives to the SRP acceptance criteria provide acceptable methods of compliance with the NRC regulations.

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<sup>1</sup> Additional supporting information of prior DC rules may be found in DCD Tier 2 Section 14.3.

Appropriate sections of the following Regulatory Guide are used by the staff for the identified acceptance criteria:

Regulatory Guide 1.113 as it relates to selection of surface water models.

The staff uses best current practices to analyze groundwater transport of radioactive liquid effluents.

1. Alternate Conceptual Models: Alternate conceptual models of hydrology in the vicinity of the site are reviewed. The description of these alternate conceptual models should be sufficient to bound the hydrogeological conditions at the site that define the transport of radioactive liquid effluent in ground and surface water environments.
2. Pathways: The bounding set of plausible surface and subsurface pathways from the points of release are reviewed. The description of these pathways should provide sufficient information including data to ensure that the bounding set of plausible pathways that may result in the worst-case contamination are adequately identified. Estimates of physical parameters necessary to calculate the transport of liquid effluent from the points of release to the site of existing or known and likely future users should be described.
3. Characteristics that Affect Transport: Radionuclide transport characteristics of the groundwater environment with respect to existing and known and likely future users should be described. Estimates and bases for coefficients of dispersion, adsorption, groundwater velocities, travel times, gradients, permeabilities, porosities and potentiometric map or piezometric levels between the site and existing or known and likely future surface and groundwater users should be described and should be consistent with site characteristics and conform to the stipulation of 10 CFR 100.20(c)(3).
4. Consideration of Other Site-Related Evaluation Criteria: The applicant's assessment of the potential effects of site-proximity hazards, seismic, and non-seismic events on the radioactive concentration from the postulated tank failure related to accidental release of radioactive liquid effluents to ground and surface waters for the proposed plant site is needed. This assessment should be sufficient to demonstrate that the applicant's design bases appropriately account for these effects.
5. Branch Technical Position BTP 11-6 provides guidance in assessing a potential release of radioactive liquids following the postulated failure of a tank and its components, located outside of containment, and impacts of the release of radioactive materials at the nearest potable water supply, located in an unrestricted area, for direct human consumption or indirectly through animals, crops, and food processing.

#### Technical Rationale

The technical rationale for application of these acceptance criteria to the areas of review addressed by this SRP section is discussed in the following paragraphs:

1. Compliance with 10 CFR 100.10(c) and 10 CFR 100.20 (c) requires that the site's physical characteristics (including seismology, meteorology, geology, and hydrology) be taken into account when determining its acceptability for a nuclear power reactor.

To satisfy the hydrological requirements of 10 CFR Part 100, the applicant's SAR should consider local geological and hydrological characteristics when determining the

acceptability of a nuclear power plant site. The geological and hydrological characteristics of the site may have a bearing on the potential consequences of radioactive effluents accidentally released from the facility. Special precautions should be planned if a reactor will be located at a site where a significant quantity of radioactive effluent could accidentally flow into nearby streams or rivers or find ready access to aquifers.

These criteria apply to SRP Section 2.4.13 because the reviewer evaluates site hydrologic characteristics with respect to the potential consequences of radioactive materials escaping from the facility. Radionuclide transport characteristics of ground and surface water environments are reviewed with respect to accidental releases in order to ensure that current and known and likely future users of ground and surface water are not adversely affected. Regulatory Guide 1.113 provides guidance in selecting and using surface water models for analyzing the flow field and dispersion of contaminants in surface waters.

Meeting this requirement provides assurance that when accidental releases of radioactive liquid effluents to ground and surface waters occur, their adverse impact on public health and safety will be minimized.

### III. REVIEW PROCEDURES

The reviewer will select material from the procedures described below, as may be appropriate for a particular case.

