effects on fish and wildlife habitat: a "low risk/ impact" rating (-1) at high disposal volumes, and a "negligible impact" rating (0) at medium and low disposal volumes.

San Francisco Bar Channel

The San Francisco Bar Channel ocean disposal site is not listed in Table 6.1-2 because its use and impacts do not vary with any of the scenarios being considered in this EIS/EIR. No fish and wildlife habitat benefits are associated with disposal at the San Francisco Bar Channel site. Similarly, no adverse water column or benthic habitat effects are expected to occur, since only sand from the immediately adjacent channel is disposed at the site, and this material is identical to the existing substrate at the site.

However, the material dredged from the San Francisco Bar Channel and disposed at the Bar Channel Site is high quality sand. This material is particularly suitable for reuse as beach nourishment material, or for other kinds of habitat restoration that need high quality sand (including sand dunes, or least tern nesting habitat). Habitat benefits could therefore be realized if nearby restoration projects are proposed that need this type of material, and if dredging of the Bar Channel could to be coordinated with them.

6.1.2.2 In-Bay Disposal

Disposal of dredged material at existing, dispersive in-Bay disposal sites would not result in any direct fish or wildlife habitat benefits; therefore Table 6.1-2 includes "negligible benefit" ratings (0) in the high, medium, and low volume categories for in-Bay disposal. Adverse effects to water column habitat could occur in association with water quality effects, as described above (section 6.1.1.2). In addition, there is the potential for adverse physical impacts on benthic habitats via grain size and other substrate changes if dredged material dispersed from in-Bay sites settles in areas with a different kind of natural substrate. In contrast to ocean disposal at the non-dispersive SF-DODS, such changes would not be restricted to the area within the site boundaries. The potential water column and benthic habitat impacts of in-Bay disposal at existing dispersive sites are discussed in the following sections.

Water Column Habitat Effects

The potential for disposal of dredged material at in-Bay sites to adversely affect water column fish and wildlife habitat is related to both water quality impacts, and to disturbance or displacement from important habitat areas, including migration corridors. As discussed above in section 6.1.1.2, there is a potential for cumulative water quality impacts associated with periodic high-frequency disposal activities at the dispersive in-Bay sites (particularly at the Alcatraz and Carquinez Strait sites). Cumulative water quality impacts would equate to cumulative degradation of water column habitat quality experienced by fish and wildlife near the disposal sites. In addition, disposal activities can cause temporary displacement of fish from the vicinity of the disposal site, especially during high-frequency disposal activity (whether due to cumulative water quality effects or due to the physical disturbance of disposal). For example, localized effects of this type have been documented around the Alcatraz disposal site, where behavioral avoidance of the area by some fish species was seen to last from 2 to 3 hours following disposal events. In worst-case situations where high-frequency disposal activities coincide with migration periods, this could effectively result in delays or disruptions to migration timing or routes. The risk of this kind of habitat effect resulting in an adverse impact is greatest at the Carquinez Strait disposal site due to its location in a constricted waterway through which fish migrating between the ocean or Bay and the Delta must pass.

The ability to minimize the potential for water column habitat quality effects depends upon the ability to avoid high-frequency disposal activities, or at least to minimize how often they occur. As discussed in section 6.1.1.2, periodic high-frequency disposal would be unavoidable at high overall in-Bay disposal volumes, and thus there is a moderate risk that cumulative effects would occasionally occur. At medium overall in-Bay disposal volumes there is a much greater ability to manage the existing disposal sites so as to minimize high-frequency disposal, although such events could still theoretically occur on occasion, so that a low risk of cumulative water column habitat quality impacts remains. At low overall in-Bay disposal volumes, high-frequency disposal events would be avoidable. In addition, substantial reductions in disposal at the Carquinez Strait disposal site would be expected. Therefore negligible cumulative impacts to water column fish and wildlife habitat would be anticipated.

