

**REVIEW OF CRITERIA
GOVERNING DREDGING AND DISPOSAL OF DREDGED SEDIMENTS
IN AND AROUND SAN FRANCISCO BAY**

**Prepared For The Port of Oakland, California
By William E. Vandenberg**

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**Testing Criteria For Dredging
In
San Francisco Bay**

This paper describes the criteria which govern testing for dredging and disposal of sediments from San Francisco Bay. The information is taken from a briefing that was presented to the Board of Port Commissioners of the Port of Oakland in December, 1989. While the testing criteria are specific to the Port of Oakland, they would apply generally to any San Francisco Bay dredging project. Summary charts used in the briefing are attached as enclosures.

REGIONAL AGENCIES AND AUTHORITIES

The agencies which regulate dredging and disposal of dredged material in San Francisco Bay are shown on Enclosure 1, sorted according to the proposed disposal location. Dredging in the Bay is always regulated by the U. S. Army Corps of Engineers, the Regional Water Quality Control Board (RWQCB) and the ^{S.F. Bay} Bay Conservation and Development Commission (BCDC). Depending on the disposal location, other agencies may also exercise regulatory jurisdiction. Additional agencies include the California Coastal Commission, if disposal is in the ocean less than three miles offshore, and the State Lands Commission, if dredging is in an area which includes submerged lands to which the State holds title or for which the State has retained mineral rights. In addition, although they do not have permitting authority, the Federal Fish and Wildlife Service, the National Marine Fisheries Service, [and perhaps the National Oceanographic and Atmospheric Administration] may be expected to comment on proposals for dredging. The State Department of Fish and Game may be expected to comment, regardless of the location of the dredging or the location of dredged material disposal.

EPA can also regulate.

NMFS is a division of NOAA.

For In-Bay disposal, regulatory agencies include the U. S. Army Corps of Engineers, whose regulatory authority derives from Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act. The RWQCB derives authority from Section 401 of the Clean Water Act, from the Porter-Cologne Act, [which is the State's version of the Clean Water Act,] and from the California Water Code. BCDC exercises regulatory authority through the McAteer-Petris Act, which is BCDC's enabling legislation. BCDC regulates according to the BCDC Bay Plan and Commission regulations.

→ Title 14 of the Natural Resources Code, the Acts implementing regulations, and the BCDC's Bay Plan policies.

For Ocean disposal, the Corps of Engineers, under its Section 10 and Section 404 authorities, regulates dredging and disposal. Both the RWQCB and BCDC exercise regulatory jurisdiction over the act of dredging but not over disposal. The Environmental Protection Agency, under Section 404 of the

Clean Water Act and either Section 102 or 103 of the Marine Protection, Research and Sanctuaries Act (the "Ocean Dumping Act"), exercises jurisdiction over disposal.

For Upland disposal, the Corps of Engineers regulates under Section 10 for the action of extraction (dredging) and for transporting the dredged material. The RWQCB regulates dredging under Section 401, the Porter-Cologne Act and the Water Code, and may regulate the disposal action under the Porter-Cologne Act and the Water Code. Finally, BCDC regulates the action of dredging under the McAteer-Petris Act.

No disposal only

IN-BAY DISPOSAL

Permitting Requirements.

Enclosure 2 summarizes the dredging permits ^{in-Bay.} required for dredging and In-Bay disposal of dredged materials. ^{For} From the Port of Oakland, the only disposal site available for In-Bay deposition of dredged material is the designated site at Alcatraz. While there are minor differences in the format of permits for new construction dredging and for maintenance dredging, the agencies involved and the testing procedures are the same. The following description outlines the permitting process, in chronological order of actions by regulatory agencies, starting with the RWQCB. Although they do not issue a permit per se, the RWQCB action amounts to the issue of a permit. The RWQCB issues a Board certification, based on analyses of test results, stating that dredging and disposal is in conformance with water quality criteria. Once the Regional Board has acted, BCDC will act, issuing a permit to dredge and dispose of the dredged material. Finally, the Corps of Engineers, having reviewed the test results and found that the material meets criteria for dredging and disposal, will issue a Section 10 permit. For maintenance dredging this process is revised as follows: the Regional Board reviews the test results and issues a ruling that the tests confirm that the material to be dredged and the method of disposal meet the applicable certification criteria. Next, the Corps reviews the test results, finds that the tests confirm that the material meets dredging and disposal requirements of the maintenance dredging permit that the Corps has already issued and issues a letter of authority to perform the dredging and disposal. (The present Corps 10-year Maintenance Dredging Permit expires in October of 1992.) Finally, the Port notifies the staff of BCDC that the material will be dredged as authorized under the Corps' Maintenance Dredging Permit and also under the BCDC 5-year Maintenance Dredging Permit. At this point the dredging may proceed.