The procedures outlined below are used to review CP applications, ESP applications, and COL applications that do not reference an ESP to determine whether data and analyses for the proposed site meet the acceptance criteria given in Subsection II of this SRP section. For reviews of OL applications, these procedures are used to verify that the data and analyses remain valid and that the facility's design specifications are consistent with these data. As applicable, reviews of OLs and COLs include a determination on whether the content of technical specifications related to hydrology-related site characteristics are acceptable and whether the technical specifications reflect consideration of any identified unique conditions.

These review procedures are based on the identified SRP acceptance criteria. For deviations from these acceptance criteria, the staff should review the applicant's evaluation of how the proposed alternatives provide an acceptable method of complying with the relevant NRC requirements identified in Subsection II.

1. Alternate Conceptual Models: Whether simple or highly complex multi-dimensional models are employed, conservative or bounding simulations are achieved by representing the existing ground and surface water systems with conservative conceptual models populated with conservative model parameters. Use of conservative model data in an inappropriate or non-conservative conceptual model will not provide a conservative analysis. For example, an aquifer in a karst geology with solution channels may not be conservatively represented by a porous medium continuum conceptual model. A variety of alternative conceptual models, each based on the geological and hydrological characteristics of the site, needs to be envisioned as part of the complete conceptual model for a site, and the combination of ground and surface water conceptual models yielding the most adverse contaminant concentrations should be used in conservative or bounding analyses. Consideration should be given to preferential flow in groundwater resulting from the geology (e.g., karst geology), or from spatial variability in sediment structure (e.g., impermeable strata forcing groundwater to perch or move laterally and form seeps or springs). Regarding the mobility of

contaminants, consideration should be given to the potential for the inclusion of organic or inorganic complexants in stored liquids that are also released during an accident. Complexants can greatly alter the sorption characteristics normally associated with radionuclides, in some cases making them freely mobile in the ground water system. In surface water conceptual models, consideration should be given to the potential for stratified flow to restrict a contaminant release to a fraction of the stream flow or lake volume, and more severely impact the ecology and people at select locations defined by the stratification.

2. Pathways: The staff should make independent calculations of the transport capabilities and potential contamination pathways of the groundwater environment under accidental conditions with respect to existing users and known and likely future users. Special attention should be directed to proposed facilities with permanent dewatering systems to ensure that pathways created by those systems have been identified. The staff should, in consultation with the organization responsible for review of solid waste and liquid and gaseous effluents, choose the accident scenarios leading to the most adverse contamination of the groundwater or the surface water.

Analysis of the contamination should commence with the simplest models, using demonstrably conservative assumptions and coefficients. Dilutions and travel times (or, alternatively, concentrations directly) resulting from the preliminary analyses should be provided to the organization responsible for review of solid waste and liquid and gaseous effluents and to the organization responsible for review of radiation protection to carry out further dose calculations. Further analyses using progressively more realistic and less conservative modeling techniques, should be undertaken if the preliminary results are not acceptable.

Independent calculations should be made of liquid effluent transport for the surface pathways identified. For preliminary analysis, the staff should employ simplified calculational procedures or models. The analysis should be performed using demonstrably conservative coefficients and assumptions, and the physical conditions (such as lowest recorded river flow) likely to give the most adverse dispersion of the liquid effluent. The applicant's model assumptions and results should be compared with the staff's results to ensure that the results are comparably conservative. The estimation of liquid effluent dispersion should reflect potential future changes that might result from variations in use by known and likely future surface and groundwater users.

Concentrations of radionuclides in the body of water under consideration should be calculated by the organization responsible for review of radiation protection based on the staff's dispersion computations and with initial concentrations corresponding to the most adverse contamination of surface waters. If the concentrations computed by conservative simplified methods are not acceptable, more precise and less conservative models, such as those used for hydrothermal prediction and coefficients, should be employed by the staff.

The use of numerical models by the applicant should be reviewed with consideration given to whether standard and accepted practices have been followed. For example, there are ASTM publications on the simulation of subsurface fluid flow and contaminant transport that may be used as a guide (see ASTM references in the Reference section). In the performance of detailed model simulations, the review should determine if the applicant has followed a strategy such as that outlined in NUREG/CR-6805 and NUREG/CR-5621.

