Comment Disposition Summary Table
FERC Risk-Informed Decision Making (RIDM) Risk Guidelines
Chapters 1 through 4
Comments Received October 1 through December 15, 2015

Comment Source	Comment Number	Page No	Section/ Paragraph/ Line	Original Comment	General Assessment/Disposition					Disposition Comments	Resolution					Resolution Comments	Other
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General Comments																	
				Overall, really nice document. Clear, well written, easy to read and digest. I think it is a step forward from where 1156 is today. No fatal flaws, just some comments to consider				X						X			
				I was duly impressed with the documents. You are much further along as you begin to enter this realm than we were at either Reclamation or the Corps. This is probably appropriate given your regulatory position. I generally found the guidance to be in my opinion on target. The only major concern I have is that the way the risk assessment section is written, I could see you getting bogged down in CSSL, VSL, WTP, DR in trying to satisfy your ALARP conditions instead of focusing on the risk estimates, the case, and the appropriate decision. I would say that there have been many risk informed decisions made without making all those calculations. Anyway, as we found out at Reclamation and the Corps, you will not have everything perfectly in place as you start down this road. But you have to jump in and start doing it to find out where improvements are needed. I'm sure you are aware of that. Again, congratulations on a great start.				X		The application and implementation of ALARP principles will be much different for public and private dams as compared with federally-owned dams. In a regulatory environment the use of ALARP becomes one of greater importance in making the case for the tolerability of risks and acceptance of alternatives. Public and private dam owners have a much stricter liability.				X			
			Cover	Do you want to put a time frame for this as a trial period?				X		Our intent is for the guidelines to remain as interim documents until such time as sufficient risk pilot projects have been completed and have provided justification for revision of the documents.				X			

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			Chapter 14	In my opinion, release of these guidelines should be accompanied by a revised/clarified version of Chapter 14, cleaned up of several inferences that PFMA's should be targeted to "Surveillance and Monitoring Plan", as stated in 14.3.1. In actuality, a PFMA feeds all aspects of risk such as portfolio management, risk analysis/assessment/management, IRRMP's (of which updating the Surveillance and Monitoring Plan is just one example of an IRRM), and Risk Communication. I believe better alignment of Chapter 14, which was last updated in 2005, is needed with new RIDM guidelines. The following are but a few examples of how Chapter 14 could be construed to conflict or confuse. 14.3.1. Consider a "supplementary PFMA" should also be conducted following a dam safety incident or changed condition in order to help understand the potential change in risk. Page 14-10. Is this Procedural Guidance and Time Frame still applicable moving into RIDM? Will PFMA reports continue to be submitted without associated risk analysis? Page 14-20. The bottom paragraph becomes harder to justify outside the context of a risk analysis. Table 1. How will Cat III PFM's be handled in a risk analysis? Do they get plotted along with other PFM's but with Low Confidence? Note that confidence and uncertainty are not the same thing.				X		Our intent is to provide a dual-track framework as part of the FERC dam safety program. The standars-based approach will continue through implementation and execution of FERC's engineering guidelines. The RIDM guidelines will provide an additional (supplemental) approach. At some point in the near future some of the engineering guidelines, including Chapter 14 will require some revision and updating so that both approaches are clear.					X	Future revisions to Engineering Guidelilnes should consider how RIDM approach can be integrated.	
			continuation of comment above	If only "risk-driving" failure modes are to be carried forward for risk analysis, and all others would be excluded, then I question the need for four Categories. The extra granularity is not needed and will only confuse the risk analysis. Page 14-24. Step 6.4 is describing an Issue Evaluation Study without understanding the risk. Again, targeting a SMP. 14.5.1 states "… using a potential failure mode analysis approach." ?? Typo. "Appendices" is misspelled. Appendix A. Considering the findings of the overall review of PFM's as being inadequately developed, consider revising this Appendix to provide better examples and guidance. Appendix D. With Chapter 2's Risk Analysis report template, to which the PFMA results are added, is this Appendix even needed? Appendix I. Will the risk analysis report be added to the STI?				X		see response to comment above				X		See response to comment above.	
				The draft document provides a wealth of information. It is currently a mixture of direct guidance or policy and explanation of the background (including literature review) for the guidance. This mixture is informative for the reader but it may be confusing as to what the FERC expects and what is a discussion of what others are doing. An approach to separately out these two aspects can be found in the ANCOLD Guildelines on Risk Assessment where a commentary was developed to contain the background and explanations separate from the guidelines themselves.				X		That is another approach that we could have employed in structuring our guidelines. For various reasons we have chosen to structure the discussions the way we did.				X			

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				The guidelines do a good job of describing the roles of those who participate in performing a risk assessment. However, the roles and responsibilities of the FERC licensees are less clearly described at present. I suggest that this is an important omission that should be addressed before these guidelines are issued. This suggestion is based on the premise that the FERC is looking to the licensee to provided risk-informed and risk-justified proposals to the FERC for risk reduction and risk management actions for a dam that they are responsible for. If this premise is correct, then it seems essential that the new expectations for the licensee's interaction with the FERC under RIDM should be clearly spelled out. The key point being that they should be prepared to use risk assessment to make the case for their proposed actions. If a licensee recognizes this, then hopefully they will take charge of the risk assessment process and direct it towards first convincing themselves what the appropriate actions should be, and then making the case to the FERC. This new expectation stands in contrast to a tendency for some licensees to look to the FERC to inform them as to what actions are needed for their dams. It is also important for licensees to understand that satisfying their regulator does not necessarily equate to meeting all their legal obligations under common law.	X					text will be added to outline broad responsibilities	X					A couple of new section have been added in Chapter 1 to more specifically address the benefits of risk (including due diligence and other benefits) and a new section on owner/licensee responsibilities.	
				It is a good idea to piggyback the Part 12 process with a risk assessment.				X		Agree				X			
				While I agree that the Risk Review Panels, if appropriately selected, should provide the FERC with a reasonable degree of regulatory assurance (confidence) that risk assessments are appropriately conducted and that their findings are appropriately justified, I have some concerns about the proposed approach for these Panels: a. I am concerned about the cost for the proposed numbers of Panel members for these reviews becoming a disincentive to the use of the RIDM approach, at least in some cases. Could Panel meetings be web meetings instead of face-to-face to keep the cost down or could more than one dam be reviewed at the same Panel meeting to share the travel expense and time? b. I am concerned that a post-hoc review will be inefficient in compared to including a review of the work plan for each risk assessment by the panel before the resources are spent on conducting the risk assessment. While this may appear to increase the review cost, it will hopefully reduce the likelihood that repeat work will be needed and also another review. c. Typically a participatory or continuous review approach has been found to be most appropriate and more efficient and cost effective for risk assessments. This is because of the need to become familiar with detailed issues throughout the risk assessment process in a way that cannot be so effectively achieved with a post-hoc approach.		X		X		a. We are also very sensitive to the costs for these activities. Reviews are an important aspect of the process to provide confidence in the result and the path forward. We will be open to cost control options such as web meetings and other items. b. Chapter 2 will be revised to indicate that peer review through the entire risk process is encouraged. c. Chapter 2 will be revised to indicate that peer review through the entire risk process is encouraged.	X					Text in chapter 2 revised to encourage licensees to incorporate peer review through the entire risk analysis process.	
				I applaud the direction that these guidelines seem to be heading in terms of using limits for tolerable risk guidelines, similar to those in use by USACE and Reclamation. I was not in agreement with the previous direction, which the FERC had taken in earlier interim guidance, of not adopting any limit guidelines.				X						X			

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				I suggest that the document should stress that the licensee and other stakeholder should consider bases for evaluating risk other than life-safety tolerable risk guidelines promulgated by the FERC as a regulator charged with protecting the safety of the public because the licensee has additional legal responsibilities and a fiduciary responsibility to their stockholders or others. They may also need to defend their dam safety decisions to their insurers and other stakeholders	X						X					A new section has been added in Chapter 1 to address owner/licensee responsibilities	
				The relationship of RIDM to the FERC's deterministic engineering guidelines will need to be worked out. USACE is doing this through the concept of essential (deterministic) engineering guidelines, which can be part of the definition of tolerable risk through ALARP considerations				X			X					A new section has been added in Chapter 1 to address the approaches to dam safety assessment including the standards based approach executed through FERC's engineering guidelines and the risk approach executed through the RIDM guidelines.	
				I suggest more emphasis on the importance of consequences experts (including economists who specialize in economic consequences estimation) being included on risk teams. There is often a tendency to short change consequences estimation or to assume that is simpler than it actually is and assign it to unqualified individuals.				X		Noted. All disciplines and expertise is important in conducting risk analyses.				X			
				In many places the term "risk analysis" is used (e.g. Page 2-23, last para.) but "risk assessment" would be more appropriate because a risk evaluation and a decision recommendation would be included in addition to identifying and estimating the risk (the scope of a risk analysis. I suggest a manual search and replace as appropriate.				X		Noted. The particular example you bring up is correctly referenced as a risk analysis and not risk assessment in that the prior risk analysis work is to be reviewed and the risk estimates updated or confirmed.						Chapters reviewed for terminology between risk analysis and risk assessment.	
				UNFORTUNATELY MANY OF THE DEFINITIONS IN APPENDIX 1A ARE INCORRECT – IT'S NOT A MATTER OF PREFERENCE – THEY ARE SIMPLY INCORRECT. That raises some serious concerns for the sources of the incorrect definitions, but I strongly suggest that FERC needs to get these right.			X			We strongly disagree. There are nearly 100 definitions in Appendix 1A that have been researched and have been correctly defined and used in the dam safety industry. We believe the reference to many incorrect definitions is grossly exaggerated. We have revised a few key risk definitions to reference the ICOLD risk assessment Bulletin 130 instead of the definitions previously referenced in the FEMA publication.	X					The risk definitions now reference those used in ICOLD Bulletin 130.	

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				Prioritization of actions for a portfolio of structures is mentioned as a decision that can be informed by risk assessment on Page 1-2. However, little is said about whether the FERC is open to portfolio information being considered as a factor that influences the prioritization of risk reduction actions across a portfolio of dams for a licensee that own multiple dams that are regulated by the FERC. The State of Victoria regulatory program in Australia, includes an annual portfolio reporting requirements that includes reporting on progress with risk reduction across the owner's portfolio and updating the plan for future risk reduction.				X		That may certainly be a pathway of natural progress that we pursue with licensees that have an inventory of dams.				X			
				A major challenge for the FERC for implementing RIDM will be the shortage of suitably qualified and experienced risk assessment practitioners.	X			X		yes it will.				X			
				These documents are very strong and represent a significant advancement not just for FERC but for the dam safety industry. We will likely borrow some of the information in the next revision of our guidelines.				X						X			
				Definition of Risk – I do not agree with the definition of risk hat is used. There are couple of reasons. First it simply says more than it needs to. Second it defines how risk is calculated (not needed in a definition) and measured. Third, it is inconsistent with the tolerable risk guidelines. The definition that is being used is simply repetition of what others have stated and used in water resources planning studies which typically have a different objective than a dam safety study that is assessing the probability that an individual will lose their life. Unfortunately, too many times terms, practices, etc. are adopted because it was referenced somewhere, without thinking through where it is right and appropriate for a particular application.				X		The definition of risk will be reviewed.	X					The definition of risk has been revised to the ICOLD definition	
				Uncertainty – Chapter 2 talks about uncertainty, different types, confidence, etc. However there does not seem to be a clear framework for defining uncertainties or guidance as to how they should be considered in the risk analysis. I would suggest adding more structure to the discussion of uncertainties; a framework, recommendations for evaluating uncertainties, requirements for their consideration, etc.				X		The very general framework for uncertainty is provided in Chapter 2. Guidance of incorporating uncertainty in risk analyses is provided by the Bureau of Reclamation and Corps of Engineers Best Practices in Dam and Levee Safety Risk Analysis. Additional uncertainty guidance will be provided at a later date.				X			
				Hydropower Projects as Systems – One of things we continue to learn in dam safety is that events (incidents) that occur at dams are often the result of circumstances that involve many of the elements of a dam system, and in some cases elements of the broader electric power grid. There seems to a lack of attention paid to the notion of dams as systems, systems analysis, etc. I think this is an area where the FERC can make advances in dam safety, by incorporating the concept of and the analysis of hydropower projects as systems.	X					Will try to find a way to weave this subject into the guidelines. Alternately, this is to be included in the next revision to the 'Best Practices in Dam and Levee Safety Risk Analysis' by BOR/USACE.				X		This should be considered as part of a larger initiative.	

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				Risk Review Board – The idea of requiring a review board for Level 4 studies is good and necessary. I would suggest some re-thinking as to when a review board is required and the way the board is engaged. Let me start by stating the obvious – the use of risk analysis in the hydro industry is new, both for the regulator, the owners, and the consultants that support the industry. This being the case, I think it is beneficial to the licensees and to the FERC if there was broader and deeper level of review (in some cases it might be one person) in other cases it might be a board. In addition, I would suggest that many of the reviews should be participatory. A late stage review is technically and logistically limited. In the spirit of consistency and technical soundness of the various applications, I think participatory reviews should be required. I recognize the idea of reviews should be scalable to the level of analysis, the complexity of the decisions, etc. So there is work to do in terms of thinking how review processes should be implemented.		X					X					The discussion on the risk review board has been revised to indicate that strong consideration should be given by licensees to incorporating a peer review process through the entire risk analysis	
				5. Tolerable Risk Guidelines – I have noted in the text what I believe are a number of inconsistencies and some possible errors. a. For instance, there are cases where the labeling on risk figures are different where I would have expected them to be the same. There are cases where the life safety metric on the label is, I believe in error. Labels that are used include: Estimated Life Loss, Number of Potential Fatalities, Incremental Potential Lives Loss, Average Incremental Life Loss, Expected Number of Lives Lost, Average Annual Potential Life Loss. These are not the same and I believe the last one in the list does not make sense to be. Why would an f-N or F-N type chart display f and the Average Annual Potential Life Loss (which is the product of the probability and the number of fatalities)? b. As currently written, the guidance seems unclear to me in terms of what the tolerable risk guidelines are and what risk results need to be generated and compared to the guidelines. For instance, are the guidelines intended to be compared to mean estimates of risk? c. The tolerable risk for individuals is defined in Figure 3-2 is defined as the Annual Probability of Incremental Life Loss for the Individual Most at Risk, however the text referring to this figure does not say this. It refers to Individual Risk in terms of the Lives Per Year. I believe the figure is correct and the text is in error.		X				a. See comments in chapter 2 below on revisions to risk charts. Labels for most axes have been revised. B. See comments in chapter 2 regarding revisions to risk guidance. C. see comments in chapter 2 for revisions to text on individual risk	X					text revised per comments in Chapter 2	
Chapter 1 - Introduction																	
			1.1.1	I see you've put routine program elements of inspection in risk management even though they are key inputs to risk assessment. Chicken and egg.				X		Acknowledged. Inspections can inform risk analyses and the results of risk analyses can inform dam safety inspections (frequency, timing, attendees, scope, etc.).				X			
			1.1.1	1st paragraph. 1st sentence. The word 'associated' . Do you need to define what risks you are managing? Its only the first sentence, but you might put a footnote.				X		This will be clarified	X	X				This workding has been revised, as presented in a new section (1.1.4) on Owner/ Licensee responsibilities	

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			1.1.1	1st paragraph. 2nd sentence. 'Risk Guidelines'. I think this is a mistake. It creates regulatory instability for the industry. As it plays out, I suspect it could undermine the integrity of the agency.				X		This will be clarified	X	X				This wording has been revised, as presented in a new sections on approaches to dam safety assessment and implementing RIDM approaches.	
			1.1.1	1st paragraph. 4th sentence. 'may become'. !!!!!!!				X		This will be clarified	X	X				This wording has been revised, as presented in a new sections on approaches to dam safety assessment and implementing RIDM approaches.	
			1.1.1	1st paragraph. Last 3 sentences. It seems to me that the agency would be better off establishing a risk-informed framework, within which all evaluations are viewed. While it is true that not all projects will require a probabilistic analysis, it seems to me that a unified framework is needed, not a disjointed approach. This first paragraph says to me: 1. We are not committed to risk informed decision making way of doing business. 2. We are not providing much guidance to the industry. 3. And we may never be a risk-informed agency (you may, but you may not).				X		This will be clarified.	X	X				This wording has been revised, as presented in a new sections on approaches to dam safety assessment and implementing RIDM approaches.	
			1.1.1	1st paragraph. Last sentence. Comment box added, but no text in comment box.				X						X			
			1.1.1	We use risk assessment to judge the relative conservatism (or lack of) of engineering guidelines and see both coexisting into the future. Ultimately we still have to design new structures so will always be a use for guidelines.	X			X		agree				X			
			1.1.1	Might be good to clarify the future role of the EGs. The EGs could still provide value in the future to guide those performing engineering analyses, but not necessarily for the purpose of regulation.				X		Engineering Guidelines will still exist along side the RIDM guidelines	X					This wording has been revised, as presented in a new sections on approaches to dam safety assessment and implementing RIDM approaches.	
			1.1.2	Not clear about the agency guideline dates referenced in this paragraph, but both existing for some time prior to these dates.	X					The publication date is correct, but HSE has been involved in this for over 20 years. Will clarify.	X					Indicated HSE involved in risk for over 20 years.	
			1.1.2	ANCOLD does not own dams	X					text will be revised	X					revised sentence to reflect comment below and remove reference to ANCOLD owning dams.	
			1.1.2	Second paragraph. Suggest rewording to. Notably, several water utilities in Australia began using the Australian National Committee on Large Dams (ANCOLD, 2003) risk management strategies to assess and manage risks for their portfolio of dams. The Australian province of New South Wales integrated some of these concepts into their regulatory framework.		X					X					text revised similar to comment. Revised to states of Victoria and New South Wales	
			1.1.2	first line of second paragraph. After the word risk, Analysis? Management?	X					clarify sentence	X					revised text to 'integrating risk approaches provide'	

