U.S. NUCLEAR REGULATORY COMMISSION

STANDARD REVIEW PLAN

OFFICE OF NUCLEAR REACTOR REGULATION

2.4.5 PROBABLE MAXIMUM SURGE AND SEICHE FLOODING

REVIEW RESPONSIBILITIES

Primary - ~~Hydrologic and Geotechnical Engineering Branch (HGEB)~~Civil Engineering and Geosciences Branch (ECGB)[1]

Secondary - None

I. AREAS OF REVIEW

In this section of the safety analysis report (SAR) the hydrometeorological design basis is developed to determine the extent of flood protection required for safety-related plant systems. The areas of review include the characteristics of the assumed probable maximum hurricane or other probable maximum wind storms and the techniques, methodologies, and parameters used in the determination of the design surge and/or seiche. Antecedent water levels, storm tracks, methods of analysis, coincident wind-generated wave action and wave runup on safety-related structures, potential for wave oscillation at the natural periodicity, and the resultant design bases for surge and seiche flooding are also reviewed. For a standard design certification applications, the maximum flood level (from all sources) and design winds are specified in the site parameter envelope that must be met by the plant design.[2]

Review Interfaces[3]

The ECGB also reviews, under SRP Section 2.3.6 (proposed), the adequacy of the site parameter envelope specified in standard design certification applications. The ECGB also reviews, under SRP Section 2.4.2, the limiting flood level specified in the site parameter envelope for design certifications.[4]

II. ACCEPTANCE CRITERIA

~~HGEB~~ ECGB[5] acceptance criteria for this ~~SRP~~ Standard Review Plan (SRP)[6] section are based on meeting the requirements of the following regulations:

1. General Design Criterion 2 (GDC 2) as it relates to structures, systems, and components important to safety being designed to withstand the effects of hurricanes and seiches.

2. 10 CFR Part 100 as it relates to evaluating the hydrologic characteristics of the site.

Specific criteria necessary to meet the relevant hydrologic requirements of GDC 2 and 10 CFR Part 100 are as follows:

If it has been determined that surge and seiche flooding estimates are necessary to identify flood design bases, the applicant's analysis will be considered complete and acceptable if the following areas are addressed and can be independently and comparably evaluated from the applicant's submission.

1. All reasonable combinations of probable maximum hurricane, moving squall line, or other cyclonic wind storm parameters are investigated, and the most critical combination is selected for use in estimating a water level.

2. Models used in the evaluation are verified or have been previously approved by the staff.

3. Detailed descriptions of bottom profiles are provided (or are readily obtainable) to enable an independent staff estimate of surge levels.

4. Detailed descriptions of shoreline protection and safety-related facilities are provided to enable an independent staff estimate of wind-generated waves, runup, and potential erosion and sedimentation.

5. Ambient water levels, including tides and sea level anomalies, are estimated using NOAA and Corps of Engineers publications as described below.

6. Combinations of surge levels and waves that may be critical to plant design are considered, and adequate information is supplied to allow a determination that no adverse combinations have been omitted.

7. If Regulatory Guide 1.59, Position 2, is elected by the applicant, the design basis for flood protection of all safety-related facilities identified in Regulatory Guide 1.29 must be shown to be adequate in terms of time required for implementation of any emergency procedures. The applicant must also demonstrate that all potential flood situations that could negate the time and capability to initiate flood emergency procedures are provided for in the less severe design basis selected.

This section of the SAR may also state with justification that surge and seiche flooding estimates are not necessary to identify the flood design basis (e.g., the site is not near a large body of water).

Hydrometeorological estimates and criteria for development of probable maximum hurricanes for east and Gulf Coast sites, squall lines for the Great Lakes, and severe cyclonic wind storms for all lake sites by the Corps of Engineers, National Oceanic and Atmospheric Administration (NOAA), and the staff are used for evaluating the conservatism of the applicant's estimates of severe windstorm conditions, as discussed in Regulatory Guide 1.59. The Corps of Engineers and NOAA criteria require variation of the basic meteorological parameters within given limits to determine the most severe combination that could result. The applicant's hydrometeorological analysis should be based on the most critical combination of these parameters.

