

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Agency /Affiliation:	USACOE, Sacramento	Address : Geotechnical and Environmental Engineering Branch	By: Letter	Date: 10/28/2008
Sent By: John R. Hess, PE		E-mail: Not Provided		

Comment Number	Agency / Affiliation	Comment	Response
1	USACOE General Comments:	<p>General Comments:</p> <p>1) Due to a number of issues with the proposed criteria, CESPCK cannot recommend use of the criteria as reported in the 22 August 2008 Draft. With significant revision and refinement, it is believed this criteria could be acceptable</p>	Acknowledged, although CESPCK is not being asked to use the interim criteria.
2	USACOE General Comments:	2) We recommend quick development of State-CESPCK-HEC team, with active HQUSACE involvement, and concurrent External Peer Review, to develop agreeable interim criteria. Criteria must be defensible and must provide appropriate public risk protection. This team could include representatives from DWR, Local Levee Owners and Others.	DWR generally agrees and supports a collaborative process for further interim criteria refinements. Such collaboration would include others beside the Corps and DWR. Meanwhile, due to the pressing need for criteria for ongoing levee designs, the next version of the interim criteria is being issued without the benefit of that process.
3	USACOE General Comments:	3) Any waiver of Corps criteria must be approved by HQUSACE. Having HQUSACE as an active participant in the criteria development team will assure HQUSACE acceptance.	It is unlikely that a waiver would be needed or requested.
4	USACOE General Comments:	4) It seems unlikely that the proposed criteria will only be used as “interim guidance”. It’s better to craft criteria all parties agree to from the start; criteria that is fully defensible, robust and results in USACE Project Crediting. Robust criteria should be the emphasis, since it’s far better to do levee remediation and improvement right the first time, than to build levee improvements that will likely require additional subsequent remediation.	Many aspects of the interim criteria may last for many years to come – others may be modified within a couple of years. Ideally, it would be preferable to offer nothing at this time and to develop, through a collaborative process, robust and highly defensible criteria. However, local agencies and DWR need criteria for levee designs now. Waiting is not a feasible option.

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
5	USACOE General Comments:	5) Interim Criteria should include datum, seismic and resilience guidance as well.	Seismic guidance is covered in the interim criteria, although it may be appropriate to provide even more specific seismic guidance. Datum and resilience guidance are appropriate topics to consider addressing, if they are not adequately covered through existing Corps guidance, as additional design criteria are developed.
6	USACOE General Comments:	6) The USACE Comprehensive Study of 2002 (and updates) must be considered as planning guidance only and not be used in any manner for design purposes.	Where better hydrology and modeling is available, the interim criteria require its use. Where the Comprehensive Study hydrology and modeling is the best available information, then there is no choice but to use it or to delay needed work for years.
7	USACOE General Comments:	7) It is my view that the “FEMA Approach” should not be used for future levee design efforts, even as interim guidance. I believe HQ and District will agree. The “FEMA Approach” and the “Corps Approach” are not equivalent, and yet they are both offered as if they are equivalent. It seems better to have one consistent approach that is more likely to be the approach of the future. A robust and resilient levee system should be inherent in levee guidance.	Some engineers would concur with this view and many others would disagree. Until some of the important details of the Corps Approach are worked out, documented, and broadly accepted in the engineering community, it may be premature to make it the only acceptable approach.
8	USACOE General Comments:	8) The proposed criteria appear to mix FEMA certification with design. A better separation should be developed between FEMA certification for the flood insurance program, and levee technical design.	The purpose of the interim criteria is to set the bar for achieving 200-year protection where a levee is involved. The designer is always free to do better and to provide more protection. But designers need to know where the bar is, in order to know whether they will achieve their goal.
9	USACOE General Comments:	9) For the “Corps Approach” (which is better retitled), use of 90% assurance is inherent when designing for the 1% chance event. It is not at all clear that 90% is an appropriate number for say, designing for the 0.5% chance event.	Acknowledged. Further work is needed to confirm or adjust the assurance level for the 200-year event. The Corps has developed its procedure for certification, examining only one level of protection – the FEMA 1% event; and that comparison between the Corps Approach and a deterministic approach with freeboard was not based on Central Valley stream experience. But there are other needs, such as certification for 200-year protection in the Central Valley per California law, that remain unaddressed under the Corps Approach. In

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
			the absence of anything definitive from the Corps on this point, it makes sense to use the same procedure employed by the Corps for the 1% event and apply it for the 200-year interim criteria. This is also consistent with the concept that the 200-year standard was adopted for the Central Valley’s urban and urbanizing areas because the residual risk for 100-year protection is unacceptably high and should be reduced by at least 50%. This is only achieved by applying a consistent assurance level for the two events.
10	USACOE General Comments:	10) The use of the 1957 Profile may be an outmoded concept, and should be evaluated for applicability to today’s levee hydrologic conditions and situation.	Since the 1957 profile is the basis for the nonfederal assurances, it is unlikely to ever become inapplicable.
11	USACOE General Comments:	11) What does DWR plan to do with Title 23 in the State Water Code?	The design criteria for the 200-year standard will likely ultimately be put into regulation (Title 23 of the California Code of Regulations). The existing Title 23 regulations may be modified on some aspects of levee design as part of this process.
1	USACOE Specific Comments: Geotech – John Hess Comments:	Specific Comments: 1) Line and page numbers have been added to the document to assist with making comments. Editorial comments should be addressed separately, as there are some editorials. Many of these comments apply to several similar remarks on different pages.	Acknowledged.
2	USACOE Specific Comments:	2) Page 1, line 4 – Suggest adding list of references, including Corps criteria documents, FEMA CFRs,...	Agreed. The interim criteria are now modified to include a list of references.
3	USACOE Specific Comments:	3) Page 1, line 6 – Suggest adding definition for AEP.	This is not necessary, since the document does not use this term.
4	USACOE Specific Comments:	4) Page 1, line 25 – Comp Study is definitely NOT recommended by Corps for design. It is purely a planning study and should never be used as more. Statement on the	See previous response to this same comment.

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

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		assumptions in Comp Study should be added to explain why it should not be used in any manner for design.	
5	USACOE Specific Comments:	5) Page 3, line 27 – Corps levee design standards are well established, but not necessarily well understood. Replace “evolving and not completely established at this time” with “changing”. This is additional reason to use “robust” criteria.	Acknowledged. This statement is changed to “...some important aspects are not established in writing at this time.”
6	USACOE Specific Comments:	6) Page 4, line 8 – Design and certification are two different processes, and not the same thing.	Agreed, except for the common situation where an engineer is designing a levee for certification.
7	USACOE Specific Comments:	7) Page 4, line 14 – Corps design policy is no upstream failures; but it does need to be presented in detail in Corps guidance. Upstream failures have been incorporated recently into at least one project H&H model to produce conservative, supportable “damages” in flood studies by Corps.	Acknowledged. DWR is unable to find the Corps’ written policy stating that no upstream failures are considered for levee design and the rationale for that policy. DWR is also aware that the Corps uses levee fragility curves to incorporate upstream levee failures in planning studies to ensure that benefits of proposed flood risk reduction projects are not overstated. This is one reason for the existing dichotomy between <i>reported performance</i> of projects authorized from feasibility studies and <i>reported and certified performance</i> of projects after design.

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8	USACOE Specific Comments:	8) Page 4, line 16 – Guidance on urban vs non-urban Safety Factors may be coming; however, this sort of guidance is not in DWR guidance nor is it really fully included in the Proposed Interim Guidance either.	Acknowledged. The interim criteria are only for Urban and Urbanizing Area applications.

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

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9	USACOE Specific Comments:	9) Page 4, line 46 – HQUSACE has stated that use of 90% assurance for 0.5% chance event may not be appropriate. Analysis is needed to develop these criteria.	See previous response to this same comment.
10	USACOE Specific Comments:	10) Page 4, line 51 – levee failure due to slope instability is quite rare in the Central Valley.	It is unlikely that this statement can be verified. There have been many slope failures that were remediated before levee failure occurred. However, there are also some important levee failures which were unobserved and it is not possible to say that they were not the result of slope instability. If the point of the comment is that seepage problems are more prevalent than slope instability, then that can be agreed upon.
11	USACOE Specific Comments:	11) Page 5, line 45 – Incorporation of uncertainty in analysis is likely simpler than portrayed, and definitely less of a problem than acquiring all of the geotechnical data required for levee design. Suggest we get past the perceptions of “this is harder” to embrace superior technology.	It is possible to incorporate uncertainty without a lot of additional work. However, when this is done, it is usually done in a simplistic matter that does not truly reflect, capture, and properly quantify the important uncertainties. For instance, let’s take storm centerings – hydrology that reflects a probabilistic approach to storm centerings in the Central Valley has not yet been done. So the current state of practice is to simply use the worst case storm centering and, if uncertainty is being quantified for storm centerings, set an uncertainty distribution around that worst case centering.
12	USACOE Specific Comments:	12) Page 6, line 7 – Let’s drop the “in absence of clear guidance from the Federal Government ...” and replace with “due to changing state of the practice, the State needs....”	This sentence is now modified to partly address this comment. It now states: “Due to the changing state of practice and the absence of specific guidance from the federal government on some...”
13	USACOE Specific Comments:	13) Page 6, line 34 – This is conventional technical stuff better left to existing criteria documents. Drop from this document.	Acknowledged, however this was added for the second draft by request of one commenter and may be helpful to some readers.
14	USACOE Specific Comments:	14) Page 8, line 21 – What is critical about the next two years? These criteria will likely be used far longer than that.	Within the next two years, RD 784’s levee designs and SAFCA’s designs for Natomas levees will essentially be complete. West Sacramento’s designs for numerous levee reaches should be complete. RD 17’s levee designs should be complete. Designs for some levee reaches protecting Yuba City should be complete. Marysville levee improvements should be in construction. Other urban areas also can

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			be expected to have significant levee design work underway by that time. Some of these designs will be for the 1% event in order to achieve accreditation by FEMA. Others will be for the 200-year standard. It is helpful to local agencies and the State to avoid expensive add-ons years later, when a little more investment could be made at the same time as work is done for FEMA accreditation.
15	USACOE Specific Comments:	15) Page 8, line 24 – Corps could not adopt this approach without extensive discussion including HQUSACE. The statement about “reduced safety factors” seems unclear. Since Corps project design criteria would require use of 90% assurance for a design water surface elevation, this “FEMA Approach” seems problematic with use of specific Corps projects.	Although it is desirable to reconcile State and federal criteria, and significant effort will be spent to do so, in the end the Corps may use whatever it wants to use for its projects.
16	USACOE Specific Comments:	16) Page 8, line 35 – In light of current changing state of the practice nationwide, suggest adoption of a “robust” set of criteria, along the lines of “Corps Approach”.	See previous response to a similar comment.
17	USACOE Specific Comments:	17) Page 9, line 15 – The Comp Study should be used for planning guidance only, never design-level activities.	See previous response to a similar comment.
18	USACOE Specific Comments:	18) Page 9, line 27 – The use of the 1957 Profile for the Central Valley Levee System should be reviewed, possibly by an outside party like National Science Foundation, to determine if this standard should continue in use.	See previous response to a similar comment.
19	USACOE Specific Comments:	19) Page 9, line 34 – Especially considering some of the other language in this document, how would one defend a relatively arbitrary use of an added one foot to account for some unknown unconservatism in the Comp Study. This seems impossible to defend technically but perhaps not good practice for a number of reasons.	DWR suggests <i>up to</i> one foot based on judgment, consideration of the physical limitations of the regional flood protection system, and a sensitivity analysis. Consequently, local agencies are forewarned that the results of new hydrology currently under development could adversely affect the level of protection that they are targeting today – triggering additional work in the future, perhaps when DWR is less able to provide financial assistance for such work.