Benthic Habitat Effects

Benthic habitat quality impacts would be more widespread and last much longer than impacts to water column habitat. As discussed in Chapter 4, the potential for adverse changes in benthic habitat quality is most pronounced in the Central Bay, where rocky shorelines, hard-bottom (reef) habitat, and extensive areas of coarse-grained (sandy) substrate naturally exist. These Central Bay habitats are vulnerable to alteration by deposition of fine-grained dredged material. The majority of all Bay Area dredged material continues to be disposed at the Alcatraz site, and the majority of this dredged material is composed predominantly (>80 percent) of fine silts and clays. In contrast, benthic habitats in the embayments most directly affected by fine grain size dredged material dispersed from the San Pablo Bay and Carquinez Straits disposal sites are predominantly fine-grained. Such areas are much less vulnerable to potential adverse habitat quality changes from dredged material.

At high overall in-Bay disposal volumes (particularly at the very high No-Action volumes), there is a moderate risk of continued adverse benthic habitat quality impacts, particularly in Central Bay associated with high-volume use of the Alcatraz disposal site. The active management necessary to minimize mounding at the Alcatraz site (to avoid increasing navigation hazards in this heavy traffic area), means that off-site movement of dredged material would be maximized. Various Central Bay Areas would thus continue to experience degraded benthic habitat quality, at least temporarily or periodically. At medium overall in-Bay disposal volumes, the degree of benthic habitat quality impact would be reduced to a relatively low level. However, some degradation of Central Bay benthic habitats could still occur, especially related to occasional periods of high-frequency use of the Alcatraz disposal site. During such periods, aggressive management to maximize dispersion and off-site movement of dredged material may still be necessary to avoid mounding. On the other hand, some benthic areas previously affected as a result of past high-volume disposal at the Alcatraz site could be expected to begin recovering as a result of natural flushing. At low overall in-Bay disposal volumes, it is expected that currents would be able to disperse sediments from the Alcatraz site without the need for aggressive management to minimize mounding. At the same time, the high energy currents of the rocky intertidal, reef, and sandy bottom habitats should be able to fully flush themselves at low overall disposal volumes. Therefore, effects to Central Bay benthic habitats outside of the Alcatraz disposal site itself are expected to be negligible.

Overall In-Bay Risk/Impact and Benefit Ratings — Habitat

A "moderate risk/impact" rating (-2) is shown in Table 6.1-2 for the high overall in-Bay disposal volume category. This degree of risk reflects the potential for cumulative effects to water column habitat quality related to water quality effects (section 6.1.1.1), and to some unavoidable adverse impacts to Central Bay benthic habitats including rocky intertidal, hard-bottom (reef), and sandy-bottom areas. At medium overall in-Bay disposal volumes the risk of adverse impacts is reduced, but adverse cumulative water column and benthic habitat effects could still possibly occur on occasion, particularly during periods of high-frequency disposal activity. A "low risk/impact" rating (-1) was therefore assigned in Table 6.1-2 to medium in-Bay disposal. There is a negligible risk of adverse impacts at low overall in-Bay disposal volumes, so a "negligible impact" rating (0) appears in Table 6.1-2.

6.1.2.3 Disposal at Upland/Wetland Reuse Sites

One of the most important overall tradeoffs addressed in this programmatic Policy EIS/EIR is the potential for placement of dredged material at upland or wetland reuse sites to result in significant benefits to fish and wildlife habitat, and at the same time for it to cause significant habitat impacts. In the San Francisco Bay/Delta Estuary, maximizing the environmental benefits that can be realized through appropriate reuse of dredged material as a resource can, to a large degree, only be accomplished through placement at upland or wetland reuse sites. Therefore, greater volumes of dredged material targeted for such sites theoretically means greater potential for environmental benefits. However, locations that would be the most feasible as reuse sites for dredged material — particularly sites that would be feasible for habitat restoration — often already provide some degree of important habitat values.

