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MEMORANDUM

TO: Julie Slevin, Oregon Emergency Management
FROM: Kenneth A. Goettel
RE: Port of Tillamook Bay – Alternative Project
DATE: April 15, 2012

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My understanding is that the FEMA HQ review can examine any and all issues bearing on project eligibility, including re-visiting issues that seemed to be resolved on earlier rounds of review and/or issues not previously raised.

FEMA's January 13, 2012 denial of the First Appeal focused on cost-effectiveness.

FEMA's March 16, 2011 eligibility determination focused on three issues:

- Failure to demonstrate that the project was cost-effective,
- Project does not solve the threat independently or constitute a functional portion of a solution to the threat, and
- Project does not include sufficient assurances to long-term and ongoing maintenance, repairs and operations.

The applicant's draft appeal (March 23, 2012 letter from Michele Bradley, General Manager, Port of Tillamook Bay to David Stuckey, OEM Deputy Director) presents counter-arguments to each of Region X's reasons for denial of eligibility.

This memo represents an objective technical analysis of the applicant's draft appeal and previous documentation provided. The analysis neither supports nor rebuts the applicant's appeal arguments. Rather, the narrative evaluates the applicant's statements, identifies key issues that should be addressed and offers constructive suggestions. In this revision, I've added detailed suggestions re: how to address FEMA's concerns.

I've removed the comments re: 1.6 year flood damages being excluded because this is not highlighted in the appeal, FEMA is probably unlikely to re-evaluate this issue, and there is no obvious rebuttal to the concerns that I raised previously.

The project cost estimate includes a 25% contingency. Isn't including such in the project budget a FEMA no-no?

1. Cost-Effectiveness (Benefit-Cost Analysis).

A) Use of FEMA Default Values

The applicant's March 23, 2012 five page "Final Appeal to Disaster Assistance Directorate, FEMA Headquarters, Washington, D.C." raises the issue of the acceptability of FEMA's default depth damage functions. The applicant primary appeal argument re: cost effectiveness is the assertion that FEMA's "default values" should always be acceptable for FEMA BCAs.

This narrative is counterproductive for three reasons:

- This assertion is incorrect and violates the fundamental principle of benefit-cost analysis: data inputs must always represent realistic estimates of damages before and after mitigation.
- The argument re: "default" values is moot, because the applicant's BCA made downward adjustments in "default" values via calibration vis-à-vis historical damages.
- The narrative is rather strident and may well "raise FEMA hackles" and reduce the likelihood of a favorable appear ruling.

This principle is illustrated by examining FEMA's default depth-damage functions for buildings. The FEMA default depth-damage functions are intended for and applicable to "ordinary" or "typical" buildings of a given category and are thus applicable to most, but not all buildings of a given category. FEMA's guidance in What is a Benefit? (page 2-2) clearly makes this distinction:

> *"FEMA has developed typical or default damage functions that express the expected percentage damage for buildings and contents. These damage functions are most useful for ordinary residential, commercial or public buildings and may have to be modified for more specialized buildings using historical damage data, professional judgment or both."*

As a simple example, consider 1 story residential buildings without basements. The FEMA default depth-damage functions are applicable to the vast majority of such buildings because, and only because, most such buildings share commonalities in their construction characteristics that govern their depth-damage function. However, the FEMA default depth damage functions are not applicable to unusual buildings with different characteristics:

- For example, a post-modern extreme home with cast-in place concrete floors and walls and elevated utility infrastructure would have much less building damage at a given flood depth than a more typical home with wood stud walls, drywall and other typical architectural details and at-grade utility infrastructure.
- On the other hand, an atypical home which used materials highly prone to water damage or with flimsy construction prone to high levels of damage even with low

flow velocities would have much more damage at a given flood depth.

- In either case, using the "default" depth-damage function for benefit-cost analysis would simply be incorrect and inaccurate.

The same concept applies to agricultural losses and agricultural buildings. Appropriate, credible depth damage functions for a single agricultural commodity, which may be peanuts or kiwis, cotton or rice, chickens or cattle, will vary dramatically, depending on the commodity. For benefit-cost analysis of a specific project with a specific agricultural crop/livestock inventory, using a generic "typical" or "default" depth damage function representing the average nationwide value of agricultural commodities makes no more sense that using a typical "building" depth damage function for a specific, unusual building.

For the proposed project, the predominant agricultural commodity is cattle. Cattle differ markedly from field crops because cattle have legs and can be moved out of harm's way from floods. For the proposed project the applicability of the "default" agricultural depth-damage function is further diminished because of the experience with cattle losses in the 1996 flood. Since this event, many ranchers have constructed high ground safe-haven areas for cattle and all ranchers are fully aware of flood risks and thus almost certain to take protective measures such as moving cattle to safe ground before a flood occurs. These common sense mitigation measures are likely to greatly reduce cattle losses and must be considered when estimating cattle losses in floods, for benefit-cost analysis.

Suggestions

1. Replace the 5 page appeal memo with a more complete memo, which summarizes the arguments made in the much longer BCA report – to make the main points stand out more clearly, rather than be "buried" in a long BCA report which the FEMA reviewers may not read it in it's entirety. That is, create an Executive Summary which has all of the main points in no more than about 5 or 6 pages, with key points made in bullet format, rather than in long paragraphs.