Data from publications of NOAA, the Corps of Engineers, and other sources (such as tide tables, tide records, and historical lake level records) are used to substantiate antecedent water levels. These antecedent water levels must be as high as the "10% exceedence" monthly spring high tide, plus a sea level anomaly based on the maximum difference between recorded and predicted average water levels for durations of 2 weeks or longer for coastal locations or the 100-yr recurrence interval high water for the Great Lakes. In a similar manner, the storm track, wind fields, effective fetch lengths, direction of approach, timing, and frictional surface and bottom effects are evaluated by independent staff analysis to ~~assure~~ ensure[7] that the most critical values have been selected. Models used to estimate surge hydrographs that have not previously been reviewed and approved by the staff are verified by reproducing historical events, with any discrepancies in the model being on the conservative (i.e., high) side.

Criteria and methods of the Corps of Engineers as generally summarized in Reference ~~32~~ 33[8] are used as a standard to evaluate the applicant's estimate of coincident wind-generated wave action and runup.

Criteria and methods of the Corps of Engineers and other standard techniques are used to evaluate the potential for oscillation of waves at natural periodicity.

Criteria and methods of the Corps of Engineers (Ref. ~~32~~ 33) are used to evaluate the adequacy of protection from flooding, including the static and dynamic effects of broken, breaking, and nonbreaking waves. Regulatory Guide 1.102 provides further guidance on flood protection. Regulatory Guide 1.125 provides guidance for using physical models in assessing flood protection.

Technical Rationale[9]

The technical rationale for application of the above acceptance criteria to reviewing surge and seiche flooding at a nuclear power plant site is discussed in the following paragraphs:[10]

1. Compliance with GDC 2 requires that nuclear power plant structures, systems, and components important to safety be designed to withstand the effects of natural phenomena such as earthquake, tornado, hurricane, flood, tsunami, and seiche without

loss of capability to perform their safety functions. The criterion further specifies that the design bases for these structures, systems, and components shall reflect the following:

a. Appropriate consideration of the most severe natural phenomena historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and time period in which the historical data have been accumulated;

b. Appropriate combinations of the effects of normal and accident conditions with the effects of the natural phenomena; and

c. The importance of the safety functions to be performed.

The first specification was adopted in recognition of the relatively short history available for severe natural phenomena (e.g., floods) on the North American continent and, when based on probabilistic considerations only, the potential for underestimating the severity of such events. This problem can be avoided by using a deterministic approach to assess design basis events. Such an approach will account for the practical physical limitations of natural phenomena that contribute to the severity of a given event.

This criterion is applicable to SRP Section 2.4.5 in that it specifies the hydrologic phenomenon (i.e., surge and seiche flooding) addressed in this section. In general terms, it also specifies the level of conservatism that must be used to assess the severity of the flood for the purpose of determining the design bases for structures, systems, and components important to safety.

Meeting the requirements of GDC 2 provides a level of assurance that structures, systems, and components important to safety have been designed to withstand the most severe flooding likely to occur as a result of storm surges or seiches.[11]

2. Section 100.10(c) of 10 CFR Part 100 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 hydrologic requirements of 10 CFR Part 100, the applicant's SAR must contain a description of the surface and subsurface hydrologic characteristics of the region and an analysis of the potential for flooding due to surges or seiches. This description must be sufficient to assess the acceptability of the site and the potential for a surge or seiche to influence the design of plant structures, systems, and components important to safety.

Meeting this requirement provides a level of assurance that plant structures, systems, and components important to safety have been designed to withstand the most severe flooding likely to occur as a result of storm surges or seiches.[12]

III. REVIEW PROCEDURES

The staff will evaluate the applicant's analysis, including all of the assumptions, techniques, and models used. If satisfied with their technical soundness and applicability to the problem, the staff's evaluation will be focused on the conservatism of parameters used by the applicant.

If not satisfied with the applicant's techniques, the staff will perform a simplified analysis of the controlling surge and seiche flooding level (coincident with wind-generated wave activity) and the resulting effects (static and dynamic) to the safety-related facilities using simplified calculational procedures or models with demonstrably conservative coefficients and assumptions. If the applicant's estimates of critical water level are no more than 5% less conservative than the staff's estimates,[1] staff concurrence will be stated. If the applicant's estimates are more than 5% less conservative, the analysis is repeated using more realistic techniques. The staff will develop a position based on the analysis; resolve, if possible, differences between the applicant's and staff's surge and seiche flooding design basis; and write the ~~SER~~ safety evaluation report (SER)[13] input accordingly. The specific review procedures are described below and outlined in Figure 2.4.5-1.

