January 13, 1976

U.S. Environmental Protection Agency
100 California Street
San Francisco, California 94111
Attn: ENPDC

Gentlemen:

DREDGE SPOIL DISPOSAL CRITERIA AND THEIR RATIONALE

We appreciate the opportunity to comment on the "Dredge spoil disposal criteria" and "Rationale for dredge spoil disposal criteria" proposed by EPA. The following members of the University of Hawaii have contributed:

A. H. Banner (Hawaii Inst. of Marine Biology)
Doak C. Cox (Environmental Center)
Richard Grigg (Hawaii Institute of Marine Biology)
L. Stephen Lau (Water Resources Research Center)
James Maragos (Hawaii Inst. of Marine Biology)
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DREDGE SPOIL DISPOSAL CRITERIA

Dredge spoil classification and site criteria

A.

The organization or classification of the material cited under the general heading "Dredge spoil classification and site criteria" is unclear. Item A. either has no title or "Dredge spoil classification and site criteria" is intended to be the title for A. If there is a classification intended, it seems to be between "unpolluted" and "polluted," but the "polluted" class is not mentioned in Section A (or elsewhere) and the choice of terminology is poor. "Sand and gravel" and "other materials" would be preferable. The usage of the
classification appears to indicate that it serve as a criterion in addition to those in section B and C, however, "Substantially sand and gravel" is the sole criterion indicated for present site SF 8 and the proposed site at Morro Bay. A combination of the "sand and gravel" vs "other material" criterion and the section B criteria is called for at the proposed site in Suisun Bay. We assume, but it is not clear that only section B criteria apply at all sites identified other than the three mentioned above. It would seem appropriate to entitle "A" "Dredge-spoil size classification and criteria."

We suggest that a classification and criteria based on the fraction of suspended material, in addition to that based on the 200 mesh screen size, might be of importance at some near-shore disposal sites.

B. Criteria for open water sites

The title of this section is misleading. It includes criteria for fills, which are apparently intended to be mainly on land and in any case not in open water. As indicated above, it seems intended that these criteria are to be additional to those based on sediment size. Section "B" would be better titled "Other site criteria."

The subsection titles also are questionable in that the "fresh-water" criteria apply to a shallow marine or estuarine site at a proposed site at Suisun Bay and a 100 fathom marine site at Moss Landing.

1. Fresh water
2. Marine (shallow) and estuarine water

For our comments on items 1. and 2. above, see Section III, Toxic Substances, "Rationale for Dredge Spoil Disposal Criteria."

3. Marine water - 100 fathom

"The discharge shall consist entirely of dredge spoil obtained by dredging at the project site." There is no definition of the "project site." Assuming all other criteria are met, what is the rationale behind a prohibition of a combination of dredge spoil from more than one site?

4. Fill sites

Where the dredge spoil is to be disposed of as a fill on land or in shallow water, there are four or more concerns related to the effects of:

i) erosion and transportation of the fill material itself from the site;

ii) discharge of settleable material from the site;

iii) discharge of suspended material from the site; and

iv) discharge of dissolved material from the site.
(a) A criticism of this subsection relates to the "erosion or wave action" phrase. "Erosion" alone would be preferred, otherwise all erosional forces need to be considered, i.e. erosion due to rainfall, fluvial, wave or wind action. A more important criticism relates to the allowance of placing dredging spoils in fills liable to erosion. If the use of a fill site results from the detrimental effects of use of an adjacent marine or estuarine site, it is illogical to allow placement in a fill from which the material will be eroded and transported to the adjacent marine or estuarine areas whether the waters are "surface waters" or deeper waters. In general fills should be especially protected from wave erosion by sea walls, rip rap, sheet piling, etc. It would seem best to require that such protection be provided unless it can be shown that the erosion, transportation, and redeposition of the fill material will cause no significant problems. Fills should rarely, if ever, be placed where they are liable to fluvial erosion. Even with protection from fluvial and wave erosion, some erosion from wind, rainfall and surface flow will occur. Hence the application of the fresh water or estuarine pollutant criteria from 1 or 2 is appropriate. In addition reference should be made to whatever state or local regulations are applicable to such erosion. In Hawaii, for example, pertinent county ordinances are being developed subject to state standards.