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

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20	USACOE Specific Comments:	20) Page 9, line 46 – This practice, in contrast to trying to make something out of a Comp Study planning effort, seems where the emphasis should be placed. And major funding should be directed to developing a real set of H&H information for the Central Valley.	DWR has contracted with the Corps for this activity. This is a multi-year effort that will be completed <i>after</i> many ongoing levee design and construction efforts.
21	USACOE Specific Comments:	21) Page 11, line 10 – Use of Comp Study in this way is not supportable.	See previous response to a similar comment.
22	USACOE Specific Comments:	22) Page 13, line 19 – The two alternative proposals do not seem to be equivalent. A single robust methodology should be developed.	Agreed. This is what DWR advocates in the longer term, as stated at the end of the interim criteria.
1	USACOE Specific Comments Geotech – Mary Perlea Comments:	<p>Specific Comments Geotech – Mary Perlea Comments:</p> <p>1) Par. 2 Background. This paragraph is pretty confusing. It said that the Corps criteria should be followed but further it explains that the Corps criteria are not clear and confusing. Since FEMA certification can be made by the State without the Corps involvement, they should just enumerate the FEMA criteria. The State should use the Corps criteria only if they want to get any credits for their work but not for certification.</p>	The Corps Approach has merit. DWR does not want to disregard it or exclude those who want to use it. It is not necessary for nonfederal levee work to follow Corps criteria in order to get federal credit for the work. It is expected that the Corps would measure the benefits of the work using its own criteria and determine federal credit accordingly.
2	USACOE Specific Comments:	2) Par. 4 Design Principles: Is flood fighting considered in design or not? The Corps does not consider flood fighting part of design.	No. Nothing in the interim criteria changes this, except that the interim criteria are being modified to point out the need for features that support robust flood fight capabilities and procedures for many reasons, including the fact that it is prohibitively expensive to know foundation conditions perfectly well and therefore we will always have some uncertainty as to how well the levee and its seepage control features will perform when tested near the design level.
3	USACOE	3) Par. 5. Proposed Interim Urban Levee Design	No. The interim criteria apply only to levees protecting urban and

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	Specific Comments:	Criteria. This paragraph sets the criteria for non-urban levee also. Should the paragraph title not be changed to include non-urban levees too?	urbanizing areas.
4	USACOE Specific Comments:	4) Par. 5, Geotechnical design criteria. The stability of the waterside slope should be also analyzed for rapid drawdown (factors of safety of 1.1 –for major rivers, and 1 for tributaries), and also for an interim river stage (factor of safety at least 1.3) even if this case is not more required in the Levee manual. A lot of levees within the Sacramento Valley had numerous slides on the waterside slope due to an interim flood stage in 2005-2006.	The interim criteria use current Corps levee design criteria except where modifications are offered. The interim criteria are now modified to emphasize this point by identifying additional Corps reference documents. In addition, the interim criteria are now modified to include some additional design details that are entirely consistent with Corps guidance, as an aid to the reader.
5	USACOE Specific Comments:	5) Par. 5, Geotechnical design criteria. The criteria for the seepage gradient at the bottom of the ditches running parallel to the levee landside toes should be set also, if the ditch is less than 150 feet from the levee. Numerous levees in Sacramento and San Joaquin basin and their tributaries have ditches up to 150 feet from the levee toes reducing the blanket thickness and showing intense sand boiling activities even for lower river stages. There are some confusion considering the gradients at the bottom of these ditches, I found SAFCA using gradients of 0.5 if the ditch is at the landside toe and 0.8 if the ditch is 150 feet from the landside toe, with interpolated gradients if the ditch is within 150 feet. This needs to be addressed in the State’s criteria also.	This is an especially helpful comment. The interim criteria are now modified to clarify that the Corps’ procedure (EM 1110-2-1913, Section V, paragraph 8-16) for allowing interpolation of allowable exit gradients between the levee toe and 150 feet from the levee toe is acceptable
6	USACOE Specific Comments:	6) Par. 5, Geotechnical design criteria. The criteria should include also the maximum gradients at the levee toe and seepage berm toe, in case the seepage is controlled by berms. The maximum gradient at the levee toe for the DWSE should be 0.5, even if a seepage berm is the seepage control, and the gradient at the berm toe	Agreed. The interim criteria state that if the gradient is greater than 0.5 at the levee toe, a seepage berm is required. Although existing Corps guidance already calls for 0.5 maximum gradient through the seepage berm at the levee toe, and the interim criteria do not change that requirement, for clarity the interim criteria are now modified to state the Corps guidance on this point

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
		should not exceed 0.8.	
1	USACOE Specific Comments: H&H – Ethan Thompson Comments	<p>Specific Comments, H&H – Ethan Thompson Comments:</p> <p>1) Pg. 4 - It indicates the Corps’ procedure for design and certification. The procedure used in the Natomas AR designation is <u>not</u> a design procedure.</p>	If an engineer designs a levee to be certifiable, then it is a design procedure.
2	USACOE Specific Comments:	2) Pg. 8 - It indicates a sensitivity analysis can be useful for increased streamflows. Is this optional? Not very strong language. What is the sensitivity analysis supposed to consider? Not clear.	Yes, it is optional. The sensitivity analysis is supposed to consider variables that could affect the design water surface, such as different storm centerings, topographic and bathymetric uncertainty, channel roughness variability, sea level rise uncertainty, and climate change impacts to hydrology.
3	USACOE Specific Comments:	3) Pg. 8 - What is the basis for reduced safety factors for the top of levee? The levee should be just as reliable at any point on the levee. Please address.	Disagree. The factor of safety reduces as the loading increases (e.g., the factor of safety when the water surface is at the midpoint of a moderately high levee should be much greater than 1.4). Since a factor of safety of 1.4 corresponds to the DWSE, it is acceptable to allow some reduction of the factor of safety for water at the hydraulic top of levee.
4	USACOE Specific Comments:	4) Pg. 9 - The Sacramento-San Joaquin Comprehensive Study hydraulic models were not developed to the necessary detail for design of levee features. The lack of a better model of sufficient detail for design does not constitute the use of the Comp study models. Several reaches contained in the models lacked appropriate hydrology. The models served better for planning level decisions and as a hydrologic routing model. The use of specific water surface profiles from the Comp study	See previous response to a similar comment.

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

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		models for levee design is completely inappropriate. Because the use of the Comp Study models is given as an option, there will be no reason or incentive to create better or newer models for design. Please address.	
5	USACOE Specific Comments:	5) Pg. 9. What constitutes an updated Comp Study model? Who decides if a model is properly “updated”?	MBK has developed updated models, shared their work with the Corps and DWR, and made it available to others. No formal system of controls exists; this is a current shortcoming that needs to be rectified.
6	USACOE Specific Comments:	6) Pg. 9. How does one consider both 1955/57 top of levee and 200-yr + 3’ freeboard. Is the greater of those used? It is not clear. Please address.	The top of levee associated with the 1955/57 profiles is applicable only to non-urban levees. The 200-year plus 3 feet of freeboard applies only to urban and urbanizing area levees.
7	USACOE Specific Comments:	7) Pg. 10. It is better for design purposes to assume no failure for any upstream levees, including non-urban levees.	Agreed. That is the proposed approach. Although some may argue that it is not <i>better</i> , it is without doubt <i>conservative</i> .
8	USACOE Specific Comments:	8) Pg.10. The use of 1 foot requirement appears arbitrary. This could be very low in some locations. Elsewhere it says DWR to provide guidance on climate change and here it includes it in the 1’ catchall for any uncertainty. Is 1 foot to be used in all cases? Who decides what is necessary?	DWR suggests adding <i>up to</i> an additional foot, based on judgment, consideration of the physical limitations of the upstream and regional flood protection system, and a sensitivity analysis. It is the local agency’s decision.
9	USACOE Specific Comments:	9) Pg. 10. It indicates in some cases new hydrologic / hydraulic data will need to be developed. Who makes this decision? If Comp study models are allowed to be used, there will be little incentive to produce newer/better models. Please address.	The Comprehensive Study does not cover all urban areas, so other models are needed. New hydrology and hydraulic models are already under development by the Corps and DWR.
10	USACOE Specific Comments:	10) Pg. 12. The use of stage-discharge/flow-frequency curves with appropriate hydrologic and hydraulic uncertainty may be more appropriate than stage-frequency depending upon location within the system. It should not just mention the used of stage-frequency.	Agreed. However, for design, stage with a specified frequency is required, whether found from a stage-frequency curve or from flow-frequency transformed with a rating curve. The interim criteria are now modified to reflect this.

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

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11	USACOE Specific Comments:	11) Pg. 15. The goal may be to have something that can be used right away, however, the interim approach will lead to much frustration if it is not properly understood that future studies/findings and change in criteria could change what a certain area claims in regards to level of protection. There needs to be a caveats and warnings about this. Worse yet, this interim approach may lead to a false sense of security, because inappropriate information is used.	The caveats are already included. This is the reason that up to an additional foot should be considered for the DWSE, based on judgment and a sensitivity analysis. It is important to note that criteria and hydrology will continue to change for the foreseeable future, so it should be expected that levels of protection certified at any point in time will be subject to change at some later time.

