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NEPA Analysis and the "Best Science"

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The goal of "using the best science" has been a discussion topic in several recent Shipley Group workshops. Usually a resource specialist states that federal decisions should be guided by the best science. Most participants seem to agree, but the implications are rarely stated.

What does this reliance on the best science actually mean in terms of a NEPA analysis? Here are some assumptions and implications behind the specialist's plea for the best science:

- Cited studies are as recent as possible, and the analysis does not ignore any relevant studies of the resources being analyzed.
- Technical studies or research reports cited should have been peer reviewed prior to publication, making their methods and results as valid as possible.
- Conclusions from the cited studies should guide agency decisions (and follow-up actions).

These implications are reasonable. Surely, a court assessing an agency's impact analysis would want no less from cited sources in an impact analysis. What, then, are the problems with these principles behind the best available science?

The main problem is that NEPA analyses realistically begin where such cited studies and reports end. Many cited studies are not directly and obviously relevant to the site-specific project area being analyzed. Also, cited studies usually hedge any stated conclusions with warnings about the limitations and uncertainties inherent in the research. Even stated conclusions are rarely applicable to the broad management questions agency decision makers are expected to address. And published studies usually exclude political considerations, especially those raised by questions and concerns from the public.

Regulations from the Council on Environmental Quality (CEQ) direct agencies to "insure the professional integrity, including scientific integrity, of the discussions and analyses in environmental impact statements" (Section 1502.24). Agencies have increasingly interpreted CEQ's language in Section 1502.24 to apply to environmental assessments and all supporting agency documents. CEQ's language emphasizes the need for agencies to use the best science!

Here, then, are five key recommendations for integrating the best science into a NEPA analysis:

1. Survey published reports and studies, and record findings about which ones are the most current and relevant to the resource questions being asked.
2. Explain how cited studies apply to the site-specific resource conditions in the project area.
3. Cite internal agency reports and studies, including prior NEPA analyses that are relevant to site-specific conditions in the project area.
4. Address questions and concerns from the public or from other governmental agencies and explain what the cited information does and does not show. (Here is where political considerations become an inevitable topic for discussion in any analysis of resource conditions.)

5. Make (and document) impact projections even when cited studies and other relevant resource sources are sketchy or missing.

The following text discusses each of these five recommendations and provides examples of how best to record and to analyze cited studies and reports.

1. Survey published reports and studies, and record findings about which ones are the most current and relevant to the resource questions being asked.

This survey of published reports and studies is similar to the classic "survey of the literature." Such surveys have been part of research publications for decades. And most graduate dissertations routinely include such surveys of the prior research literature, usually accompanying a comprehensive bibliography. In some instances, the listed bibliography of prior publications in a dissertation might include a hundred or even two hundred publications; but substantive text in the dissertation might eventually discuss, at most, two dozen such publications. This is why such extensive bibliographies are unnecessary in most NEPA documents.

NEPA resource specialists should pare down their bibliography of cited items to those central to a discussion of impacts in the project area. Criteria for choosing cited items should reflect the specialist's framing of resource topics of concern. For example, if changes in road density are linked to changes in habitat suitability for grizzly bears, then chosen studies should focus on this cause-and-effect linkage. Remember that actual studies almost never deal with simple on-the-ground causes and effects. Resource specialists should focus their written survey/summary of research on the most current and relevant reports and studies. So a survey need not begin with classic studies (such as discussed in standard handbooks or comprehensive textbooks). Instead, the survey should include and discuss studies and reports that are actually going to be used in the identification of potential impacts in the project area.

All studies included in this project-specific survey (and bibliography) should also appear in the text that describes resource conditions and forecasts impacts. And the converse is true. All studies cited in the text should appear in the survey (and bibliography) of relevant reports and studies.

A necessary legal consideration is that this survey must also address, if only briefly, any studies or reports suggested in comments from the public or from other agencies. Coverage of such suggested sources need not be extensive, but the legal record should show that the agency considered them. As appropriate, an agency specialist should explain (in writing!) why a suggested study or report is not relevant to the current NEPA analysis.

Discussions of suggested studies and reports are mandatory for an EIS and advisable for an EA. The legal goal for both documents is to show the courts that the agency seriously considered all suggested reports and studies.