In general, the conservatism of the applicant's estimates of flood potential from surges and seiches is judged against the criteria indicated in subsection II above and as discussed in Regulatory Guide 1.59. If the site is not near a large body of water, the staff findings may be prepared a priori. Methods of the Corps of Engineers and National Oceanic and Atmospheric Administration (NOAA) (HUR 7-97 and amendments, Ref. 41)[14] are used to develop the critical probable maximum hurricane (PMH) parameters for the site. The Corps of Engineers model SURGE (or other verified models) may be used to estimate the maximum surge stillwater elevations at coastal sites. Coincident wind-generated waves and runup are estimated from publications by the Corps of Engineers (Ref. ~~32~~ 33). Reports of NOAA and the Corps of Engineers are used to estimate probable maximum wind fields over the Great Lakes. Models such as Platzmann's (Ref. 26),[15] or other verified models, may be used to estimate the maximum surge or seiche stillwater elevation for Great Lakes sites; coincident wind-generated waves and runup are estimated as above.

Two-dimensional models (Refs. ~~17, 28, and 44~~ 18, 29, and 45) include seiching effects. Seiching potential is evaluated using one-dimensional models by comparing the natural period of oscillation (resonance) of the water body with the estimated meteorologically induced wave periods. Resonance of a water body may be calculated by the methods presented in Reference ~~32~~ 33 or standard texts. Generally, a demonstration that the water body cannot generate or sustain waves of the required period for resonance is satisfactory to discuss the possibility of damaging seiching. Similarly, seismically induced seiching is precluded if the natural period of oscillation of the water body is dissimilar from the period of ~~precluded~~[16] seismic excitation. ~~Coordination with the Geosciences Branch (GB) to determine the controlling seismic parameters may be required.~~[17] If resonance is possible, the maximum seiche must be considered in the selection of the critical flood design bases.

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1 Based on the difference between normal water levels and the flood event.

The above reviews are performed only when applicable to the site or site region. Some items of review may be done on a generic basis.

For an application referencing a certified standard design, the reviewer verifies that historical data related to surges and seiches are consistent with the flood levels specified in the site parameter envelope for the certified design.

Requirements and procedures governing issuance of early site permits for approval of proposed sites for nuclear power facilities are specified in 10 CFR Part 52. Information required for such a permit includes a description of the site's hydrometeorological characteristics. For this type of permit, the procedures above should be followed.[18]

For standard design certification reviews under 10 CFR Part 52, the procedures above should be followed, as modified by the procedures in SRP Section 14.3 (proposed), to verify that the design set forth in the standard safety analysis report, including inspections, tests, analysis, and acceptance criteria (ITAAC), site interface requirements and combined license action items, meet the acceptance criteria given in subsection II. SRP Section 14.3 (proposed) contains procedures for the review of certified design material (CDM) for the standard design, including the site parameters, interface criteria, and ITAAC.[19]

IV. EVALUATION FINDINGS

For CP and early site permit[20] reviews, the findings will summarize the applicant's and staff's estimates of critical water level (including wind-generated wave levels) at the site. If the estimates meet the criteria (described in subsection II above), staff concurrence will be stated. If the applicant's estimates do not meet the criteria in subsection II above, and the proposed plant may be adversely affected, a statement requiring use of the staff's estimates for the design basis will be made. If the flood conditions do not constitute a design basis, the statement will so indicate.

For OL reviews of plants which have received detailed reviews during the CP review, the CP conclusions will be referenced. For review of a plant proposed for a site that has been granted an early site permit, the early site permit's conclusions regarding surge and seiche flooding will be referenced.[21] However, a review will be made to ~~assure~~ ensure that protection against the design basis water level conditions established in the CP or early site permit[22] review has been properly implemented. In addition, a review will be made of surge and seiche history since the CP or early site permit review ~~will be made~~.[23] Any new information or improvements in predictive models will be noted. If no detailed CP or early site permit[24] review was undertaken, this fact will be indicated in the OL or COL[25] findings.