Agency /Affiliation:	California Central Valley Flood Control Association	Address : 910 K Street, Suite 310 Sacramento, CA 95814	By: Letter	Date: 10/30/2008
Sent By: Melinda Terry, Executive Director		E-mail: Not Provided		

Comment Number	Agency / Affiliation	Comment	Response
	CCVFCA	Opening/Introduction: Letter is written on behalf of RD 827, RD 999, RD 1000, RD 2068, RD 2103, American River Flood Control Agency, Sacramento Area Flood Control Agency, City of Marysville, City of Sacramento, City of Wheatland, Sutter Butte Flood Control Agency, Three Rivers Levee	Agreed, except that in general the interim criteria are not used for determining eligibility for funding.

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

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		<p>Improvement Authority, City of West Sacramento, and the West Sacramento Area Flood Control Agency.</p> <p>CCVFCA greatly appreciates the opportunity to have input into this critically important document. The CCVFCA understands that these criteria, once finalized, will be used by DWR to establish eligibility requirements for funding local and regional flood risk reduction projects under the State’s Early Implementation Project and Capital Outlay Projects grant programs. We also believe that these criteria will be used by the State to establish the 200-year standard for flood protection that will be used in conjunction with the requirements of the recently enacted Senate Bill 5 that would limit future development unless adequate progress is made to achieve 200-year flood protection.</p>	
1	<p>CCVFCA General Comments: CCVFCA General Comments:</p>	<p>General Comments:</p> <p>1) The CCVFCA applauds DWR for working to develop this set of criteria. It is urgently needed to define parameters for design of flood risk reduction projects; and it helps to provide clarity with regard to many technical issues. CCVFCA generally concurs with many, if not most, of the criteria being proposed. We particularly appreciate the fact that DWR offers a choice in criteria: one set corresponding to traditional deterministic approaches consistent with the requirements for levee certification/accreditation by the Federal Emergency Management Agency (FEMA), and the other consistent with the risk and uncertainty (R&U) approaches under development by the United States Army Corps of Engineers (Corps). The latter R&U approach promises to</p>	<p>Acknowledged.</p>

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
		<p>be a valuable risk-based approach, but is currently not fully developed and remains a combination of mostly conservative deterministic assumptions coupled with limited probability and uncertainty calculations. While CCVFCA appreciates the efforts of the Corps in working to develop this approach, and inviting local and State engineers to participate in the demonstration project, this approach will need a significant development and calibration effort before it reaches its full potential. Thus, the deterministic alternative offered by DWR represents an extremely important path for local and regional agencies to follow in reducing flood risks.</p>	
2	<p>CCVFCA General Comments:</p> <p>CCVFCA General Comments:</p>	<p>2) The principal area where CCVFCA believes that the DWR Draft interim criteria needs to be modified is in regard to specific geotechnical requirements associated with the water surfaces set at the top of the levee. While DWR establishes several reasonable and established geotechnical criteria related to seepage and slope stability for the 200-year design water surface, it also is proposing new criteria for a water surface set at the hydraulic top of levee – potentially a much higher standard than the official 200-year level of flood protection (in the deterministic alternative proposed by DWR, the hydraulic top of levee is set 3 feet higher than the 200-year water surface). DWR is apparently proposing these new criteria so that there is confidence that the levee remains structurally sound up to the point that the levee overtops by elevated flood stages. CCVFCA understands the considerations of such an approach, but is concerned about the specifics of the proposed criteria and how it might influence the cost and economic viability of levee</p>	

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Comment Number	Agency / Affiliation	Comment	Response
2.1		<p>improvement projects. Our concerns include the following:</p> <p>1) Some of the proposed criteria, in their current form, do not represent minimal checks of the proposed 200-year level of flood protection. Instead, some of the criteria for the “top of levee” actually control the design of the levee remediation that is needed. We do <u>not</u> believe this is DWR’s intent. Please comment.</p>	<p>1) DWR recognized that some of the interim criteria for the “top of levee” would control the remediation design in many circumstances. If a criterion were never to control, there would be no point in having it as a criterion.</p> <p>2) Agreed, if one chooses to measure “level of protection” differently than the method provided in the interim criteria.</p>
2.2		<p>2) Proceeding with these criteria in their current form may result in significantly higher target levels of flood protection than the 200-year stated objective. This may lead to significantly higher costs for both the State and local agencies for the target level of flood protection (200-year), and may not be feasible or achievable in some urban areas. Please comment.</p>	<p>3) Agreed, if one chooses to measure “level of protection” differently than the method provided in the interim criteria. Also, there is no intent to equalize levels of protection for the urban areas based on the stage-frequency corresponding to top of levee. The intent is to have levees designed to meet essentially conventional geotechnical criteria for the expected 200-year design water surface and for the levees, within reason, to be able to handle exceedance of that stage without failing from slope instability or seepage/underseepage.</p>
2.3		<p>3) Designing to the “top of levee” will not provide consistent levels of flood protection throughout the flood control system. For example, on the Sacramento River in Natomas, the exceedance frequency of a flood event that would generate a 200-year plus 3 feet flood stage is so extreme that it cannot currently be calculated, but is estimated to be in excess of a 10,000-year flood event. The 200-year stage plus 3 feet on the American River levees would represent about a 240-year stage even after the Joint Federal Project at Folsom Dam is in place. Please comment.</p>	
	CCVFCA Specific	Specific Comments:	

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
1	<p>Comments:</p> <p>CCVFCA Specific Comments:</p>	<p>CCVFCA offers specific comments and recommendations for adjusting DWR’s proposed deterministic criteria in the paragraphs below. None of these comments or recommendations is intended to alter DWR’s intended objectives.</p> <p>1) We concur with the maximum allowable underseepage exit gradients at the toe of the levee and the toe of a seepage berm for the 200-year design water surface, set at 0.5 and 0.8, respectively. This is consistent with established Corps criteria. We also concur with a maximum allowable underseepage exit gradient of 0.6 set for the top of levee water surface (200-year + 3 feet). This higher allowable exit gradient corresponds to about a 20% reduction in the factor of safety (i.e. 1.3 vs. 1.6 for average soils), but still maintains a strong margin of safety for the levee for a water surface set at its crown.</p>	<p>1) Acknowledged.</p> <p>2) The interim criteria are now modified to address this comment. After much consideration, the modified criterion will be 0.9 maximum exit gradient for seepage berms less than 300-400 ft wide for a water surface set at the hydraulic top of levee and the hydraulic top of levee definition is now modified to include an upper limit of the 500-year expected water surface, computed with the assumption that levees do not fail (because allowing levees to fail during this event in many cases will result in a water surface close to, if not lower than, the expected 200-year water surface – and this would be incompatible with the goal of having levees designed to fail from overtopping). Because this would allow some seepage berms to have factors of safety against piping of less than unity when design stage is exceeded, the interim criteria now also emphasize the need for facilities that support inspection and monitoring, instrumentation, evaluation of instrumentation and field performance, and further remediation where instrumentation/performance indicates a problem. Even though an exit gradient of 0.9 can represent a factor of safety against piping of less than unity (except for soils with high saturated unit weights), there is value in having this criteria – if for no other reason – to limit the vigor of boils and make them manageable with conventional flood fighting techniques.</p>
2	<p>CCVFCA Specific Comments:</p>	<p>2) We do not concur with the proposed maximum exit gradient of 0.8 at the toe of a seepage berm for a water surface set at the top of the levee (200-year + 3 feet) for the reasons listed below:</p> <p>a. A seepage berm is commonly the only reasonable mitigation alternative for underseepage deficiencies and this requirement essentially makes the top of the levee water surface the controlling design loading. For many levee reaches, the top of the levee represents a relatively extreme loading (e.g. >500-year). Consequently, this requirement leads to an extremely high level of protection</p>	
2a			

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
2b	CCVFCA Specific Comments:	<p>compared with the official target of 200-year protection.</p> <p>b. Requiring seepage berms to have exit gradients of less than 0.8 at their toes for a water surface set at the top of the levee will likely lead to major costs over and above those associated with a 200-year level of flood protection.</p>	
2c	CCVFCA Specific Comments:	<p>c. A seepage berm is not, by itself, the critical flood protection element – the levee is. A seepage berm is intended to help buttress the levee. Accordingly, a seepage berm and its foundation can accept a significant amount of distress, including some foundation piping, before the levee itself is compromised. This should be acceptable for an extreme loading condition such as a top of levee (overtopping) water surface.</p>	
2d	<p>CCVFCA Specific Comments:</p> <p>CCVFCA Specific Comments:</p>	<p>d. This criterion may have the unintended consequence of influencing local agencies to implement relief wells as the primary mitigation measure for underseepage.</p> <p><u>We recommend that this criterion be eliminated, or alternatively, only be applied when the top of levee is not higher than the water surface of the 500-year flood.</u></p>	

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
3	CCVFCA Specific Comments:	3) We concur with the minimum slope stability factor of safety for steady state seepage of 1.4 for the 200-year design water surface since this is consistent with current Corps criteria. We also commend DWR for accepting lower phreatic surfaces for slope stability analysis depending on the duration of the design hydrograph and the composition and dimensions of the levee. This is consistent with the intent of current Corps criteria and practice and represents a practical and reasonable approach for assuring public safety.	Acknowledged.
4	CCVFCA Specific Comments:	4) We do not concur with the proposed minimum factor of safety for steady state seepage of 1.3 for the top of levee water surface (200-year + 3 feet). The 1.3 value is high considering the low potential for flood stage to reach the top of levee elevation. <u>We recommend that the slope stability factor of safety criterion for the top of levee water surface be reduced from 1.3 to 1.1 for top of levee water surfaces. This factor of safety still ensures that stability is maintained for an extreme loading that might last for only a few hours or days. Alternatively, a value of 1.2 could be required for</u>	Agreed. The interim criteria are now modified to require a minimum factor of safety of 1.2 for slope stability with water at the hydraulic top of levee. This represents a 14% reduction from 1.4 and a 20% margin of safety. This is reasonably consistent with the seepage criteria, where the factor of safety is reduced from 1.6 to 1.3 for the water at the hydraulic top of levee. This represents a 19% reduction from 1.6 and a 30% margin of safety.