Where should this survey of sources be recorded?

No single answer is possible. But in most instances, the survey of literature need not appear in the basic text of an EIS or EA. Instead, the survey is best located in an appendix. Section 1502.24 of the CEQ Regulations suggests placing a "discussion of methodology in an appendix."
Optionally, an agency might decide to include a survey of sources in the NEPA file for a project. This survey could be a standard summary for all agency actions addressing similar impacts on a specific resource. Once prepared, this survey could be referenced in later documents and updated as necessary.

A file survey of sources tells how the agency has handled comments from the public on possible sources for the agency to use. As such, this information properly belongs in a file, not in the text for an

EIS or an EA. Remember that an EIS and an EA are both disclosure summaries, with emphasis on their role as clear summaries of impacts. Their legal roles are somewhat different, but they both have as their main goal the clear disclosure of potential impacts to all interested and affected parties.

2. **Explain how cited studies apply to the site-specific resource conditions in the project area.**

This recommendation reflects the weakest feature of cited sources in the NEPA documents: cited reports and studies do not convincingly apply to a specific NEPA project area.

The weakness occurs because cited sources usually analyze experimental areas and identify results (and conclusions) not necessarily relevant to a site-specific NEPA project area. Consider, for example, studies dealing with the effects of pesticides on different fish species. For decades, both private scientists and scientists for the U.S. Fish and Wildlife Service have been studying such effects, so data are available as to how much pesticide constitutes a lethal dose as well as the adverse effects of lesser concentrations (those hindering reproduction, causing genetic defects, or limiting growth). Assume that these data have been published in peer-reviewed journals, as has often been the case. These data on pesticide effects surely represent the best available science about the health effects of pesticides on fish. But how does an agency NEPA team use such data?

In a simple instance, assume that an accidental discharge of a pesticide is a possibility at a site (perhaps a chemical storage building). This discharge would affect not only nearby streams, but measurable amounts could move downstream, perhaps contaminating hundreds of miles of streams. The area of potential effects would include all affected streams where a measurable concentration of the pesticide was a concern.

Projected impacts of this pesticide discharge would be extremely complex. NEPA analysts would have to construct a local model showing just how the concentrations of the pesticide changed the further a stream segment was from the point of initial discharge. A NEPA analyst would need to take the changing concentrations into account in setting the area of potential effects. Analysis complexity would increase as fish biologists analyzed the degree of impacts on different fish species in the affected streams. Biologists would also have to identify key habitat features, such as spawning areas, which might be affected by the pesticide residues.

So, in this instance, the initial "best science" only becomes relevant to a NEPA analysis when its valid and reliable research findings are adapted to site-specific field conditions.

Examples such as the preceding one are why recommendation 2 urges NEPA analysts to add clear and convincing text showing that certain research studies are applicable (and relevant) to the impacts in a site-specific project area. Text in such a discussion (in either an EIS or EA) should contain sentences or sentence openings that read like the following:

- Gaylord and Kruse's study (1997, pp. 33-38) deal with soils that are very similar to soils in the project area. This similarity is important because . . . [The key word here is "because." Every site-specific observation and conclusion should be linked with causative language to cited sources.]

- Thompson's 1968 study (pp.128-137) is still relevant despite its early publication because . . .

- Guilford's study (1996, pp. 22-24) deals with plant species very similar to ones in the project area. Guilford's study, however, covered a research area over 200 miles south of the current project area. This difference means that Guildford's findings need to be adjusted in order to be valid for the project area. Adjustments include. . .

- Robertson's excavation of similar archeological sites (1984, pp. 228-239) used methodology current in the 1980's. The applicable methodology is now different because of . . .

- Clark's research on pesticide X (2001, pp. 43-44) shows that concentrations of X parts per million are lethal to native perch and bass. This threshold is relevant because certain streams near the point of discharge would likely experience concentrations of this magnitude. Clark's study also shows that lower concentrations of up to X parts per million can create adverse health effects in perch and bass. This lower level of contamination would be present up to 25 miles downstream from the point of initial discharge.