If Regulatory Guide 1.59, Position 2, is elected by the applicant for protection, a statement describing lesser design bases will be included in the findings with the staff conclusion of adequacy.

A sample statement for an OL review follows:

> The design basis hurricane-induced high and low stillwater levels were established during the CP review at elevations ~~22.0 feet~~ 6.7-m (22.0-ft)[26] MSL and ~~-7.5 feet~~ -2.3-m (-7.5-ft)[27] MSL, respectively. These levels are based upon the estimated water levels, exclusive of wave action, that would occur during passages of a probable maximum hurricane (PMH) to the south and north, respectively, of the plant. At the request of the staff, the applicant analyzed the wave conditions on safety-related facilities that could accompany the ~~22 foot~~ 6.7-m (22-ft)[28] MSL surge level. The results of these analyses indicate the most severe wave action would be restricted to the canal, and that high ground levels would limit wave heights in the vicinity of exposed safety-related buildings, except the service water intake, to ~~1.6 feet~~ 0.5 m (1.6 ft).[29] For the intake, the applicant has estimated waves ~~3 feet~~ 1 m (3 ft)[30] high. The resulting wave runup levels were estimated to reach a maximum elevation of ~~28.3 feet~~ 8.6-m (28.3-ft)[31] MSL on the intake and ~~25.6 feet~~ 25.6-m (25.6-feet)[32] MSL on other exposed buildings.
>
> The staff concludes that the plant design meets the requirements of General Design Criterion 2 and 10 CFR Part 100 with respect to surge and seiche flooding. The bases for this conclusion is that the intake structure and the other exposed plant buildings are designed to withstand wave runup to ~~29.0 feet~~ 8.8-m (29.0-ft)[33] MSL and ~~26.0 feet~~ 7.9-m (26.0-ft)[34] MSL respectively, which are above the maximum calculated wave runup levels discussed above.

For an application referencing a certified plant design, the reviewer's findings should include a concluding statement similar to the following:

> Historical data for the proposed site are consistent with the flood levels identified in the site parameter envelope specified in the certified plant design documents.[35]

For design certification reviews, the findings will also summarize, to the extent that the review is not discussed in other safety evaluation report sections, the staff's evaluation of inspections, tests, analyses, and acceptance criteria (ITAAC), including design acceptance criteria (DAC), site interface requirements, and combined license action items that are relevant to this SRP section.[36]

V. IMPLEMENTATION

The following is intended to provide guidance to applicants and licensees regarding the NRC staff's plans for using this SRP section.

This SRP section will be used by the staff when performing safety evaluations of license applications submitted by applicants pursuant to 10 CFR 50 or 10 CFR 52.[37] Except in those cases in which the applicant proposes an acceptable alternative method for complying with specified portions of the Commission's regulations, the method described herein will be used by the staff in its evaluation of conformance with Commission regulations.

The provisions of this SRP section apply to reviews of applications docketed six months or more after the date of issuance of this SRP section.[38]

Implementation schedules for conformance to parts of the method discussed herein are contained in the referenced regulatory guides.

VI. REFERENCES

1. 10 CFR Part 50, Appendix A, General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena."

2. 10 CFR Part 52, "Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants."[39]

3. 10 CFR Part 100, "Reactor Site Criteria."

4. G. Birkhoff, "Hydrodynamics; a Study in Logic, Fact and Similitude," Princeton University Press (1960).

5. B. R. Bodine, "Storm Surge on the Open Coast: Fundamentals and Simplified Prediction," Technical Memorandum No. 35, Corps of Engineers, Coastal Engineering Research Center (1971).

6. C. L. Bretschneider, "Hurricane Surge Predictions for Chesapeake Bay," Miscellaneous Paper 359, U.S. Army Beach Erosion Board (1959).

7. C. L. Bretschneider and J. I. Collins, "Prediction of Hurricane Surge; An Investigation for Corpus Christi, Texas and Vicinity," NESCO Technical Report No. SN120, prepared by National Engineering Science Co. for U.S. Army Engineer District, Galveston (1963).

8. R. Dorrenstein, "Wave Setup on a Beach," NHRP Report No. 50, Proc. of the Second Technical Conference on Hurricanes, U.S. Weather Bureau, pp. 230241 (1962).