3. Characteristics that Affect Transport: Characteristics of both the surface and subsurface environments affect the mobility of contaminants. For instance, retardation of a subsurface contaminant is determined in part by the site-specific properties of the soil; the mixing of a contaminant in a lake can be limited by stratification. The properties used by the applicant to define the mobility and dilution of a contaminant need detailed consideration of site-specific properties unless the uncertainty in these properties is conservatively offset in the applicant's assessment. For instance, if the applicant finds any retardation of the contaminant relative to the velocity of water to be negligible, then detailed site-specific adsorption studies may not be necessary.
4. Consideration of Other Site-Related Evaluation Criteria: 10 CFR Part 100 describes site-proximity hazards, seismic, and non-seismic evaluation criteria for power reactor applications. Subpart A to 10 CFR Part 100 addresses the requirements for applications before January 10, 1997, and Subpart B is for applications on or after January 10, 1997. The staff's review should include evaluation of pertinent information to determine if these criteria are appropriately used in postulation of the release of radionuclides from a single tank for accidental releases of radioactive liquid effluent (see SRP Section 11.2 and BTP 11-6) in ground and surface waters at the proposed plant site.
5. Review Procedures Specific to 10 CFR Part 52 Application Type
  - A. Early Site Permit Reviews: Subpart A to 10 CFR Part 52 specifies the requirements and procedures applicable to the Commission's review of an ESP application for approval of a proposed site. Information required in an ESP application includes a description of the site characteristics and design parameters of the proposed site. The scope and level of detail of review of data parallel that used for a CP review.

In the absence of a compliance or adequate protection issue, a modification necessary based on updating early site permit-emergency preparedness information or a variance, 10 CFR 52.39 precludes the staff from imposing new site characteristics, design parameters, or terms and conditions on the early site permit at the COL stage. Accordingly, the reviewer should ensure that all physical attributes of the site that could affect the design basis of SSCs important to safety are reflected in the site characteristics, design parameters, or terms and conditions on the early site permit.
  - B. Standard Design Certification Reviews: DC applications do not contain general descriptions of site characteristics because this information is site-specific and will be addressed by the COL applicant. However, pursuant to 10 CFR 52.47(a)(1), a DC applicant must provide site parameters postulated for the design. The reviewer verifies that:
    - i. The postulated site parameters are representative of a reasonable number of sites that have been or may be considered for a COL application;
    - ii. The appropriate site parameters are included as Tier 1 information. This convention has been used by previous DC applicants. Additional guidance on site parameters is provided in SRP Section 2.0;

- iii. Pertinent parameters are stated in a site parameters summary table; and
  - iv. The applicant has provided a basis for each of the site parameters.
- C. Combined License Reviews: For a COL application referencing a certified standard design, NRC staff reviews that application to ensure that sufficient information is presented to demonstrate that the characteristics of the site fall within the site parameters specified in the DC rule. Should the actual site characteristics not fall within the certified standard design site parameters, the COL applicant will need to demonstrate by some other means that the proposed facility is acceptable at the proposed site. This might be done by re-analyzing or redesigning the proposed facility.

For a COL application referencing an ESP, NRC staff reviews the application to ensure the applicant provides sufficient information to demonstrate that the design of the facility falls within the site characteristics and design parameters specified in the early site permit as applicable to this SRP section. In accordance with 10 CFR 52.79(b)(2), should the design of the facility not fall within the site characteristics and design parameters, the application shall include a request for a variance from the ESP that complies with the requirements of 10 CFR 52.39 and 10 CFR 52.93.