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			1.1.2	Inventory refers to assets. Portfolio refers to investments. Licensees generating power consider their dams assets not investments. Term appears in all documents, suggest search and replace all. Inventory appears in some documents also.	X					will revise throughout text	X					inventory	
			1.1.2	Suggest rewording as follows, Recognizing the importance of having a consistent Federal approach to managing dam safety risks, several agencies (BOR, USACE, FERC, TVA, FEMA) began collaborating and developing general dam safety risk guidance. Their work culminated with the 2015 FEMA publication Federal Guidelines for Dam Safety Risk Management (FEMA, 2015).	X						X					revised text per comment	
			1.1.3	The 4 pillars or definitions of TRG are higher level principles that should find there place in your principles.				X		TRG is certainly a part of No. 4 in the numbered list. Want to keep this list as high level principles. Getting into what constitutes tolerable risk is a bit too detailed for here. It is presented in Chapter 3.				X			
		1-2	1.1.3	No.4 of your principles indicates FERC will require reduction of risk to as low as reasonably practicable (ALARP). What does that mean in a regulatory environment and how will it be applied uniformly across licensees?				X		See Chapter 3, and in particular the discussion of ALARP,				X			
			1.1.4	The document uses the term risk more broadly than you define here (only relative to failure). In particular non-breach risk wouldn't be covered by this definition. Consider broadening.	X					Good point. Risk definition has been updated.	X					used an abridged version of the definition from ICOLD Bulletin 130.	
			1.1.4 and appendix	The definition of risk is a narrow one applying only to the average annual risk (product of likelihood and consequences). This is widely recognized to have significant limitations for low probability-high consequences risk such as major dam failures. The definitions of risk in ICOLD, ANCOLD, CDA, UK Defra/EA, USACE and many other documents are much broader – unfortunately FEMA (2015) used the narrow definition. I strongly recommend that the FERC adopt a more general definition of risk, such as that in ICOLD Bulletin 130: *Measure of the probability and severity of an adverse effect to life, health, property, or the environment. In the general case, risk is estimated by the combined impact of all triplets of scenario, probability of occurrence and the associated consequence. In the special case, average risk is estimated by the mathematical expectation of the consequences of an adverse event occurring (that is, the product of the probability of occurrence and the consequence, combined over all scenarios).*		X				revise per ICOLD	X					Used the first line of the definition from ICOLD Bulletin 130. Just want to keep it simple here.	

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			1.1.4	Risk definition. I disagree with this definition. It does two things: 1. It dictates that risk is an expected value, which I believe is incorrect. 2. It dictates that risk measure by an expected, which I believe it is not. Expected values are useful as an end product for some applications, but they should not be the means for doing the analysis. 3. It dictates a procedure, which I don't think a definition of risk should include. In my view, this definition has been used far too long in the dams industry. It is for the most part a definition that is copied from one user to the text. It is particularly unfortunate that the recent FEMA document has used it. Propose this simple definition - Risk is the likelihood of adverst consequences.		X				revise per ICOLD	X					used the first line of the definition from ICOLD Bulletin 130.	
			1.1.4 and appendix	Similarly, I suggest a better definition of risk analysis (the current definition uses the more limited definition of risk as a product of likelihood and consequences) such as in ICOLD Bulletin 130:*The use of available information to estimate the risk to individuals or populations, property or the environment, from hazards. Risk analyses generally contain the following steps: scope definition, hazard identification, and risk estimation. Consistent with the common dictionary definition of analysis, viz. "A detailed examination of anything complex made in order to understand its nature or to determine its essential features", risk analysis involves the disaggregation or decomposition of the dam system and sources of risk into their fundamental parts.*		X				revise per ICOLD	X					Used the first part of the definition from ICOLD Bulletin 130.	
			1.1.4	Risk Analysis definition. A quantitative risk analysis yields a numerical estimate of the likelihood (the word risk does not belong here) ~~risk~~ of adverse consequence. ~~, multiplying the probability of load times the probability of dam failure given the load times the magnitude of adverse consequence given dam failure.~~				X		revise per ICOLD	X					Used the first part of the definition from ICOLD Bulletin 130.	
			1.1.4 and appendix	The definition of risk evaluation does not match that used by USACE and most others (it is also consistent with the discussion in Section 1.2) – I suggest using the ICOLD Bulletin 130 definition:*The process of examining and judging the significance of risk. The risk evaluation stage is the point at which values (societal, regulatory, legal and owners) and value judgements enter the decision process, explicitly or implicitly, by including consideration of the importance of the estimated risks and the associated social, environmental, economic, and other consequences, in order to identify and evaluate a range of alternatives for managing the risks.*	X					revise per ICOLD	X					revised per ICOLD Bulletin 130	
			1.1.4 and appendix	The definition of risk management does not match that used by USACE and most others (it is also consistent with the discussion in Section 1.2 and uses "acceptable risk," which is not consistent with "tolerable risk") – I suggest using the ICOLD Bulletin 130 definition (although I suggest adding "communicating" as shown below): *The systematic application of management policies, procedures and practices to the tasks of identifying, analyzing, assessing, communicating, mitigating and monitoring risk.*	X					revise per ICOLD and comment suggestion	X					revised per ICOLD Bulletin 130 and comment suggestion	

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			1.2.1	Second paragraph. Suggest rewording the sentence “For risk analysis, the key activity is risk estimation” to read “For risk analysis, the key activities are risk and dam system identification and risk estimation.”		X					X					revised text very similar to the comment.	
			1.2.1	Need to consider non-breach risk. The term "reservoir safety" is a little confusing. The definition should add the phrase "to assure due diligence in management of risks".	X					clarify/revise.	X					Bullet of non-failure risk added. Reservoir safety has been revised to dam safety. Added suggested text to risk management section	
		1-4	1.2.1	No. 1 in the middle of the page – should this also include mis-operation such as gate failure, etc?		X				should be part of No. 2	X					included misoperation in No. 2	
			1.2.1	fourth paragraph. “Indirect consequences” are not correctly defined. ER 1110-2-1156 (2013) has the following discussion of indirect economic impacts (note that on Page 2-8 you use similar text to this so the definition on Page 1-4 just needs to be made consistent with what is below): *5.3.9.3 Indirect economic impacts are those associated with the destruction of property and the displacement of people due to the failure. The destruction due to the failure flood can have significant impacts on the local and regional economy as businesses at least temporarily close resulting in loss of employment and income. Similarly, economic activity linked to the services provided by the dam will also have consequences. These would include economic impacts on business that provide goods and services for the recreation activities associated with the reservoir. All these indirect losses then have ripple or multiplier effects in the rest of the regional and national economy due to the resulting reduction in spending on goods and services in the region. In this way, a dam failure can have widespread economic losses throughout the region. These losses are the increment to flood losses above those that would have occurred had the dam not failed.*		X				don't want to get into the entire definition of indirect consequences here. We will leave that for Chapter 2. We will include a very short definition here and indicate that it should be estimated, where possible.	X					revised text to indicate indirect consequeces should be estimated, when possible.	
			1.2.1	improve figure quality of figure 1-2	X					will use figure 4-1 instead	X					Deleted figure and replaced with what is also included in Figure 4-1.	
			1.2.1	Figure 1-2: The title of this figure should be broader, such as “Recurring and Non-recurring Dam Safety Activities.” The outer loop is recurring activities and the inner loop is non-recurring activities. How about modifying this to introduce the FERC vision for RIDM, including Part 12 inspections and different types of RIDM risk assessments, instead of the generic version from FEMA (2015)? Looks like this is Figure 4-1.		X				Still want to keep this general in this chapter, so won't get into the various levels of risk analysis until chapter 2. Will consider using figure 4-1	X					Deleted figure and replaced with what is also included in Figure 4-1.	
			1.2.1	2nd paragraph. 'risk estimation'. I don’t understand this sentence. I don’t understand why we need another term to define risk analysis. Risk Analysis=Risk Estimation?? It seems an intermediate term is being created that has no particular meaning.				X		Risk estimation is a part of risk analysis. More goes into risk analysis than just risk estimation. Just trying to indicate some of the more important components of risk analysis. Also this follows general dam safety risk concepts used in dam safety in the US and in ICOLD publications.				X			

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			1.2.1	2nd paragraph. 'risk evaluation'. Ditto.				X		Similarly, risk estimation is part of risk assessment. There is more to risk assessment than just risk evaluation. Again, this follows general dam safety risk concpts used in dam safety in the US and in ICOLD publications.				X			
			1.2.1	3rd paragraph. Multiple edits to text in numbered list. The term risk, when used in the context of dam safety, is comprised of three parts: 1. The likelihood of occurrence of a load (e.g., flood, earthquake, reservoir elevation, operational challenges, etc.), 2. The likelihood of unsatisfactory or adverse performance of the dam system (e.g., uncontrolled release of the reservoir, damage to the dam that results in disruption of hydropower operations or compromises the safety of the system, damaging spillway discharge, etc.) given the load, 3. Given uncontrolled release of the reservoir, the likelihood and magnitude of downstream releases, and 4. The magnitude of consequences (e.g., life loss, economic damages, environmental damages, etc.)resulting from: a. Uncontrolled release of the reservoir, b. Unplanned, controlled releases, c. Adverse performance of the dam system.				X		Noted. No changes to current text based on comment. What is written is general framework used in US dam safety risk practices.				X			
			1.2.1	4th paragraph. "they can be incorporated into the risk estimates" What are you going to require? This seems like a very nebulous statement.				X		This is an overview/introduction section. More detailed information is provided in Chapter 2.				X			
			1.2.1	Figure1-1. I don’t think that failure mode identification belongs in this figure in the manner shown. I think it is a subset of what is shown as risk estimation.			X			It's important to show licensee's who are familiar with the PFMA process how this is used and how risk is in part an extension of the PFMA process.				X			
			1.2.1	Figure 1-1. Multiple edits to figure with arrows and added text.				X		the process and terminology shown in the figure have been adopted by the federal agencies that employ risk management processes. There may be other ways and other terms by other industries and others using risk, but this is what the federal agencies in dam safety risk management have adopted.				X			
			1.2.2	1st sentence. Suggest adding system performance, structure system, component and operator reliability to the list.				X		too detailed for this discussion.				X			
			1.2.2	2nd sentence. The word 'identified'. Only identified. Suggest re-wording this and the next sentence.				X		must first identify potential failure modes. Then you can evaluate and move on from there.				X			

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			1.2.2	Instead of "qualitative", consider "semi-quantitative". This paragraph should speak to risk drivers, not just driving PFM'S as sometimes consequences are the driver.	X						X					text revised relative to risk drivers.	
			1.2.2	last two sentences. This is understated, per my comments above regarding the elements of a risk analysis.				X						X			
			1.2.3	first paragraph after the word criteria. Is criteria the best word here? Perhaps “factors” or “considerations” or “guidelines” because of the wide range of things that might also be considered. Not everything might be treated strictly as “criteria.”	X					clarify	X					revised to factors	
		1-7	1.2.3	Last sentence in the last paragraph; should decommissioning be a possible decision resulting from a risk assessment?				X		It could be an alternative to consider. Generally the decision to decomission a dam is made in a much larger context and considers more information than is included in a risk assessment.,				X			
			1.2.3	Suggest removing “the regulator” since in the context of this document there is a regulator. This sentence could be rewritten as follows: “The risks are assessed by the dam owner and the FERC as the regulator, and if applicable, the owner’s engineer, or other stakeholders.”	X						X					text revised per comment	
			1.2.5	Paragraph should say "why" communications are important - an informed public can participate in the management of risks and realization of shared responsibilities.	X					revise text	X					Risk communication provides many benefits, including enhancing communication with the public, internally within dam owning and regulating organizations, and emergency management agencies (EMAs) for the purposes of improving the chances that dam safety decisions will be supported within and outside of the organization, better preparing the organization and the public for taking action in the event of an emergency, and instilling confidence in the dam safety office of an organization. In this sense, risk communication is essential for all agencies, organizations, and individuals that have a stake in the dam or would be impacted by its failure.	
			1.2.5	third sentence. While this is true, suggest more statements about why risk communication is also essential in the FERC regulatory environment – especially with the various relationships between Licensee-Regulator-Consultant, as well as stakeholders.	X					revise text						text revised as included in above response.	
			Appendix - APF	Each PFM has an APF, so not sure why definition assumes a combined sum. Seems like definition is addressing “Total AFP.”	X					will broaden definition to cover individual PFMs as well	X					text revised to broaden definition to cover individual PFMs as well.	
			Appendix - ALL	weighted average	X						X					revised text to 'weighted average'	

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			Appendix - dam failure	From a regulatory perspective, this might not provide sufficient guidance, and could lead to inconsistent interpretation by licensees and regulators. There could be many PFMs that involve malfunction and uncontrolled release (single gate, outlet works e.g. Hebgen, etc.) that may not exceed the safe channel capacity. At the same time, licensees should be considering risk associated with more than just the "dam" itself. Without additional guidance, regulators could spend considerable time deciding if PFMs are dam failures or not.				X		This definition is simply defining dam failure. It is not trying to determine what potential failure modes or events might need to be considered in a risk analysisl.				X			
			Appendix - event trees	some branches end in no failure	X					revise definiiton	X					revised text in clarify terminal branches and non-failure branches.	
			Appendix - incident	it seems that an incident can also be related to a potential failure mode that initiates but does not progress to dam breach	X					revised definition	X					definition revised to include PFM initiation and not resulted in failure of the dam	
			Appendix	suggest adding ALARP to the glossary				X		it is already there under 'As-low-as-reasonably-practivable				X			
			Appendix - life safety tolerable risk guidelines	last line of definition after the ';' I am not sure what this means here.				X		it means that the third measure of life safety includes looking at life loss on an f-N chart				X			
			Appendix - risk characterization	risk definition - No.				X					X			term deleted	
			Appendix - risk characterization	Identification of uncertainties related to risk estimates would also be helpful.				X					X			term deleted	
			Appendix - risk informed	should add a definition for this.				X		it is already there				X			
			Appendix - robustness	this is not always possible.				X		agree				X			
			Appendix - threshold flood	design max water surface elevation - At Reclamation, design maximum reservoir water surface (MRWS) usually included freeboard. I think the threshold flood typically results in a MRWS at the crest of the dam.				X					X			term deleted	
			Appendix - variability	I have not seen variability defined this way.				X					X			term deleted	
Chapter 2 - Risk Analysis																	
			2.1.1	first sentence. The word 'interpretation'. What does interpretation mean here?				X						X		FERC is responsible for interpretating the appropriateness of the methodoliges proposed and used by licensees and consultants conducting risk analyses.	
			Figure 2.1	"Risk control" is now a dated term in industry.	X					agree			X			reference to risk control is removed	
			2.1.2	first paragraph. The limited definition of risk as the product of likelihood and consequences is again referred to here.				X				X	X			Deleted 1st paragraph with text referring to FEMA. Added risk anlaysis definition from ICOLD and other ICOLD text on risk analysis.	
			2.1.2	first paragraph. The phrase 'risk of adverse consequences'. Redundant.	X					part of the definition quoted in FEMA document		X	X				
			2.1.2	first paragraph. Last sentence. As noted before, I disagree with this definition.				X				X	X				
			2.1.2	second paragraph, 3rd sentence. This is closer to the right idea; an estimate of: a. Likelihood of occurrence, b. magnitude of consequences. Not an estimate of the product of likelihood of occurrence times the magnitude of consequences.				X						X			