At what point?

Testing Criteria.

Enclosure 3 outlines the testing criteria for In-Bay disposal of dredged material. These criteria are followed both by the RWQCB and by the Corps of Engineers. Testing criteria specify a three-tiered process. Tier 1 tests are quite simple. If the sediments to be dredged are more than 80% sand, they are exempt from further testing (unless either the Regional Board or the Corps have some "reason to believe" that the fine-grained portion of the sediment contains contaminants in concentrations high enough to be a particular concern, in which case they would request Tier 2 tests).

Tier 2 tests are the most commonly used tests for In-Bay disposal, governing at least 90% of dredging projects. As shown in Enclosure 3, Tier 2 tests involve Physical Characteristics, Sediment Chemistry and Bioassays, with the greatest attention given to Sediment Chemistry and Bioassay results. A recent addition to the elements considered in Physical Characterization is the measure of Total Recoverable Petroleum Hydrocarbons (TRPH) as a adjunct to the measurement of oil and grease.

Under Sediment Chemistry there are a number of constituents of particular interest. The numbers following each category indicate the numbers of constituents commonly reported by the Port's laboratory. Some of the required numbers are slightly lower; for instance, only 6 phenols are on the required list. The Port's laboratory reports the greater numbers of constituents because the results are automatically generated in their laboratory process; it is convenient and no additional expense for them to make such reports.

Bioassays are conducted on the suspended phase, that is, the mixture of liquids and suspended sediments that do not settle out of a stirred-up sample of dredged sediment. The organisms tested are bivalve larvae, generally either oysters or mussels. They are exposed to the suspended phase material for 48 hours, then examined to see how many survived and how many exhibit abnormalities as a result of this exposure. (The author of this paper has not the slightest idea how one would determine that an oyster larva is abnormal.) Bioassays are conducted both on the sediments to be dredged and on sediments taken from the proposed disposal site. (Typically referred to as a reference sediment.)

If either the Regional Board or the Corps of Engineers the questions whether the results of the Tier 2 tests are conclusive in determining that the material can or cannot safely be dredged and disposed of at Alcatraz, they can call for Tier 3 tests. Tier 3 tests include a confirmatory bioassay on the suspended phase. In addition, Tier 3 calls for a solid phase bioassay. This is a 10-day test for survival, using bivalves and worms exposed to the material that settles out after the sample has been stirred. The solid phase bioassay examines sediments that are proposed to be dredged, sediments at the Alcatraz disposal

and is outlined in
a document entitled
"Interim Testing Procedure
for Evaluating Dredged
Material Suitability
for Disposal
in S.F. Bay"

site, and sediments from a reference site. The test results from all three sites are then compared in order to make a judgment as to the suitability of the material for disposal.

The Port staff has learned to be cautious regarding the site proposed as a reference site. In particular, the Port requests that the physical characteristics of the sediments at the reference site be similar to those of the material to be dredged. On occasion the Port has had material that is proposed for disposal questioned as to its suitability because of bioassay differences between the dredged material and the reference site material when the reference site sediment was almost pure sand while the material to be dredged was a mixture of silt and clay. Some test organisms are highly sensitive to the difference between coarse grained and fine grained sediments.

Finally, Tier 3 includes bioaccumulation tests, examining the organisms from the solid phase bioassay to see if there are accumulations in their tissues of some of the contaminants shown under the sediment chemistry tests.

Interpretation of the test results is not solely a matter of numerical pass/fail chemical measurements. Heavy weight is given to bioassay results under Tier 2 tests while Tier 3 tests are entirely bioassay and bioaccumulation. Interpretation of these results requires the exercise of judgment by the staffs of the regulatory agencies. The fact that judgement is being exercised is occasionally used by environmental interest groups to oppose dredging on the basis that if there is some effect shown, however small, the effect must be deleterious. This situation leads to pressure for regulatory agencies to adopt numerical test criteria to regulate dredging and disposal of dredged material. The applicability of numerical test criteria is discussed further at the end of this paper.

Numbers of Tests.

Enclosure 4 shows the numbers of tests required for In-Bay disposal of dredged material. Depending on the amount of material, one or more sampling areas will be required, with either 3 or 4 samples to be taken from each sampling area. All of the samples from one sampling area are composited, that is, all the material is thoroughly mixed and a portion of the composited material is sent to the laboratory for analysis.