For example, as discussed in section 4.4, many farmed, diked historic baylands are subsided below sea level. These areas generally represent the most feasible locations to consider restoration of tidal salt marsh habitat using dredged material to restore appropriate elevations for the marsh vegetation. In doing so, important new acreages of habitat, including critical habitat for some species that are listed as special status, can be created. However, these diked historic baylands often already support some degree of valuable seasonal wetlands and other important habitats. Therefore, more upland or wetland reuse of dredged material does not necessarily mean maximizing *net* environmental benefits. The challenge is to maximize net environmental benefits by minimizing associated losses of other important, existing habitat values.

This challenge is made more acute because some degree of habitat tradeoff would be inevitable with almost any habitat restoration project using dredged material. Decisions need to be made about the relative value of existing habitat types (such as seasonal wetlands), and about the need for creation or restoration of different habitat types (such as tidal wetlands). These decisions — for example, whether restoration of tidal wetlands to support sensitive species, at a site that currently supports some acres of seasonal wetlands, would represent a net environmental benefit — must be made on a case-by-case basis. And the decisions could be different at different times: habitat that is needed and appropriate to restore at one location during a particular year, may no longer be needed or appropriate to restore at an adjacent site at a later time if other habitat types are regionally more valuable or limited by then. For these reasons, such decisions are best made in the context of a comprehensive resource management plan for the area involved. An important policy-level mitigation measure, common to all LTMS alternatives (see section 5.1.2.1), is that habitat restoration projects using dredged material must result in an overall net environmental benefit that is fully coordinated and consistent with the needs identified in resource management plans for any area.

Other kinds of upland or wetland reuse, including levee maintenance and stabilization, and the construction of rehandling facilities, have no direct fish and wildlife habitat benefits. Potential losses of existing habitat values are associated with these reuse categories. In the case of levees, the majority of the habitat losses are temporary, and would occur as a result of maintenance or stabilization regardless of whether dredged material is used as the source of fill. On the other hand, rehandling facilities (and other potential upland placement sites such as CDFs for NUAD-class material) would cause the permanent loss of existing habitat values with no offsetting on-site habitat restoration inherent in their operation. Such facilities would have to fully mitigate for all habitat losses associated with their construction and operation (see section 5.1.3).

Finally, reuse of dredged material at existing sites approved for other purposes such as landfills (for daily cover, cap, liner, or berms), or as fill in construction sites (such as roadway base material) are not evaluated below. It is assumed that any habitat loss or other impact associated with these kinds of projects would be addressed in the project's environmental documentation. However, in some cases the substitution of dredged material for other sources of fill can be of benefit in reducing overall cumulative effects. This would be the case, for example, at landfills where use of dredged material for daily cover or capping eliminates the need to excavate soil for these purposes from another location, where other impacts would otherwise occur.

The habitat benefits and impacts of placing SUAD-class dredged material at upland, wetland, or reuse sites are compared in the following paragraphs. In each case (high, medium, or low overall volumes), the evaluations are based on the relative percentages of the total volume that could reasonably be expected to be available for placement under each upland/wetland reuse category (see Appendix N and section 4.4.3).

Habitat Restoration

A high overall volume of UWR placement (80 percent of all SUAD material, or 3.8 mcy per year) has the potential to achieve the greatest fish and wildlife habitat benefit, because the greatest number and acreage of wetland sites would be restored. As described earlier in section 6.1.1.3, it is assumed that 66 percent of this volume (~2.5 mcy per year) would be reused in wetland restoration projects. This equates to an assumed 17 or 18 new wetland restoration projects, at all of the potential sites with moderate or high feasibility rankings (LTMS 1994f). These projects would result in the restoration or creation of as many as 12,500 acres of wetlands for the region. The potential habitat benefits from this degree of wetlands restoration are considered to be high (+3), given that over 90 percent of the Estuary's historic wetlands have been destroyed. (However, other environmental effects would also occur: see, for example, Water Quality Comparisons [section 6.1.2] and Air Quality Comparisons [section 6.1.5].) At the same time a substantial degree of adverse impact (-3) to existing habitats, including seasonal wetlands, could also occur since, at high placement volumes, some projects would be constructed in relatively sensitive areas. The term "relatively sensitive areas" can be defined as habitat that provides some value for estuary species, but is not considered high quality or does not provide the optimal habitat functions.