Such sentences as the preceding ones put research studies and their findings in the foreground of the NEPA text. This placement differs greatly from how NEPA writers often record their citations. Most often, text in a NEPA document draws several conclusions about resource conditions and/or impacts, and then a paragraph ends with a citation or citations in parentheses. Readers rightly wonder just how the stated conclusions about the resource conditions relate to the research recorded in the citations. Citations alone, without explanatory text, are not sufficient. Readers of NEPA documents should never have to guess if conclusions or data in a cited study are directly relevant to the current project area. Writers of a NEPA document should explain the relevance because such explanations provide legal credibility for any conclusions recorded.

So, as in the preceding example, the "best science" about the effects of a pesticide only becomes credible if it is carefully integrated into the site-specific NEPA project analysis.
As in most resource analyses, the best science is only present if the agency NEPA team prepares a clear, logical profile of potential impacts, including any cited sources for project-specific impact.

3. Cite internal agency reports and studies, including prior NEPA analyses that are relevant to site-specific conditions in the project area.

In a sense this recommendation is redundant with recommendation 1 above. In a routine survey of technical and scientific sources, a specialist should have mentioned agency studies and other internal technical documents. But some specialists worry that reliance on internal agency studies signals to readers that the analysis is already going to be biased. (Members of the public often argue that an agency has already made its decision by the time it issues an EIS or EA for public review. Citing many internal agency documents just reinforces this suspicion.)

Internal agency documents are rarely peer reviewed, so in some people's minds they are not blue-ribbon research. Yes, it is true that internal documents rarely face a full blind third-party review. At the same time, agency documents are likely to deal with actual resource questions faced by the agency managing the area to be analyzed. As such, internal agency documents may be the most directly relevant to NEPA impact discussions in agency documents.

Remember, also, that under NEPA's disclosure and processing requirements, a NEPA document has its own version of a peer review system. After all, both members of the public and specialists from governmental agencies are responsible for reviewing and commenting on the adequacy of NEPA documents, especially an EIS.

The relevance of prior NEPA documents is why a survey of the research literature should include internal agency studies (or reports), especially those prepared supporting full compliance with NEPA. Prior NEPA documents, if they exist, often have usable profiles of the existing environment in a project area. Even more important, they may contain monitoring information regarding how resource conditions have changed or are changing in the project area. Monitoring data is important because it

can show whether prior NEPA forecasts (and associated resource analyses) were accurate. This proof is valuable, especially if an agency uses it to convince the courts that its new NEPA projections are valid, based on this prior NEPA information.

In the preceding paragraph, I inserted the phrase "if they exist" because increasingly I am talking with employees from field offices where turnover has been excessive. In such instances, new employees (or outside contractors) may not be very familiar with prior NEPA projects and all of the associated supporting documents. These documents represent the valuable agency memory of prior decisions (and supporting analyses). Without access to this agency memory, newly hired resource specialists have a great deal of catching up to do, and their NEPA analyses are often less credible than the agency would desire.

As a final reminder, cited internal sources should include field data from site visits. A resource specialist who is drawing a conclusion about the project area might often need to reference a memo summarizing a field visit to the project area. In such an instance, the specialist writing a NEPA resource report will be citing his or her own field notes. This is not illegal. In fact, this approach provides a written record of the logical process the specialist is using to arrive at impact profiles in an EIS or EA.

4. **Address questions and concerns from the public or from other governmental agencies and explain what the cited information does and does not show. (Here is where political considerations become an inevitable topic for discussion in any analysis of resource conditions.)**

One of NEPA's two main compliance mandates is that impact information be shared with all interested parties (individuals, groups, other agencies, and even those who disagree with an agency's upcoming decision).

An implication of this mandate is that agency must track and respond to all substantive points raised by the public (both individuals and groups) and by other agencies, including Native American tribes. Tracking begins on day 1 when the agency's decision maker decides that the time is ripe for a proposed action to begin. The agency's NEPA responsibilities also begin on day 1 when the decision maker appoints a NEPA project leader. On day 1 the agency should open a NEPA tracking file. Such a file would include written comments from any and all interested parties. Emails about the proposed action would be in this file. Also, any internal documents about the proposed action would also be in this file; such internal documents might include telephone records of individuals calling to ask questions or to state their views about a project. Agencies must keep careful records of every comment received.