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

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		<p><u>situations where the top of levee surface represents less than a 500-year flood.</u></p>	
5	CCVFCA Specific Comments:	<p>5) The levee failure assumptions for the Option 2 (R&U) Corps approach are very conservative. Consideration should be given to adopting a more appropriate upstream levee performance scenario. The historic, main stem levee failures on the Sacramento River Flood Control Project (SRFCP) have almost always occurred at water surface elevations well below the top of the levee. In addition, all of the fragility curves that have been developed to date show a very high (e.g. >90%) probability of failure at or below the top of levee (this includes urban areas that have already been improved). While it is reasonable to assume that the urban areas will be further improved in the future, the fate of the rural, non-urbanizing levees is far from certain. Consideration should be given to assuming reasonably foreseeable improvements in the flood protection system. <u>The legislature has already recognized that the current system represents a dichotomous system of protection whereby the urban areas have higher levels of protection than do the non-urban areas (SB 5).</u> Since it is unlikely that the non-urban levees will be improved so that they could withstand water surfaces ranging up to the top of levee without failure, Option 2, Paragraph 1a(i) should be modified as follows: <i>“All upstream and downstream non-urban levees are to be modeled to incorporate a minimum crown elevation equal to the 1955/57 original Corps design profiles. For analysis, all such levees are assumed to fail when the water surface reaches the top of the levee. This is not to</i></p>	<p>This would be significantly less conservative than either the Corps or FEMA approaches, as currently understood by DWR. DWR would not agree to this approach unless the Corps were to agree. Otherwise this may allow a lower design standard than the Corps and likely lower than FEMA when it migrates to the Corps R&U. One approach that has been considered by the Corps for hydraulic impact analyses is to set the expected failure at the levee crown or slightly above the levee</p>

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
		<p><i>suggest that overtopping is the mode of failure, but rather this elevation is a conservative estimate of when the levees are likely to fail from various seepage and structural deficiencies.” Please comment.</i></p>	<p>crowns (and this could be done with some uncertainty distributed evenly or unevenly about it).</p>
6	CCVFCA Specific Comments:	<p>6) The Draft Interim Criteria is silent with respect to allowable vegetation on and adjacent to levees. We recommend that DWR specify that its Fall 2007 Interim Vegetation Inspection/Management criteria is to be met as part of a 200-year level of flood protection. Please comment.</p>	<p>Agreed. This needs to be addressed next. This needs to be done carefully, as the Interim Levee Vegetation Inspection Criteria represent the minimum requirements for inspection and emergency response – and may be found to be inadequate in the long term for 200-year certification.</p>
7	CCVFCA Specific Comments:	<p>7) The Draft Interim Criteria is silent with respect to pipelines and other penetrations within levees. We suggest that any new pipelines or pipelines needed to be modified/relocated as part of a project to achieve 200-year level of flood protection are raised/set so that the inverts of the pipelines within the levee crown section are no lower than the 200-year design water surface, not the 200-year + 3 ft as proposed in the draft guidelines. Existing pipelines which do not need to be moved for other aspects of achieving a 200-year level of flood protection would be considered on a case by case basis. In addition, mitigation measures to address seepage or siphoning concerns, such as encasing the pipelines in grout or providing positive closure devices, should also be considered. Please comment.</p>	<p>Agreed. This needs to be addressed next. Per current Board regulations in Title 23, it would be acceptable to place the inverts at or above the 200-year DWSE. The interim criteria do not suggest that it is necessary to place the inverts at the 200-year + 3 feet elevation.</p>
8	CCVFCA Specific Comments:	<p>8) Finally, we recommend that DWR temper its criteria with considerations regarding how much flood protection will be achieved within the next 10 to 20 years. We note that Corps criteria calls for levee certifications to extend for only 10 years, and that the available bond funds for flood risk reduction will last less than 10 years. In</p>	<p>These interim criteria are independent of what may happen in the future except:</p> <ul style="list-style-type: none"> • Climate change and sea level rise, which is only advice at this time; • New hydrology results, which is only advice at this time;

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
		<p>developing its criteria, DWR should recognize what types of improvements are likely within a reasonable time frame, and how this shapes the overall flood risk reduction plan for the Central Valley. Please comment.</p>	<ul style="list-style-type: none"> • Assumptions regarding other levees and their corresponding elevations; • Assumptions that other levees do not breach. <p>DWR believes it is important to base designs on conservative assumptions so additional urban work is not triggered sometime in the future, at great cost for little additional protection. This scenario is possible because non-urban areas can exercise their prerogative to restore their levees and prevent them from failure from overtopping. In addition, the interim criteria are now amended to remove the requirement that the DWSE be based upon urbanizing area levees having 3 feet of freeboard for the 200-year flood. This requirement was removed because it is not possible to predict which urbanizing areas will achieve 200-year protection. Removing this requirement is introducing one unconservative assumption into the methodology.</p>

Agency /Affiliation:	Anonymous - Citizen	Address : Not Available	By: Person	Date: 10/16/2008
Sent By: Comments on File Card at the Public Workshop	E-mail: Not Available			

Comment Number	Agency / Affiliation	Comment	Response
1	Citizen	<p>Specific Comments:</p> <p>What earthquake value should be used in the stability analyses? Please comment.</p>	<p>The stability analyses should include the strongest ground motion from a 200-year event.</p>
2	Citizen	<p>What flood level and corresponding water elevation on the levee should be used for the earthquake design criteria</p>	<p>The typical winter and typical summer water levels should be used for</p>

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
		specified in number 1, above? Please comment.	these analyses.
3	Citizen	Please provide more examples of underseepage requirements especially for levees that are normally dry except for rare flood events. For our area these flood events generally last less than 10 days.	The underseepage requirements apply for levees that are not subject to water loading on a long term basis. If sustained loading is expected, levees are to be designed as dams, with more stringent criteria. Even short-term loading typically results in underseepage pressures similar to what would be expected from sustained loading due to typical levee foundation geology having stratified soils with high horizontal permeability.
4	Citizen	Should underseepage requirements be applied to levees that are dry except for major events and how will FEMA look at this? Please comment.	Yes, please refer to the response provided above. FEMA's current guidance already references Corps documents EM 1110-2-1913 and ETL 1110-2-569.

Agency /Affiliation:	USACOE, Sacramento District Hydraulic Design Section	Address : Sacramento District – US Army Corps of Engineers 1325 J Street Sacramento, CA 95814	By: E-mail	Date: 10/17/2008
Sent By: Gene Maak, Hydraulic Engineer		E-mail: Eugene.c.maak@ usace.army.mil		

Comment Number	Agency / Affiliation	Comment	Response
1	USACOE Specific Comments:	Specific Comments: 1) Section 1. Definitions: Early Implementation Program – How would a “no regret” decision be made? If after subsequent analyses it was determined there were “regrets” how would mitigation be accomplished?	There are no plans to go backward and perform “mitigation” if we find regrets.
2	USACOE Specific Comments:	2) Section 2. Background, Para 1. – Design guidance in many, if not all segments of the industry are continuously evolving to incorporate new methods and new knowledge.	Acknowledged, but the Corps’ design guidance lacks the specificity on some points as needed for consistent application.

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
		Contrary to the last sentence in this section the Corps does not have a set of design guidance that can be applied at any given time.	
3	USACOE Specific Comments:	3) Section 2. Background, Para 2. – State the source of 200 year protection. This could be construed as an additional FEMA requirement.	Acknowledged. The interim criteria are now clarified on this point by referencing Senate Bill 5.
4	USACOE Specific Comments:	4) Section 2. Background, The FEMA Approach (3 rd sentence) “uncertainty in stage” should read “uncertainty in flow and stage”. Also in this sentence “is characterized and justifies” should read “is characterized jointly”.	Agreed, with respect to the first proposed revision (and this sentence is now modified accordingly), but not the second proposed revision.
5	USACOE Specific Comments:	5) Section 2. Background, The FEMA Approach: A statement should be made that the sentence 3 provision is very similar (if not the same) to the Corps method as cited in the next section.	Agreed that the two approaches are consistent in this respect. However, it is not necessary to point it out in this section. It is already pointed out in the 3 rd paragraph under Design Principles .
6	USACOE Specific Comments	6) Section 2. Background, The FEMA Approach, last sentence: We do not believe it is accurate to say that the Corps is working to get FEMA to abandon their deterministic approach. This is a misrepresentation of the coordination efforts and should be removed from this document.	Disagree. However, the text is now revised to characterize the situation more neutrally.
7	USACOE Specific Comments	7) Section 2. Background, The Corps Approach, General comment on 1 st paragraph. Guidance cited as “additional specificity is needed because Corps has not yet presented..” are engineering decisions that need to be made with either a deterministic or uncertainty approach. Not sure why this is deemed the “Corp’s Approach”. Please comment.	The Corps Approach includes many engineering decisions, including these.
8	USACOE Specific Comments	8) Section 2. Background, The Corps Approach, 2 nd para, last sentence. This statement is misleading. Guidance for developing geotechnical fragility functions for assessing	This sentence is not referring to fragility functions, for which the Corps has guidance as cited in the comment. It is referring to a risk based geotechnical design methodology, which has been under

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
		geotechnical performance has been in existence since May, 1999. ETL 1110-2-556 Risk Based Analysis for Geotechnical Engineering for Support of Planning Studies, Dated May 1999. Please comment.	development for some years now.
9	USACOE Specific Comments	9) Section 3. Assumptions and Considerations, paragraph 4. Methodology has been developed and is essentially ready for use.	Disagree in that this methodology does not reflect the specificity needed.
10	USACOE Specific Comments	10) Design Principles, Paragraph 3, sentence 2. Text reading, “..with analysis of stage uncertainty..” should read “...with analysis of stage and flow uncertainty..”.	Agreed. The text is now modified accordingly.
11	USACOE Specific Comments	11) Section 5. Proposed Interim Urban and..; Paragraph 2. It is unclear why “no overtop” condition is used for urban and urbanizing area levees. Please comment.	Please refer to bullet number 5 under section 4.
12	USACOE Specific Comments	12) Section 5. Proposed Interim Urban and..; General. It is unclear why there are two approaches available for use. One method recognizes uncertainties and one does not, except for freeboard. Selecting method based on results seems arbitrary at best. Please comment.	Please refer to bullet number 4 under section 3.
13	USACOE Specific Comments	13) Section 5. Proposed Interim Urban and..; Option 2 Modified Corps Approach, Paragraph 1 b. Use of stage frequency (s-f) method is not recommended since there is an approach in place that recognizes the various uncertainties where s-f uncertainties can only be defined by period of record. Please comment.	The interim criteria are now modified for clarity on this point. In some cases, use of a flow-frequency curve and rating curve is appropriate. However, in other cases, relevant for the State-Federal Project Levees, this leads to oversimplification of complex hydraulics. A stage-frequency function better represents the impacts of backwater, diversion, tide, and so on. The interim criteria are intended to permit the analyst to select and use the appropriate models.
14	USACOE Specific Comments	14) Section 5. Proposed Interim Urban and..; Option 2 Modified Corps Approach, Paragraph 2. See comment 12.	Please refer to bullet number 4 under section 3.
15	USACOE Specific Comments	15) Section 6. Achievements and Considerations. Arbitrarily adding 1 foot could be tested had an uncertainty approach been exercised and had uncertainties	DWR proposes a sensitivity analysis, which is applicable for either approach. Ambitious analysts may even take the next step and assign an uncertainty distribution based on the sensitivity analysis, if desired.