9. G. E. Dunn and B. I. Miller, "Atlantic Hurricanes," Louisiana State University Press, Revised Edition (1964).

10 J. C. Fairchild, "Model Study of Wave Set-Up Induced by Hurricane Waves at Narragansett Pier, Rhode Island," U.S. Army Beach Erosion Board Bulletin, Vol. 12, pp. 9-20 (1958).

11. H. Fortak, "Concerning the General Vertically Averaged Hydrodynamic Equations with Respect to Basic Storm Surge Equations," Report No. 51, National Hurricane Research Project, U.S. Weather Bureau, p. 70 (1962).

12. J. C. Freeman, Jr., L. Baer, and C. H. Jung, "The Bathystrophic Storm Tide," Jour. of Marine Research, Vol. 16, No. 1 (1957).

13. H. E. Graham and D. E. Nunn, "Meteorological Considerations Pertinent to Standard Project Hurricane, Atlantic and Gulf Coasts of the United States," Report No. 33, National Hurricane Research Project, U.S. Weather Bureau and Corps of Engineers (1959).

14. D. L. Harris, "The Effect of a Moving Pressure Disturbance on the Water Level in a Lake," Meteorological Monographs, Vol. 2, No. 10, American Meteorological Society, pp. 46-57 (1957).

15. D. L. Harris, "Characteristics of the Hurricane Storm Surge," Technical Paper No. 48, U.S. Department of Commerce (1963).

16. D. L. Harris, "A Critical Survey of the Storm Surge Protection Problem," The Eleventh Symposium on Tsunami and Storm Surges, pp. 47-65 (1967).

17. B. Haurwitz, "The Slope of Lake Surfaces Under Variable Wind Stresses," Technical Memorandum No. 25, U.S. Army Beach Erosion Board (1951).

18. J. J. Leendertse, "Aspects of a Computational Model for Long-Period Water Wave Propagation," Memorandum RM-5294-PR, prepared for United States Air Force, Project Rand (1967).

19. M. S. Longuet-Higgins and R. W. Stewart, "Radiation Stress and Mass Transport in Gravity Waves, with Application to 'Surf Beat,'" Jour. of Fluid Mechanics, Vol. 13, pp. 481-504 (1962).

20. M. S. Longuet-Higgins and R. W. Stewart, "A Note on Wave Set-Up," Jour. of Marine Research, Vol. 21, pp. 4-10 (1963).

21. M. S. Longuet-Higgins and R. W. Stewart, "Radiation Stress in Water Waves; a Physical Discussion, with Application," Deep-Sea Research, Vol. 11, pp. 529-562 (1964).

22. C. Marinos and J. W. Woodward, "Estimation of Hurricane Surge Hydrographs,' Jour. Waterways and Harbors Division, Proc. Am. Soc. Civil Engineers, Vol. 94, No. WW2, pp. 189-216 (1968).

23. M. Miyazaki, "A Numerical Computation of the Storm Surge of Hurricane Carla 1961 in the Gulf of Mexico," Technical Report No. 10, Dept. of Geophysical Sciences (1963).

24. V. A. Myers, "Characteristics of United States Hurricanes Pertinent to Levee Design for Lake Okeechobee, Florida," Hydrometeorological Report 32, U.S. Weather Bureau (1954).

25. G. W. Platzmann, "A Numerical Computation of the Surge of 26 June 1954 on Lake Michigan," Geophysica, Vol. 6 (1958).

26. G. W. Platzmann, "The Dynamical Prediction of Wind Tides on Lake Erie," Technical Rpt. No. 7, Contr. CWB-9768, Dept. of Geophysical Sciences, University of Chicago (1963).

27. L. Prandtl, "The Mechanics of Viscous Fluids," in "Aerodynamic Theory," W. F. Durand, Ed., Springer-Verlag, Berlin, Volume III, Div. 6 (1935).

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29. R. O. Reid and B. R. Bodine, "Numerical Model for Storm Surges in Galveston Bay," Jour. Waterways and Harbors Division, Proc. Am. Soc. Civil Engineers, Vol 94, No. WW1, pp. 33-57 (1968).