Testing Costs.

Enclosure 5 shows the Port's recent cost experience in conducting Tier 2 and Tier 3 tests. As illustrated by these figures, if Tier 3 tests are required, sampling and analysis costs may amount to as much as \$2.00 a cubic yard for material to be dredged.

OCEAN DISPOSAL

Ocean disposal is regulated both by the Corps of Engineers and the Environmental Protection Agency. They make no distinction between new construction dredging and maintenance dredging. *for what purpose? testing? There is also no distinction made between ^{new} construction + maintenance for in-Bay disposal or testing -*

Permitting Requirements.

Enclosure 6 describes the permits required for ocean disposal. First, no dredging may occur and no permits will be issued unless a disposal site has been designated by the Environmental Protection Agency under the provisions of the Marine Protection, Research and Sanctuaries Act. Two sections of the Act are applicable. Section 103 of the Act governs designation of an ocean disposal site for a single project. A Section 103 site is nominated by the Corps of Engineers and confirmed by EPA. (Site "B1B", which the Port had proposed to use in early 1988 for disposal of Phase I material from Oakland Inner Harbor, is a Section 103 site.) An ocean disposal site, for general use for any dredging project, comes under Section 102 of the Act. A Section 102 site must be designated by EPA. As a practical matter, there is substantial input by the Corps of Engineers during the site designation process. EPA, as a general practice, has depended on the Corps of Engineers to provide most or all of the funding for the tests and studies required in order to designate either a Section 102 or a Section 103 site.

Dredging for disposal in the ocean requires RWQCB certification that the dredging itself, but not the disposal, meets water quality criteria. Dredging also requires a BCDC permit for the dredging action, but not for the disposal. Finally, the Corps of Engineers will issue a dredging permit under Section 10 and either Section 102 or 103, whichever applies.

Testing Criteria.

Testing criteria for ocean disposal are shown in Enclosure 7. Testing and interpretation of test results are governed by a joint EPA/Corps publication called the "Green Book." (The formal title is, "Ecological Evaluation of Proposed Discharge of Dredged Material Into Ocean Waters", January, 1977.) EPA and the Corps, with substantial input from other agencies, have been at work for the past 3 years on revising and updating the "Green Book." The current estimate of when the revised version will become effective is September of 1990.

Under the Green Book, three levels of tests are required: liquid phase, which uses filtered liquid from the settling process; suspended particulate phase; and solid phase.

The Green Book utilizes a tired-testing protocol but a fourth-tier has been added.

There is no approved ocean site as of Jan. 1990

? 401 sign

Liquid phase tests consider either (a) soluble chemicals evaluated against water quality criteria, provided there has been a local agreement reached between the Corps and EPA on what these test criteria would be, or (b) bioassays using three species of organisms.

Suspended particulate phase tests consider bioassays, again using three species, and also consider bio-accumulation as a secondary concern.

The Green Book states that the major effort in evaluation of test results will be placed on solid phase tests. The first element in solid phase tests is bioassays, using three species and analyzing not only the dredged material but also material at a reference site. (Again, caution in selection of the reference site is warranted because of the sensitivity of some test organisms to sediment particle size.) Solid phase tests also consider bioaccumulation in the organisms that went through the bioassays. The stated concern is for "statistically significant" variations in the bioaccumulation of chemical constituents. This feature is a concern to dredgers because statistical significance is a measure only of the likelihood that variations noted are or are not random. As the Green Book itself points out, "a statistically significant effect in a laboratory bioassay does not necessarily imply that an ecologically important impact would occur in the field."

Test Costs.

The Port has no experience with test costs for ocean disposal; all of the 1986 and 1987 Green Book tests on Oakland Harbor material were conducted by the Corps of Engineers. The best current estimate is that test costs for ocean disposal would be about three times the cost of tests for In-Bay disposal.