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
		on downstream boundary, storm centerings, and hydrology been included in the individual function uncertainties. This comment tries to relay that the added 1 foot increment and the benefit to performance could have been tested by varying the various parameter uncertainties the increment was intended to capture. i.e. change in hydrology, tidal influence, etc. However, it does appear that test is included in the procedure. Testing those parameters could show that the increment helps little or that 1 foot is not enough. Please comment.	

Agency /Affiliation:	American River Flood Control District (ARFCD)	Address : 165 Commerce Circle, Suite D Sacramento, CA 95815	By: Letter	Date: 9/26/2008
Sent By: Tim Kerr, General Manager		E-mail: tkerr@arfcd.org		

Comment Number	Agency / Affiliation	Comment	Response
1	ARFCD General Comments:	General Comments: 1) Upon examining these criteria it is not clear what the end product is intended to be as a result of implementing these guidelines. It is difficult to provided comments on the suitability of the criteria when many issues remain unmentioned regarding how the criteria will be implemented, how projects will be developed and sponsored and what the insurance rate impacts will be on the community. Adoption of these criteria could have vast impacts on the landscape Sacramento flood control but	Acknowledged. The end product is to provide criteria, pursuant to SB 5, for 200-year levee design. Timeliness is paramount due to the pressing need for design criteria for numerous ongoing levee designs.

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
		those impacts are not mentioned or apparently considered. Please comment.	
2	ARFCD General Comments:	2) It is not clear what the State’s role will be when modifying existing levees if these criteria are adopted. Please comment.	DWR’s role is to establish the criteria, pursuant to SB 5 and to fund eligible levee repair and improvement projects that, in urban areas, work toward or meet the criteria.
3	ARFCD General Comments:	3) It is also unstated how discrepancies between State and Federal levee standards could be resolved given a fluctuating Federal policy. Please comment.	Criteria are engineering standards and procedures. The topic of how discrepancies with federal criteria may or may not be resolved is beyond the scope of these interim criteria. However, DWR does intend to collaborate with the Corps, FEMA, and local agencies to continue to develop the 200-year criteria.
4	ARFCD General Comments:	4) Although we appreciate the State’s effort to define the terms of the 200-year flood protection, the criteria seem incomplete without addressing the implications of adopting them. The communities and Agencies impacted by the levee standards need an understanding of the State’s ultimate plan for flood control and the roles each entity will serve before endorsing the metric to judge its success.	On the other hand, State and local agencies need a metric in order to plan improvements to the flood protection system. For instance, it is impossible to estimate required levee heights and their costs without knowing the target standard.
5	ARFCD General Comments:	5) Our District would like to engage DWR to better understand these criteria and we are therefore requesting a meeting with DWR management and one or more of our Trustees.	Acknowledged. An invitation has been provided.
1	ARFCD Specific Comments:	<p>Specific Comments:</p> <p>1) The discussion of the Corp’s approach to determining a probabilistic water surface states that simplifying assumptions are made that tend to be very conservative.</p> <ul style="list-style-type: none"> • Are the conservative assumptions to be used solely for the design of new levees or are they also to be used when analyzing the protection level of 	Yes to both scenarios. And, there is no difference when the goal is to design to a certain level.

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

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		existing levees?	
2	ARFCD Specific Comments:	2) The criteria recommend using 2002 Comprehensive Study Hydrology and Hydraulics. <ul style="list-style-type: none"> • There are many ways to modify data and geometry in the Comp Study models to calibrate them to observed conditions. There is no guidance on how these tasks are to be performed. Please comment. 	DWR is not prepared to create standards for modeling. However, MBK has developed updated models, shared their work with the Corps and DWR, and made it available to others. No formal system of controls exists; this is a current shortcoming that needs to be rectified.
3	ARFCD Specific Comments:	3) The criteria clearly state each exit gradient criteria to use at different levee cross-sections. <ul style="list-style-type: none"> • The criteria should also address allowances for cross-sections that include slurry cut-off walls. 	There should be no difference from Corps procedures with respect to slurry walls.
4	ARFCD Specific Comments:	4) The criteria do not clearly state if landside ditches are to be modeled full or empty. <ul style="list-style-type: none"> • This condition needs to be clearly stated. 	The landside ditches should be modeled as being empty unless there is assurance otherwise.
5	ARFCD Specific Comments:	5) The direction to allow local Agencies to add “up to 1-foot” to the water surface to account for variability from climate change is inconsistent. <ul style="list-style-type: none"> • One foot far exceeds the increment deemed by the CVFPB as an impact to the water surface, allowing 1-foot variability on top of levee design could result in claims of hydraulic impacts. • Setting criteria to account for climate change establishes a moving target. Investments made to this criteria could have a greatly diminished value in the future. 	Hydraulic impacts need to be analyzed for any project, based upon changes to the levee. Hydrology has always been a moving target and climate change has only added further movement.
6	ARFCD Specific Comments:	6) Incorrect terms on Page 9. Replace two instances with the following: “ used to set the <i>hydraulic</i> top of levee”. <ul style="list-style-type: none"> • This condition aids in understanding the author’s intent. 	Disagree.

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

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7	ARFCD Specific Comments:	7) The criteria have a clear delineation of the seismic event as 200-year shaking event. <ul style="list-style-type: none"> This delineation is helpful to determine the recurrence interval of both a seismic event and a high water event simultaneously. 	Acknowledged.
8	ARFCD Specific Comments:	8) The criteria have a clear direction to use factors of safety higher than one for seepage and stability when the water surface is at the top of the levee. <ul style="list-style-type: none"> These criteria will clearly yield a robust levee that is designed to withstand seepage or stability issues prior to overtopping. This may be overly conservative. Please comment. 	If levees are more likely to fail from overtopping and not from other causes, we can significantly improve evacuations and reduce loss of life during urban flooding, as well as personal property damage. This does not seem overly conservative to many people. In fact, many advocate that urban levees should not be allowed to fail at all – there should be system resilience that precludes levee failure. The interim criteria fall short of that lofty goal.

Agency /Affiliation:	K. Hovnonian Homes	Address : 1375 Exposition Blvd., Suite 300 Sacramento, CA 95815	By: E-mail	Date: 10/28/2008
Sent By: Frances Knight, VP Land Planning		E-mail: fknight @khov.com		

Comment Number	Agency / Affiliation	Comment	Response
1	K. Hovnanian Homes, Specific Comments:	Specific Comments: 1) Please clarify the guidelines/regulations regarding the population. I ask that when making a determination whether an area is projected to have 10,000 residents or more within the next 10 years that the area is assumed to have the necessary flood improvements in place to permit this development. Otherwise, no area currently in a floodplain that has a population under 10,000 residents	The criteria do not provide guidance on the urban and urbanizing area definitions in SB 5. There is no basis for assuming that an urbanizing area would or would not have flood improvements in place. After, 2015, if they do not, then development will have to stop (unless there is adequate progress). If they do, then development may continue. With adequate progress, development may continue indefinitely outside of areas protected by facilities of the State Plan of Flood Control. Within areas protected by facilities of the State Plan of Flood

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
		now could make that assertion because of the limits of development in the floodplain.	Control, adequate progress may not be utilized beyond 2025 as a basis for continuing to approve development. These decisions regarding whether to invest in 200-year protection or develop in the 200-year floodplain are local decisions.
2	K. Hovnanian Homes, Specific Comments:	2) Please explain the 10,000 population threshold. Given the current market conditions, the 10,000/10 year growth projection may place urbanizing areas at a greater disadvantage to provide the local share funds for flood protection since these areas have large infrastructure burdens beside the levee improvements required to proceed with new development. Flexibility and State discretion in determining whether an area meets this definition of an “urbanizing area” is advisable. Please comment.	DWR is considering establishing rules as to how local governments should make the determination whether they are an “urbanizing area”. Since this is a local decision it is not reasonable to presume which areas are, or will become, urbanizing areas. Therefore, the interim criteria are now modified not to require the DWSE to be based upon an assumption that the urbanizing area levees will be raised to the 200-year water surface plus 3 feet for freeboard. Those who assume that no urbanizing levees will be raised may be erring on the unconservative side.

Agency /Affiliation:	NOAA National Marine Fisheries Service (NMFS)	Address Not provided	By: E-mail	Date: 10/22/2008
Sent By: Howard Brown		E-mail: Howard.Brown@NOAA.GOV		

Comment Number	Agency / Affiliation	Comment	Response
	National Marine Fisheries Service (NMFS) Opening / Introduction:	Opening/Introduction: This document is provided as a general guideline for bank stabilization and erosion sites projects. The guidelines can be used as technical assistance to assist the project design and biological assessment of the action.	Acknowledged.