In addition, long-term environmental changes and changes to the region resulting from human or natural causes may have introduced changes to the site characteristics that could be relevant to the design basis. In the absence of certain circumstances, such as a compliance or adequate protection issue, 10 CFR 52.39 precludes the staff from imposing new site characteristics, design parameters, or terms and conditions on the early site permit at the COL stage. Consequently, a COL application referencing an ESP need not include a re-investigation of the site characteristics that have previously been accepted in the referenced ESP. However, in accordance with 10 CFR 52.6, "Completeness and Accuracy of Information," the applicant or licensee is responsible for identifying changes of which it is aware, that would satisfy the criteria specified in 10 CFR 52.39. Information provided by the applicant in accordance with 10 CFR 52.6(b) will be addressed by the staff during the review of a COL application referencing an ESP or a DC.

For a COL application referencing either an ESP or DC or both, the staff should review the corresponding sections of the ESP and DC FSER to ensure that any early site permit conditions, restrictions to the DC, or COL action items identified in the FSERs are appropriately handled in the COL application.

#### IV. EVALUATION FINDINGS

The review should document the staff's evaluation of site characteristics against the relevant regulatory criteria. The evaluation should support the staff's conclusions as to whether the regulations are met. The reviewer should state what was done to evaluate the applicant's safety analysis report. The staff's evaluation may include verification that the applicant followed applicable regulatory guidance, performance of independent calculations, and/or validation of appropriate assumptions. The reviewer may state that certain information provided by the applicant was not considered essential to the staff's review and was not reviewed by the staff. While the reviewer may summarize or quote the information offered by the applicant in support of its application, the reviewer should clearly articulate the bases for the staff's conclusions.



The reviewer verifies that the applicant has provided sufficient information and that the review and calculations (if applicable) support conclusions of the following type to be included in the staff's SER.

1. Construction Permit, Operating License, and Combined License Reviews

The following statements should be preceded by a summary of the site characteristics and parameters used for the plant:

As set forth above, the applicant has presented and substantiated information relative to the accidental releases of radioactive liquid effluent in ground and surface waters important to the design and siting of this plant. The staff has reviewed the available information provided and, for the reasons given above, concludes that the identification and consideration of the potential effects of accidental releases of radioactive liquid effluents in ground and surface waters on existing users and known and likely future users of ground and surface water resources in the vicinity of the site are acceptable and meet the requirements of 10 CFR Part 100 [10 CFR 100.10(c) or 10 CFR 100.20(c), as applicable], with respect to determining the acceptability of the site.

The staff finds that the applicant has considered the appropriate site phenomena in establishing the transport of radioactive liquid effluent in ground and surface waters that are important to safety of ground and surface water resources in the vicinity of the site. The staff has generally accepted the methodologies used to determine the potential effects of accidental releases of radioactive liquid effluents in ground and surface waters on existing users and known and likely future users of ground and surface water resources, as documented in safety evaluation reports for previous licensing actions. The staff concludes that the identified design bases meet the requirement(s) of 10 CFR 100.10(c) [or 10 CFR 100.20(c)], with respect to establishing the effects of accidental releases of radioactive liquid effluents in ground and surface waters.

2. Early Site Permit Reviews

The following statements should be preceded by a summary of the site characteristics and design parameters to be included in any ESP that might be issued for the proposed site:

As set forth above, the applicant has presented and substantiated sufficient information pertaining to the identification and evaluation of effects of accidental releases of radioactive liquid effluents in ground and surface waters on existing users and known and likely future users of ground and surface water resources in the vicinity of the proposed site. Section 2.4.13, "Accidental releases of Radioactive Liquid Effluents in Ground and Surface Waters," of NUREG-0800, Standard Review Plan, provides that the site safety analysis report should address the requirements of 10 CFR Part 100 as they relate to identifying and evaluating effects of accidental releases of radioactive liquid effluents in ground and surface waters on existing users and known and likely future users in the vicinity of the site. Further, the applicant considered the most severe natural phenomena that have been historically reported for the site and surrounding area while describing the hydrologic interface of the plant with the site, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated. The staff has generally accepted the methodologies used to determine the severity of the phenomena reflected in these site characteristics, as documented in safety evaluation reports for

previous licensing actions. Accordingly, the staff concludes that the use of these methodologies results in site characteristics containing sufficient margin for the limited accuracy, quantity, and period of time in which the data have been accumulated. In view of the above, the site characteristics previously identified are acceptable for use in establishing the design bases for SSCs important to safety, as may be proposed in a COL or CP application.