Emphasize that the applicant's March 2012 Benefit-Cost Analysis report provides very detailed documentation of the basis for the data inputs into the BCA. This robust documentation represents a good-faith effort to provide the best available data inputs, including calibration of DDFs with historical damage data and the level of documentation provided substantially exceeds the typical level of documentation for FEMA BCAs. Also emphasize the lower bound nature of many inputs. Here, I'm suggested in effect a summary of the Executive summary – one paragraph at the beginning and/or the end, making these key points.

Note that: given a lower-bound BCR of 1.25, with credible upward adjustments from benefits not included in the analysis or refinement of BRVs, an more conservative BCA with further downward adjustments would still result almost certainly result in a BCR >1.0

2. Remove the entire argument re: “default” values.

3. To counterbalance similar previous arguments, acknowledge explicitly that FEMA “default” values, while applicable to many specific situations are not universally applicable and all benefit-cost analysis inputs must always represent realistic estimates of damages before and after mitigation. FEMA’s standard for BCA data inputs has always been “best available data.”

4. Acknowledge that the DDFs for dairy cattle, dairy agricultural buildings and other building types may differ from the typical HAZUS DDFs. Emphasize in clear bulleted summaries, the applicant’s good faith effort to calibrate DDFs with the best available historical damage data, including:

- HAZUS residential building DDFs used for the analysis are about 40% lower than NFIP claims data and thus represent lower-bound type inputs.
- Commercial building losses reduced per discussion on page 14 of the BCA report. Note: this text is difficult to follow and hard to understand exactly what adjustments were made. Discuss each category separately with a subheading to identify which category is being discussed.
- Agricultural inventory losses – same notes as above.
- NOTE: the third bullet on page 13 is incorrect and mistakes the relationship between HAZUS estimates and historic estimates, per the text above the bullets

5. Provide brief summary in bulleted form, emphasizing the downward adjustments in DDFs, calibration with the best available historical data, including NFIP claims data and that the DDFs are conservative, lower-bound inputs.

6. Notes on Section 7.2 of BCA Report. These are important omissions.

a) Applicant could quantify the net present value of reductions in Highway 101 closures, using the FEMA standard value per hour of delay/detour time and the daily traffic count data referenced.

b) Similarly, the assertion that cost estimating guides have more realistic BRVs than appraised values is very important. This could be documented and the impact on the BCR estimated.

These two additions to the BCA report would reinforce the statement that the BCR is a lower bound and document how much higher it may be.

7. Note that the project has environmental benefits not counted in the BCA: restoration of over 520 acres of wetlands.

2. Does the project solve the threat independently or constitute a functional portion of a solution to the threat?

The GIS analysis of parcel affected by the proposed project included all parcels where flood depths were reduced by 0.1 foot (1.2 inches) or more.

The proposed project generally reduces flood depths over the project area from 6 inches to 18 inches. Given the history of severe flooding with flood depths of several feet in buildings and flood depths deep enough in 1996 to drown cattle, reducing flood depths by 6 to 18 inches does not obviously appear to "solve the threat independently" or "constitute a functional portion of a solution to the threat."

The applicant's benefit-cost analysis shows expected annual damages before mitigation and after mitigation of $3,269,161 and $2,516,846, respectively. This level of effectiveness represents only a 23% reduction in damages attributable to the project, even accepting the applicant's benefit-cost analysis verbatim. This very low level of effectiveness is substantially lower than typical effectiveness percentages for flood projects, which are often 90% or greater for levee or elevation projects and 100% for acquisition projects.

Suggestions

1. Emphasize that many alternatives were evaluated and that the proposed project is the best alternative. That is, there is no economically feasible "magic bullet" project that completely eliminates flood risk in this area.

2. Acknowledge that the percentage reduction in expected average annual damages and losses, 23% is lower than many flood mitigation projects, but:

- 23% is a significant improvement and the project is cost effective,
- Ongoing flood mitigation measures implemented by individual dairy farmers and other building owners will continue to gradually reduce future flood losses in addition to the reductions achievable by the proposed project.

3. Does the project include sufficient assurance to long-term and ongoing maintenance, repairs and operations?

The applicant's benefit-cost analysis includes $20,000 per year in annual maintenance costs for the project.

The proposed project lowers flood levels by opening up the floodplain, removing impediments to flow. Given such hydraulic changes, flow velocities will be lower in the future, with a likelihood of increased accumulation of sediment. This tentative conclusion, which is subject to verification by detailed hydraulic and sediment transport calculations, suggests that the effectiveness of the project may gradually decrease over time.

I do not have details of what measures are proposed for the $20,000 annual maintenance budget, but dredging to remove sediment would almost certainly be very expensive and require meeting a plethora of environmental regulatory requirements. Thus, $20,000 per year appears substantially inadequate if periodic dredging is required to maintain the effectiveness of the proposed project.

A realistic annual maintenance budget and an identified source of ongoing funding over the postulated 50-year lifetime are both essential for determining the viability of the proposed project.

Determination of the adequacy of the assurances for long-term and ongoing maintenance, repairs and operations requires additional information not available to me and may also require additional hydraulic and sediment transport analyses.

Suggestions

1. Very important to provide details of what is included in the $20K annual maintenance budget, why this budget is adequate, where the funding will come from and documentation that the future funding is assured.