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

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1	NMFS General Comments:	<p>General Comments:</p> <p>1) NMFS recommends that DWR give priority to consideration of building set back levees and other flood management projects that provide increased regional flood control benefits and restore natural flood plains and rearing habitats for native fish species that are within the flood control system. For repairs that may impact fishery resources, NMFS provides Draft Central Valley Levee Repair Guidelines that integrate fish habitat and ecosystem protection and restoration principles into site repairs.</p>	<p>This is the current DWR policy and is reflected in much higher state cost sharing for setback levees. DWR understands the NMFS Guidelines for repairs and has incorporated these Guidelines effectively in repair projects.</p>
2	NMFS General Comments:	<p>2) NMFS recommends that DWR include an eighth criterion titled “Guide to applicants for complying with National Marine Fishery Service (NMFS) requirements under the NEPA and CEQA constraints.” These notes will be helpful to those proposing projects that must consider listed species and critical habitats under the Endangered Species Act and Clean Water Act.</p>	<p>Acknowledged; however, this is outside the current scope of the interim criteria.</p>
A	NMFS Specific Comments:	<p>Specific Comments:</p> <p>A. Characterize Pre-construction Condition of Project Site</p> <p><i>This information provides a basic background of the existing condition of the project site.</i></p> <p>1) Site Description/Characterization of the Damaged Site</p> <ul style="list-style-type: none"> • Area, linear foot • Present types of vegetation, density and percent shade • Slope of levee and damage • Name of water body 	<p>Acknowledged; however, this is outside the current scope of the interim criteria.</p>

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
		<ul style="list-style-type: none"> • Agency’s numeric designation/ID# • Present in-stream woody material (IWM) in and around the project site • In-stream sediment composition D₅₀ • Types of vegetation on the project site(s) <p>2) Site Location with the following:</p> <ul style="list-style-type: none"> • Map • Lat/Long Coordinated (Start and End) • River mile/Levee Mile • Bathymetric analysis if applicable (pre- and post construction) • GIS <p>3) Pictures (Pre-, during, and post-construction)</p> <ul style="list-style-type: none"> • Upstream • Downstream • Profile/longitudinal (across the river) • Aerial, if possible <p>4) Preliminary Designs/General Templates w/Winter, Spring, Fall, and Summer water levels on them.</p> <ul style="list-style-type: none"> • X-section • Longitudinal • Plan View <p>5) Vegetation Plan <i>(See Attachment 1 for a list of species appropriate for planting at different elevations along the levee slope)</i></p> <ul style="list-style-type: none"> • X-section • Longitudinal • Plan View • Description 	

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
		<ul style="list-style-type: none"> • Planting time • Planting template/palate • Irrigation plan • Strategy for dealing with existing vegetation <p>6) Description of Construction Activities</p> <ul style="list-style-type: none"> • Timing (Start, duration, staging, etc.) • Land vs. Water • Access (ingress) and Exit (egress) points • Types of equipment used (i.e., track hoe, front loader, cranes, barges, etc.) • Staging area • Storage area • Erosion control plans • Type and Volume of Materials • Stages of Construction (plans are preferred along w/ description) • BMP's for erosion control and water quality <p>7) Analyses/Modeling</p> <ul style="list-style-type: none"> • Hydraulic Analysis, if necessary (to get the water level of the area during flood and dry seasons) and/or <p>Standard Assessment Method (SAM) (Corps 2004) to quantify the impacts to all life-stages of Federally-listed fish within the action area. To assist you, you may check our website, <u>http://swr.nmfs.noaa.gov/sac/myweb8/webpages/biol_opinions.htm</u>, to review previously issued biological opinions on bank stabilization and levee erosion control projects. These will provide examples of the types of effects and the extent of the effects analysis which should be included</p>	

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
		<p>in your biological assessment for the proposed project.</p> <p>NOTE: The Specific Comment “B” did not appear in the NMFS comments letter.</p>	
C	NMFS Specific Comments:	<p>C. Project Selection and Design Guidelines</p> <p>1) Prioritize projects as follows:</p> <ul style="list-style-type: none"> • Encourage construction of set back levees as possible • Restore natural flood plain habitats • Create regional flood control benefits that are multiplicative rather than simply additive <p>2) Choose projects that emphasize repairs in place:</p> <ul style="list-style-type: none"> • Land-side levee extensions • Slurry wall inserts into the core of the levee <p>3) Apply water-side repairs as general design approaches</p> <ul style="list-style-type: none"> • Bank Slope Depending on the project site, NMFS’ preferred bank slope is 3:1 on the outer bend of a river with a mixture of dense IWM (at least 60%) and willow cuttings incorporated in the design to armour the bank and to create immediate and future refugia/rearing habitat. A 5:1 to 10:1 slope is preferred on the inner bend and non-meandering areas of the river with a mixture of IWM, willow cuttings and /or planting of native grasses, where feasible. • Bank Slope with Benches Depending on the project site (<i>i.e.</i>, Delta or upper river reaches), NMFS prefers that benches be incorporated into the design of the bank stabilization project. Benches should be 	<p>Acknowledged; however, this is outside the current scope of the interim criteria.</p>
C	NMFS Specific Comments:		

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
C	NMFS Specific Comments:	<p>designed with the appropriate slope criteria stated above and have IWM submerged during the average winter water levels and partially submerged during the average summer water levels. Width of the benches should be 5-10 feet on outer bends and >10 ft on inner bends. In areas where these types of benches cannot be created, emergent benches to hold intertidal or submerged wetlands species could be used as an alternative. This would provide summer and winter habitat during the migration and rearing life stages.</p> <ul style="list-style-type: none"> • Inundation The designs should strive for the lower slope to be submerged during an average two year flood. This would provide minimum water level where the benches and sloping should start towards the water. • Bank Substrate Size The preferred size for riprap or fill material is 8 inches or less. This smaller rock size does not create large crevasse and eddies where predator species are known to hide and ambush juvenile salmonids. In sites where larger riprap are needed for structural integrity, an outer layer of smaller rock mixed with soil (30% or greater) and other bioengineering designs should be used to prevent predator species from hiding in between the crevices and to encourage vegetation growth for shaded riverine habitat. 	

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
C	NMFS Specific Comments:	<ul style="list-style-type: none"> • In-stream Structure A minimum of 60% coverage of IWM is desired along constructed banks, and should be placed facing downstream at a 45^o angle. The IWM should be ¾ covered and secured in the bed of riprap, and/or cabled to larger boulders. This will provide cover/refugia during high flows and summer months and assure the IWM does not float downstream. • Aquatic Vegetation Bank line coverage should be >60% preferably 100%. This will provide cover/refugia during high flows and summer months. • Overhanging Shade Overhanging shade should be >50%. This will provide shade, minimize the rise of water temperature during the summer months, and contribute to a good food source and future IWM. • Re-vegetation of disturbed areas Depending on the location on the levee, re-vegetation plantings should be set on 2 to 5 foot centers and mixed with native grass and shrubs. This will minimize erosion and sedimentation from the re-vegetated slope, provide an energy dissipater and deposition area and refugia during high flows. The types of species that should be planted along and below the wave break line of the average summer water level are a mixture of button bush, willow, and sedges planted at 2 feet center intervals. These plants provide cover and 	

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
		<p>shade during the summer months and can survive the average winter water levels. Sedges, native grass, willows, hardwood trees (<i>i.e.</i>, box elders and cotton wood live oaks), etc. should also be planted above the average summer water level (See Attachment 1 for species list and examples).</p>	
<p>D</p> <p>D</p>	<p>NMFS Specific Comments:</p> <p>NMFS Specific Comments:</p>	<p>D. Construction Guidelines</p> <p>1. Logistics</p> <ul style="list-style-type: none"> • <i>Timing:</i> In-stream work should be conducted during the summer months from July 1 to October 1, in the dry, or when listed species are least likely to occur. (Start, duration, staging, etc.). The window may vary depending the reach and area of the river. • <i>Land-Base:</i> Minimize the disturbance and removal of vegetation to the maximum extent possible. Trees with $D_{bh} > 6$ inches should be left in place. Plans to remove trees with $D_{bh} < 6$ inches, shrubs and sedges should be reviewed and approved by NMFS prior to removal. • <i>Construction Path from Land:</i> There should be one access point, one exit point, and one construction road to minimize the disturbance and removal of vegetation. NMFS review and approval is required if constructions activities and disturbance area is beyond 100 feet and more than one access and exit points are needed. • <i>Large equipment (i.e., track hoe, front loaders, bulldozer, cranes, etc.) and materials:</i> Staging 	<p>Acknowledged; however, this is outside the current scope of the interim criteria.</p>

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
D	NMFS Specific Comments:	<p>and storage areas for large equipment, materials and chemicals should be exclusive from wetlands and riparian areas and at least 200 feet away from the river where feasible.</p> <ul style="list-style-type: none"> • <i>Vegetation Plan, Erosion Control plan and BMP's:</i> An erosion control and water quality plan, and list of BMP's should be reviewed and approved by NMFS prior to construction. Once approved, the plans should be incorporated in the project description/biological assessment and clearly listed in the design plans and stated in any construction contracts. • <i>Water-base:</i> Barges, cranes on barges, and land construction equipment entering or moving near the river should have a spill response plan 10 days prior to construction for NMFS review and approval. The spill response plan should include NMFS contact information in the list of agencies to contact if a spill occurs. In addition, the spill response plan should indicate that all construction equipment working near, in and on the river/water bodies should carry a spill response kit and the list of agency contact numbers. • <i>Stages of construction:</i> A description of the stages of construction and design plans should be provided, reviewed, and approved by NMFS prior to construction. • <i>Pre-construction meeting:</i> NMFS should be notified 10 days prior to construction and be 	

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
D	NMFS Specific Comments:	<p>included in a pre-construction meeting with the contractor at least two days prior to construction. NMFS staff would provide information and reiterate important conservation measures and special considerations for construction activities to assure impacts to listed species are minimize to the maximum extent possible.</p> <p>2. Design Alternatives and Suggestions</p> <ul style="list-style-type: none"> • <i>Riprap</i>: Use a mixture of at least 30% soil and 70% riprap. Another preferred alternative to consider is the alternating “riprap and soil” layers with a jute mat/coir fabric as the last layer on a hydro-seeded/manually-planted bed of soil. • <i>IWM</i>: Brush layering, wattles and fascines (bundled brush) are adequate and sufficient alternatives when large woody trees are not available • <i>Geo-tech materials</i>: No nylon/plastic netting should be used in bank stabilization activities. The nylon/plastic netting can act as a gill net for juveniles when the covered area is flooded or if the netting breaks free of the bank and enters the waterway. Woven fabric mats (coir or jute mat) are the preferred material. These mats should be placed on the upper slope benches as an erosion control measure during the winter months. These materials can also be used to create a plant box for revegetation and as a bark protection cover for trees with $D_{bh} >$ 	<p>DWR’s experience with this 70:30 mixture of riprap and soil has shown that this soil rock mixture on the bank does not withstand the river currents and the soil is re-deposited into the river resulting in high sedimentation rates and poor visibility and poor water quality. This soil rock blend would likely need several construction seasons for the vegetation to take root adequately for it to prove successful. Many of the other construction suggestions are already employed by DWR and its Contractors.</p>