Therefore, the staff concludes that the identification and consideration of the climatic site characteristics set forth above are acceptable and meet the requirements of 10 CFR 52.17(a)(1)(vi), 10 CFR 100.20(c), and 10 CFR 100.21(d).

In view of the above, the staff finds the applicant's proposed site characteristics related to hydrology for inclusion in an ESP for the applicant's site, should one be issued, acceptable.

### 3. Design Certification Reviews

The following statement should be preceded by a list of the applicable site parameters used for the plant:

The NRC staff acknowledges that the applicant has selected the site parameters referenced above for plant design inputs (a subset of which is included as Tier 1 information) and agrees that they are representative of a reasonable number of sites that have been or may be considered for a COL application. Effects of accidental releases of radioactive liquid effluents in ground and surface waters on existing users and known and likely future users of ground and surface water resources in the vicinity of the site are site-specific and will be addressed by the COL applicant. This should include the provision of information sufficient to demonstrate that the design of the plant falls within the site parameters specified by the siting review.

## V. IMPLEMENTATION

The staff will use this SRP section in performing safety evaluations of DC applications and license applications submitted by applicants pursuant to 10 CFR Part 50 or 10 CFR Part 52. Except when the applicant proposes an acceptable alternative method for complying with specified portions of the Commission's regulations, the staff will use the method described herein to evaluate conformance with Commission regulations.

The provisions of this SRP section apply to reviews of applications submitted six months or more after the date of issuance of this SRP section, unless superseded by a later revision.

## VI. REFERENCES

In addition to the following references describing methods and techniques of evaluation, methods, techniques, and data published by Federal, State, and other agencies and organizations may be used as available.

1. 10 CFR Part 100, "Reactor Site Criteria."
2. ASTM 2004, "Standard Guide for Application of a Ground-Water Flow Model to a Site-Specific Problem," ASTM Designation: D 5447-04.

3. ASTM 2002, "Standard Guide for Conducting a Sensitivity Analysis of a Ground-Water Flow Model Application," ASTM Designation: D 5611-94.
4. ASTM 2003, "Standard Guide for Developing Conceptual Site Models for Contaminated Sites," ASTM Designation: D 1689-95.
5. ASTM 2000, "Standard Guide for Subsurface Flow and Transport Modeling," ASTM Designation: D 5880-95.
6. ASTM 2002, "Standard Guide for Comparing Ground-Water Flow Model Simulations to Site-Specific Information," ASTM Designation: D 5490-93.
7. ASTM 2002, "Standard Guide for Defining Boundary Conditions in Ground-Water Flow Modeling," ASTM Designation: D 5609-94.
8. ASTM 2002, "Standard Guide for Defining Initial Conditions in Ground-Water Flow Modeling," ASTM Designation: D 5610-94.
9. Neuman S.P. and P.J. Wierenga, 2003, "A Comprehensive Strategy of Hydrogeologic Modeling and Uncertainty Analysis for Nuclear Facilities and Sites," NUREG/CR-6805.
10. Cole, C.R. et. al., 1998, "Groundwater Models in Support of NUREG/CR-5512," NUREG/CR-5621.
11. U.S. EPA 1994, PB 94-205804 EPA 402-R-94-012, "A Technical Guide to Ground-Water Model Selection at Sites Contaminated with Radioactive Substances."

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**PAPERWORK REDUCTION ACT STATEMENT**

The information collections contained in the Standard Review Plan are covered by the requirements of 10 CFR Part 50 and 10 CFR Part 52, and were approved by the Office of Management and Budget, approval number 3150-0011 and 3150-0151.

**PUBLIC PROTECTION NOTIFICATION**

The NRC may not conduct or sponsor, and a person is not required to respond to, a request for information or an information collection requirement unless the requesting document displays a currently valid OMB control number.

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