At medium overall placement volumes (50 percent of all SUAD material, or ~2.4 mcy per year), 63 percent of this material (~1.5 mcy per year) would be used for wetlands restoration (see Appendix N and section

4.4.3). This equates to an assumed 10 new wetland restoration projects. These beneficial reuse projects would result in 7,225 additional acres of wetlands for the region. The potential habitat benefits from this degree of wetlands restoration are considered moderate (+2), given that over 90 percent of the Estuary's historic wetlands have been destroyed. At the same time, fewer projects would be constructed overall, so that relatively sensitive areas could more easily be avoided. Therefore, adverse effects to fish and wildlife habitat are expected to be low (-1).

At low overall placement volumes (20 percent of all SUAD material, or ~1 mcy per year), 57 percent of this material (only ~0.55 mcy per year) would be used in wetland restoration projects (see Appendix N and section 4.4.3). In this case, it is assumed that only four new wetlands would be created, resulting in 2,812 additional acres of wetlands for the region. The potential habitat benefits from this degree of wetlands restoration is considered to be low. At the same time, relatively sensitive areas should easily be avoidable. Therefore, adverse effects to fish and wildlife habitat are expected to be negligible.

Levee Maintenance and Stabilization

Levees represent important habitats for a variety of wildlife species (see section 4.4). In general, maintenance and stabilization of levees can result in at least temporary losses of habitats that have developed at the toe (the base of the levee) and on the inside face of the levee since the previous maintenance occurred. These habitat effects are largely physical, and would occur regardless of whether dredged material were the source of fill used for the maintenance and stabilization.

A caveat to this is related to salinity. Dredged material from high-salinity areas would not generally be used for maintenance or stabilization of Delta levees. Some of the dredged material that could be reused (for example, from the Suisun Bay Channel) may also still have low levels of salinity that can affect plant re-establishment. Therefore some wildlife habitat quality effects may occur. However, only very small quantities of dredged material — an average of approximately 500,000 cy per year or less — are reasonably expected to be reused on Delta levees, under any of the upland/wetland reuse placement volume scenarios (see Appendix N and section 4.4.3). In contrast, the overall, long-term need for fill material to strengthen and stabilize to federal standards the 1,000+ miles of levees in the LTMS planning area is estimated to be between 50 and 100 mcy. Additional material may also be needed for long-term maintenance of these strengthened levees within the Delta and the lower reaches of the Estuary.

Compared to the degree of (temporary) habitat losses experienced at any one time due to maintenance and stabilization of levees using fill sources other than dredged material, the potential salinity-related habitat effects of reusing small quantities of dredged material on levees are considered to be negligible. Therefore a "negligible risk/impact" rating (0) has been assigned to levee maintenance and stabilization under high, medium, and low overall upland/wetland reuse volume categories in Table 6.1-2.

Rehandling Facilities

If high volumes of dredged material (80 percent of all SUAD material, or 3.8 mcy per year) are placed in UWR sites, it is assumed that 20 percent (~0.75 mcy per year) would be processed at rehandling facilities (see Appendix N and section 4.4.3). One new moderate-size rehandling facility or two new smaller rehandling facilities would be needed to process an average of ~0.75 mcy per year of SUAD material under a high overall placement volume scenario. (This is in addition to any facility[ies] constructed to rehandle the ~1 mcy per year of NUAD material assumed to be generated under all LTMS scenarios.)

At medium overall placement volumes (50 percent of all SUAD material, or ~2.4 mcy per year), it is assumed that 16 percent of this volume (~0.4 mcy per year) would be processed at rehandling facilities (see Appendix N and section 4.4.3). At this volume, it is assumed that one additional rehandling facility would be required.