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
		<p>6 inches. This assures existing and future vegetation will be established and protected.</p> <ul style="list-style-type: none"> • <i>Willow cuttings:</i> Live willow cuttings should be soaked for ~ 10 days prior to planting and buried ¾ into the ground, assuring the stake reaches the water table/wetted area throughout the year. • <i>Seeding:</i> Hydroseeding or planting native grasses on disturbed area is necessary to prevent erosion and to assure vegetation is established and shading is available during the next summer months. This should be done on slopes and benches above the average summer water levels. • <i>Irrigation:</i> Any pumps used for pumping water from an area where listed species may be present should have a screen which meets NMFS' criteria for water pump intakes (http://swr.nmfs.noaa.gov/hcd/policies.htm). In addition, the pump should be at least 100 feet away from the river and excluded from wetlands and riparian vegetation to prevent petroleum products from contaminating the area. 	
E	NMFS Specific Comments:	<p>E. General Conservation Measures and Recommendations</p> <ol style="list-style-type: none"> 1. Stockpiling of construction materials, including portable equipment, vehicles and supplies, including chemicals, shall be restricted to the designated construction staging areas and barges, exclusive of any riparian and wetlands areas. 	<p>Acknowledged; however, this is outside the current scope of the interim criteria.</p>

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
E	NMFS Specific Comments:	<ol style="list-style-type: none"> 2. Erosion control measures (<i>i.e.</i>, Best Management Practices [BMPs]) that prevent soil or sediment from entering the river shall be placed, monitored for effectiveness, and maintained throughout the construction operations. 3. All litter, debris, unused materials, equipment, and supplies shall be removed daily from any areas below the ordinary high water line and deposited at an appropriate disposal or storage site. 4. Any spills of hazardous materials shall be cleaned up immediately and reported to the resource agencies within 24 hours. Any such spills, and the success of the efforts to clean them, shall also be reported in post-construction compliance reports. 5. A representative shall be appointed by FEMA who shall be the point-of-contact for any FEMA employee, or contractor, or contractor employee, who might incidentally take a living, or find a dead, injured, or entrapped threatened or endangered species during project construction and operations. This representative shall be identified to the employees and contractors during an all-employee education program conducted by FEMA relative to the various Federally-listed species which may be encountered on the construction sites. 6. If requested by the resource agencies, during or upon completion of construction activities, FEMA biologist/environmental manager or contractor shall accompany USFWS or NMFS personnel on an on-site, post-construction inspection tour to review 	

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
E	NMFS Specific Comments:	<p>project impacts and restoration success.</p> <ol style="list-style-type: none"> 7. The intakes for any water pumps needed for the construction process shall be screened to NMFS salmonid-screening specifications. 8. A Corps representative shall work closely with the contractor(s) through all construction stages to ensure that any living riparian vegetation or IWM within “vegetation clearing zones,” which can reasonably be avoided without compromising basic engineering design and safety, is avoided and left undisturbed to the extent feasible. 9. Maintenance of conservation measures will be conducted to the extent necessary to ensure that the overall long-term habitat effects of the project are positive, as determined by the SAM. This approach will adaptively manage project conservation measures based on SAM modeling, monitoring, and professional judgment. Language providing such assurance(s) shall be provided to the resource agencies for review and concurrence before formal O&M documents are finalized by FEMA, and written evidence of acceptance of such assurance language by the local maintaining agency or district, shall be provided to the resource agencies. 10. Minimize effects by altering engineering design to avoid potential direct and indirect effects. 11. Incorporate sensitive habitat information into project bid specifications. 12. Fence sensitive habitats with orange construction fencing or similar material. 	

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
E	NMFS Specific Comments	<p>13. Incorporate requirements for contractors to avoid identified sensitive habitats into project bid specifications.</p> <p>14. Minimize vegetation removal to the extent feasible, and leave as much existing IWM in place as possible, anchoring the IWM in place with rock.</p> <p>15. Perform no grubbing or contouring of the sites.</p> <p>16. Ensure all fill materials are placed with no excavation or movement of existing materials onsite.</p> <p>17. Ensure all construction activities; including clearing, pruning, and trimming of vegetation, is supervised by a qualified biologist to ensure these activities have a minimal effect on natural resources.</p> <p>18. If a cofferdam is needed during construction, it will be constructed by placing the sheet piles sequentially from the upstream to the downstream limits of the construction area (however, it is not anticipated at this time that a cofferdam will be needed). Prior to the closure of the cofferdam, seining will be conducted within the cofferdam with a small-mesh seine to direct fish out of the cofferdam and remove as many fish as possible. Upon completion of seining, exclusionary nets will be placed in the river to prevent fish from entering the cofferdam before the cofferdam is closed. When the cofferdam is partially dewatered, a final seining effort will be conducted within the cofferdam. Only low-flow pumps with screened intakes will be used during dewatering operations.</p>	

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
		<p>If seining cannot rescue all listed species, a qualified fisheries biologist will use electrofishing to capture any remaining fish. All captured juvenile salmonids shall be released into the river downstream of the construction area.</p> <p>19. Avoid direct and indirect effects on habitats containing or with a substantial possibility of containing listed terrestrial, wetland, and plant species to the extent feasible.</p>	
F	NMFS Specific Comments:	<p>F. Post Construction</p> <ol style="list-style-type: none"> 1. Site Description/Characterization <ul style="list-style-type: none"> • Area, linear foot • Present types of vegetation • slope of levee 2. Pictures <ul style="list-style-type: none"> • Upstream • Downstream • Profile/longitudinal (across the river) • Aerial 3. Monitoring Plan <p>In order to evaluate the merit of the mitigation measures at the construction sites, a monitoring program is sometimes requested. The monitoring program should assess not only whether the design criteria were implemented, but whether they resulted in any observable influence on the fish</p> 	<p>Acknowledged; however, this is outside the current scope of the interim criteria.</p>
F	NMFS Specific Comments:		

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
		<p>populations or habitat conditions in the vicinity of the project. The SAM model values under each parameter (as listed above) should be obtained and used as performance standards and recommended goals. The monitoring plan should have the following four basic elements:</p> <ul style="list-style-type: none"> • Riparian vegetation • Shaded Aquatic Riverine (SRA) Cover • In-stream SRA Cover • Fisheries 	
<p>G</p> <p>G</p>	<p>NMFS Specific Comments:</p> <p>NMFS Specific Comments:</p>	<p>G. Documents that may need to be submitted to NMFS to initiate consultation with NMFS</p> <ol style="list-style-type: none"> 1. Biological Assessment that includes the 6 information needs described in the attached letter. 2. Final Design Plans incorporated with NMFS recommendations. 3. Final Vegetation Plan incorporated with NMFS recommendations. 4. Detailed project description, which includes site location, construction activities, area description, designs, NMFS recommendations and conservation measures, etc. 5. Final Monitoring Plan, if requested. 	<p>Acknowledged; however, this is outside the current scope of the interim criteria.</p>
	<p>NMFS Attachment:</p>	<p style="text-align: center;">Attachment 1</p> <p style="text-align: center;">Selected Plants for Sacramento River System Levees</p> <p>The plants selected below represent a sample of</p>	<p>Acknowledged; however, this is outside the current scope of the interim criteria.</p>

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
		<p>appropriate native plants to be used on Sacramento River and the Sacramento-San Joaquin Delta habitat plantings on levees.</p> <p>This detailed 3-Page NMFS Attachment is also available for review if needed.</p>	

Agency /Affiliation:	ARCADIS	Address: 2033 North main Street, Suite 340 Walnut Creek, CA 94596	By: E-mail	Date: 10/18/2008
Sent By: Robert Pyke PhD, GE Vice President		E-mail: Robert.pyke@arcadis-us.com		

Comment Number	Agency / Affiliation	Comment	Response
	ARCADIS	<p>Opening/Introduction:</p> <p>We concur with the comment made at the public meeting on October 16th that these interim criteria should be published in some form and that a collaborative effort should be initiated to work toward a broad consensus on longer-term criteria.</p> <p>There is much language in the Geotechnical Levee Practice, Rev. 2, dated April 11, 2008 issued by the Sacramento Corps that is appropriate for longer-term criteria and we hope that in spite of the organizational differences between the State and Federal governments it might be possible to come up with common criteria that apply to CA.</p>	<p>Agreed.</p>

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
1	ARCADIS Specific Comments:	<p>Specific Comments:</p> <p>1) We believe DWR has focused in on appropriate numbers for the return period of the design earthquake, 200 years, the minimum factor of safety on slope stability assuming steady state seepage at the Design Water Surface Elevation (DWSE), 1.4, and the maximum exit hydraulic gradient for the same condition, 0.5 at the toe and 0.8 beyond a seepage berm that has a minimum width of four times the height of the levee.</p>	Acknowledged.
2	ARCADIS Specific Comments:	<p>2) To the best of our knowledge, levees rarely fail because of inadequate margins of safety and seepage analyses. They fail because of adverse, very localized conditions which may involve vegetation or rodent activity, unknown or apparently minor geologic details in the foundation or construction defects, including the use of “brittle” details. Thus, design analyses of idealized cross-sections should be taken with a grain of salt and reviewers should ask not just whether any prescribed numerical criteria have been met but are the numerical criteria appropriate in this circumstance and have all the non-numerical criteria been satisfied.</p>	Acknowledged.
3 3	ARCADIS Specific Comments: ARCADIS Specific Comments:	<p>3) We believe a return period of 200 years is appropriate for assessing the ground motion to be considered to act simultaneously with either typical summer or winter WSEs. The present language simply requires an “analysis of seismic vulnerability” rather than a prescribed level of performance and I believe that is also appropriate. I applaud the use of analysis to identify possible weaknesses and the description of a range of expected responses that vary with circumstances, such as whether the levee permanently retains water or not.</p>	Acknowledged.