Responses to comments vary depending on the document being prepared (EIS vs. EA) and on the timing of the comment (when it was received). Responses are mandatory for an EIS and are recorded in the FEIS. For EAs, agencies differ in their expectations as to how comments should be answered. As a minimum, the written agency record should show what specialists have decided about the relevance of any suggested studies or reports. This written record is especially important when a specialist concludes that a study or report is not relevant to the project being analyzed.

The problem of the best science arises because comments from the public or from other agencies often cite resource studies (or reports) as evidence for conclusions about the proposed federal action. The legal importance of such suggested sources is why specialists must assess suggested studies in their area of expertise. After all, a NEAP team leader cannot be expected to judge, for example, whether a study of fish habitat captures the best of current scientific thinking about a certain fish species and its habitat. Here is where recommendations 1 and 2 are important. Each specialist

contributing to a project must be responsible for written assessments of all suggested studies, especially if the sources suggested are not widely published or accepted by experts in the field. Politics inevitably enters the discussion at this point. One person's best science study is someone else's example of stacked information or special pleading. Look no further than the topic of global warming. It took nearly two decades before a scientific consensus developed that human-generated greenhouse gases were changing the global climate. And even today, no single viewpoint exists as to the degree of change (for example, how much the average global temperature will increase in the next 20, 50, or 100 years). As with any forecast of the future, viewpoints range from the very conservative (with the lowest estimates of temperature change) to the most aggressive (with the highest estimated temperatures). The truth is likely to be somewhere within this range, but each "expert" is likely to have a political vision of what is the "correct" view.

Then enter John and Susie Q. Public. If every scientist has a viewpoint, then hundreds or thousands of personal and conflicting viewpoints exist in the general public. This is why a federal agency can receive hundreds or even thousands of comment letters on a highly visible NEPA project. These comment letters usually range from the very conservative (as in the global warming example above) to the very aggressive, even alarmist comments. And in many instances, the comment letters are citing "studies" as important. Sometimes, these studies are truly blue-ribbon publications, but in other instances, the public comment may be citing a Sunday-supplement commentary by a newspaper columnist. This range of suggested sources is why a resource specialist must be involved in assessing any studies in his or her area of expertise.

The specialist's responsibility is to record judgments about suggested sources in a survey of the available studies/reports (see recommendation 1 above). This written record properly records any different points of view in the technical or scientific literature. The best guidance for a specialist is to record both what is known and what is not known.

5. Make (and document) impact projections even when cited studies and other relevant resource sources are sketchy or missing.

The Council on Environmental Quality was really addressing "the best science" in its 1986 discussion of incomplete and unavailable information in Section 1502.22. That guidance is similar to the points made in the preceding recommendations. Writers of NEPA documents are told to be as honest as possible about what is known and what is not known.

Listed sub point 4 in 1502.22 states: "the agency's evaluation of such [significant adverse] impacts based on theoretical approaches or research methods generally accepted in the scientific community." This final CEQ step implies, perhaps mandates, that agency resource specialists should make at least a preliminary statement as to the potential impacts on their resources. CEQ's language throughout 1502.22 shows that the Council understands very well that such impact projections need to use "research methods generally accepted in the scientific community." Such methods are really the best science, as discussed above in the preceding four recommendations. CEQ adds later in sub point 4 that the impacts discussed should reflect "credible scientific evidence." Again, this is a best science requirement.

In the real world of agency decision making, a decision maker has to rely on what the agency staff is able to project about impacts. Who better than agency specialists to make projections, even highly hedged projections? After all, in today's economically and politically driven culture, decisions about proposed actions are frequent, and these decisions inevitably produce environmental impacts. So agency resource specialists should remember that their legal responsibility under NEPA is to estimate the likely impacts even if such estimates are hedged with conditions and assumptions. The professional challenge for specialists is to present their conclusions about impacts in text that is clear

yet not misleading. If they manage to do this, then their resource reports will reflect the integrity of the best science available to agencies in their day-to-day decision making.

This challenge is surely implied by the language of Section 1502.24: Methodology and scientific accuracy. The text opens with this statement: “Agencies shall insure the professional integrity, including scientific integrity, of the discussions and analyses in environmental impact statements.” Best science is a CEQ mandate for NEPA documents.