At low overall placement volumes (20 percent of all SUAD material, or ~1 mcy per year), no SUAD-class dredged material would be processed through rehandling facilities. Therefore, no additional rehandling facilities would be needed, and no adverse fish and wildlife habitat effects would occur.

Overall Upland/Wetland Reuse Risk/Impact and Benefit Ratings — Habitat

Overall, a substantial wildlife habitat benefit would result from upland or wetland reuse of dredged material at high overall placement volumes. This benefit is associated entirely with the volume of dredged material that would be available for habitat restoration (as opposed to use on levees or at rehandling facilities), and would primarily result from tidal wetlands restoration rather than from other kinds of habitat restoration. A "high benefit" rating (+3) is therefore shown for Habitat Restoration in Table 6.1-2 under high volume placement, while "negligible benefit" ratings (0) are shown under Levee Maintenance/Stabilization and under Rehandling Facilities, at high, medium, and low overall disposal volumes. On the other hand, a relatively large loss of existing habitat values would be associated with this scenario, as well, since some sensitive existing habitats (including seasonal wetlands) could not be avoided. This loss would come about primarily as a result of the relatively large number of habitat restoration projects; therefore, a "high risk/impact" rating (-3) is shown for Habitat Restoration under the high volume placement category in Table 6.1-2. However, the construction of two additional rehandling facilities would also result in a permanent loss of some existing habitat; a "low risk/impact" rating (-1) is thus assigned in Table 6.1-2 under this category. A "negligible risk/impact" rating (0) is assigned under the high volume category for Levee Maintenance/ Stabilization, because only very limited volumes of dredged material would be used.

At medium overall placement volumes a substantial number of new wetlands acres would still be created. This is shown as a "moderate benefit" rating (+2) under Habitat Restoration in Table 6.1-2. At the same time, enough sites with relatively low existing values for habitat restoration would be available at this overall placement volume to avoid adversely affecting the most sensitive existing habitats. Therefore a "low risk/impact" rating (-1) has been assigned to Habitat Restoration at medium placement volumes. One additional rehandling facility would be needed at medium overall placement volumes; however, sensitive habitats should be fully avoidable. Therefore a "negligible risk/impact" rating (0) has been assigned in Table 6.1-2.

At low placement volumes a degree of habitat restoration would still occur but it would be reduced, as reflected in the "low benefit" rating (+1) under this category in Table 6.1-2. Sensitive habitats should be almost entirely avoidable at low placement volumes, however, and no additional rehandling facilities would be needed. Therefore, a "negligible impact" rating (0) is assigned under each of these categories in Table 6.1-2.

6.1.3 Special Status Species Comparisons

Dredged material placement can have either beneficial or adverse effects on special status species and their habitat. Chapter 4 discusses the special status species that may be affected by dredged material placement at ocean, in-Bay, and upland/wetland reuse sites. The degree of potential benefit or impact to special status species is generally related to the overall degree of habitat benefit or impact discussed for all fish and wildlife species, as discussed above in section 6.1.2.1.

Simple disposal of dredged material as a waste at ocean or in-Bay sites does not result in benefits to special status species, and may have adverse effects depending on the site and the method of disposal. This can be true not only for unconfined disposal at ocean or in-Bay sites, but also when dedicated CDFs or rehandling facilities are developed in existing upland or wetland locations for dredged material management. On the other hand, reuse of dredged material for habitat restoration, creation, or enhancement can have substantial benefits to special status species that can be significant to the region as a whole.

The potential impacts and benefits to special status species at high, medium, and low volumes of dredged material placement in each disposal environment are summarized in Table 6.1-3 and discussed in the following sections.