As regards the availability of ocean disposal sites: the only currently designated ocean disposal site in the vicinity of San Francisco Bay is Site "B1B", the Section 103 site designated for disposal of Phase I material from Oakland Harbor. The Corps of Engineers and the Regional Office of EPA have announced their intention to conduct studies and analyses for the purpose of designating a Section 102 site, that is, a general use ocean disposal site outside of San Francisco Bay. The optimistic estimate by EPA and the Corps in April of 1989 was that a Section 102 site might be identified by December, 1991. There has been no visible progress towards this goal since that announcement and the availability of funding for the necessary tests, almost all of which was to come from the Corps of Engineers, is now in serious question. Thus, the most optimistic estimate for designation of a Section 102 site is late 1992. Meanwhile, the RWQCB, based on the expectation that a Section 102 site would be

Should be a new header "Status of Disposal Sites" however it is not usable

separate #

designated by the end of 1991, has voted to prohibit disposal of any new construction dredged material in San Francisco Bay after December, 1991. *This is presently being reviewed, but has not yet been adopted by the Regional Board's oversight agency, the State Water Resources Control Board.*

UPLAND DISPOSAL

If dredged material cannot be placed in the Bay and if it cannot be placed in the ocean, the only remaining option is to place the material somewhere on the land.

Permitting Requirements.

Enclosure 8 shows the permitting requirements for upland disposal of dredged material. There is no difference between permitting for new construction and for maintenance dredging. The first requirement is a certification from the RWQCB that dredging conforms to water quality criteria. Then, depending on the upland site and the use to which the dredged material would be put, the Regional Board may decide that no further regulation is required or may decide to regulate disposal under the California Code, Title 23, Chapter 3, Subchapter 15, entitled, "Discharge Of Waste To Land." The rationale for this latter form of regulation is that the dredged material or the constituents of the dredged material may have some effect on groundwater or surface waters. The Port has found, in its proposal to use Phase I sediments to reinforce Delta levees, that if the RWQCB decides to regulate the action under Subchapter 15 and classifies the material as a "waste," various county agencies may also decide that they need to assert jurisdiction and regulate the disposal action.

Some mention perhaps of beneficial uses such as wetland creation?

chemical

For upland disposal, BCDC will issue a permit for dredging but not for disposal (unless a part of the disposal site falls within BCDC's 100-foot shoreline band of jurisdiction). Finally, dredging and upland disposal will be permitted by the Corps of Engineers under Section 10. BCDC may comment under the Policy

guidance of the Diked Historic Baylands Policy

Testing Criteria.

Testing criteria for upland disposal are outlined in Enclosure 9. Testing for the act of dredging follows the same criteria as testing for In-Bay Disposal. However, there are no established testing criteria for upland disposal of dredged sediments. If the RWQCB proposes to regulate the disposal action in accordance with the criteria that they use to regulate sanitary landfills (i.e. Subchapter 15), test requirements are known as Wet Extraction Tests (WET). These tests use weak citric acid to extract chemicals, primarily heavy metals, from the dredged sediments. The purpose of the tests is to determine the potential for leaching heavy metals from liner material in the landfill, with the subsequent entry of these heavy metals into groundwater or surface waters.

When the Port proposed to use dredged material to reinforce levees in the Delta, the sediments were subjected to the WET and passed these tests. The Regional Board staff determined that this did not properly describe the physical conditions that would be encountered. By agreement between the Port staff and Regional Board staff, additional tests were conducted. First, leaching of heavy metals was tested with a simulated acid rain, using water at a pH of 4.7. In addition, toxicity tests were conducted using three freshwater species. First, acute toxicity tests looked for mortality within a 72 hour period. Then, chronic toxicity tests looked for mortality and abnormalities in a 7-day period. The Port sediments passed all these tests and the Regional Board issued their version of a permit, in the form of Waste Discharge Requirements.

Testing requirements for other upland disposal projects would be defined at the time of project development, based on the characteristics of the disposal site, the method of disposal and the use to which the materials would be placed.

NUMERICAL TEST CRITERIA

As stated earlier, evaluation of results of tests for dredged material disposal requires the exercise of judgement ^{by} ~~on~~ the part of regulatory agencies. This makes some observers nervous, suspicious or apprehensive that judgment might not be properly applied. One result of this nervousness and apprehension is an impetus toward devising a pass/fail type of test in which numerical criteria could be established which proposed dredged material would have to pass before it could be approved for disposal. The impetus towards use of numerical test criteria is primarily aimed at proposed aquatic disposal, either in the Bay or in the ocean. One such numerical measure, known as Apparent Effects Threshold (AET), has been adopted by the State of Washington; there are various proposals in the State of California to establish similar numerical criteria. Much, if not most, of the scientific community does not favor numerical test criteria because such criteria do not measure the actual ecological effects of disposing of dredged material but substitute what many consider to be a simplistic means of measurement in place of a scientifically valid measure, albeit one that requires the exercise of judgment. Nevertheless, the push toward establishment of numerical test criteria continues.

(reason to believe)

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