REVISED June 1, 2011

FINDINGS, ASSUMPTIONS AND CONCLUSIONS TO BE REVIEWED

The statute mandate for external scientific peer review (Health and Safety Code Section 57004) states that the reviewer's responsibility is to determine whether the scientific portion of the proposed rule is based upon sound scientific knowledge, methods, and practices.

We request that you make this determination for each of the following findings, assumptions and conclusions that constitute the scientific basis of the proposed regulatory action. An explanatory statement is provided for each issue to focus the review.

For those work products which are not proposed rules, as with the subject of this review, reviewers must measure the quality of the product with respect to the same exacting standard as if it was subject to Health and Safety Code Section 57004 requirements.

The topics of this review include a proposed State Water Board wetland definition and related delineation methods. Both of these will be implemented in a planned State Water Board wetland policy, currently under development.

This attachment consists of twelve statements to be addressed. The statements are scientific findings, assumptions and conclusions. We are requesting that all statements be addressed, as expertise allows, in the order presented. The statements are arranged by the following two topics:

I. A Proposed Wetland Definition for Use By the State Water Board
II. A Wetland Delineation Method for the Proposed State Water Board Definition.

Each statement includes citations to sections in the Staff Report, Technical Memoranda and related literature. Literature references, which are numbered in order of citation, are listed in Attachment 4. Full copies of all reference material, except standard texts, will be provided to the reviewers in a separate binder.

REVISED June 1, 2011

A Proposed Wetland Definition for Use by the State Water Board

1. The proposed definition references three indicators normally present which reflect current scientific understanding of the formation and functioning of wetlands: a) wetland hydrology; b) hydric substrates; and c) hydrophytic vegetation. (ref. # 1, Section 2, pp. 14-16; Section 3.2, pp. 34-36.)

The specific hydrologic regime of a wetland is its defining attribute, and this hydrologic regime commonly leads to the formation of characteristics such as hydric soils, which in turn support unique biotic communities, such as hydrophytic vegetation. The National Research Council (NRC) explains:

> "A wetland is an ecosystem that depends on constant or recurrent, shallow inundation or saturation at or near the surface of the substrate. The minimum essential characteristics of a wetland are recurrent, sustained inundation or saturation at or near the surface and the presence of physical, chemical, and biological features reflective of recurrent, sustained inundation or saturation. Common diagnostic features of wetlands are hydric soils and hydrophytic vegetation (ref. #6. Ch. 3, p. 59)."

2. Use of the phrase "saturated by groundwater or inundated by shallow surface water for a duration sufficient to cause anaerobic conditions within the upper substrate" is consistent with the scientific understanding of wetland characteristics. (ref. # 1, Section 2.1, p. 15; Section 3.2, pp. 34-36)

Wetland hydrology is defined by the NRC as "constant or recurrent, shallow inundation or saturation at or near the surface of the substrate" (ref. #6., p. 3, p. 59). Wetland hydrology is considered the "driving force" that "controls the abiotic and biotic characteristics of wetlands" (ref. #6., p. 22). Duration refers to the length of time that an area is continuously saturated or covered by water. It is the period available for the formation of anaerobic substrate conditions.

3. Use of the phrase "hydric substrate conditions indicative of such hydrology" is consistent with the scientific understanding of wetland characteristics. (ref. # 1, Section 2.2, pp. 15-16; Section 3.2 pp. 34-36; Section 4.3, pp. 43-44)