6.1.3.1 Ocean Disposal

SF-DODS

Disposal of dredged material at SF-DODS would not result in any direct benefits to special status species; therefore Table 6.1-3 includes "negligible benefit" ratings (0) in the high, medium, and low volume categories for ocean disposal. Potential adverse effects could occur to water quality, and therefore to water column habitat, in relation to the temporary on-site water quality effects discussed previously and as a result of disturbance due to disposal operations. However, such effects would be temporary, and would be contained entirely on site. As discussed in section 6.1.1.1, high-frequency disposal activity that could potentially result in cumulative on-site water quality- or disturbance-related habitat degradation is not expected to occur. Therefore adverse impacts are not expected to any species, including special status species. In addition, SF-DODS is not located in critical or biologically limiting habitat, so that any special status fish and wildlife species that may occasionally visit the site would not be expected to suffer adverse impacts from moving to another area. Nevertheless, there is some risk of occasional habitat quality degradation. Therefore, the same ratings assigned to ocean disposal

Table 6.1-3. Potential Impacts and Benefits to Special Status Species, by Placement Environment and Disposal Volume

	Special Status Species Benefits (a)			*Special Status Species Impacts/Risks (b)*		
Placement Environment	*High Volume*	*Medium Volume*	*Low Volume*	*High Volume*	*Medium Volume*	*Low Volume*
Ocean	0	0	0	-1	0	0
In-Bay	0	0	0	-1	0	0
Upland/Wetland Reuse						
Habitat Restoration	+3	+2	+1	-1	0	0
Levee Maintenance	0	0	0	0	0	0
Rehandling Facility	0	0	0	0	0	0

Notes: a. Benefits: +3 = High Benefit
+2 = Moderate Benefit
+1 = Low Benefit
0 = Negligible Benefit
b. Impacts/Risks: -3 = High Risk/Impact
-2 = Moderate Risk/Impact
-1 = Low Risk/Impact
0 = Negligible Risk/Impact

under water quality (section 6.1.1.1) and to fish and wildlife habitat (section 6.1.2.1) are also assigned in Table 6.1-3 to adverse effects on special status species: a "low risk/impact" rating (-1) at high disposal volumes, and a "negligible impact" rating (0) at medium and low disposal volumes.

San Francisco Bar Channel

The San Francisco Bar Channel ocean disposal site is not listed in Table 6.1-3 because its use and impacts do not vary with any of the scenarios being considered in this EIS/EIR. No benefits to special status species are associated with disposal at the San Francisco Bar Channel site. Similarly, since only sand from the immediately adjacent channel is disposed at the site, and this material is identical to the existing substrate at the site, no adverse water column or benthic habitat effects are expected to occur that might result in adverse effects on special status species.

However, the material dredged from the San Francisco Bar Channel and disposed at the Bar Channel Site is high quality sand. This material is particularly suitable for reuse as beach nourishment material, or for other kinds of habitat restoration that need high quality sand (including sand dunes, or least tern nesting habitat). Habitat benefits to some special status species could, therefore, theoretically be achieved if nearby restoration projects are proposed that need this type of material, and if dredging of the Bar Channel could to be coordinated with them.

6.1.3.2 In-Bay Disposal

Disposal of dredged material at existing, dispersive in-Bay disposal sites would not result in any direct benefits to special status species; therefore Table 6.1-3 includes "negligible benefit" ratings (0) in the high, medium, and low volume categories for in-Bay disposal. Adverse effects to water quality (section 6.1.1.1), and to water column habitat in association with water quality effects (section 6.1.1.2), could theoretically affect special status fish species, especially if high-frequency disposal events occurred during migration periods. The risk of this kind of effect resulting in an adverse impact to special status species is greatest at the Carquinez Strait disposal site due to its location in a constricted waterway through which fish migrating between the ocean or Bay and the Delta must pass. However, application of policies common to all LTMS alternatives would ensure that disposal at in-Bay sites, including the Carquinez Strait site, would not occur during critical time frames, at rates or frequencies that could jeopardize any special status species (see section 5.1.2.2). For this reason, the effects of in-Bay disposal on special status species are considered to be low (-1) at high volumes, and negligible (0) at all other overall disposal volumes; a "negligible impact" rating (0) is therefore assigned in Table 6.1-3.