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		2-1	2.1.2	Second paragraph; I would suggest the term unique specific potential failure modes to distinguish the importance of the uniqueness of each project site as opposed to the term “general” or “common” potential failure modes.				X		will emphasize the 'site-specific' nature of PFM's.	X					added the phrase 'site-specific' before potential failure modes at two locations in the paragraph.	
			2.1.3	second paragraph. I suggest changing the following: Risks are typically evaluated by individual potential failure mode (NOT CORRECT – TOLERABLE RISK GUIDELINES ARE APPLIED AT THE TOTAL RISK LEVEL). The potential failure modes are then rolled up within a decision framework at a particular structure. TO: Risk analyses should consider the interactions between individual potential failure modes in order to properly understand the overall risk and how that risk can be reduced. The decision framework for a particular structure considers the rolled up risk across all potential failure modes, which may not be a simple sum of the risk for each potential failure modes considered individually.	X							X	X			deleted text and added text as suggested in the comment.	
			2.1.3	Figure 2-1. See comments in Chapter 1				X						X		see earlier response	
			2.1.4	Section heading. Having read this section, I don’t know what Philosophy and Approach mean here.	X						X					revised section heading to 'Considerations"	
			2.1.4	first paragraph first sentence. Dam failure is also defined in the introduction document. See comments there.		X						X				revised definition to include It is recognized that there are lesser degrees of failure and that any malfunction or abnormality outside the design assumptions and parameters that adversely affect a dam’s primary function of impounding water could be considered a failure. [FEMA, 2015]	
			2.1.4	first paragraph, first sentence. This first sentence seems inconsistent with: 1. The definition of risk given in Chapter 1. 2. The principles in Section 1.1.3	X							X					
			2.1.4	first paragraph. Last three sentences. This text seems to me to be out of place for a section label Philosophy and Approach	X						X					revised section heading to "Considerations"	
			2.1.4	second paragraph. I am confused by this paragraph. I am unclear as to what is/is not considered.	X							X				added clarifying text as suggested in the comment.	
			2.1.4	second paragraph. I suggest adding the underlined text as follows; … then the risk associated with these cascading failures would be attributed back <u>as a consequence</u> to the dam being assessed (USACE, 2014). Risks generated by failures of ‘upstream’ infrastructure are usually not considered <u>at the downstream dam</u>.	X							X					
			2.1.4	Sometimes safe operations can O/T downstream dams...how is this addressed? Be more consistent with Fig. 2.2				X		clarify.	X					revised text to indicate failure or non-failure of the dam being assessed . . . Risk would be attributed back as a consequence to the dam being assessed.	
			2.1.4	DSRC - is this based on incremental risks?				X		Yes				X		defined in Chapter 4	
			2.1.4	While “limit state exceedance” may not be the initiator, it is on the step-by-step progression, and would be considered a More Likely factor. Suggest instead rewording the sentence to “…and may not necessarily progress to failure.”				X		Agree but disagree at the same time. Not trying to get too specific regarding the concepts of initiation-continuation-progression in this discussion.				X			
			2.1.4	third paragraph. These two paragraphs seem incosistent to me. No, you are not considering cascading failures; then yes you are. I am not sure what the message is. This also seems out of place – why is this being talked about under philosophy?	X			X		clarify	X					added clarifying text as suggested in the previous comment and changed title of section.	

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			2.1.4	third paragraph. Last sentence. Is this suggesting that multiple licensees on the same river should work together or would it only apply to owners of multiple dams on the same river?				X		Could be either or both, depending on the circumstances.				X			
			2.1.4	fourth paragraph. Second sentence. Suggest replacing analyst with team. You want to encourage team efforts not individual, right?	X			X		In a level II risk analysis it could be an individual. For level III and IV risk analyses it would be a team.	X					changed 'analyst' to 'analyst or team'	
			2.2.1	first paragraph. 3rd sentence. 'inundation scenarios'. I understand the notion of inundation scenarios – it is clear enough. What I don't get is calling these different types of risks? This is not clear to me.				X		Categorizing or distinguishing between incremental risk (risk due to some physical failure of the infrastructure) and non-breach risk (non physical failure of the infrastructure) is helpful in evaluating possible risk reduction measures and actions.				X			
			2.2.2	first paragraph. I suggest deleting the last sentence of this para. It seems to imply that "risk" is most often considered as "consequences in the reservoir area."				X			X					Moved the last sentence of the first paragraph to after the first sentence of the first paragraph.	
			2.2.2	fourth paragraph. Unclear – incremental only applies to flood cases – seems complicated to bring internal erosion and seismic into an incremental risk discussion.	X					delete paragraph to remove confusion			X			Paragraph deleted.	
			2.2.2	last paragraph. I suggest changing the word "hazard" to "severity." Hazard in the sense used in potential flood hazard could change as a result of constructing the dam and also the term hazard is typically applied in risk assessment to the flood or seismic characterization (i.e. flood hazard or seismic hazard).	X						X					revised text as suggested in the comment.	
			2.2.3	You should think long and hard about the non-breach risk. I almost think you ought to say – non-breach risk is the mission of USACE I'm concerned that this will confuse things. It's important to reinforce the concept that no matter what, risk remains, but I would explain that very simply rather than with Figure 2-3				X		From an infrastructure standpoint it is important to know where the risks are coming from. This helps to inform appropriate actions and urgency. It is important to know the residual risk as this is the overall risk. Identifying the non-break risk will be important for dam owners to communicate to downstreamm communities and has the potential to help them better understand and manage their risks. This may include reaching out to USACE or others in developing community planning studies or other appropriate actions.				X			

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			2.2.3	Do you want to focus on pre-construction for evaluating non-breach inundation? I think is usual to consider that downstream interests have become used to the situation with the dam in place and that non-breach risk evaluation should compare with the with-dam situation and carefully evaluate any increase to that risk that may occur due to risk reduction measures or changes in operation with before the risk reduction but with (not without) the dam. For example: lowering or widening a spillway crest.	X					That is certainly the intent of evaluating non breach risks (not considering prior to the dam being there.)				X			
			2.2.3	last paragraph. Non-breach risk has always has been a standard output from DAMRAE.				X						X			
			2.2.5	Section heading. Are you requiring these to be evaluated? If so, for all projects?				X		Yes. Section 3.3.1 states the consequences to be considered. The scope, detail, and effort for each project should be appropriately scaled for the magnitude of the consequence and decision.				X			
			2.2.5	first paragraph. I suggest making the point that a FERC licensee might be very interested in assessing their potential financial losses in addition to economic losses. I suggest that the FERC should still require that economic losses be estimated. I suggest that a statement should be included here that it is essential that a qualified economic should be retained to estimate economic losses.	X							X				added text on owners financial losses and recommendation for analysis to be performed by qualified economists.	
			2.2.5	Organizationally it's not clear why 2.2.5 and 2.2.6 are included in the "Types of Risk" section. These are categories of consequences in the event of failure. Both of these are part of the decision making process (risk assessment) but not really part of risk analysis. Also, this section covers economic and environmental issues, but it's strange that life loss is not covered first.		X				They are still risks, just not life safety risks. Agree that life safety should be discussed first. Will revise text	X					Transferred risk measures discussion from Chapter 3 to before this discussion. Left risk guideline discussion in Chapter 3.	
			2.2.5	4th paragraph. 3rd sentence. They are certainly a cost to the owner, who is likely in many cases to want to rebuid/repair the dam.				X		Yes, but that decision to repair or not repair would be made by the dam owner.				X			
			2.2.5	5th paragraph. 1st sentence. Whose property? Isn't this the same as direct impacts?				X		The destruction of property would be a direct impact. However the destruction of property will cause indirect impacts to others due to the loss of that property. Those are indirect impacts that must be identified and evaluated.				X			
			2.2.5	5th paragraph. Last two sentences. Why is this the case? In a lot of cases it takes work to make these estimates – is that what you mean by difficult?				X		Identifying and quantifying the ripple effect of the losses can be very difficult.				X			
			2.3.1	This section generally describes the four categories or levels of risk analyses and indicates documentation will be required for the qualitative, semi-quantitative and quantitative analyses. In a regulatory environment, what will these analyses documents look like or how will they generally be characterized? (i.e. screening level reports, Part 12D Risk Analysis Addendum, quantitative risk assessment reports…?)				X		Later in the chapter are documentation requirements for level 3 and 4 risk analyses. Documentation for Level 2 risk analyses are still to be worked out once the methodology is developed.				X			

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			2.3.1	1st paragraph. Last sentence. This implies that epistemic uncertainties are reducible. In a practical sense they are not. What I mean by this is, we might from time to time be able to reduce some of the epistemic uncertainty by say gathering more data. In the final analysis, epistemic uncertainty will still be there and it will generally not be trivial.	X						X					Last sentence rewritten to "better understand and reduce the uncertainty, when and where possible, and increase the confidence in the risk estimates.'	
			2.3.1	3rd paragraph. A good point is made about the scalability of risk assessment approaches as one progresses through the levels of risk assessment. I am not clear, however, how scalability works for the specific levels listed in the second para.: in other words can one scale up from a qualitative or semi-quantitative risk analysis to a quantitative risk analysis? If not then the document should probably indicate that while scalability is desirable it cannot be achieved throughout the proposed approach.				X		The intent of the paragraph is to indicate that the information needed for each more advance level of risk analysis is built on the information obtained from the lower level risk analysis. When and where needed, this information is supplemented by additional information in the higher level risk analysis. Through this process additional knowledge/insight is gained but only so much as the information needed to support the decision.				X			
			2.3.1	third para., line 8: “I think that “accuracy” should be “precision.”	X						X					text revised per comment.	
			2.3.1	3rd paragraph. Last 4 sentences. I understand what you are trying to say here, but it seems to me it is a bit of a slippery slope. First off, these words are reasonable and appropriate when we are dealing with an informed owner and user. With an non-informed user and owner, these are words they guide	X					Agree. Hence our rationale for including the information in Section 2.5.1 on preparing for a risk anlaysis and the inclusion of a risk analysis plan and meetings with FERC to establish the requirements and expectations.				X			
			2.3.1	third para, last sentence: This sentence was originally based on the following quote, which is often attribute to Einstein: “Everything should be as simple as it can be, but not simpler.” May I suggest changing this last sentence to the following: “The analysis should be as simple as it can be, but not simpler.” (Interestingly much of the text adapted from USACE, UK EA, ANCOLD, NSWDSC, ICOLD, etc. is text that I either wrote originally or have reviewed and edited!).	X					You certainly have had a hand in nearly every dam safety risk guidance document developed.	X					text revised per comment.	
			2.3.1	4th paragraph. 1st sentence. This is just a general statement. Seems like a livel 4 is quantitative.	X						X					text revised to indicate levels range from qualitatitive to quantitative approaches.	
			2.3.1	5th paragraph. Seems a bit wishy washy to me. I would think that FERC should provide very clear guidance as to what level of risk analysis is appropriate for a given problem type.				X		I believe we do later in the section. This section (2.3.1) is meant to provide a general overview of the process.				X			
			Table 2.1	Seems this is missing reference to the decision to be made: risk characterization or risk reduction investment. These are key drivers in level of effort.				X		The reference to the decison being made is included in the discussion for each level of risk analysis. Not able to include that information in this table.				X			

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			Table 2.1	4A consequences cell. Clarify type of analysis method expected. Unclear what this statement means. Is it level 4B if there are >1000 PAR? And 4C if >50,000? If that is what is intended, it seems like the PAR criteria could be confused with the level of risk analysis. You'd still work your way from simpler to more complex, right? Regardless of the PAR.	X					clarify	X					text revised. Removed reference to PAR. Changed text to level of difficulty.	
			Table 2.1	I really like the idea of this table. However, it seems to have very limited value at present because the approaches mentioned are too general in most cases. I suggest leaving it out but if it is included then it needs to be carefully vetted. As an example, is FERC serious about requiring a SSHAC-type approach for loadings at Levels 4B or 4C? If so, what level SSHAC process? Levels 1 or 2 may be justifiable but Levels 3 or 4 can be very expensive. As another example, I am not sure that the having a PAR > 50,000 should automatically require a Level 4C and therefore a SSHAC process for loadings as seems to be implied here.	X						X		X			Removed reference to SSHAC in the table, but left it in the discussion later in the section. Removed reference to PAR in consequences.	
			Table 2.1	4a row. What does simple loading mean? The east has earthquakes, but they are relatively rare (compared to the west). Is this simple?				X		Simple in the context of straight-forward to estimate. No real technical challenge. Simple does not mean rare in occurrence.				X			
			2.3.2	1st paragraph. 1st sentence. Used for portfolios only? Frankly, I am a bit leery of this level of analysis. Without a well defined approach, strong oversight, and a knowledgeable staff, the results can be questionable.	X					yes. Portfolio only.				X			
			2.3.2	first para.: I am not convinced that the techniques that are often used with the claim that they give a "relative risk estimate" really are capable of doing that. As you say it is a "goal."				X		Results of Level 1 risk analyses must be used with the understanding of the intent and level of effort as well as the limitations.				X			
			2.3.2	first paragraph. Last sentence. Relative risk among the dams to be evaluated. Is this level required for owners of 1 dam? 3 dams?				X			X	X				Added text to indicate that Level 1 risk analyses are not a requirement of a dam owner. However a Level 1 risk analysis by a dam owner with multiple dams can be beneficial and help with prioritization of actions for multiple dams.	
			2.3.2	1st paragraph. Last sentence. Who is the beneficiary of the screening risk analysis? If it is the owner only, the why would you need to have this in the guidelines? Is FERC going to require this? If so, will you review the methodology and the implementation? I am not sure what the point is?				X		see comment above	X					added additional text to indicate how this could be used for owners with multiple dams. Also emphasized the limitations of the process. Added text at end of section to indicate Level 1 risk analyses are not a FERC requirement.	
			2.3.2	You might also want to point out that in general higher level studies have shown that the highest risk dams identified by these tools were not that high (e.g. Yellowtail Dam at Reclamation). I am not sure you want licensees grabbing these tools and using them. Without a strong failure mode basis, it is doubtful the risk results will be that meaningful.	X						X		X			removed reference to USBR and USACE screening tools.	
			2.3.2	second paragraph. Invetory vs portfolio. Same comments as above.	X						X					text revised per comment (throughout document)	

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			2.3.2	third paragraph. More detailed instead of modification. Screening level analyses would initiate further more indepth studies to determine IF risk reduction is necessary. Don't think you'd go from screening level to modification study.	X					correct	X					text modified to remove reference to modifications.	
		2-13	2.3.2	In the 5th paragraph; the results of screening level risk analyses may not be suitable for making a decision about whether risks of certain potential failure modes are tolerable or unacceptable, however, for more quantitative screenings that include enough information in an assessment, recommendations on tolerability and unacceptability may be possible.				X		Using our definition and scale of screening level risk analysis, this would not be possible. A more detailed, quantitative level of risk analysis could be developed (as used by TVA), but we would refer this to a more advance level of risk analysis.				X			
			2.3.2	6th paragraph. RPBS..Just an observation if someone were to ask how this worked, don't think Reclamation could answer or provide any documentation.	X					understand	X		X			reference to RBPS is deleted.	
			2.3.2	Is it wise to mention the RBPS and SPRA approaches of Reclamation and USACE? As you state neither agency now uses these tools and I think for good reason. My concern is that others may pick them up and start using them – I have seen this as recently as a couple of years ago in Canada where someone was using RBPS. The method is certainly not capable of providing a relative risk estimate because of the maximum percentage constraint on the risk from each loading type. This is an example of background discussion that could be confused with the FERC advocating something that you are not really intending to endorse.	X					good point.	X					text revised to refer to both agencies using screening level tools, but no reference is made to the tools themselves.	
		2-13	2.3.2	Examples of screening level risks tools include USACE and USBR; Is it possible for your guidelines to include TVA as an example: 3. Screening Risks Assessments (SRA), created and used by the TVA in 2011-2013 TVA screening level analyses were performed utilizing a more quantitative methodology than the other two agencies but used essentially the same way.				X		Deleted all references to agency specific screening tools.				X			
			2.3.2	8th paragraph. Screening level risk analysis tool. Provide a reference for instructions on how to assign failure likelihood category and consequence category. Or include guidance in this document explaining the basis fo different categories.			X			This section and document will not present the Level 1 risk methodology. The text in this section is intended to be illustrative and not perscriptive.				X			
			2.3.2	Figure 2-5. Shouldn't each block have a range rather than a single value. Oh, these are scores?				X						X			
			2.3.3	Seems primary purpose is risk characterization or confirmation? Should state so.	X					Agree	X					text revised.	
			2.3.3	first numbered list. #2. last sentence. This is a really important point for licensees to understand. It might incrrease the cost of a P12 but certainly is more labor efficient than an off-cycle risk analysis. Perhaps this point would be highlighted more if it was also in Chapter 1 Framework section?	X					Agree to the point, but don't feel like this is something for Chapter 1.				X			