The NRC defines hydric soil as "soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper

part (1991 National Technical Committee on Hydric Soils definition)" (ref. #6., p. 286). While many standard reference texts refer to hydric soil indicators and processes, this should not be taken to exclude non-soil substrates from consideration when identifying a wetland area. Cowardin, et al. (ref. #7. 1979, p. 11) notes that "The single feature that most wetlands share is soil or substrate that is at least periodically saturated with or covered by water." The NRC states that "…recurrent, sustained saturation of the upper part of the substrate is the most basic requirement for wetlands" (ref. #6., 1995, p. 90). The NRC also states on p. 57 that "although most wetlands do form on soils and are specifically associated with hydric soils, a few types occupy substrates that are nonsoil or nonhydric soil…" and "… the vast majority of wetlands do in fact have hydric soils, and they can be identified by the presence of hydric soils in the absence of hydrologic alterations. Some wetlands do, however, develop on substrates that are not now classified as hydric soil." The NRC goes on to report that "some frequently saturated substrates do not develop hydric soil because they are frequently disturbed (mud flats, sand bars) or because they receive insufficient amounts of organic matter to support the development of hydric soil" (ref. #6., Ch. 5, p. 136).

4. Use of the phrase "anaerobic conditions within the upper substrate" is consistent with the scientific understanding of wetland characteristics. (ref. # 1, Section 2, pp. 15-16; Section 3.2, pp. 34-36; Section 4.2.1, pp. 41-42)

Sustained inundation or saturation tends to create anaerobic conditions, or a lack of oxygen, in wetland substrates, which limits the types of chemical and biological activity that can occur. The minimum duration of inundation or saturation needed to cause reducing conditions for all substrate types is difficult to determine (ref. #6., p. 92). Technical Memorandum No. 4 explains "the regional supplements adopt a minimum duration of 14 days as a standard, but the same supplements also conclude that areas where the substrate is inundated and/or saturated to the surface for 7 continuous days are wetlands, provided the soil and vegetation parameters are met" (ref. # 5, Section 4.7.2, p.20). Although this minimum duration is known to vary with soil temperature, soil pH, and other environmental factors, scientific evidence indicates that in most California environments the chemical transformation to anaerobic conditions in the upper substrate occurs within 7 to 14 days.

5. In California, wetland vegetation may not be present in areas where the physical, chemical and biological functions characteristic of wetlands are evident. Vegetation may be lacking in some years (especially during prolonged dry periods), or may permanently lack vegetation such as tidal flats, playas, and non-vegetated shallow snowmelt pools. As reviewed above, normally wetlands are

> **identified based on three indicators: (1) wetland hydrology, (2) hydric substrate and (3) hydrophytic plants. However, in the special case where vegetation is entirely absent, wetland identification may be based on the remaining two wetland indicators (i.e., wetland hydrology and hydric substrates) (ref. # 3, p. 4).** (To clarify: this statement only addresses the condition where vegetation is absent and is not intended to imply that other combinations of two out of three indicators are equally applicable.) **(ref. # 1, Section 2.3, p. 16; Section 3.2, pp. 34-36; Section 4.4, pp. 45-46)**

What the statement applies to are areas that lack vegetation that meet both the wetland hydrology and hydric substrate criteria and provide functions and services commonly ascribed to wetlands. Dominance by hydrophytes (greater than 50% dominance based on percent cover) need only be considered as a criterion if the wetland is vegetated.

Scientific support for identifying wetlands based solely on wetland hydrology and hydric substrate indicators may be found in the report from the NRC, which provides a reference definition of wetlands:

> Common diagnostic features of wetlands are hydric soils and hydrophytic vegetation. **These features will be present except where specific physicochemical, biotic, or anthropogenic factors have removed them or prevented their development** (emphasis added)*."* (ref. #6., Ch. 3, p. 59)

The NRC definition recognizes that that hydric soils and hydrophytic plants are common diagnostic features, but that they are not absolute necessities in identifying wetlands. In support of this viewpoint, the NRC cites Mitsch and Gosselink's textbook in the discussion of "*Other Indicators of the Substrate and Biological Criteria*," which states that:

> The biological criterion for wetlands is typically satisfied by vegetation analysis, although……. some wetlands lack vascular plants entirely, either because the plants have been removed or because the chemical or physical habitat is unsuited for their growth, as in the case of some playas or mud fiats or areas where sulfide accumulation causes high vegetation mortality (ref. #8. Mitsch and Gosselink, Wetlands, 2nd edition, 1993, Ch. 5, p. 136)."