In some instances, the act of dredging itself has the potential to cause adverse impacts to special status species of fish and wildlife if it occurs at times or in areas where these species are present. Dredging may also physically impact important habitats used by these species (for example, if widening slough channels results in the loss of cordgrass habitat for the California clapper rail). Although the alternatives analysis does not evaluate the effects of dredging itself because the alternatives do not vary the amount of dredging, a policy-level mitigation measure has been developed in coordination with the resource agencies to facilitate the permitting process (see section 5.1.2.2).

6.1.3.3 Disposal at Upland/Wetland Reuse Sites

As discussed in section 6.1.2.3 for fish and wildlife habitat in general, the reuse of dredged material for habitat restoration at upland or wetland reuse sites can result in significant regional benefits to special status species. At the same time, it can cause adverse impacts if habitat restoration measures for one species result in the loss of habitat for other species. The habitat benefits and impacts of placing SUAD-class dredged material at upland, wetland, or reuse sites are compared in the following paragraphs.

Habitat Restoration

In the Estuary, maximizing the benefits to special status species that can be achieved through appropriate reuse of dredged material can primarily be accomplished through placement at upland or wetland reuse sites. Therefore, greater volumes of dredged material targeted for such sites theoretically means greater potential for direct benefits to special status species. However, locations that would be the most feasible as reuse sites for dredged material — particularly sites that would be feasible for habitat restoration — may at times already support some use by special status species, or provide important related habitat values.

A high overall volume of UWR placement (80 percent of all SUAD material, or 3.8 mcy per year) has the potential to achieve the greatest benefits to special status species, because the greatest number and acreage of wetland sites would be restored. As detailed in Appendix N and section 4.4.3, it is assumed that 66 percent of this volume (~2.5 mcy per year) would be reused in wetland restoration projects. This equates to an assumed 17 or 18 new wetland restoration projects over the 50-year planning period. It is assumed that all the projects with moderate or high feasibility rankings (LTMS 1994f) would be restored, resulting in the restoration or creation of as many as 12,500 acres of wetlands for the region. The potential habitat benefits for special status species from this degree of wetlands restoration are considered to be high, given that over 90 percent of the Estuary's historic wetlands have been destroyed. At the same time, some adverse impacts to existing habitats could also occur. However, the protection for special status species habitat under the federal and state Endangered Species Acts are stronger than those for non-special status species under other acts, and impacts to existing special status species habitat would have to be avoided to the maximum extent possible. Projects that would result in the direct loss of special status species habitat generally would not be permitted if less environmentally damaging alternatives were possible, or if an overall net benefit to the same species or habitat would not ultimately result. Therefore, impacts to special status species at high overall upland/wetland reuse placement volumes would be less than could occur to other kinds of fish and wildlife habitats at the same placement volumes. Overall, adverse effects to special status species and their habitats are expected to be low.

At medium overall placement volumes (50 percent of all SUAD material, or ~2.4 mcy per year), 63 percent of this material (~1.5 mcy per year) would be used for wetlands restoration (see Appendix N and section 4.4.3). This equates to an assumed 10 new wetland restoration projects over 50 years. These beneficial reuse projects would result in 7,225 additional acres of wetlands for the region. The potential benefits from this degree of wetlands restoration are considered moderate, given that over 90 percent of the Estuary's historic wetlands have been destroyed. At the same time, fewer projects would be constructed overall, so that relatively sensitive areas could more easily be avoided. Therefore, adverse effects to special status species and their habitats are expected to be negligible.

At low overall placement volumes (20 percent of all SUAD material, or ~ 1 mcy per year), 57 percent of this material (only ~0.55 mcy per year) would be used in wetland restoration projects (see Appendix N and section 4.4.3). In this case, it is assumed that only four new wetlands would be created, resulting in 2,812 additional acres of wetlands for the region. The potential habitat benefits from this degree of wetlands restoration is considered to be low. At the same time, relatively sensitive areas should easily be avoidable. Therefore, adverse effects to special status species and their habitats are expected to be negligible.