The "Summary of DSDC Comments and Consideration Given in Revision of the DSDC" accompanying the "Criteria" and "Rationale" documents indicates (p. 3) that establishment of beach disposal sites has been recommended, and that "Dredge spoil which is essentially sand/or gravel may be discharged at a beach site so long as the spoil complies with sediment analyses for the receiving water." Dredging of sand from offshore deposits may be a useful means for the enlargement of beaches, particularly those that have retreated as a result of injudicious mining of sand from the active part of the beach system. However, the restriction to sand and gravel particle size may not ensure that the dredged material will be satisfactory for beach enlargement from either the esthetic or stability standpoints.

(b) The first clause of this subsection relates to the discharge of settleable solids, "Any discharge from a land disposal site shall not contain settleable solids in excess of 1.0 ml/1/hr. . . . ."

The concentration limit thus proposed would make sense if the settleable solids were subject to dilution as are dissolved solids. However, this is not the case. The settleable solids settle and accumulate with time on the bottom near the discharge. In highly sensitive areas such as live coral reefs, no discharge of settleable solids should be permitted. In less sensitive areas a limit should be set, not to the concentration of suspended solids, but to the total quantity of suspended solids, the product of concentration, discharge rate, and discharge duration.

The second clause, "... nor cause a violation of applicable water quality standards," is the only part of the dredge spoil and disposal site criteria that may relate to the discharge of suspended or dissolved solids through applicable water quality standards. In combination with subsection a), which makes metal criteria applicable, it may adequately deal with potential problems with dissolved solids, which may reach the surface and coastal waters by way of
leaching and seepage. It is questionable that it deals adequately with the suspended solids.

C. Other provisions

1. The implication of this subsection is that by selective dredging, the material can be removed and disposed of separately from successive 6-foot depth increments. Although it is expected that horizontal gradients of pollutant concentrations will in general be much smaller than vertical gradients, some provision for averaging over selectively dredgeable horizontal extents as well as vertical extents would seem appropriate.

We do not have available the "Preliminary sampling and analytical procedures" referred to in subsection 3. If they do not prescribe spacing for cores, a prescription should be included in subsection 1.

Dredge spoil disposal sites

We have no comments on the specific sites listed except those in Hawaiian waters.

Assuming that previous use of the three present Hawaiian sites listed has already effected such deleterious impacts that might result from disposal of dredging spoil, we know of no reason for discontinuing their use. However, we strongly recommend that the impact of the disposal at these sites be investigated.

Concerning the proposed future sites we have the following comments:

a. Honolulu and Pearl Harbor, Oahu

This site is in an area with potential for the future harvest of large shrimp. It is near the present Honolulu site, and we see no reason why a second site in the vicinity should be used.

b. Kalaupapa, Molokai

This site also is in an area with shrimp-harvest potential. We are not aware of any needs for dredge spoil disposal at this site, but if they exist deeper sites are available at no great distance.

c. Kaunakakai, Molokai

There appears to be a mistake in the latitude identified for this site. If the site is in 150 fathoms south of Kaunakakai, it is very near an area of black coral. We recommend clarification of the location of the site and its situation in water of at least 290 fathoms.

d. Maneli, Lanai

The latitude identified for this site is in error. A site 3.7 miles south of Maneli in 190 fathoms is in an area of bamboo and gold coral. We recommend that the site be moved west or WSW to a depth of 1000 fm.
The depth and location given for this site do not agree. A site at 100 fm would be close to good shrimp and crab grounds. We recommend that the site be located well beyond the 100 fm contour, and if possible to the 500 fm contour.

f. Kawaihae, Hawaii

As proposed this site would be just outside a black coral area and just inside gold and pink coral areas. We recommend that the site be located at least 10 miles offshore in 300 fm and preferably in more than 500 fm.

g. Hilo, Hawaii

A very modest increase in the distance of this site from Hilo would locate it in water of 1000 fm. depth, which we recommend.