In California, the condition of "no evident vegetation" is specifically addressed in the Arid West Regional Supplement to the Corps Wetland Delineation Manual which states that:

> "Many factors affect the structure and composition of plant communities in the Arid West, including climatic variability, ephemeral water sources, saline soils, and human land-use practices. As a result, some wetlands may exhibit indicators of hydric soil and wetland hydrology but lack any of the hydrophytic vegetation indicators." (ref. #9. U.S. Army Corps of Engineers, 2008a, p 85-86).

Some areas in California function as wetlands despite lacking abundant wetland vegetation. For example, non-vegetated playas, tidal flats, river bars, and ephemeral or intermittent washes provide a variety of wetland functions, including water filtration, groundwater recharge, and the support of wildlife. (ref. # 3, p.4).

6. Definition of wetlands proposed for adoption:

An area is wetland if, under normal circumstances, it

(1) is saturated by ground water or inundated by shallow surface water for a duration sufficient to cause anaerobic conditions within the upper substrate;

(2) exhibits hydric substrate conditions indicative of such hydrology; and

(3) either lacks vegetation or the vegetation is dominated by hydrophytes. **(ref. # 1, Section 3.2, pp. 34-36)**

This proposed definition was developed based on the current scientific understanding of the formation and functioning of wetlands found in California, and is consistent with standard scientific research (ref. #6., p. 60-63).

Wetland Delineation Methods for the Proposed Definition

As noted in Technical Memorandum No. 4, delineating a wetland area is "the process of demarcating wetland areas from other adjoining areas that do not satisfy the wetland definition, based on field investigation." In California, the Corps delineation methods (ref. #'s 9, and 10,11. U.S. Army Corps of Engineers, 1987, 2008, 2010) are commonly used for both federal and State regulatory purposes in identifying wetland boundaries. (ref. # 5, Section 2.0, p. 2).

As mentioned in Attachment 1, the State Water Board directed staff to develop a wetland definition for California that not only captured the regional variation in

wetlands across the State, but that was also based on the Corps delineation methods to the extent possible. The proposed State Water Board wetland delineation methods use the Corps delineation procedures with appropriate modifications to allow field identification of wetlands based on the proposed State Water Board wetland definition. These proposed changes to the standard Corps delineation methods for use with the proposed State Water Board wetland definition are described in Technical Advisory Team Technical Memorandum No 4 (ref. # 5, discussed below in statement No. 4).

To clarify, the reviewer is asked to focus comments on the delineation methods that may vary from the Corps procedures as highlighted in Technical Memorandum No. 4. However the review should not focus on the merits of these changes but on whether the scientific portion of the proposal (including the proposed delineation methods) is based on sound scientific knowledge, methods, and practices.

7. Some procedural clarifications in the Corps delineation methods are proposed to be used when conducting wetland delineations based on the proposed State Water Board definition. Implementing these adjustments would effectively implement delineation methods applicable to the proposed State Water Board definition. (ref. # 1, Section 4.1, pp. 38-41)

Technical Memorandum No. 4 recommends adoption of the 1987 Corps Wetland Delineation Manual with the Arid West Supplement and the Western Mountains Supplement as the primary guidance for wetland delineation under the proposed wetland definition. Specific details on implementing the Corps delineation procedures in California, including the modifications noted in Table 1, are found in Sections 4.2 (Vegetation), 4.3 (Substrates) and 4.4 (Hydrology) in Technical Memorandum No. 4. These procedural adjustments include emphasizing the presence of observed substrate conditions (as opposed to soil conditions; see Assumption 3). In addition, the proposed definition allows an area to be identified as wetland if it's not vegetated and thus some indicators of wetland hydrology and substrate/soil used in the Corps delineation procedures would not apply to the Water Board delineation methods because the Corps procedures rely on the presence of vegetation.