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		2-15/17	2.3.3	General note: This periodic Risk Assessment appears to be or is described as being analogous to the Federal Guidelines for Dam Safety requirement for periodic inspection of dams and thus would align with the FERC Part 12D independent consultant inspections. This would establish a portfolio risk assessment frequency cycle of five years for the FERC inventory of dams. Other agencies (USACE, USBR, TVA) establish their assessment cycle based in part on resource requirements as an intrinsic part of the risk methodology. How will FERC include or consider this for licensees who seek to enter the risk informed decision making program on a portfolio basis?				X		FERC envisions Level 2 risk analyses becoming a component of the Part 12D process, as described in this section. Level 3 and Level 4 risk analyses will be available for those owners that elect to use risk analyses as a tool in their dam safety decision making process.				X			
		2-16	2.3.3	Examples of Federal agencies that have incorporated risk analyses into their periodic inspection and review programs: Is it possible for TVA to be included in your guidelines as No.3 with?; 3. The risk analysis methodology developed and used by TVA in support of their Formal Inspection process (FI).				X		We could consider this in the future. We are just not that familiar with TVA's processes to include them by reference at this time.				X			
		2-16	2.3.3	first and last bullet: Why is the term “vulnerability” used instead of “potential failure mode”?	X						X					text revised to not PFMs. Vulnerability removed.	
			2.3.3	add bullet to primary purpose of a level 2 risk analysis list • Provide support to inform dam safety decisions for taking action (or not) to better define risks through higher level studies, or reduce risks.	X							X				added bullet per comment.	
			2.3.3	after list. Performed by an individual or by a small team. Suggest discouraging an individual approach. Suggest that a small team including owner’s engineer, FERC regulatory, consultant, and consultant’s peer reviewer are the minimum. Agree that a full facilitated meeting is not needed.				X		Agree that a team-based approach provides more confidence in result. Some owners may choose this approach and FERC will encourage them to do so. In an effort to manage the cost of the Part 12 effort, teams will be encouraged, but not required.				X			
		2-16	2.3.3	penultimate para., line 4: I suggest that “credible” should be “credible and significant.”	X						X					text revised per comment	
		2-16	2.3.3	penultimate para., line 4: I“credible”. Who makes this judgment/assessment? How?				X		The case will have to be made in the report as to why a particular PFM is considered credible and significant or not. Additional guidance on this will be provided with the roll out of the Level 2 risk analysis methodology currently under development.				X			
			2.3.3	penultimate para. Last sentence. 'agency' FERC? Owner?				X					X			sentence deleted. Guidance will be provided in Level 2 risk methodology roll out.	
		2-16	2.3.3	last line: I think that “Individual” should be “Incremental.”			X			Individual risk is correct				X			
		2-16	2.3.3	last line in paragraph. I don't understand this. Life safety risk is estimated? Individual risk is not?				X		Per 1st sentence of the paragraph, only incremental risk is estimated. No other life safety risks are estimated.				X			

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			2.3.3	interval between assessments determined by the agency. How does FERC propose to decide the interval? Why not simply coincide with the P12?	X					It likely will be. However this guidance will be provided at a later date with the roll out of the Level 2 risk analysis methodology.		X				sentence deleted	
		2-17	2.3.3	second line on page. 'may also be included' Who or what determines if they are included?	X						X					sentence revised to include those consequences if they are significant or large.	
			2.3.3	Individual risk. Did you mean "residual" risk not individual risk?			X			Individual risk is correct.				X			
		2-17	2.3.3	Last comment of the section indicates FERC is currently developing the methodology for level 2 (Periodic) risk analysis. I would suggest/request that TVA work closely with FERC in this process as there is some interest in seeking a “level playing field” for TVA within the energy industry.				X		Will do.					X	FERC to follow up with TVA on this.	
		2-17	2.3.4	1st paragraph. 1st line. Level 2 is semi-quantitative or quantitative and Level 3 is only semi-quantitative?	X						X					revised text in section 2.3.3 to indicate Level 2 risk analysis is semi quantitative.	
			2.3.4	first paragraph. A level 3 risk analysis. Might be good to clarify somewhere how the risk approach is phased. Meaning – does the outcome from Level 2 periodic help decide whether a level 3 semi-quantitative RA is needed? If the level 2 is quantitative, is the level 3 still semi-q? It's not clear who you would need a Level 3. Seems like in some cases Level 2 would provide enough information to move beyond level 3.	X						X	X				Added a new figure that shows the relationship of the levels of risk analysis in the overall risk analysis process.	
			2.3.4	first paragraph. Last sentence. . . . Do not need additional study or risk analyses. Wouldn't level 2 give you this information?				X		perhaps not if only done by an individual. It would/could if performed by a qualified team.				X			
		2-17	2.3.4	First two paragraphs appear to make the first activity of a level 3 risk analysis a parsing of the previously determined and documented potential failure modes (PFMA Reports since 2002 in FERC Engineering Guidelines Chapter 14) which were developed by a different team into those which are to be included in the risk analysis. I would suggest you consider a process of formalizing this activity into a two tier definition of the potential failure modes, those which are significant and credible, to be included into the risk analysis?	X					Agree. We believe this is addressed just a couple of pages later when going through the steps for each PFM.				X			
		2-17	2.3.4	2nd para, second line: I suggest inserting the underlined words in “the full range of identified credible and significant potential failure modes.”			X	X		Disagree, but it may just be in semantics. Level 3 risk analyses should consider all developed PFMs for the project. Those PFMs that are judged to be credible and significant will be carried forward into the risk analysis. Those PFMs that are excluded, the rationale for excluding them must be documented in the report. So all PFMs are addressed in some way.				X			
		2-17	2.3.4	2nd paragraph. 3rd sentence. How so if they are only semi-quantitative?				X		The inputs may be a combination of quantitative information and qualitative information. Not necessarily eliciting numeric values, but rather qualitative descriptors.				X			

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			2.3.4	second paragraph. Last sentence. . . .specific actions to take to implement permanent risk reduction measures. Maybe true, but there could be situations where an action such as monthly monitoring for sediment could result in risk reduction. The risk analysis should have sufficient confidence to make decisions about specific actions to better define risks	X						X					revised sentence to indicate results should have sufficient confidence to make deciisons about specific action to better define the risks.	
		2-19	2.3.4	Annotated steps to be taken for each identified potential failure mode. Should these steps be required for each identified significant and credible potential failure mode or all identified potential failure modes? (refer to previous comment)				X		This process should be followed for each identified project PFM. Now in practice some PFMs can easily be ruled out, but the rationale for excluding the PFMs must be documented in the report. This process provides a framework to work thorugh each PFM.				X			
			2.3.4	first bullet zero freeboard - same as dam crest	X						X					text revised	
			2.3.4	first bullet the dam crest = zero freeboard and the dam crest are the same thing.	X						X					text revised	
			2.3.4	list of 'additional information typically needed. Typically? The listed items depend on the PFMs, and are typical only if there are PFMs related to those loading conditions. These listed typical items only cover the loading side and the consequence side, they don't address the structural response side. "Typical" additional information might also include subsurface information, material properties or other information that helps better define the structural response.				X		Since FERC regulated dam owners are familiar with the PFMA requirements, this list was intended to represent the major pieces they don't typically gather for a PFMA (loading frequency and consequence estimates.).	X					revised text to add a fourth bullet to indicate 'other information that helps better define the structural response.'	
			2.3.4	list of 'additional information typically needed. Bullet 1. the zero freeboard flood frequency. It seems that these two things could be different – the threshold flood could be greater than the flood that exceeds the design capacity of the spillway – especially if freeboard was included in the original design.	X						X					text revised to distinguish between spillway capacity and dam crest frequencies.	
			2.3.4	list of 'additional information typically needed. Bullet 2. second sentence. Why highlight the MCE? The highest risk might come from more frequent loadings. The full range should be emphasized, no t just the MCE.				X		The bullet states development of PSHA curves so the whole range of loading is expected. It goes on to include identification of those ground motions and analyses that might have been performed for common design standards such as MCE as this can help provide an analysis point in the risk analyses.				X			
			2.3.4	list of 'additional information typically needed. Bullet 3. third sentence. Unclear why this is highlighted. The main point is life loss estimate – need inundation information, PAR estimate, flow information depth, velocity – and warning and travel time.				X		Agree. It is not the intent to emphasize the factors that go into a consequence estimate here, but rather that a consequence estimate is needed since this information is typically not provided in the past during PFMAs.				X			
			2.3.4	the following steps list. First bullet. Bolded sentence. Sketches/figures depicting the PFM can be very valuable.	X						X					added text to indicate sketches and figures can be very valuable.	

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			2.3.4	the following steps list. 4th bullet. The notion that consensus should be sought is inappropriate in my view. I don't know why you would want or need consensus. The goal should be to understand the system and make assessments of the likelihood of performance. Typically, evidence is conflicting and therefore there will be different interpretations.				X		This is not a fully quantitative risk analysis. Just trying to get a feel for for which PFMs will need full QRA and which ones will not.				X			
			2.3.4	the following steps list. Last bullet. Modify as.considerably less than assumed in thesome older inundation studies that were developed for the purpose of EAPs, not necessarily for estimating life loss consequences.	X						X					revised text per comment.	
		2-19	2.3.4	the following steps list, last bullet: Should something be stated about only "qualified" team members participating in the consequences estimation process? This is every bit an area in which specific skills are required as geotechnical engineering or flood frequency, for example.				X		will leave the discussion of qualifications of risk analysis personnel to section 2.4.				X			
			2.3.4	Although individual risk is typically not evaluated, the Annual Failure Probability in accordance with Reclamation guidelines can and has been roughly evaluated based on a horizontal line between Moderate and High categories. I'm not sure how this would relate to FERC guidelines.	X					That's correct. That will give us a general sense of individual risk results.				X			
			2.3.4	last paragraph. Last sentence. Basically you are asking the analysts to do risk calculations and uncertainty calculations in their heads.				X		Asking the analysts to separate out likelihood of failure and consequences. Those are considered separately. Then consider uncertainty and confidence and provide a qualitative assessment of these factors based on their understanding of the information available in the risk analysis.				X			
			2.3.4	figure 2-6. Note this chart differs from Figures 2-4 and 2-5 above – there are 6 categories for likelihood and 6 for consequences. Blue boxes for PMFs vs PFM titles in colored boxes. Red line vs colored boxes. Suggest consistency, particularly in examples on how FERC would like to see the level 3 risk portrayed.				X		Original figures 2-4 and 2-5 are examples of the SLPRA methodology used for level 1 screening level risk analyses. Original figure 2-6 is for level 3 risk analysis. They serve different purposes and were developed under different requirments. It is unfortunate that they are not consistent, but that is not a requirement.				X			
		2-20	2.3.4	Figure 2-6: I suggest associating numerical ranges of probability with the vertical axis and numerical ranges of consequences with the horizontal axis, especially because limit lines are shown implying a relationship to an f-N chart.				X		The methodology for performing Level 3 risk analysis is documented in the *Best Practices* document. That information is included in that document.				X			

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		2-20	2.3.5	First paragraph. It is stated that “Level 4 risk analyses are typically focused on one specific (or more than one) potential failure mode …” Although “focusing” on one or a few specific failure modes may be appropriate, I suggest mentioning that all credible and significant PFMs should be included for a Level 4 risk analysis [this is mentioned on Page 2-21 (second para.] to provide a perspective on the interactions between failure modes and so that tolerable risk evaluation can be conducted, which requires that all credible and significant PFMs are considered. The present wording could be interpreted as only including one specific (or more than one) potential failure mode.	X					good point.	X					text revised to indicate credible and significant PFMs from the results of the level 3 studies.	
			2.3.5	1st paragraph. Second sentence. Reduce uncertainty – relative to what. I think this notion is a bit misguided. Up to this point you really have not addressed uncertainties. I agree with the idea of increasing confidence.				X			X					text revised to indicated supporting activities are completed to aid in quantifying and reducing uncertainty, if possible	
			2.3.5	Should state primary purpose is decision on large investments.	X						X					text revised to indicate level 4 risk analyses are conducted primarily to inform the decision for making or not making dam safety investments.	
			2.3.5	first paragraph. Add sentence to the end of paragraph. "Risk informed decisions made based on the level 3 risk analyses can help focus the studies.		X					X					text revised slightly from the comment	
			2.3.5	second paragraph. Based on the description of the Level 3 analysis, isn’t this always the case?	X					yes				X			
			2.3.5	second paragraph. Last two sentences. I am not sure I get the idea of confirmed and unconfirmed.	X					clarify	X					reworded sentences and removed the terms confirmed and unconfirmed.	
			2.3.5	System response curves are not needed if individual event tree nodal estimates are used to determine the conditional failure probability, but could be developed from those estimates I suppose.	X						X					removed reference to system response curves	
			2.3.5	first bulleted list. Second bullet. Adequacy of current or need for additional intermin or permanent. This is awkward wording.	X						X					revised sentence	
			2.3.5	first bulleted list. Third bullet. Support prioritization. Is this relative prioritization for the licensee? Or does this really mean the speed at which studies and/or modifications should be completed? (i.e. target 1 year or 5 years?). The regulatory prioritization concept isn’t quite clear yet. Maybe that is a topic for a different section. For example, would a licensee with one dam at DSRC 4 be expected to reduce risk faster than another DSRC 4 dam owned by a licensee with 3 other DSRC 3 dams?				X		Prioritization within the licensee's inventory is certainly part of it. There are also resources outside the licensee's control that must be considered as well.	X					revised sentence to add the word, 'urgency'	
			2.3.5	add bullet: • Build the case for why the risk estimates make sense and are consistent with the current conditions of the project;	X							X				revised text per comment	
			2.3.5	revise bullet to: • Develop risk reduction alternatives, as appropriate, and evaluateestimate ALARP. Build the case for why the recommended actions are consistent with the risk estimates and conditions of the project.	X							X				revised text per comment	
			2.3.5	6th paragraph . I find this statement puzzling. Are you trying to convey a sense of degree, compared to other level 4 analyses?				X		correct.	X					revised statement to uncertainties are not large	

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			2.3.5	7th paragraph. ALARP considerations are relatively easy to determine. In Reclamation's experience, ALARP evaluations are rarely easy.				X		Not all FERC projects are as large as Reclamation's projects. Also it is expected that some ALARP considerations will be relatively straightforward (in some cases due to few to no low cost alternatives available)				X			
		2-22	2.3.5	7th paragraph. I don't think that "ALARP" has been defined before here – I suggest referring to a section where it is defined or giving a brief definition here (maybe a footnote) to help the reader.	X						X					footnote added to refer the reader to section 2.5.5	
			2.3.5	8th paragraph. Last sentence. Resulta are not sensitive to the final result or decision. Unclear - results not sensitive to the decision, or decision not sensitive to results?	X					clarify	X					reworded sentence for clarity.	
			2.3.5	Level 4 risk analysis bullet list. First bullet. I disagree with this as a leading activity. Potential failure modes are probably already available, such as they are. The detailed identification and evaluation of failure modes is a subset of the fragility analysis.			X			PFMA is a foundational element. Licensees are familiar with what is required to identify and develop PFMs and this will be the springboard for embarking into risk analyses.				X			
			2.3.5	Level 4 risk analysis bullet list. Second bullet revise to - • Develop event trees and fault trees (as applicable) for each initiating event that is being evaluated		X				want entire event tree developed for each PFM, not just for the initiating events.	X					revised text to include "and fault trees (as applicable)'	
			2.3.5	Level 4 risk analysis bullet list. Third bullet. Seems like a strange way to say this. The loading function, or hazard curves for external events such as earthquake, floods, high winds, etc. are developed. I don't think of them as a being developed for the each PFM.	X						X					revised text to loads (hazard curves) needed for each loading event. Removed reference to PFM.	
			2.3.5	Level 4 risk analysis bullet list. Insert a new bullet after third bullet. • In the case of external events such as earthquakes, floods, estimate the conditional probability of failure for structures, systems and component; as			X			This is rolled into the bullet that follows.				X			
			2.3.5	Level 4 risk analysis bullet list. Existing 4th bullet. Revise to - • Determine the conditional probability of occurrence for each event tree sequence that leads to unsatisfactory performance of the dam system		X				See response to comment below	X					revised text to remove system response reference. Left text reference to conditional probability of failure for each PFM.	
			2.3.5	Level 4 risk analysis bullet list. Existing 4th bullet. There is a difference between response probability and fragility (conditional probability of failure (structural or conditional as the case may be)). Response probabilities is not what we want in the risk calculation.		X				agree about system response.	X					text revised to conditional probability of failure	
			2.3.5	Level 4 risk analysis bullet list. Insert new bullet before existing 5th bullet. • Estimate the dam breach or other releases that my occur and the inundation downstream;	X							X				text added per comment.	
			2.3.5	Level 4 risk analysis bullet list. Last bullet. ALARP. There is no discussion of evaluating epistemic uncertainties.				X		Not here				X			
			2.3.5	last bulleted list. 6th bullet. 'non-breach risk'. See previous comment.				X		See response to previous comment on non-breach risk.				X			
			2.3.5	last bulleted list. Revise last bullet to read - • Develop risk reduction alternatives and estimate evaluate whether risks are considered ALARP for the alternatives.	X						X					text revised per comment and USACE comment on same bullet.	
		2-23	2.3.5	last bulleted list. fourth bullet: Change "estimate ALARP" to "evaluate ALARP." See definition of risk evaluation.	X						X					see response to comment above.	