30. T. Saville, Jr., "Experimental Determination of Wave Set-Up," NHRP Report No. 50, Proc. of the Second Technical Conference on Hurricanes, pp. 242252 (1962).

31. T. Saville, E. McClendon, and A. Cochran, "Freeboard Allowances for Waves in Inland Reservoirs," Jour. Waterways and Harbors Division, Proc. Am. Soc. Civil Engineers, Vol. 88, No. WW2, pp. 93-124 (1962).

32. "Waves in Inland Reservoirs: Summary Report on CWI Projects CW-164 and CW-165," Technical Memorandum No. 132, U.S. Army Beach Erosion Board (1962).

33. "Shore Protection Planning and Design," Technical Report No. 4, Third Edition, Corps of Engineers Coastal Engineering Research Center (1966), and "Shore Protection Manual" (1974).

34. "Policies and Procedures Pertaining to Determination of Spillway Capacities and Freeboard Allowances for Dams," Engineer Circular No. 1110-2-27, U.S. Army Corps of Engineers (1966).

35. "Computation of Freeboard Allowances for Waves in Reservoirs," Engineer Technical Letter No. 1110-2-8, U.S. Army Corps of Engineers (1966).

36. W. C. Van Dorn, "Wind Stress on an Artificial Pond," Jour. of Marine Research, Vol. 12 (1953).

37. T. Von Karman, "Mechanische Ahnlickeit und Turbulenz (Mechanical Similitude and Turbulence)," Proc. of the 3rd International Congress for Applied Mechanics, Stockholm, Vol. I, pp. 85-93 (1920).

38. P. Weylander, "Numerical Prediction of Storm Surges," Advances in Geophysics, Vol. 8, pp. 316-379 (1961).

39. Regulatory Guide 1.29, "Seismic Design Classification."

40. Regulatory Guide 1.59, "Design Basis Floods for Nuclear Power Plants."

41. "Interim Report - Meteorological Characteristics of the Probable Maximum Hurricane, Atlantic and Gulf Coasts of the United States," U.S. Weather Bureau Memorandum HUR 7-97, and HUR-97A (1968).

42. U.S. Atomic Energy Commission, Crystal River Nuclear Power Plant Docket No. 50-302, letter to Florida Power Corporation requesting additional information regarding hydrologic engineering and hurricane surge verification, October 12, 1973.

43. Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants."

44. ANSI N170, "Standards for Determining Design Basis Flooding at Power Reactor Sites" (1976).

45. Y. J. Tsai and Y. C. Chang, "Prediction and Verification of Storm Surges in Lake Ontario and Lake Erie," 17th Conference on Great Lakes Research, International Association for Great Lakes Research, August 12-14, 1974, Hamilton, Ontario.