8. Delineating a wetland requires evaluating whether the area meets the criteria of the wetland definition. This includes determining whether the presence or absence of wetland conditions are due to "normal circumstances," or "altered circumstances," or "new normal circumstances" or to being a "problem area." (ref. # 1, Section 4.5-4.8, pp. 47-53)

REVISED June 1, 2011

These terms, as recommended in Technical Memorandum No. 4, should be used for delineating wetlands using the proposed definition.

- A "**normal circumstance**" is defined and further described in Technical Memorandum No. 4 (ref. # 5) as follows:

  "The hydrologic, substrate, and vegetation conditions that are present in the absence of altered circumstances. Normal circumstances include natural seasonal and interannual variations in hydrology, substrate, and vegetation conditions. Natural, purposeful, or inadvertent conversion of a non-wetland area into a wetland area or conversion of a non-channel area into a channel can cause **new normal circumstances** (see below). This definition incorporates much of the meaning of normal circumstances as defined by the Corps, which states that normal circumstances are the soil and hydrologic conditions that are normally present, without regard to whether the vegetation has been removed. The determination of whether or not normal circumstances exist in a disturbed area involves an evaluation of the extent and relative permanence of the physical alteration of hydrology and hydrophytic vegetation and consideration of the purpose and cause of the physical alterations to hydrology and vegetation (based on Regulatory Guidance Letter 90-7, 26 Sep 90; HQ USACE, 7 Oct 91" (ref. # 5, Sec. 3.2.1., p. 8, and Glossary, p.28-29).

- According to the Corps delineation procedures, **new normal circumstances** exist when altered circumstances are likely to be permanent (see *altered circumstances* below). For example, the establishment, enhancement, and restoration of wetlands can cause new normal circumstances.

- In Technical Memorandum No. 4 the definition of "atypical situations" is modified for California by terming it "**altered circumstances**" and defining it as existing:

  "for wetland areas when one or more of the three wetland parameters (hydrology, substrate, and vegetation) have been sufficiently altered by recent human activities or natural processes to preclude wetland conditions, based on the State Water Board methodology for identifying and delineating wetlands. The determination of altered circumstances requires a consideration of both their causes and their expected duration. Given altered circumstances for wetlands, practitioners must use supplementary identification/delineation procedures to characterize the pre-alteration condition. This definition incorporates the concept of "atypical" wetland situations presented in the Corps methodology for wetland identification and delineation (ref. #10. U.S. Army Corps of Engineers - Environmental Laboratory, 1987)" (Technical Memorandum No. 4, p.26).

- Some typical characteristics that occur in California wetlands are referred to as "**problem areas**" by the Corps. Problem areas are defined by the Corps as areas in which indicators of one or more of the three common wetland characteristics "may be periodically lacking due to normal seasonal or annual variations in environmental conditions that result from causes other than human activities or catastrophic natural events" (ref. #10., p. 77). For this reason, the recommendation is made for the State Water Board delineation methods that the term "problem areas" be replaced with "**difficult to resolve**" areas.

9. The proposed delineation methods include a provision that delineations be made during the wet season, but if done during the dry season, that boundaries of wetlands be considered provisional or temporary until verified by wet-season data if possible and if conditions permit. (ref. # 1, Section 4.9.2, pp. 55-56)

Reliance on delineations during the wet portion of the growing season will help minimize the uncertainty of wetland identification and delineation, especially in arid regions of the State.

10. Describing the wetland area's water source and landscape setting as part of the delineation process provides information useful for analyzing the wetland's beneficial uses and the potential sources of stress from surrounding areas. (ref. # 1, Section 4.9.4, p. 57)

Generally, wetland hydrology is the study of the movement of water in and out of the wetland ecosystem. In wetlands the presence of water is the critical characteristic of the ecosystem. Technical Memorandum No. 4 recommends that the proposed State Water Board delineation methods incorporate a requirement to report the water source(s) and landscape setting(s) of the delineated areas (e.g., site location at toe of slope; fringe of another water body; floodplain area; concave land surface). This recommendation provides a basis for understanding wetland ecological functioning at any given site and the potential sources of stress. It is consistent with standard references and the NRC recommendations as noted below:

> "Hydrology is probably the single most important determinant of the establishment and maintenance of specific types of wetlands and wetland processes….The starting point for the hydrology of a wetland is the climate and basin geomorphology…" (ref. #12., Mitsch & Gosselink, 2000, p. 108).