We strongly recommend investigation of the bottom and near-bottom conditions at each of the sites proposed before it is used and monitoring of the effects of dredge spoil disposal subsequently.

Further comment

Section II of the "Rationale" document constitutes a set of criteria additional to those now included in the "Criteria" document. That section should be added to the "Criteria" document.

RATIONALE FOR DREDGE SPOIL DISPOSAL CRITERIA

The "Rationale" document is actually a combination of rationale for some of the criteria in the "Criteria" document and additional criteria. For some of the criteria in the "Criteria" document, no rationale is presented in the "Rationale" document.

II. General requirements for open water and fill sites

This section does not present rationale. It constitutes a set of criteria additional to those in the "Criteria" document and should be transferred in its entirety to the "Criteria" document.

A. Water Uses

Two additional criteria for prohibition of dredge spoil disposal should be added to the present five criteria:

1. Prohibition of dredge spoil disposal on coral reefs or in areas from which spoil materials may be transported and deposited on live coral reefs, except
where the fill over the coral reef is undertaken deliberately and with all due regard to state and local regulations. The exception (which is perhaps covered in section D) should rarely be made.

2. Acknowledgement and restriction of disposal sites where crustacean fisheries may be affected should be included if the other specific fisheries are itemized.

B. Water Quality Standards

3. Is there any biological or environmental basis for the 50% figure cited? Temporarily suspended fine sediments should be included.

C. Toxic substances

1. Bioassay

   Is "bioassay" the proper term or is "biological survey" what is intended?

2. This paragraph implies preliminary analyses. Who is responsible and what are the accepted analyses procedures.

III. Toxic Substances

The toxic substances in this section include only four heavy metals—mercury, cadmium, lead and zinc. While these four metals are indeed among those of high toxicity, especially the first three, several other metals such as arsenic, chromium, nickel, and copper are not included. In an earlier version of the document, most or all of these omitted metals were included. The present omission is not explained.

Section III sets forth the recommended concentrations for toxic metals (mercury, cadmium, lead, zinc) in receiving waters as contained in proposed water quality criteria published by EPA in October 1973. These concentrations are substantially higher than those known for Hawaiian coastal waters. However, there is no explicit statement in the subject review document regarding the applicability of these proposed concentrations.

The same section alludes to the concentrations of toxic pollutants in background and polluted sediments in the coastal waters and cites data from California locations. It should be pointed out that a body of similar data has been developed for some Hawaii coastal waters. These data are used in the subsequent parts of this review.

The biological significance of toxic metals in waters and sediments found in coastal water is little known and understood as the subject review document correctly points out. Here, the concept of biological availability of these toxic metals whether in coastal waters or coastal sediments is not recognized in the subject review document. A recent study conducted in Hawaii (Quality of
Coastal Waters Project) on the biological availability of toxic metals found in coastal water and sediment to several Hawaiian estuarine biota shows that the availability is related to the type of sediment and its organic fraction. The same study found several fish off a primarily agricultural coastal land with mercury concentration over the allowable 0.5 ppm set by FDA for edible fish and yet the maximum mercury concentration ever found in the coastal sediment was 0.22 ppm, satisfying the proposed 1.5 ppm mercury concentration in the dredge spoil for marine (shallow) and estuarine water.

IV. Other pollutants

Criteria for pesticides in dredge spoil should be provided, but there is not enough known about all the pesticides to set quantitative limits. Unlike heavy metals which have an acute toxicity, pesticides at concentrations less than lethal doses result in chronic toxicity involving changes in (1) reproduction, i.e., chlorinated hydrocarbon activating enzymes in the liver to eliminate estrogen, making calcium unavailable for strong eggshell production in birds, (2) stimulatory effects on thyroid activity of fishes, (3) reduced number of eggs in spawning fish.

It is also difficult to come up with quantitative criteria because many insecticides such as DDT are constantly recycled in the biosphere, and food webs are complex enough so that concentrations at various trophic levels must be determined first.