46. Regulatory Guide 1.102, "Flood Protection for Nuclear Power Plants."

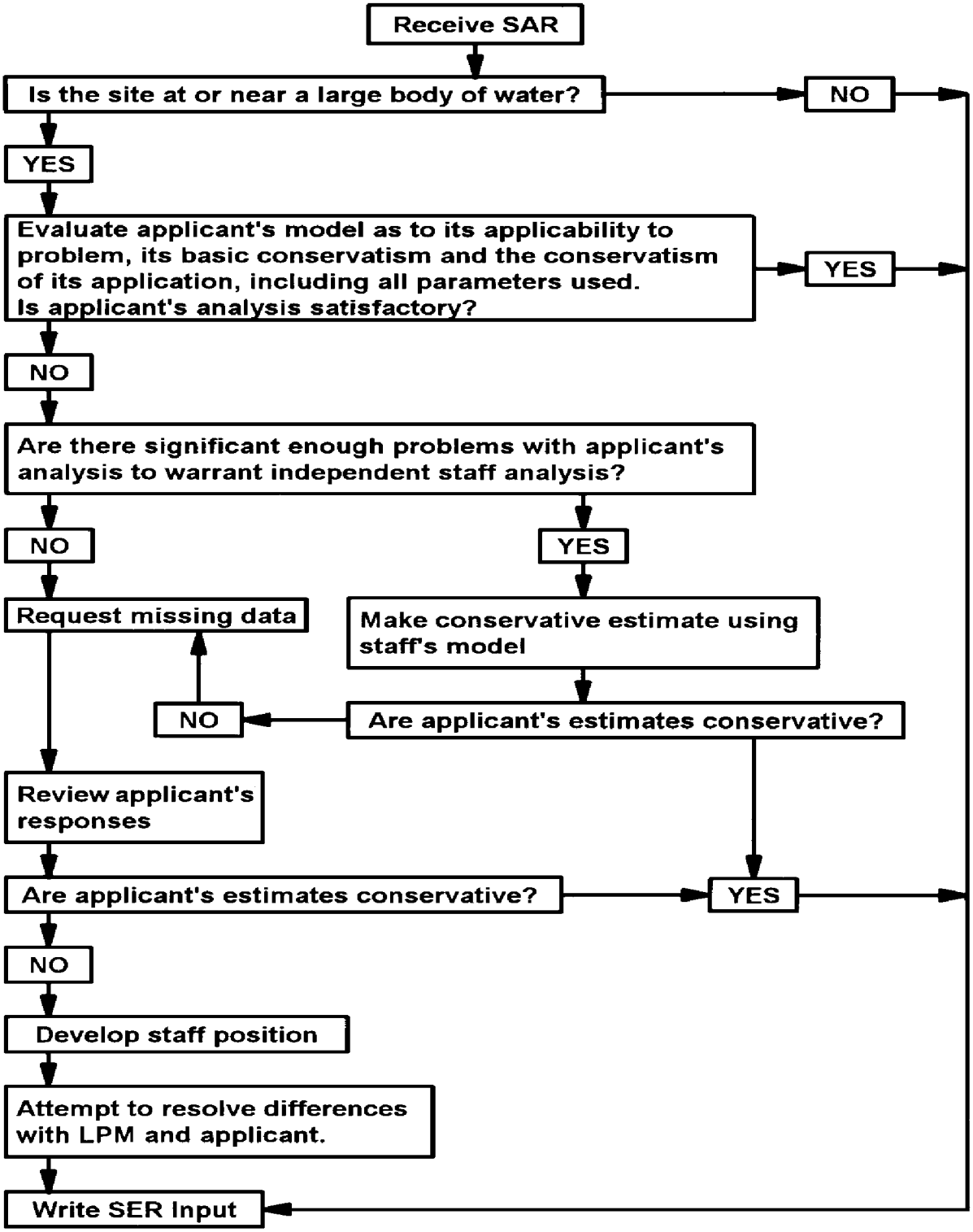
47. J. J. Dronkers, "Tidal Computations in Rivers and Coastal Waters," North-Holland Publishing Company, Amsterdam Publishers, John Wiley and Sons, Inc., New York, 1964.

48. F. D. Masch et al., "Analysis of Hurricane Tides at Padre Island, Texas," Proceedings, 12th Coastal Engineering Conference, American Society of Civil Engineers, Vol. III, Chapter 123, pp. 2031-2050, September 1970.

49. C. Taylor and J. M. David, "A Finite Element Model of Tides in Estuaries," International Symposium on Finite Element Methods in Flow Problems, Swansea, U.K., January 1974.

50. Regulatory Guide 1.125, "Physical Models for Design and Operation of Hydraulic Structures and Systems for Nuclear Power Plants."

Figure 2.4.5-1
STANDARD REVIEW PLAN SECTION 2.4.5



SRP Draft Section 2.4.5
Attachment A - Proposed Changes in Order of Occurrence

Item numbers in the following table correspond to superscript numbers in the redline/strikeout copy of the draft SRP section.