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		2-23	2.3.5	FERC and BOR (suggest using “Reclamation” as their preferred abbreviated name as I understand it) sources of guidance are mentioned in this para. Will one have preference over the other for the FERC?	X						X					Sentence revised to say, 'Except as otherwise noted by FERC-D2SI, risk analyses should use the latest version of the Best Practices . . .'	
			2.3.5	last paragraph. Must be review and updated. Might be beneficial to point out that this is not necessarily a big effort (compared to getting through the level 4 risk analysis). The scope will vary, depending on the PFMs being addressed, the design, and how well the risk reduction alterative was defined.	X						X					added some text similar to the comment.	
		2-23	2.3.5	last para.: Suggest including these two risk assessments in Figure 1-2 or a version of that figure adapted for FERC terminology.	X					will consider how best to represent this.	X	X				New Figure 2-6 illustrates part of this effort.	
			General	Chapter 2 does a good job of laying out the technical rigor of risk analyses based on level of scalability. Will FERC issue guidelines on how these methods and procedures should be implemented by licensees? (i.e. will FERC require the licensee to take leadership of this risk management effort such as within their own developed Dam Owners Dam Safety Program or will FERC require implementation of these guidelines on a project specific level ?)				X		These RIDM guidelines will be required for licensees that want to pursue using risk as a tool in their decision making process.				X			
			2.4	First bullet. Shouldn't they have input or assistance?				X		This is a rapid assessment process. Some sound engineering judgment must be used. Might not have opportunity to get all the information you'd like to have.				X			
			2.4	Second bullet, level 2 risk analysis: Table 2-1 says “or small team”. My feeling, having done it both ways, is that the small team approach results in a better evaluation. In the case of a small team, someone has to facilitate the process, such as is done in the USACE PA process.	X					hence the reference to other subject matter experts participating in the risk analysis. The team would necessarily be small.				X			
		2-24	2.4.1	In addition to the types of participating individuals we have also found it essential to have a project manager. There is mention of “Review personnel” but will these participate in the team meetings? This is explained in a later chapter.	X							X				added Project manager to the list	
			2.4.2	Typo: change addiitonal to addition.	X							X				text revised per comment.	
			2.4.2.1	third bullet, number 2 and 3 - could a checker be assigned these responsibilities?	X							X				text revised per comment.	
			2.4.2.1	third bullet. At Reclamation a 'checker' performs this, not the facilitator.	X							X				text revised per comment.	
		2-27	2.4.2.1	after the bold add the following ", but may point out inconsistencies or other information that the facilitator feels the team has not adequately considered, also in bold.	X							X				text revised per comment.	
		2-25	2.4.2.1	Last section on this page: Facilitators shoulder a heavy load as they are primarily tasked to ensure (BOR, 2015). Consider adding another bullet for facilitators;• Ensure data, information and assumptions used in the risk analysis (i.e. hydrologic flood studies, breach analysis, consequence studies, etc) are consistent with the elicited subjective beliefs by subject matter experts where that type analysis is used.				X		Considered, but chose to leave this proposed text out.				X			
			2.4.2.3	edit 2nd and 3rd sentences to read. discussions and concepts during the risk analysis. A good note taker can capture a group discussion in a few sentences, and does not attempt to simply record each statement made.	X							X				text revised per comment.	

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			2.4.2.3	first bullet. Add initial sentence and revise original first sentence to read. • Taking notes during a risk analysis meeting is distinctly different than administrative note taking. It is extremely helpful if the note taker is an engineer involved with the project.	X							X				text revised per comment.	
			2.4.2.3	first bullet, end of first sentence, add, "with knowledge of dam projects in general"	X							X				text revised per comment.	
			2.4.2.3	second bullet. Revise to read. • It helps can be more efficient if the note taker is the primary writer author of the risk analysis report. This provides an added motivation of the note taker to record good notes and improves the quality of the final product.	X							X				text revised per comment.	
		2-27	2.4.2.3	Second paragraph; regarding note taking, an additional word of caution at the end of this paragraph might be to guard against using previously prescribed notes which were developed during other similar risk analysis sessions to be edited by overhead or projection techniques and could possibly lead the team along a series of events or a scenario that does not require critical thought about the unique failure modes under consideration				X		Noted. Don't want to get into this level of detail here. But a good point.				X			
			2.4.2.5	FERC personnel section. Last paragraph. Well, okay, agree that FERC is not responsible to ensure the risk analysis goes properly. But at the same time, if FERC personnel have an issue with any of the above, they should not just stand by. It is a team effort.				X		At least in the early stages of the risk program, there could be a number of risk analysis being performed at any given time that FERC personnel may attend, but may not be qualified to provide input to the risk processes. We don't want an owner thinking that just because FERC personnel are present that means FERC must be endorsing the end product as well. Also, FERC will not just standby and not provide comments when an issues is recognized.				X			
		2-29	2.4.2.5	In the first paragraph under Independent Consultant the last sentence disallows an independent consultant from serving as a facilitator under certain conditions. Should this information also be included in section 2.2.4.1 Facilitators Roles and Responsibilities or in section 2.4.3.1 Facilitator Qualifications?				X		We will keep that information where it is.				X			
			2.4.2.5	in list. Number 1. second sentence. See the point, but asking licensees to bring in members from multiple firms could easily lead to much higher costs because each firm would want to have adequate representation and input on the report. In addition, logistical and professional issues like is the report authored and signed jointly?				X		Not asking licensees to bring in multiple firms. Just wanting to make sure that kind of bias may exist. Agenda may exist in trying to discredit others work, generating additional work, or defending one's work.	X					added a sentence - 'This may not be avoidable, but should be recognized.'	
			2.4.2.5	We have been trying to avoid the use of the word vote, even in quotes. It implies the democratic majority somehow has the right answer. However, it is really the case that draws on the appropriate technical and scientific information that wins the day.	X					Agree. Will clarify. The use of the term 'vote' was intended to be sarcastic	X					removed the word 'vote'	
		2-29	2.4.2.5	I strongly suggest removing any reference to “voting.” This is contrary to the spirit of expert elicitation.	X					See response to comment above	X					See response to comment above.	
			2.4.2.5	change 'vote' to 'estimate risks'. There’s some pretty good language in the SSHAC that you might want to borrow.	X					See response to comment above	X					See response to comment above.	
			2.4.3.2	There’s some pretty good language in the SSHAC that you might want to borrow.				X		will consider.				X			

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			2.4.3.2	add to the last sentence of the last paragraph, ", as well as for other relatively straight forward estimates as determined by the facilitator." Not sure if you want to add this, but it may be tough and expensive to find 4 to 6 SME's for several potential failure modes that vary across disciplines in a given risk analysis. Say you had 4 potential failure modes, piping, rock erosion, spillway slab jacking, and gate arm buckling. Would you need to bring in 16 to 24 SME's to conduct the risk analysis?	X									X		text revised per comment.	
			2.4.3.3	first paragraph. Second sentence. It is required. Above (3 pgs up) language says it's "helpful" - here it's required. Be consistent.	X						X					Text revised here and in next section to indicate 'should' rather than 'required'.	
			Table 2-2	General comment – while it's true that qualified people are needed, you don't want to hold up risk analysis projects and have a large backlog because of a lack of available qualified individuals. Suggest re-visiting, and consider lowering the qualifications for the lower level RAs so the projects of most concern are able to advance through the process more quickly, with the goal of reducing risk sooner.				X		Acknowldeged. On the other hand if risk participants don't have sufficient experience and training, risk analysis won't go well, results may be invalid, and may require additional effort (time and $$) to re do. This could also serve to discredit the risk analysis process. Expediting risk reduction is certainly an objective but this must be done using well thoughout risk analyses performed by qualified individuals and teams.				X			
			Table 2-2	I applaud your ambition!				X						X			
		2-31	Table 2-2	Suggest clearly stating for this table which entries/rows refer to years of relevant experience and which refer to numbers of risk assessments successfully completed. The numbers of risk assessments completed look low.	X					will clarify units for each row.	X					labels revised	
			Table 2-2	Years of dam safety experience. Reclamation does not have such requirements – could severely limit the number of qualified individuals that could participate in risk analyses				X		Reclamation has other internal reviews and controls to ensure consistency in process, inputs, and decisions.				X			
			Tab;e 2-2	Author/presenter case histories..Clarify. Seems high. Not sure if anyone has authored this many. However, if "participant" means have listened to case histories, the only way non-Feds would have this is the ASDSO conference dam failure series, and those are so brief that I don't think they add the value you're looking for.				X		Precedents are an important factor in risk analyses. This may prove to be a bit high but it's good to aim high.				X			
			Table 2-2	Risk Analysis experience. Consider calling this guidace rather than requirements.	X						X					text revised in table title.	
			Table 2-2	Level 4b risk analysis. Clarify if co-facilitating prior to meeting all the requirements is acceptable, and if that experience then satisfies these requirements.				X		co-facilitating is a special case that will have to be evaluated separately				X			

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			Table 2-2	Training. General comment – aggressive training requirements will limit available pool of engineers, could result in backlog of risk analysis until people receive training. For SME's, is the facilitator expected to use this table and make judgements about the qualifications of someone?				X		Acknowldeged. On the other hand if risk participants don't have sufficient experience and training, risk analysis won't go well, results may be invalid, and may require additional effort (time and $$) to re do. This could also serve to discredit the risk anlaysis process.							
			Table 2-2	Regarding professional societies, I don't see how this really helps someone become more qualified to participate in risk analyses.			X			The thought is that someone who is a member and involved in a professional society is better informed and updated on refinements to policies and procedures as compared to someone who is not.	X					revised text to 'regularly participates in professional society (meetings, conderences, workshops, publications)' to indicate ongoing industry knowledge.	
			Table 2-2	There is no basis for requiring a facilitator to be on a technical committee. Facilitation is a skill that is not obtained or improved by being on a technical committee			X			See response ot comment above.						see response to comment above.	
			Table 2-2	Seems like a lot of required training for SME's. Couldn't they get the same training by other courses or experience? It will be pretty hard to find enough SME's as it is, but if they need to complete all this required training first, it will be even tougher. I am not sure Reclamation or USACE have these strict of required training. How often and by whom will the training be offered?				X		Acknowledged. A training plan is under development. The training and experience guidelines included in the table are to represent the eventual status quo. We recognize that initially this will be difficult to achieve and selected compromises might be needed to allow the industry to gain this experience. However this will be done on a case by case basis.				X			
			Table 2-2	These qualifications are certainly ambitious. I know for a fact that many people currently doing Level 4 do not meet with many of these minimum qualifications. This will also severely limit the number of qualified candidates in an already thinly populated field with high demand. Training will also take a long time. Consider that risk analysis is not the same as being the lead designer/engineer for a new dam, i.e. no liability. I would suggest cutting the years of experience in half for the facilitator will still provide adequate experience.			X			See response to comment above.				X			
			Table 2-2	"Other" I think PE/PG would be acceptable for all, not just SME. "Loading and Consequences" Suggest S be for all risk assessments less than Level 4 and R for Level 4 A/B/C.			X			A facilitator should have a strong understanding of engineering principles and applications. Not all professional geologists have this knowledge or experience. Agree with 'S' for Level 3 RA. Could still be 'S' for level 4 if loading not driving the results.				X			
			2.5.1.1	end of second paragraph add, "In some cases additional site geologic information or testing may be required."	X							X				text added per comment	

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			2.5.1.1	3rd paragraph. Risk analysis work. Meaning - work to support the team risk anlaysis or the actual team meeting/workshop? Clarify.	X						X					text revised to indicate initiating eny investigations, analyses, or other efforts in preparation of the risk analysis work.	
		2-33	2.5.1.1	This section uses the terminology “Risk analysis project plan”, “risk analysis risk plan” and “risk analysis plan”; consider clarifying this terminology to avoid confusion	X						X					changed all to risk analysis project plan.	
		2-33	2.5.1.1	Do all the meetings with FERC-D2SI mentioned here need to be face-to-face or can web meetings be used? Web meetings would be a significant cost savings.	X							X				added sentence that coordination meetings can be face-to-face or web-based/conference calls.	
			2.5.1.2	compile background information. Second sentence. Risk analysis session. Clarify terminology - session is the same as workshop is the same as meeting?	X						X					revised text to meeting. Changed reference to risk session and workshop to meeting for clarity.	
		2-35	2.5.1.2	First sentence after the bullet points; What part of the risk information should be included into the STID updates, if any?	X							X				Added a sentence. Appropriate information discovered, collected, or generated from the risk analysis work should be included in an update of the Supporting Technical Information Document (STID).	
			2.5.1.2	to the last bullet in system response subsection, add, "and probabilistic analysis where appropriate"	X							X				text revised per comment	
			2.5.1.2	consequences subsection. First sentence. Project hydrologic and hydraulic analyses. Clarify – consequence analysis is based on reservoir level corresponding to potential failure modes, dam break studies and associated downstream inundation.	X							X				text revised per comment.	
			2.5.1.2	Consequences subsection. To the next to last sentence in first paragraph, add, "and reasonable extrapolations or interpolations cannot be made with confidence."	X							X				text revised per comment	
			2.5.1.2	consequences subsection. Add the following two bullets to the list • Flood wave depths and velocities within the inundation area • Evacuation routes	X							X				text revised per comment	
			2.5.1.2	consequences subsection. Add this as the second bullet. • Dam failure flood flow characteristics such as depth, velocity and travel time	X							X				text revised per comment	
			2.5.1.2	Meeting logistics heading. Section seems out of place - should be in 2.5.2?				X		review placement of this section	X					information is for meeting preparation so left information where it is in the section. Changed heading to Meeting Preparation and Logistics	
			2.5.1.2	meeting logistics. Add to the end of the second bullet, "Key pieces of information should be captured for inclusion in the report."	X							X				text revised per comment	
			2.5.1.2	meeting logistics. To the third bullet. Add the following after the first sentence, "Large size non-distorted scale drawings posted on the walls allow for sketching failure modes with proper appreciation for differential heads, gradients, etc. "	X							X				text revised per comment	
			2.5.2.3	second paragraph. Demographic. Demographic setting?	X						X					removed demographic	

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			2.5.2.4	In reference to Kahneman reference It would be good if some ways to avoid these biases could be presented along with their description. That's what we tried to do in Best Practices.	X					Because these biases are often overlooked, just wanted to provide a quick acknowledgement and introduction to them here.				X			
			2.5.3	First paragraph. This does not seem related to software.	X					However need to introduce this subject here as a segway into the software discussion.				X			
			2.5.3	Is DAMRAE available commercially? Is the Monte Carlo version available?				X		yes, DAMRAE is comercially available for purchase. However, DAMRAE, or other commercially available software, is not an endorsement by FERC for the product.				X			
			2.5.3	second paragraph. After colon, revise as follows: DAMRAE and Palisade's Decision Tools Suite (which includes Precision Tree and @Risk). Precision Tree @risk.	X						X					text revised per comment	
			2.5.3	Reference should be corrected to (BOR, 2015).	X						X					text revised per comment	
			2.5.4.1	third paragraph. Analysts. The analyst hasn't been defined. Is this an SME? Facilitator? Or the author? Clarify or use consistent terminology.	X						X					changed to risk analysis team members.	
		2-43	2.5.4.1	last paragraph. Last sentence. Suggest changing "on" to "against" since not all aspects of tolerable risk evaluations are graphical.				X			X		X			deleted last sentence in paragraph. This information is presented later in portrayal of risk estimates.	
			2.5.4.2	The mean value can be influenced by outliers. Should the "median" value instead be portrayed? Facilitators will sometimes select a "consensus" value from a group of estimators that is neither the mean nor the median. Note Chapters 3 and 4 mention mean and median.				X		Agree, but median is not what we are looking for.				X			
		2-43	2.5.4.2	What do you have in mind by stating that risk estimates are to be portrayed as mean estimates? Mean is the same as expected value but is different than most likely. Most likely is the peak of a probability density function (may be more than one peak) not the mean. To get either a mean (expected value) or most likely estimate of the risk requires that an uncertainty analysis is done – is that what you have in mind for all RIDM risk assessments? The other option is to use what are considered to be most likely or mean estimates of inputs to the risk analysis; but that is unlikely to give mean or most likely estimates of the risk due to non-linearities and skew in the transformation from inputs to estimated risk.				X		clarify	X					text revised to state mean and range (distribution abut the mean) to be provided. Removed reference to most likely.	
			2.5.4.3	first paragraph. This is a very confusing paragraph. The first sentence is incommplete, if not incorrect. The second sentence describes aleatory uncertainty only. I suggest deleting it.		X				changed uncertainty definiiton to what is inlcuded in appendix to chapter 1. Revised second sentence per comment below.	X					Uncertainty is the result of imperfect knowledge about the present or future state of a system, event, situation, or population under consideration (FEMA, 2015).	
		2-43	2.5.4.3	first paragraph. I suggest using the definition of uncertainty from Appendix 1A in the first sentence.	X					See response to comment above	X					See response to comment above.	