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
4	ARCADIS Specific Comments:	<p>4) I believe the current suggested minimum factor of safety on slope stability of 1.4 assuming steady state seepage at the DWSE is fine and I would have no problem with the previously suggested factor of safety of 1.5 either. More important issues include the degree to which the cross section being analyzed is representative, the quantity and quality of data on the cross section and the material properties, whether the driving water pressures are correctly included in the slope stability analysis and the degree of conservatism that might result from assuming steady state seepage. I applaud wording that allows the responsible engineer to make a valid argument when there is one to be made but provides default guidance for situations. I believe the phrase “when the geometry, composition and material properties of the levee and its foundation are known with the accuracy that is normal for the evaluation of slope stability problems” should be added to the sentence that defines the minimum factor of safety as 1.4.</p> <p>Somewhere near the top of the document DWR might try to spell out the general design principles that should govern the design of urban and urbanizing levees in the future. In my judgment this requires biting the bullet and stating that in urban areas levees that hold water for short periods of time should be designed in general accordance with the same principles that are employed in the design of embankment dams that permanently retain water. Paramount among these principles is that seepage must be controlled. Please comment.</p>	<p>Agreed. It is important to consider that the 200-year design criteria include ETL 1110-2-569, which provides guidance on the levee evaluations and data requirements. Without higher quality data, the standards (factors of safety) would need to be more stringent.</p> <p>This may be true but, “normal” is expected to be “good.” And, DWR agrees that it would be appropriate to make conservative assumptions where data for good site characterization is lacking or to require higher factors of safety where site characterization is poor. Current Corps guidance requires good site characterization.</p>
5	ARCADIS	5) I am confused by the language of the Second Draft on	

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
	Specific Comments:	<p>the requirements to demonstrate stability for the water surfaces higher than the DWSE. Clearly there should be some “reserve capacity” and the levee should not blow out if the DWSE is exceeded. However, on page 3 it states that “urban and urbanizing area levees are to be designed for a factor of safety greater than 1.0 for stages up to the hydraulic top of the levee” and on pages 10 and 13 it states that “a minimum factor of safety of 1.3 is also required for an appropriate phreatic surface corresponding to the water surface set at the hydraulic top of the levee”. As discussed at the public meeting, the “hydraulic top of the levee” should be replaced by “the lesser of the hydraulic top and the 500-year water surface elevation” but, the 1.3 number is excessively limiting and more general wording such as “the computed factor of safety should not show a sudden decrease for water surface elevations above the DWSE and should not fall below 1.0” is recommended. Please comment.</p>	<p>The interim criteria are now modified to require a factor of safety of 1.2. If a criterion were to be set saying that “the computed factor of safety should not show a sudden decrease...,” it would be helpful, if not necessary, to define what constitutes a “sudden decrease.” By allowing a slightly lower factor of safety for slope stability when water is at the hydraulic top of levee as compared to slope stability for water at the DWSE, we are in effect doing just that – controlling the rate of change of the degradation of the factor of safety for water levels that exceed the DWSE, and setting a limit on what the lowest acceptable factor of safety should be.</p>
6	ARCADIS Specific Comments:	<p>6) I am troubled by the use of exit gradient alone as the criterion for potential failures resulting from underseepage although I understand the history of its use and accept that it is necessary as a component of these interim criteria. Piping, erosion and failure must be a function of flow and/or velocity and the erodibility of the material in question. I strongly suggest that DWR add the words “in cohesionless or other highly erodible soils” wherever constraints are placed on the allowable exit gradients. Please comment.</p>	<p>Agreed, mostly. This applies to soils subject to piping which are near the surface or underlying a blanket of relatively low permeability soils. To require an absence of a sudden change in behavior would require setting parameters for what constitutes a sudden change in behavior. By allowing a slightly lower factor of safety for the exit gradient when water is at the hydraulic top of levee as compared to the exit gradient for water at the DWSE, we are in effect doing just that – controlling the rate of change of the degradation of the factor of safety for water levels that exceed the DWSE, and setting a limit on what the lowest acceptable factor of safety should be.</p>

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
7	ARCADIS Specific Comments:	7) I have not commented on the procedures for establishing the DWSE although I recognize this is a critical issue. In general I concur with the approach that DWR has taken allowing two alternatives at this time. Please comment.	Acknowledged.

Agency /Affiliation:	NOAA National Marine Fisheries Service (NMFS)	Address; 650 Capitol Mall, Suite 8-300 Sacramento CA 95817-4706	By: Letter	Date: 9/30/2008
Sent By: Maria Rea, Supervisor, Sacramento Area Office	E-mail: Madelyn.Martinez@NOAA.GOV			

Comment Number	Agency / Affiliation	Comment	Response
	National Marine Fisheries Service (NMFS) Opening / Introduction:	Opening/Introduction: Please be advised that until DWR requests formal section 7 consultations with NOAA’s NMFS, this response is provided as informal technical assistance.	Acknowledged.
1	NMFS General Comments:	General Comments: 1) It is important to DWR to follow the USACOE (Corps) design standards to provided consistency in system improvements, comply with existing standards, and to facilitate federal funding/crediting. However, the Corps	Acknowledged.

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
		standards are evolving and not completely established. As an interim, DWR plans to modify both FEMA and the Corps' approaches to develop this plan.	
1	NMFS Specific Comments:	<p>Specific Comments:</p> <p>1) Available information indicate the following Federally listed anadromous species and their critical habitat may occur within the proposed area:</p> <ul style="list-style-type: none"> • Sacramento River winter-run Chinook salmon Evolutionarily Significant Units (ESU) – Critical Habitat • Central Valley spring-run Chinook salmon ESC – Critical Habitat • Southern District Population Segment (DPS) of North America green sturgeon – Threatened • Central Valley steelhead DPS – Critical Habitat 	Acknowledged; however, this is outside the current scope of the interim criteria.
2	NMFS Specific Comments:	2) The proposed project may affect Essential Fish Habitat (EFH) for Chinook salmon as described in the regulations.	Acknowledged; however, this is outside the current scope of the interim criteria.
3	NMFS Specific Comments:	3) Bank protection projects have significant potential to cause adverse affects to anadromous fish and their habitat. Bank protection projects affect salmonid habitat availability and the processes that develop and maintain preferred habitat by reducing floodplain connectivity, changing riverbank substrate size, and decreasing riparian habitat, and shaded riverine aquatic habitat (SRS). Individual bank protection sites result in two levels of impacts to the environment: 1) site level impacts that	Acknowledged; however, this is outside the current scope of the interim criteria.

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

Comment Number	Agency / Affiliation	Comment	Response
		affect the physical habitat structure, and 2) reach-level impacts which are cumulative impacts to ecosystem functions and processes within a given river reach.	
4	NMFS Specific Comments:	4) Levee systems isolate urban areas from the river systems resulting in a disconnect of natural water stormwater to the river system. The isolation of natural runoff has resulted in the following impacts to listed species: 1) Above normal increased flow and higher water levels in the constricted levee system, affecting SRA, the recruitment of riparian seedlings; and 2) degraded water quality from the stormwater water with increased pollutants and concentration of ammonia, and decreased concentration of dissolved oxygen.	Acknowledged; however, this is outside the current scope of the interim criteria.
1	NMFS Recommendations:	<p>Recommendations:</p> <p>1) NMFS understands in urban areas it is difficult to set back levees due to the amount of development in these areas. However, NMFS suggests that setback levees should be part of the optional design criteria and be considered in the first steps of the planning stage.</p>	Agreed. This is the current DWR policy and is reflected in much higher state cost sharing for setback levees under the Early Implementation Program. However, this is outside the current scope of the interim criteria.
2	NMFS Recommendations:	2) If setback levees are not feasible for a project site, NMFS suggests working with the city or county on their general plans to start designating flood zones, such as the practice in Sacramento along the American River.	Acknowledged; however, this is outside the current scope of the interim criteria.
3	NMFS Recommendations:	3) The stormwater systems of urban areas should be evaluated and assessed as part of evaluating and designing levees. Stormwater management should maximize groundwater recharges and minimize peak flow discharges.	Acknowledged; however, this is outside the current scope of the interim criteria.

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

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4	NMFS Recommendations:	<p>4) Consider using biotechnical remediation techniques that minimize the application of rocks and focus on restoring the natural formation and function of the riverbank. Such techniques are described in the Federal Interagency Stream Restoration Working Group’s Stream Corridor Restoration Handbook at: http://www.nrcs.usda.gov/technical/stream_restoration/. Other “fish friendly” levee repairs use the following criteria:</p> <ul style="list-style-type: none"> • Use a soil-rock mixture to facilitate revegetation of the project area. A 70:30 ratio of rock to soil is acceptable. • The riprap size should be between 8 – 18 inches. Larger riprap would create larger interstitial spaces and provide habitat for predator species. • Revegetate or vegetate the project area to develop the SRA. A vegetation plan should included a list of species and designs to show the locations of the species and its density. 	<p>Acknowledged; however, this is outside the current scope of the interim criteria.</p> <p>DWR’s experience with this 70:30 mixture of riprap and soil has shown that this soil rock mixture on the bank does not withstand the river currents and the soil is re-deposited into the river resulting in high sedimentation rates and poor visibility and poor water quality. This soil rock blend would likely need several construction seasons for the vegetation to take root adequately for it to prove successful. Many of the other construction suggestions are already employed by DWR and its Contractors.</p>
5	NMFS Recommendations:	<p>5) The proposed project should, to the extent possible avoid and minimize the amount of vegetation removal on the waterside of the levee, particularly the large mature trees.</p>	<p>Acknowledged; however, this is outside the current scope of the interim criteria.</p>
6	NMFS Recommendations:	<p>6) Where removal of vegetation is unavoidable, a comprehensive revegetation plan should be developed and implemented, including full compensation for the impacts to the habitat. The vegetation plan should include a list of species and designs to show the locations of the species</p>	<p>Acknowledged; however, this is outside the current scope of the interim criteria.</p>

Responses to Comments on the Second Draft Interim Levee Design Criteria for Urban and Urbanizing Area State-federal Project Levees

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		and its density at each elevation on the levee slope. Where revegetation is not able to compensate fully for the impacts to SRA habitat, additional compensation should be provided through the purchase of credits at a NMFS approved conservation bank.	