"Because particular hydrologic conditions are essential requirements for wetlands, it is logical that hydrology be evaluated when wetlands are identified or delineated." (ref. #6., Ch. 5, p.91)

11. Since the three wetland indicators (wetland hydrology, hydric substrates and hydrophytic plants) vary geographically due to such factors as climate, geology and topography, consideration should be given to developing statewide ecological regions and providing supplemental delineation guidance for these regions. (ref. # 1, Section 4.10.1, pp. 58-59)

Although the policy adopts the Corps two Regional Supplements, recognizing additional sub-regions will improve wetland delineations by identifying wetland indicators unique to these smaller areas, including lists of wetland plants.

12. The wetland delineation procedure should include two delineations: the inner wetland boundary and an adjacent outer "aquatic support area" boundary that defines an area related to the wetland area since it shares the same moisture continuum (see Figure 1 below). Additionally locating the outer "aquatic support area" boundary would provide information on where the wetland boundary might shift during the wet season if the wetland is delineated during the dry season. It also would indicate the area that should be protected through the policy to assure that the beneficial uses of the wetland area are adequately protected. (ref. # 1, Section 4.9.5, pp. 57-58)

A wetland may be recognized as a landform found along an extended moisture continuum from a wet area, such as a stream, to a dry upland area. The area immediately outside of a wetland will exhibit one or two of the three wetland indicators and may be identified as an "aquatic support area" (See Figure 1 below). These areas are connected to wetlands ecologically and/or through hydrology (i.e., runoff, high groundwater, etc), and therefore may be viewed as "supporting" the health of the wetland and its functions. The ecological importance of this area is recognized in buffering wetlands from stressors and supporting and enhancing wetland functions by increasing adjacent wildlife habitat and providing linkages with other aquatic or upland areas. (ref. #4, , Section 2.3, p. 7)

Technical Memorandum No. 4, Section 4.3 recommends that aquatic support areas be identified and delineated along with wetland areas (*aquatic support areas* exhibit some but not all the characteristics of wetlands; "aquatic support area" is defined in Technical Memorandum No. 4, Glossary). The intended result

of the field delineation exercise is a map with two boundaries, one for the wetland area and one for the associated aquatic support area. The delineation will depict both the area of focus for the delineation (i.e., the wetland area) and the area that should be considered to enhance protection of the wetland area (i.e., the aquatic support areas).