V. Recommended criteria

B. Criteria for open-water sites

1. Fresh water criteria and

2. Marine (shallow) and estuarine water

We have examined the proposed criteria in the light of known published Hawaiian data. If limited in accordance with these criteria, disposal of dredged spoils will be generally acceptable in freshwater or estuarine water sites on the basis of time and areal averages of the Hawaiian data. The acceptable situations include relatively undeveloped land such as Kahana Bay area, urban domestic land development such as Hawaii-Kai Marina and Maunalua Bay, urban recreation land development like Waikiki Beach area. Sediments in Pearl Harbor and the Ala Wai Canal on Oahu would be considered polluted in terms of cadmium and zinc respectively. Also, stream sediments in Kapalama Canal in the industrial area of Honolulu would be considered polluted in terms of mercury, lead, and zinc. It should be noted that much less data are available for Hawaii streams including the above mentioned tidal affected, Kapalama Canal and Ala Wai Canal. Case-by-case study should be made involving actual dredge spoil sampling and analysis.

It should be pointed out that the proposed criteria apply to the values obtained by averaging analysis for any continuous six feet of core or to any core having a total depth less than six feet. It stands to reason that the top sections
of the sediment would normally collect more man-developed toxic substances than
the deeper sections in the sediment. The Hawaii data were all surface samples
taken within the top few inches and hence, probably represent the extreme condi­
tions representing higher concentrations of pollutants than those averaged from
a 6-foot core.

Biological availability of the toxic substances in dredge spoil to
marine biota is of greatest ecological importance. Hence, we question the
significance of the criteria for toxic metals such as mercury, without discri­
mination of the biological availability and type of mercury.

The following comments apply to specific subsections:

1. Freshwater criteria. Because these criteria are extended in the
"Criteria" document to certain marine and estuarine sites, some rationale should
be presented for this extension.

4. Fill sites are not open-water sites. This section should logically be
a major one--"C. Criteria for fill sites."

5. General conditions. Since these apply to both fill and open-water sites,
this should also be a major section--"D. General conditions."

Further comment

No rationale is presented in the "Rationale" document for the dredge spoil
disposal site selection. Appropriate rationale for continuing the use of existing
disposal sites may well lie in the likelihood that most of the detrimental effects
of the use of these or similar sites have already been induced if these sites have
been used in the past. Clearly, part of the rationale for the proposed sites, as
for the existing sites, consists of proximity to ports at which dredging has been
or is to be performed. But the reasons for selecting the particular blocks of
ocean proposed for the disposal of dredge spoils in the future are unclear. To
what extent have depth criteria been used? To what extent have bottom slope
criteria or the proximity to submarine canyons been used? To what extent are
depth and bottom conditions so uniform that within wide areas the selection is
arbitrary, and necessary only to confine future disposals to the same site? As
indicated by our comments on specific Hawaiian sites, no consideration has been
given to the distribution of sea-bottom or near-bottom resources such as manganese
crusts or nodules, precious coral, or shrimp, or to the effects of disposal of
dredge spoil on these resources.

ADDITIONAL COMMENT

Although we recognize that the criteria and rationale presented in the
documents reviewed above pertain only to dredge spoil disposal and not to the
dredging operation itself, we feel impelled to comment that many of the important
detrimental effects of dredging in Hawaii relate to the dredging itself.

First, dredging of a living coral reef, as for ship and boat channels, directly destroys a part of the living coral reef.

Second, dredging of a reef may alter the pattern of waves, currents, and sediment transport. For example, at Kapaa, Kauai, the dredging of a coral reef led to the interruption of the pattern of shoreward sand transport and the retreat of the beach. On Oahu, the dredging of a channel connecting the exit of Ala Wai Canal with Kewalo Basin along the front of Ala Moana Park distributed a fresh-water discharge over the coral reef seaward, probably contributing to coral kill. (The fresh water discharge distribution was subsequently altered again by the dredging of the Ala Wai boat channel and blocking of the Ala Moana channel by Magic Island.)

Third, even with suction dredging, the dredging operation usually releases fine materials that can be transported in suspended form for a considerable distance causing not only turbidity in the water but detrimental effects on the biota such as coral.

Yours very truly,

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