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			2.5.4.3	revise second sentence to read, "Uncertainty is used to portray variability or a range of values for loads, consequences, conditional response estimates, and risk estimates, rather than a single point estimate for those values. "	X						X					revised text per comment.	
		2-43	2.5.4.3	second paragraph. line 4: I suggest changing “can be” to “may be.” There are many dam safety situations in which it may impractical or too costly to reduce uncertainty – e.g. existence of a flaw deep within a dam.	X						X					revised text per comment.	
			2.5.4.3	last paragraph. Last sentence. Large uncertainty (vs small uncertainty) does increase the mean value of risk because the upper bound of the uncertainty range drives the mean more than the lower bound of the range. A smaller, upper bound on the uncertainty will lower the mean risk.	X								X			deleted last sentence of paragraph.	
			2.5.4.4	second sentence in section - Not sure there is a “correct” estimate. Estimate is reasonable?	X						X					text revised per comment	
		2-44	2.5.4.4	first paragraph. line 4: Suggest changing “is correct” to “ can be relied on for the intended decision purposes” or something similar.	X					see response to comment above	X					See response to comment above.	
			2.5.4.4	last paragraph. Last sentence. This does not seem to help with possible confusion.				X		Some have found that statement helpful.				X			
			2.5.4.5	Last paragraph, second sentence - add "and reasonable" after Plausible. Third sentence, add "and confidence in the expected value is not high" after significantly. Last sentence add "and reasonable" after the word plausible.	X						X	X				text revised per comment	
			2.5.5.1	Suggest that ALARP remain qualitative for now, until there is greater use and application of ALARP to support dam safety decisions in the US.			X	X		ALARP is the concept to use to test for tolerability of risk. Granted it hasn't been used much in the US dam safety industry, but it has been used for this purpose within many other industries internationally. There are no other good alternatives. ALARP does consist of both qualitative and quantitative factors for which a case must be made for satisfying ALARP.				X			
		2-45	2.5.5.1	first paragraph. ALARP also include consideration of “Any relevant recognized good practice” and “Societal concerns as revealed by consultation with the community and other stakeholders.” The good practice consideration has some background to it in that for well-defined systems HSE relies on codes of practice to define when ALARP is satisfied without the need to perform a risk assessment – that needs some interpretation for dam safety. USACE has referred to this as “essential engineering guidelines” or something similar, which is a concept that could perhaps work for the FERC also.	X					I believe that is further explained in the paragraphs below				X		text revised in section 2.5.5.5 to indicate good practice also includes meeting FERC Engineering Guidelines.	
			2.5.5.1	last paragraph. ALARP is a requirement of level 4 risk analyses. This would mean level 4 risk analysis must also consider risk reductrion alternatives.				X		That's correct.				X			

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			2.5.5.1	last paragraph. ALARP not typically included. Not quite following the ALARP application logic. If risks are tolerable after level 1 and 2 risk analysis (which is likely to be the case for many dams), wouldn't a qualitative discussion of ALARP be part of the discussion at that point?	X					revised text	X					text revised to indicate ALARP required for Level 4 risk anlayses, but can also be done in a qualitative sense for Level 2 and 3 risk analyses. Not appropriate for Level 1 since not used for decisions.	
			2.5.5.2	Cost effectiveness title. Suggest that FERC not emphasize quantitative calculations until there has been more application and us in the United States for applying ACSSL to dam safety decisions. Suggest initially building case for ALARP on qualitative judgments, and eventually work into quantitative			X	X		See response to comment above on the same topic.				X			
		2-47	2.5.5.2	next to last paragraph. The "strength of ALARP justification" was a concept that I developed and ANCOLD adopted prior to developing the disproportionality ratio concept. I suggest focusing on disproportionality, which is the underlying concept for "strength of ALARP justification." Disproportionality is also arguably relevant to the licensees' level of defensibility and is practiced by US industry to avoid product lability law suits. This is an example of things that the licensees should be thinking about that the FERC may or may not require a level of disproportionality that matches the licensee's level of risk tolerability/appetite.	X						X					text revised. Removed reference to strength of justification.	
			2.5.5.2	last paragraph. Last sentence. Change chapter reference from chapter 4 to chapter 3.	X						X					text revised per comment.	
			2.5.5.3	first sentence, Not sure what this means?	X						X					See response to comment below	
		2-47	2.5.5.3	The first sentence is not consistent with the usual tolerable risk definition. Typically no consideration is given to cost if the risk is above tolerable risk limits. Reclamation has not incorporated this concept as far as I know. The "exceptional circumstances" consideration above tolerable risk limits does not consider cost, but rather the lack of availability of practical options – e.g. Norway-Oakdale. Let me know if you would to discuss this.	X						X					Paragraph revised to indicate this applies to risks that are below the limit of tolerability.	
			2.5.5.4	first sentence. There is little benefit for using both CSSL and disproportion. With a constant VSL it is a duplicae consideration.			X			strongly disagree. Although both factors serve to evaluate cost effectiveness of each risk reduction alternative, each factor serves a different purpose. CSSL has general guidance, whereas disproportionality has legal ramifications.				X			
			2.5.5.4	second paragraph, first sentence. Are you sure you want to say this? Risks should be reduced below the guidelines except in exceptional circumstances. I'm not sure disproportionality by itself can be used to argue one way or the other.				X		by itself, disproportionality will not be used. However, in combination with other ALARP factors it will help to justifiy the appropriate actions.				X			
		2-48	2.5.5.4	Second paragrpah. I suggest mentioning that it is the intention of USDOT to update the value for VSL annually.	X							X				Text added in 4th paragraph to indicated VSL is updated annually by USDOT.	

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			2.5.5.5	These good practices are all related to operations management. What about good practices in maintenance, documentation, structural evaluations, etc.	X							X				Added additional bullets on owners dam safety program, documentation in STID, and meeting FERC engineering Guidelines.	
			2.5.5.7	first sentence. This is a repeat in another chapter. Suggest keeping all ALARP in one location in the documents.		X				Will revise text as far as trying to keep risk analysis discussions in Chapter 3 and risk assessment discussions in chapter 4 and not duplicate text.	X					text revised as appropriate. Moved some of Cahpter 3 discussion here, but also left some in Chapter 3 as it pertains to risk assessment.	
			2.5.5.7	The most useful tool I have seen for justifying ALARP is a plot of incremental risk reduction vs. cost to obtain each increment of risk reduction or risk vs. cost to obtain the risk. The plot often makes a sharp bend at which point it costs a lot to obtain very little risk reduction. People tend to get bogged down in CSSL, VSL, WTP, DR, when often times a simple graph is more useful and convincing.				X		This information can be used as well to support cost effectiveness. However this should not be the sole basis for ALARP, particularly in regards to legal liability.				X			
			2.5.5.7	1st bullet. Shorter term risks. Unclear what short term risks would be.				X		Trying to indicate a slight emphasis or focus on those potential failure modes that are associated with nearly constant or enduring risks as compared with those that have shorter exposure. It is a subtle shade of gray.				X			
			2.5.5.7	5th bullet. This is only useful if the only failure modes of concern are covered by standards.	X					That's correct.				X			
			2.6.1	1st paragraph. Understood by decision makers. Is it clear in the FERC regulatory environment who exactly the decision makers are for each project?	X						X					revised text to 'dam owner and FERC'	
			2.6.3	section heading. Building the case, not making the case.	X						X					text revised per comment.	
			2.6.3	The 2nd and 4th paragraphs cite the same reference and are somewhat redundant. Consider combining or eliminating the 4th para	X					good point.	X					2nd and 4th paragraphs combined into one paragraph. Repetition deleted. Formed a new 2nd paragraph.	
		2-53	2.6.4	first paragraph. Since the f-N chart displays weighted average incremental life loss and the F-N chart displays incremental life loss, I suggest using a different symbol for the f-N, such as $\bar{N}$. Suggest changing on Figure 2-19 and elsewhere also.	X						X					revised to N hat.	
			2.6.4	2nd para, 1st sentence. Suggest de-aggregated.	X						X					text revised per comment.	
			2.6.4	3rd para. The first part of this para is confusing. Suggest instead the following: "The N value is a weighted life loss calculated by first summing the product of the probability and incremental consequences for the end branches of relevant pathways and then dividing by the annual probability of failure for that failure mode."				X		That could work too. Text revised per comments below.				X		text revised per comments below.	
		2-53	2.6.4	third para.: In the second line I suggest inserting underlined words as follows: "relevant <u>event tree</u> pathways." In the third line I suggest adding the underlined word: "weighted <u>average</u> value for N."	X							X				text added per comment.	
			Table 2-3	This table shows "N-bar", as opposed to N.				X		N-bar would be the correct notation				X			

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			Table 2-3	suggest defining “risk driver.” In Appendix 1A, the term “average annual life loss (AALL)”, which has been adopted by USACE is defined, whereas in this table “annualized life loss (ALL)” is used. Suggest being consistent.	X					Table header was incorrect. AALL is shown in the table columns.	X					revised table title to AALL	
			2.6.5	last paragraph, add after the last sentence, "However, it is just as important to justify the results by building an adequate case."	X							X				text added per comment.	
			Figure 2-7	Can’t really read this figure, so don’t know what it is showing.	X					Figure will be eliminated.			X			Figure deleted	
			Figure 2-7	Image is fuzzy, can't make out axes or legend. Replace	X					See comment above			X			See above comment	
			Figure 2-7	Um. . .?	X					See comment above			X			See above comment	
			Figure 2-7	several figures not legible.	X					See comment above			X			See above comment	
			Figure 2-7	Not readable. Not sure what this is saying.	X					See comment above			X			See above comment	
			Figure 2-7 thorugh 2-9	These types of plots are an option in DAMRAE.				X						X			
			Figure 2-8	It would be good to provide some discussion as to what this is telling us. For example, why does the curve turn over?		X		X		Good point, but that's a little more detail than we want to get into in the risk guidelines. Those types of discussions will be included in risk analysis training workshops.,				X			
			Figure 2-9	It would be good to provide some discussion as to what this is telling us. For example, why does the curve turn over?		X		X		Same comment as above.				X			
			Figure 2-10	The figure is difficult to read and I don’t see much blue? Comment on the huge spread? What is causing it? What are the three point clouds?	X					Figure will be eliminated.			X			Figure deleted	
			Figure 2-10	Image is fuzzy. Replace.	X					See comment above			X			See above comment	
			Figure 2-10	Your charts and tables need a professional . . .	X					See comment above			X			See above comment	
			Table 2-4	Seems like a bit of discussion about what is being done here would be appropriate. This is obviously internal erosion and several of the nodes are independent of reservoir elevation? Why? Also, only a best estimate is provided. Under what conditions is this appropriated?				X		Simply trying to illustrate different ways one might display risk analysis results. Not tyring to get into any specifics here.				X			
			Table 2-5	A little more discussion would be helpful. What are we learning from this?				X		Simply trying to illustrate different ways one might display risk analysis results. Not tyring to get into any specifics here.				X			
			Figure 2-13	This probably needs more discussion. You should be clear that the range should not be estimated by multiplying all the high and then all the low estimates through the event tree. This gives and unrealistically large box. A Monte-Carlo analysis would not sample all highs and all lows at the same time.				X		Simply trying to illustrate different ways one might display risk analysis results. Not trying to get into risk analysis methodology. Those discussions are referenced to the Best Practices document.				X			
		2-87		Suggest that guidance may be needed (based on experience at USACE) with ways to document Excluded Failure Modes with rationale for why the failure mode was excluded. Otherwise, you’re bound to receive one-liners such as “The failure mode was ruled out by the team.”				X		Training will be provided to highlight this.				X			

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			2.7.4.2	There are some contract implications here. The consultant contracts do not typically include a limitation of liability and do require professional liability insurance. I think there needs to be some discussion with the licensees to see if they are willing to support this concept and include it in their contract documents. Also, many consultants will not participate without a site visit. This probably needs to be addressed.				X		Site visits can be included at the licensees discretion. However, we disagree that a site visit for a review of a risk analysis document would be a normal requirement. For exampmle, contract reviewers for USACE Quality Control and Consistency review meetings rarely perform site visiits.				X			
			2.7.4.2	last bullet. Note that the other bullets above have time frames.				X						X			
			2.8	I suggest adding a reference to the latest DAMRAE user manual.				X		There are a couple of disadvantages to doing this. 1) it may be interpreted to some that we are then endorsing this particular software over others, which we don't do. 2) updates to the user manual would require updates to the reference list to keep it updated.				X			
			Appendix 2A	section 7. Sometimes this takes a while to develop considering all the results. Subsequent meetings and consultations might occur. It might be aggressive and pre-mature to ask for this during the risk meeting.	X						X					text revised to indicate, as available.	
			Appendix 2A	section 8. Same comment - this takes time to develop and get the right decision.	X			X		Might just be high-level discussions at this point but it's good to keep the end in mind and capture the team's initial thoughts on this while it is fresh in their minds.				X			
			Appendix 2B	Include the word adjusted in the title. This is important because the adjustment is the reduction in the numerator that is associated with the economic consequences. Unadjusted, or CSSL, will be higher should not be used.	X						X					a' added to CSSL	
			Appendix 2B	AC. Clarify – it's not the cost divided by the number of years. This is an annualized capital cost (considering cost, time frame and discount rate).	X					it is an annualized cost				X			
			Appendix 2B	Ecwo. Clarify – this is the total value of the damages caused by dam failure, plus the lost economic benefits (hydro power) multiplied by the annualized failure probability without.	X									X			
			Appendix 2B	Seems like you need to provide the place to go for what constitutes a reasonable CSSL and what would be excessive.				X		If we had that guidance it would be included in the risk assessment chapter.				X			
			Appendix 2C	Provide an example with ranges and distributions?	X			X		Perhaps after we have some good examples we will include in a future update.				X			
		2-83	Appendix 2C	Figure is not legible	X			X		just for illustrative purposes.				X			
			Appendix 2D	Add Justification for Risk Results before Major findings section	X							X				added text per comment.	
			Appendix 2D	Add 'with Justification' after Risk Estimates (Chapter 9)	X							X				added text per comment.	
			Appendix 2D	Add, "Dam Safety Case" after summary of risk results	X							X				text added per comment	
			Appendix 2D	Appendix J. Are you endorsing this software? If so: 1. why, 2. Has it been QA'd, 3. Is it readily available, 4. How do you justify the freezing of prabablities?	X					No. We are not endorsing any particular software.	X					text revised to make it more generic.	