REVISED June 1, 2011

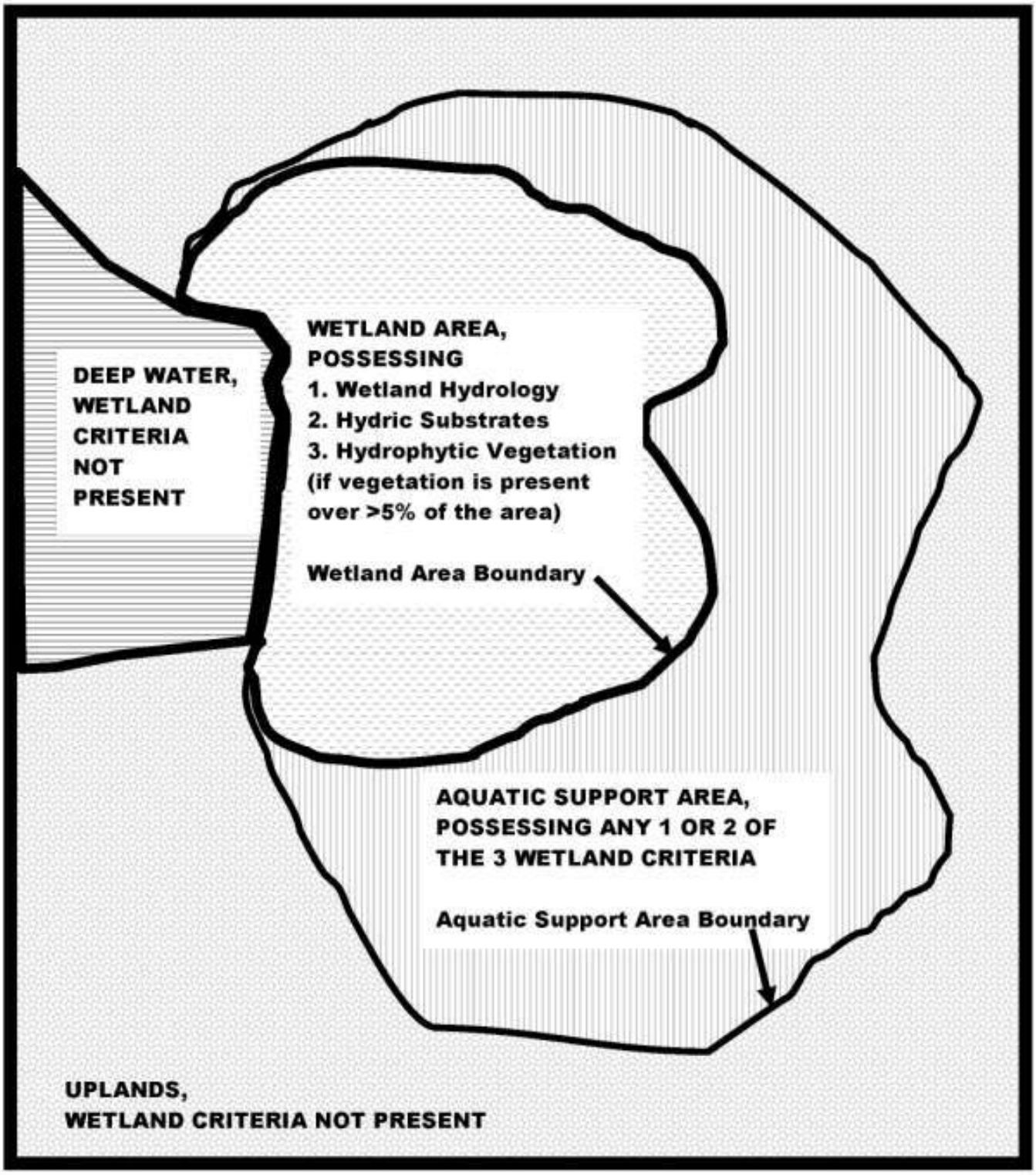

Figure 1: Schematic diagram of relationship between wetland areas, aquatic support areas, upland areas and deep water areas under the proposed wetland definition.

REVISED June 1, 2011

The Big Picture

Reviewers are not limited to addressing only the specific issues presented above, and are asked to contemplate the following questions.

> **(a) In reading the supporting documents for the proposed wetland definition and delineation methods, are any additional scientific issues found that are not described above? If so, please comment with respect to the statute language given above in the first three paragraphs of Attachment 2.**
>
> **(b) Taken as a whole, are the wetland definition and delineation methods based upon sound scientific knowledge, methods, and practices?**

Reviewers should also note that some proposed actions may rely significantly on professional judgment where available scientific data are not as extensive as desired to support the statute requirement for absolute scientific rigor. In these situations, the proposed course of action is favored over no action.

The preceding guidance will ensure that reviewers have an opportunity to comment on all aspects of the scientific basis of the proposed definition and delineation methods. At the same time, reviewers also should recognize that the Board has an obligation to consider and respond to all feedback on the scientific portions of these topics. Because of this obligation, reviewers are encouraged to focus feedback on the scientific issues highlighted.