Item	Source	Description
1.	Current PRB name and abbreviation	Changed PRB to Civil Engineering and Geosciences Branch (ECGB).
2.	Integrated Impact No. 391	Noted site parameter envelope for standard design certification.
3.	SRP-UDP format item	Added "Review Interfaces" to AREAS OF REVIEW.
4.	Integrated Impact No. 391	Included review interfaces to new SRP Section 2.3.6 and to SRP Section 2.4.2 for review of DC site parameter envelope.
5.	Current PRB abbreviation	Changed PRB to ECGB.
6.	Editorial	Defined "SRP" as "Standard Review Plan."
7.	Editorial correction	Changed "assure" to "ensure" (global change for this section).
8.	Editorial	Renumbering references necessitated by addition of new Reference 2 (global change for this section).
9.	Develop technical rationale	"Technical Rationale" added to ACCEPTANCE CRITERIA and presented in paragraph form.
10.	Develop technical rationale	Added lead-in sentence for "Technical Rationale."
11.	Develop technical rationale	Added technical rationale for GDC 2.
12.	Develop technical rationale	Added technical rationale for 10 CFR Part 100.
13.	Editorial	Defined "SER" as "safety evaluation report."
14.	Editorial	Added reference number to assist reviewer in identifying the correct guidance document.
15.	Editorial	Added reference number to assist reviewer in identifying the correct guidance document.
16.	Editorial	Deleted second "precluded" for clarification.
17.	Current ECGB review responsibility	Deleted sentence because the Geosciences Branch is now a part of ECGB.
18.	Integrated Impact No. 391	Added paragraphs to describe reviews for early site permits and applications referencing a certified design.
19.	SRP-UDP Guidance, Implementation of 10 CFR 52	Added standard paragraph to address application of Review Procedures in design certification reviews.
20.	Integrated Impact No. 391	Added reference to early site reviews.
21.	Integrated Impact No. 391	Added guidance for a review that references an early site permit.

Item	Source	Description
22.	Integrated Impact No. 391	Added reference to an early site permit review.
23.	Integrated Impact No. 391, Editorial	Added reference an early site permit review and reordered sentence for clarity.
24.	Integrated Impact No. 391	Added reference to an early site permit review.
25.	SRP-UDP format item	Added reference a COL review.
26.	Conversion to SI units	Converted 22.0 ft to 6.7 m.
27.	Conversion to SI units	Converted –7.5 ft to –2.3 m.
28.	Conversion to SI units	Converted 22 ft to 6.7 m.
29.	Conversion to SI units	Converted 1.6 ft to 0.5 m.
30.	Conversion to SI units	Converted 3 ft to 1 m.
31.	Conversion to SI units	Converted 28.3 ft to 8.6 m.
32.	Conversion to SI units	Converted 25.6 ft to 7.8 m.
33.	Conversion to SI units	Converted 29.0 ft to 8.8 m.
34.	Conversion to SI units	Converted 26.0 ft to 7.9 m.
35.	Integrated Impact No. 391	Added requirement for a statement regarding the site parameter envelope to EVALUATION FINDINGS.
36.	SRP-UDP Format Item, Implement 10 CFR 52 Related Changes	To address design certification reviews a new paragraph was added to the end of the Evaluation Findings. This paragraph addresses design certification specific items including ITAAC, DAC, site interface requirements, and combined license action items.
37.	SRP-UDP Guidance, Implementation of 10 CFR 52	Added standard sentence to address application of the SRP section to reviews of applications filed under 10 CFR Part 52, as well as Part 50.
38.	SRP-UDP Guidance	Added standard paragraph to indicate applicability of this section to reviews of future applications.
39.	Integrated Impact No. 391	Added reference to 10 CFR Part 52.

SRP Draft Section 2.4.5

Attachment B - Cross Reference of Integrated Impacts

Integrated Impact No.	Issue	SRP Subsections Affected
391	10 CFR Part 52 specifies that applications for standard design certifications must contain the site parameters postulated for the design, and an analysis and evaluation of the design in terms of such parameters. Integrated Impact No. 391 states that consideration should be given to (1) developing a new SRP section for review of the site parameter envelope,... and (2) revising the existing SRP sections, including SRP Section 2.4.5, for review of site-specific parameters to reflect the site parameter-related requirements of 10 CFR Part 52. Regarding consideration (1), action is proceeding on development of the new SRP section 2.3.6. Regarding consideration (2), the revision of SRP Section 2.4.5 addresses the appropriate use of a site parameter envelope.	Subsection I, AREAS OF REVIEW, first paragraph and added REVIEW INTERFACES Subsection III, REVIEW PROCEDURES, last two paragraphs Subsection IV, EVALUATION FINDINGS, first and second paragraphs Subsection IV, EVALUATION FINDINGS, new finding paragraph Subsection VI, REFERENCES, Reference 2
642	Consider performing a detailed side-by-side comparison between the cited and latest version of this standard to allow SRP reviewers to use the latest version.	No changes to SRP Section, no comparison conducted based upon ongoing work by the PRB.