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				for appendices, I suggest that somewhere you note that this is not to be a data dump. Only the pertinent information that supports the risk estimates should be included in the report. We recently had a USACE report with nearly 14,000 pages. That is not useful to anyone.	X							X				text added to section 2.6.2	
			Appendix 2E	What is the proposed difference in significance and what is different about what it is expected to be considered above and below the dashed sloping line passing through (1, 1e-5) since ALARP applies in both areas?				X		This is discussed in Chapter 3.				X		No changes to this chapter.	
			Appendix 2E	Figure 2E-1. The horizontal axis is incorrectly labelled – it should be "weighted average life loss, $\bar{N}$"not AALL.	X					I believe this comment applies to Figure 2E-2. If so, then agree with the comment.	X					figure revised	
			Appendix 2E	Figure 2E-1. Why is the X- axis labeled Incremental Life Loss, N? It seems this characterization does not generally apply.			X			Most FN charts label this axis as N, fatalities. We chose to be more descriptive to indicate that the life loss is from incremental consequences (not to include consequences from non-breach or normal releases from the dam)				X			
			Appendix 2E	Figure 2E-1. Shouldn't the Y-axis label read, Frequency of Exceedance per Year of N>n?		X					X					Axis title revised	
			Appendix 2E	Figure 2E-2. Why is this not labeled the same as the F-N chart?			X			these are different charts that portray the same information in a different manner. They don't have the same axes	X					Axis title revised	
			Appendix 2E	Figure 2E-2. Why is this labeled Average Annual Life Loss? Is t really the Expected Number of Lives Lost Per Year?			X			It is a weighted average from the expected value of the various event tree branches.	X					Axis title revised to weighted average life loss	
			Appendix 2E	Figure 2E-2. If it is the ALL, why? This is not a typical f-N chart.				X		I can't speak for other industries that might be using fN charts, but this is typical of dam safety practice in the US	X					Axis title revised to weighted average life loss	
			Appendix 2E	Figure 2E-2. Why is the Y-asix labeled Annual Probability of Failure? Shouldn't it read Annual Frequency of Occurrence?		X				These two terms represent the same information that is presented on the Y axis.	X					Axis title revised	
			Appendix 2F	Potential Failure Modes item, Have these been defined? We have mostly gone with the term "risk driver" to denote those potential failure modes that control the risk, whether the risk is high or low. It got pretty confusing otherwise.				X		this will be similar to what we are proposing to do.				X			
			Appendix 2F	15 minutes seems short for consequences in comparison to the time given for engineering aspects. Is there a definition for "critical" failure modes? Should "significant" failure modes be "credible and significant?" Or is "credible" implied?				X		might be a little short. Just providing general guidance.				X			
			Appendix 2G	Suggest adding questions about the appropriateness of the scoping of the risk assessment, the risk model form, and failure mode interactions.				X		These are typically discussed during the course of the review meetings				X			
Chapter 3 - Risk Assessment																	

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			Chapter 3 - general	I suggest starting with the proposed FERC tolerable risk guidelines and moving the review of what others use to an appendix or separate commentary.				X		As this background information is fundemental to the understanding and development of the FERC tolerable risk guidelines, we believe this information should lead off the discussions.				X			
			3.1.1	second paragraph. Technical qualified team. Clarify - is this the risk review b oard (chapter 2) or a different team?				X		in this sense, the review team could be made up of individuals from the owner, external reviewers and FERC personnel.				X			
			3.1.1	second paragraph. The measure of concern, and the type and degree of remedial action. Suggest that decision making, and how information is developed and socialized in order to inform decisions be discussed in greater detail, perhaps in Chapter 4. Decision making and who does it, may be unique and more complicated for FERC.				X		that information is included in Section 3.4 of this chapter				X			
			3.1.1	Second bullet, A risk analysis has to deal with consequences, not PAR.	X						X					text revised to remove populationat risk	
			3.1.1	second bullet: ALL is referred to here but AALL elsewhere.	X					AALL is the correct term	X					Text revised to AALL	
			3.1.1	third bullet: I think that “annualized cost” should probably be “average annual economic loss.”	X						X					text revised per comment.	
			3.1.1	bullet list: Suggest making clear here and elsewhere what risk is being referred to – I think this is breach risk as opposed to non-breach risk. Maybe your intent is to imply “breach” if only “risk” is used? Also suggest referring to F-N and F-$ plots.	X					clarify	X					text revised to show incremental risk. Also added reference in second and third bullet to f-N and F-N charts and F-$ charts.	
			3.1.3	Where is the "Future without action concept"? Without this you are likely to build in unnecessary structural measures for "line huggers".				X		With the inclusion of ALARP, trying to tuck risk estimates just below the limit of tolerability line should be less of a concern (hopefully)				X			
			3.1.3	last bullet: Suggest adding the following underlined words: “The goal of remedial dam safety actions is to reduce risk to tolerable levels (including	X							X				added text per comment.	
			3.2.1	to the paragraph prior to the numerical list, add, "The width of the triangle suggests the effort that must be expended in addressing the risks." after the second sentence.	X							X				text added per comment.	
			3.2.2	third paragraph, second sentence, Since ALARP only has meaning when comparing alternatives, does this mean there can never be a risk analysis without also developing a suite of alternatives and costs to reduce risk?				X		To truly evalauate if risks are indeed tolerable, ALARP is the tool used to provide that assessment.				X			
			3.2.3	add the following bullet to the top of the first bullet list.• Additional information is needed to better define the risks (increase confidence, decrease uncertainty) and risks need to be re-evaluated using the new information before making subsequent dam safety decisions.	X							X				text added per comment.	
			3.2.3	tolerable risk guidelines. Term not used by Reclamation - which is listed below as having developed tolerable risk guidelines.	X						X					removed BOR from bullet list	
			3.3.2	2a - How does this represent risk?				X		as will be defined in a subsequent section, this is an FN chart				X			
			3.3.2.1	Interesting: applying ALARP to individual risks. Maybe a good idea.				X						X			
			3.3.2.1	numbered list. The units for individual risk are “per year” not “lives per year.”	X						X					text revised per comment	

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			3.3.2.1	Figure 3-2 and numbered text are not the same. The text talks abou an expected number of lives lost per year. The figure referes to the annual probability that the most at risk person will lose their life. These are not the same. Numerically you can argue they are the same thing in fact they are quite different conceptually and quantitatively. I think the figure is correct.	X						X					text revised per comment above.	
			3.3.2.1	in each of the numbered list, lives per year is not correct	X						X					text revised per comment above.	
			3.3.2.1	number 2 - Why did you choose the negative implication instead of “risks will be considered tolerable provided ALARP considerations are met”. This causes some real confusion later on when you talk about the limit of tolerability.				X		From a regulatory perspective it is advantageous to indicate that the onous is on the owner to prove the risks are tolerable.				X			
			3.3.2.1	number 3 - What happened to broadly acceptable? Can’t get there now? Again this causes some confusion later when you talk about the negligible region, etc.	X					Broadly acceptable will be presented in terms of HSE definition, but will clarify that this term does not generally apply to dams	X					text revised in a later section, but not here.	
			3.3.2.1	No. 3. and Figure 3-2: What is the proposed difference in significance and what is different about what it is expected to be considered above and below 0.000001 per year?				X		clarify	X					Added text to clarify area between the two diagonal lines.	
			3.3.2.1	last paragraph above the figure. This description is correct and consistent with the figure.. The above text is not consistent with this description.	X						X					text revised per comment above.	
				Figure 3-2. Reference for this figure, or is this your figure?				X		This is a FERC figure				X			
			3.3.2.2	"Except in exceptional circumstances" should reference that this often the result of not having adequate feasible options to further reduce risks (think Oahe and Garrison), vice just mentioning great benefit. Still, risks must be communicated.	X					good point		X				text added per comment.	
			3.3.2.2.1	The footnote is correct but the definition of CCDF in Appendix 1A is incorrect.	X					revise	X					definition in Appendix 1A revised	
			3.3.2.2.1	5th paragraph, 1st sentence. And instead of or?				X		Not sure what this means.				X			
			3.3.2.2.1	last paragraph. Full compliance with essential FERC engineering guidelines will be expected. It’s unclear why this would be needed if it has already been decided that risks can be tolerated on account of the special benefits. (perhaps this statement belongs in the previous paragraph discussing LPHC area)			X			Because the consequences are so high, even given the special benefits the dam provides, it would be expected that all prudent measures must be done, including meeting engineering guidelines, to make sure all is being done to manage and keep the risks as low as practicable.				X			
			3.3.2.2.2	AALL section heading. This is total all?				X		yes				X			
			3.3.2.2.2	No. 4 in list.: What is the proposed difference in significance and what is different about what it is expected to be considered above and below 0.00001 lives per year?				X		add text to clarify	X					Added text to clarify area between the two diagonal lines.	
			3.3.2.2.2	Consider Nates ASDSO Unicorn briefing and "all the weird risk areas".				X		Notd. Probably more detail than we want to include in this document.				X			
			figure 3-3 and 3-4	What is the proposed difference in significance and what is different about what it is expected to be considered above and below the dashed sloping line passing through (1, 1e-5) since ALARP applies in both areas?				X		add text to clarify	X					Added text for both figures to clarify area between the two diagonal lines.	
			Figure 3-4	label for x axis is circled in red.	X						X					figure axis revised	

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			3.3.2.2.2	figure 3-4. Review titles of Figures 3-3 and 3-4, be consistent. The difference is that 3-3 is cumulative F, and 3-4 is not, but the titles say 3-3 is societal risk and 3-4 is AALL.	X						X					figure titles revised	
			3.3.2.2.2	figure 3-4. Re-consider if risks below ALL 10-5 really need ALARP considerations to be employed. HSE defines the lower limit below which risks are broadly acceptable, without ALARP considerations.				X		In theory, ALARP does not have a practicaly lower limit. Each risk should be evaluated if risk reduction measures exist that would be practical to implement. In practice as risks approach the lower line fewer and fewer risk reduction measures will become practical.				X			
			3.3.2.2.2	Figure 3.4. The horizontal axis and figure title are incorrect – they should be “weighted average life loss, N” not AALL.	X						X					Figure revised per comment.	
			3.3.3	1st paragraph. 2nd sentence. The word (breach). Would you tolerate a gate failure that didn't lead to "breach"?	X						X					The word 'breach' removed in this paragraph	
			3.3.3	APF > 10X-4 hard to accept for low consequence PFMs	X					agree				X			
			3.3.4	You can look at my comments from Chapter 2. It’s not obvious what your licensees should do with the non-breach risk information.				X		Each dam owner has the responsibility for knowing the risks their dams pose. This is not just the risks due to failure of the dam, but also from the operation of the dam. Non-breach risks will be used to help identify opportunities to better inform affected populations, provide better warning. it can also be useed by downstream communities to see where addiitonal flood studies might be warranted or pursued.		X				additional paragraph added to help clarify	
			3.3.4	Non-breach risks should be used to determine where additional flood risk studies are warranted.	X							X				text added per comment.	
			3.3.4	You may want to expand on what non-breach risks are and how to do this on an F-N chart. I assume you are considering planned flood operational discharges primarily so you would be plotting life loss associated with flood discharges exceeding various values? Are there any other situations where this would be used, and how would it be used?	X							X				text added per above comment	
			3.3.4	Seems like some non-breach PFMs will have zero life loss. Not sure how they would be plotted. If only the total is plotted, still could have the issue if all non-breach PFMs were associated with zero life loss.				X		only non-breach PFMs that have asociated non-brach life loss can be plotted.				X			
			3.3.4	second paragraph, first line. Is this sentence a repeat?	X						X					text revised	
			Figure 3-5	x axis label is circled in red				X		x-axis is correct				X			
			Table 3.1	We no longer reference disproportionality.				X		We acknowlege the USACE has removed this ALARP provision from their guidelines. However, disproportionality becomes an important concept in the assessment of ALARP and legal libility for public and private dam owners.,				X			

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			Tables 3.1 and 3.2	I suggest using disproportionality over ALARP justification – see previous comment about this.	X					agree. The ANCOLD tables are just an example for reference to disporportionality ratios and are not intended to represent a FERC position.	X					added text to clarify tables are just an example	
			3.3.6.1	first sentence. Strict liability. What about negligence?				X		That could enter in as well.				X			
			3.3.6.1	4th paragraph. Judge whether or not an owner has discharged his or her duty. If the courts find an o wner did not do their duty to protect the public, is there a negligence aspect as wwell? Or a crimilan aspect?				X		Depending on the circumastances, there could be negligence or criminal actions.				X			
			3.3.6.1	paragraph 8, Again, a simple plot of risk reduction or risk vs. cost to achieve will often show a sharp curve where the costs become incrementally great relative to the risk reduction achieved. Such a plot is often more telling and compelling than CSSL, VSL, WTP, DR, etc. It might be worth mentioning that somewhere.				X		That type of information can be used to evaluate cost effectiveness. However that is only one element or factor of ALARP. Other ALARP factors will also have to be evalauted to judge if risks are truly tolerabole.				X			
			3.3.6.1	last paragraph, last sentence, So, what are the chances the licensees going to pick up on this value and you are going to be seeing a lot more of it?				X		I think we've made it clear that this value is updated annually by USDOT. So if this happens we will refer the licensee to the correct reference.				X			
			3.3.6.2	1st sentence. Last sentence. Suggest that ALARP determination remain qualitative until there is more experience and precedent with using ALARP, CSSL, disproportion in making dam safety decisions in the US. Reclamation has found this is a complex topic and deserves very careful consideration.				X		We acknowledge the limited experinece within the US dam safety practice using ALARP. We also acknowledge that the computations of CSSL and the related disproportionality factor can be complicated; however, both of these factors are important concepts to consider in evaluating ALARP and risk tolerability				X			
			3.3.6.2	Number 1, last sentence, Are you sure you want to hang your hat on only this?				X		Don't believe this is a matter of hanging one's hat on this. The guidance indicates this is just one ALARP factor.				X			
			3.3.6.2	number 1, last sentence. Use 'adjusted' ACSSL' to account for benefits - see comments in Chapter 3.	X					revise	X					text revised per comment	
			3.3.6.2	Number 3 ANCOLD Guidelines - Seems like chances are pretty good that the licensees will try to run with this.				X		That would be unfortunate since the guidelines state that they should justify their use of disporportionality factors				X			
			3.3.6.2	Note 1. Should this be Chapter 2 – Risk Analysis?	X						X					text revised per comment	
			Table 3-1	What is your tolerable risk limit? As I interpret what you have written, it is below AFP ~10-6.				X		The upper limit is 10-3. There is no lower limit identified. Tolerability will be evaluated and decisions based on ALARP				X			

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			Table 3-2	You don't have a broadly acceptable region?	X					That's correct. But the tables reproduce information from ANCOLD that does use broadly acceptable.				X			
			3.3.6.2	Number 3. So what happens if FERC does not agree with the owner's legal advice?				X		Then we will comment on that and dhave additional discussions with the licensee				X			
			3.3.6.2	Number 3, last paragraph, This seems like a real can of worms to me. Will you accept the recommendation of the owner's legal counsel? Is it likely they will be familiar with this?				X		it is their responsibility to be familiar with this. They hold the liability. A regulator can not legislate this.				X			
			3.3.6.2	Number 4, The difference between FERC and NSW is that FERC requires a PFMA, which will typically identify potential failure modes not covered by the Engineering Guidelines. I think you need to say something about potential failure modes identified during a PFMA that are not covered by the FERC Engineering Guidelines.				X		This is intended to represent both PFMs that are covered by our engineering guidelines as well as those guidelines that are not covered by our engineering guidelines.				X			
			3.3.6.2	No 4.b.: What is meant by "in the long term?" Does this imply some consideration of consequences (population) growth or assurance of sustainability of any licensee or community emergency actions upon which the estimated risk level is based, or something else? Suggest clarifying				X		long-term is to help clarify that it is not intended for a short duration or temporary condition.		X				text added to indicate not a temporary or short duration condition	
			3.3.6.2	Number 5, public meeting and comment process. When is this required?				X		clarify	X					revised text to indicate societal concerns addressed through public meetings, comment solicitation and response, or by other appropriate measures.	
			3.3.6.2	Number 5. second paragraph. Lack of guidance. Agree - so approach ALARP carefully using qualitative considerations first (similar to starting with PFMA before risk).				X		for factors such as societal concerns carefully using qualitative considerations will be impportant. However, where quantivied measures can be estimated then they should be used as well.				X			
				Number 5 - What is meant by "rate" societal concerns? Rather that rating would it be better to "identify and appropriately address" or something like that? I think that the point of considering societal concerns is more about how they are addressed than necessarily lowering the risk in general. If there is to be a rating system I would suggest that it should be developed by the FERC for consistency of application and evaluation – i.e. what does low, intermediate, or high rating mean?	X						X					text revised to indicate focus on what the societal concerns are and how they would be addressed. But also revised text to include some indication of low, intermediate, and high. Have not provided definition of these as it would be difficult to capture every factor and scenario to include.	
			3.3.6.2	Number 6 - first bullet. Clarify - or provide an example of short duration or long duration risk.				X		Noted. We will handle this on a case-by-case basis				X			
			3.3.6.2	Number 6, 3rd bullet. Some clarification may be necessary. We have found that risk reduction (construction) can pose a higher risk temporarily. The context here may be different, but some clarification would help.				X		Noted. Like above, we will handle this on a case-by-case basis. This list is just to bring up some other ideas at a high level. Other factors could also be considered, as appropriate.				X			
			3.3.6.2	Number 6 last bullet. Agree. See other comments regarding qualitative approach emphasis.				X		noted				X			

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			3.3.6.2	2nd paragraph after numbered list. (cost effectiveness, level of risk, disproportionality)..This focus is on quantitative evaluation. Cost effectiveness and disproportionality are essentially the same factor, and will provide the same guidance. Suggest that good practice should also be weighted more and build a qualitative case.			X			As indicated in the guidance, there are important differences between cost effectiveness and disproportionality. They are similar but they measure different things, particularly in relation to liability. A case will have to be made on the basis of the qualitative and quantitative evidence and built into a defensible argument to support the decision.				X			
			3.3.6.2	Last paragraph. I am still not sure what the limit of tolerability is. The wording says risks are intolerable unless ALARP is satisfied. Seems like a Catch 22 unless you are talking about APF<10-6.				X		limit of tolerability is shown on Figures 3-3 and 3-4				X			
			3.3.6.2	Last Paragraph. I don't think you have defined a negligible region.	X					correct	X					text revised to remove reference to broadly acceptable or negligible region.	
			3.3.6.2	Number 6, 5th bullet - Is this referring to potential failure modes not covered by the standards, or those that are?						standards that apply to each potential failure mode				X			
			3.3.6.2	final remarks, last bullet - negligible region - I am not sure this was ever defined?	X					will clarify	X					text revised to remove reference to broadly acceptable or negligible region.	
			3.3.6.2	last bullet in section. Does the FERC have the legal authority to designate a risk as being tolerable for a particular dam? Should the wording here indicate that for purpose of FERC public safety responsibilities a risk may be viewed as tolerable but that this in no way guarantees how a legal proceedings may view the risk or some such wording? It is really the same issue that FERC deals with under deterministic engineering guidelines and determining what is adequately safe, except that under RIDM the determination is to be made in terms of tolerability of risk.	X						X	X				text revised and added to clarify	
			3.3.7	last paragraph - This implies probability of failure multiplied by economic consequences. Economic risk - This is usually a small number and not very useful in making decisions.	X					will revise	X					text revised to clarify. Removed reference to economic risk.	
			3.3.7	last paragraph. Last sentence. This will be difficult – how would FERC advise if the economic risk is tolerable? On what basis? Then, would that be applied to all owners consistently?	X						X					text revised to clarify.	
			3.3.7	last paragraph. Same question as previous comment except this applies to economic risk.	X						X					text revised.	
			3.3.8	last bullet - Is there a difference between intolerable and unacceptable? You may want to review your terminology for consistency				X		There is an important distinction between these terms.				X		intolerable is the correct term here.	
			3.3.8	last paragraph. Last sentence. Based on what? Can this be applied consistently?	X						X					text revised	
			3.3.8	last paragraph. Last sentence. Same question as previous comment except this applies to environmental risk.	X						X					text revised	
			3.3.8	Environmental risk is often viewed in terms of the uniqueness of habitat or cultural or other resources that may be destroyed/damaged and the potential for restoring them.	X							X				text added per comment	

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			3.4	section heading. It's unclear who the decision makers are in the FERC regulatory environment, and how decisions are documented. Is FERC a decision maker, or just the owners? What about the IC role? Does this explanation exist elsewhere, or should there be some statements in RIDM docs that require some identification of the decision makers and documentation process?				X		RIDM doesn't change who the decision makers are or how decisions are documented.				X			
			3.4.2.3	first sentence. Add "load curves, consequence assumptions" after nodal risk estimates.	X						X					text added per comment	
			Figure 3A-4	I thought they had some newer guidance.	X					They do.							
Chapter 4 - Risk Management																	
			4.1.3	There are many ways to prioritize dams for risk reduction. A key concept is focusing on risk reduction opportunities (interim and long-term actions, risk reduction and uncertainty reduction – better information/understanding) not just magnitude of the existing risk. Worst first or cost effectiveness are example of prioritization approaches but there are many others and in general a hybrid approach is likely appropriate. Is this discussion intended to apply to an individual dam or a portfolio of dams?				X		Just wanting to provide a general overview here. Will add some general text here.	X					Added additional text very similar to the words from your comment. Wanting to keep this general in this section.	
			4.1.3	last sentence. If the cost of reducing risk. . .Clarify – depends on the risk level relative to the risk guidelines and the risk of the other dams. Elsewhere it is stated that for risks above the TRG, risks should be reduced at any expense. I don't recall disproportion being a prioritization consideration when risks are above guidelines.	X					clarify			X			last half of the sentence is deleted. This will be worked out on a case-by-case basis	
			4.2.1	1st bullet: Suggest inserting "for" between 'Options' and 'assessment'.	X						X					text revised per comment	
			4.2.1 Figure 4-1	Nice to see the FERC process in this figure! How about including "FERC RIDM" in the figure title?	X						X					figure title revised	
			Table 4-1	Title of 1st column includes "Urgency". It's redundant to include it every row below. Suggest filling out "Characteristics" for DSRC II-IV. Consider changing DSRC numbering to Arabic numerals.	X						X	X				deleted 'urgency' in each row. Revised description and characteristics text for each box. Did not change numbering.	
			Table 4-1	characteristics column. Suggest adding characteristics of other DSRC II. III. And IV.	X							X				see response to comment above.	
			4.2.2	DSRC: should state main purpose is consistency in risk communication and risk reduction action. We no longer reference Essential Engineering guidelines except for routine program	X						X					added communication to first sentence of section	
			4.2.2	Is DSRC intended to differ from USACE's DSAC? I note that Table 4-1 distinguishes "urgency" by risk and confidence, which are related to potential actions, which is similar in principle to the USACE DSAC.				X		It's similar to both. Kind of a hybrid. It's intended to communicate risk and the urgency of actions.				X			
			4.2.2	DSRC I. Last sentence. Risk to be unacceptable. Something missing here, and same sentence in II and III.	X					revise text	X					text revised	
			4.2.2	DSRC III. Last sentence. This language m eans risks above guideline are III and risks below the guideline are IV.	X					generally that will be the case. Uncertainty and confidence enter into this as well, as do other factors.				X			
			4.2.2	DSRC IV. Seems like a dam could be a DSRC IV and still satisfy ALARP if costs for risk reduction are grossly disproportionate.	X					DSRC is a risk communication tool and is a function of the risks, as they are portrayed, not about if the risks are tolerable.				X			

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			4.2.2	DSRC V. Am guessing the large majority of dams would not satisfy Engineering Guidelines (same can be said about BOR and USACE inventory) and therefore V classifications will be rare. But with this language of DSRC IV dams being “inadequate,” seems like eventually most all dams in FERC portfolio will need some type of improvements. Sounds like a great deal of work that may not be necessary. Can see a legitimate argument that IV dams that meet ALARP and pose low risk wouldn’t need any work even though they don’t meet all Engineering Guidelines.	X						X					removed reference to inadequate.	
			4.2.2 Table 4-1	DSRC V: "risk broadly acceptable" must be a mistake as there are no dams I know of in this category - all dams require an engaged and caring owner that manages risks and reduces further if necessary. Broadly acceptable means no risk management is required.	X					This was a mistake. will remove the reference to broadly acceptable	X					deleted sentence on broadly acceptable.	
			4.2.2 Table 4-1	“Broadly acceptable” is not a goal for dams – it is a categorization of risk that can only apply if no overt action is required to manage the risk because it is by nature too small to need managing – e.g. below a regulatory threshold. As I understands it the FERC has not regulatory threshold (often dam height or reservoir capacity) for dams to be in the regulatory program, but even so “broadly acceptable” would exclude dams above the very smallest from every being classified as DSRC V, which I doubt is the intent. I suggest changing “Broadly acceptable” to “tolerable including meeting ALARP considerations,” which is the goal.	X					This was a mistake. will remove the reference to broadly acceptable	X					deleted sentence on broadly acceptable.	
			4.2.2 Table 4-1	I am concerned that it is required that there should be “very high to high confidence” in the risk estimates for a dam to be classified as DSRC I. It seems that precaution would require that even if confidence is not high, if it appears that the risk could be extremely high, then the actions should be commensurate with that indication, and only relaxed if there is high confidence that the risk are not extremely high. That is erring on the side of safety as a way to address uncertainty.	X					agree. Revised table	X					revised DSRC table for DSRC II to indicate very low to low confidence for very high risk.	
			4.2.2 Table 4-1	Can the various categories of risk described qualitatively in the second column of Table 4-1 be displayed on an f-N chart?				X		Noted. It's probably possible, but because of unique situations where a dam might not completely fit into one category or another, we are reluctant to try to delineate this at this time.				X			
			Table 4-1	Broadly acceptable. I'm not sure this ever really got defined?	X					See comment above	X					broadly acceptable text removed.	
			4.2.2	DSRC IV and V: Will the FERC define what its “essential FERC Engineering Guidelines” are? The concept here as developed for USACE was that even if risk does not justify meeting an engineering guideline it may be required because it is regarded as good practice.				X		understood. We did not intend to use the word 'essential' in our guidance and instead just referenced our Engineering Guidelines. Each dam will be evaluated on a case-by-case basis.	X					deleted the word 'essential' in relation to FERC Engineering Guidelines throughout the chapter.	

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			4.2.3	Confusing: ALARP is part of risk management, not risk characterization. We don't reclassify risks based upon possible/planned actions. I disagree with use of ALARP in this manner in DSRC				X		DSRC is assigned based on many considerations of the risk. Within DSRC IV dams, some risks may be tolerable (meet ALARP) and some may not be tolerable (ALARP not met). That information would be used to help prioritize the actions for dams where the risks are not tolerable.				X			
			4.2.3	6th paragraph. Suggest explaining how urgency and priority are different. I have some text on this if you need it. I think there is also some in ER 1110-2-1156.	X			X			X					added a few sentences on this from 1156.	
			4.2.3	We use economics as a discriminator within DSAC				X						X			
			4.2.3	last paragraph, last sentence - Unless FERC wants to have all dams in their Region classified for tracking purposes?				X		We will be prioritizing dam from a regional and national perspective as well.				X			
			4.3.2	Interim Risk Reduction heading. At Reclamation, IRRM is considered once there is a decision to go into CAS. It is not common to implement IRRMs during CR or IE phases. Implementation of IRRMs in this document appears inconsistent with how Reclamation uses IRRM to temporarily mitigate high risks.				X		It may take many years for some dams to get through the dam safety study process and risk analyses. Developing interim measures to implement quickly will be a very important risk management tool in our dam safety program. We would not want to wait perhaps years to take advantage of risk reduction strategies that could be implemented quickly and relatively inexpensively.				X			
			4.3.2.1	first paragraph. . . And III dams. Suggest that it could be optional for DSRC III dams - because it depends on the confidence of the risk. Dam assigned as DSRC III after a level 2 RA might become a DSRC IV dam with additional information and a more detailed team RA.				X		DSRC III dams are still in the unacceptable range. We will consider the confidence in the risk to help guide how robust the plan needs to be for those cases where the confidence is low (the dam may be a DSRC IV)				X			
			4.3.2.1	First paragraph. Add after the first sentence, "In some cases, interim risk reduction measures will become part of a long term risk reduction effort."		X				may become	X					Text added with modification - may become	
			4.3.2.3	number 9. This means all DSRC I, II and III dams will have an updated EAP – is that the intent? Perhaps this should state “Review EAP and update as needed to reflect….”	X						X					text revise per comment.	
			4.3.2.5	first paragraph. . . .major dam safety issue is identified. Clarify - consider relating the timeline of IRRM to DSRC.				X		This information is provided in Section 4.3.2.7	X					a note is added to refer to section 4.3.2.7 for IRRMP submittal requirements	
			4.3.2.5	first bullet. Add after last sentence, "Internal erosion is not the only potential failure mechanism where judgment comes into play. Almost any potential failure scenario will have uncertainties that need to be addressed by judgment."	X							X				text added per comment	
			4.3.2.5	after target grout program sentence, add, "If grouting is performed under reservoir head, there is the potential for the grout to travel and set up downstream, creating a barrier that increases pressures under the dam. This must be considered and monitored for any such grouting."	X							X				text added per comment	

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			4.3.2.5	The first 2 of 3 bullets immediately above 4.3.2.6 are redundant with bullets on preceding pages. Suggest re-ordering this IRRM section to eliminate redundancy, such as putting principles up front and eliminating subsequent redundant points. As a former Review Manager for IRRM Plans with USACE, I can almost guarantee that some Plans are going to propose "Studies" as a way to reduce risk. I suggest including a statement or principle that "Studies, e.g. seepage and stability analyses, do not reduce risk. At best they reduce uncertainty. When combined with careful evaluation of instrumentation data, subsurface conditions, performance data, construction records, and engineering judgment, their results can be useful within a risk analysis."	X					good point	X					First two bullets of list deleted and third bullet turned into a sentence. A short paragraph on IRRMs are things in which some form of action is taken. IRRMs do not include such things as additional studies or analyses.	
			4.3.2.7	first paragraph. First sentence. . . Must be developed for DSRC I, II, and III dams. Depends on the level of risk analysis.			X			based on the results of a level 2, 3, or 4 risk analysis.	X					added, "as designated from the results of a level 2, 3, or 4 risk analysis."	
			4.3.3	heading. It might be helpful to licensees and consultants to explain how FERC envisions the different risk analysis levels, particularly, levels 3 and 4, would being used to support the different IE and DSMS studies	X						X					added some text to provide some general guidance.	
			4.3.3	third paragraph, second sentence, An IES is typically focused on a specific issue or a few specific issues that are driving the high risk. Hence the word Issue. It is not real clear whether you expect a complete update of a previous baseline risk analysis during an IES. Certainly it should be reviewed and updated where necessary.	X					revise text		X				text added to indicate to perform a level 3 RA or review previous level 3 RA prior to doing a level 4 RA.	
			4.3.3	fourth paragraph, first sentence, add ",typically for those potential failure modes identified during an IES study as needing remediation."				X		revise text	X					text revised from addressing above comment	
			4.3.3.1	fourth paragraph. First sentence. Consider loosening or revising this requirement – this will result in pressure to focus on the risk number – and make sure it gets just below guidelines to avoid an IE. Rather, the question of whether IE is required or not should be dependent on the risk and the case – if a case is built for not taking action to define risks, then no IE would be required.				X		I think we are saying the same thing here, with perhaps the clarification and in the context of whether the risks are considered to be tolerable or not through evaluation of ALARP factors.				X			
			4.3.3.2	section heading. Might be helpful to tie together the risk levels and DSMS.	X						X					referenced Level 3 and level 4 risk analyses	
			4.3.5.1	add geotechnical engineer to the inspection team list.	X							X				text added per comment	
			4.3.5.2	second paragraph, last sentence. Licensees instead of Districts?	X						X					licensees instead of districts	
			4.4.5.1	section heading. Says 4.3.5.1. should be 4.4.5.1	X						X					revised section number in section 4.4.	
			4.4.5.2	EAP. Section number. First paragraph. First sentence. Only if the DSRC is based on a higher level risk analysis. An initial DSRC II could likely be revised to DSRC IV after a few years of studies and an IE reports.			X			It could take many years to get around to many of our risk analyses due to limited resources. We would certainly take into account the confidence we have with the lower level risk estimates, but won't wait to implement until we have Level 4 results				X			
			4.5.3	Is communication the responsibility of the liscencee or the dam owner/operator? They are not always the same.	X					good point		X				footnote added to address where licensee is not the dam owner.	
			4.5.3	second paragraph. Are there any security issues that should be mentioned here?				X		going to steeer clear of that for the time being.				X			

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			4.5.3	last paragraph. No comment				X						X			
			4.5.6.3	What organizations are these?				X		organizations that could be impacted by a dam failure or dam safety actions. Could be irrigation or water supply organizations that could be impacted by reservoir drawdown, recreational departments, etc.				X			
			4.5.7.2	first paragraph, second sentence - This was a security concern in the past.				X		important for risk communication				X			
			Appendix 4A	heading. Don't think a brief paragraph covering several PFMs is enough to provide an example that people can use to discern the difference between DSRCs for their own use. Suggest providing examples in a future document with more write-up on each.				X		Will consider additional future guidance. Will leave what we have for now				X			
			Appendix 4A	Examples of DSRC I dams - Few of your examples mention anything about a risk analysis? It Implies you can assign DSRC without one?				X		Acknowledged. These are meant to be general and illustrative examples, not detailed full-scale summaries. Additional information would be needed to adquately evaluate them for DSRC. Examples provided for a general sense of what kinds of factors and dam safety concerns might lead to different DSRC's.				X		Will consider providing more detailed examples in future guidance.	
			Appendix 4A	Examples of DSRC I dams - Dam A - I did not read about any observations of soil movement confirming internal erosion. How do you reach the conclusion that this dam will fail in the near future?				X						X			
			Appendix 4A	Examples of DSRC I dams - Dam A, cooler zones in the rock foundations - not sure this is unexpected under normal conditions?				X						X			
			Appendix 4A	Examples of DSRC I dams - Dam B - glacial deposits - These are typically not problematic with respect to continuing erosion.				X						X			
			Appendix 4A	Examples of DSRC I dams - Dam C - Is the embankment in contact with these cavities?				X						X			
			Appendix 4A	Examples of DSRC II dams - Dam D - population at risk - how large?				X						X			
			Appendix 4A	Examples of DSRC II dams - Dam G - This presumes there is some knowledge about the exceedance probability of a flood this large?				X						X			

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