Levee Maintenance

Levees represent important habitats for a variety of wildlife species, including some that are special status species (see section 4.4). No direct benefits to special status species would occur as a result of reusing dredged material for levee maintenance and stabilization. In general, maintenance and stabilization of levees can result in at least temporary losses of habitats that have developed at the toe and on the inside face of the levee since the previous maintenance occurred. These habitat effects are largely physical, and would occur regardless of whether dredged material were the source of fill used for the maintenance and stabilization. However, only very small quantities of dredged material — an average of approximately 500,000 cy per year or less — are reasonably expected to be reused on Delta levees under any of the upland/wetland reuse placement volume scenarios (see Appendix N and section 4.4.3). The degree of habitat impact associated with use of this volume of dredged material on levees was identified in section 6.1.2.3 as being negligible for fish and wildlife overall; impacts to special status species or habitat would be even less because special efforts would be made to avoid them.

Rehandling Facilities

At high overall upland/wetland reuse placement volumes, two additional rehandling facilities would need to be constructed. At medium overall placement volumes one additional facility would be needed, while no additional facilities would need to be constructed under the low volume scenario. Unlike some kinds of habitat restoration projects, rehandling facilities do not necessarily need to be located in diked historic baylands or similar areas that are likely to support some sensitive habitats.

No direct benefits to special status species or habitats are expected from construction or operation of these facilities. Special efforts would have to be made to avoid and minimize any loss or adverse impact to special status species or their habitats by these facilities. However, since only two facilities would be needed at high overall placement volumes, and only one at medium volumes, most impacts should be avoidable. Any unavoidable impacts would have to be fully mitigated. Therefore, the potential for adverse impacts to special status species or their habitats as a result of construction and operation of rehandling facilities for SUAD-class dredged material is considered to be negligible at any overall placement volume.

Overall Upland/Wetland Reuse Risk/Impact and Benefit Ratings — Special Status Species

Overall, a substantial benefit to special status species and their habitats would result from upland or wetland reuse of dredged material at high overall placement volumes. This benefit is associated entirely with the volume of dredged material that would be available for habitat restoration (as opposed to use on levees or at rehandling facilities), and would primarily result from tidal wetlands restoration rather than from other kinds of habitat restoration. A "high benefit" rating (+3) is therefore shown for Habitat Restoration in Table 6.1-2 under high volume placement. At the same time some adverse effect to special status species could occur, to the extent that some existing special status species habitat could not be avoided. Every effort would be made to minimize and mitigate for any adverse effect, however. Therefore a "low risk/impact" rating (-1) has been assigned under Habitat Restoration in Table 6.1-3.

No direct special status species benefits would be associated with levee maintenance and stabilization or with construction or operation of additional rehandling facilities at any placement volume. Therefore "negligible benefit" ratings (0) are shown under these categories in Table 6.1-3 for high, medium, and low volumes. Similarly, adverse impacts to special status species from levee maintenance and stabilization and from additional rehandling facilities should be avoidable and/or fully mitigable at all disposal volumes. Therefore a "negligible risk/impact" rating (0) has been assigned under the high, medium, and low overall upland/wetland/reuse volume categories in Table 6.1-3.

At medium overall placement volumes, moderate special status species benefits would be associated with habitat restoration, so a "moderate benefit" rating (+2) is assigned to this category in Table 6.1-3. However, because fewer restoration projects would occur at this volume, adverse impacts to special status species should be avoidable. Table 6.1-3 therefore includes a "negligible risk/impact" rating (0) under this category.

At low overall upland/wetland/reuse placement volumes, some habitat restoration projects benefitting special status species would still occur. A "low benefits" rating (+1) is assigned to this category in Table 6.1-3. Also, adverse impacts should be even more avoidable that under the medium volume scenario ("negligible risk/impact" rating [0]).

6.1.4 Transportation System Comparisons

The transportation system needed to move dredged material to disposal or reuse sites, and the potential impacts associated with movement of dredged material via these systems, can differ depending on the placement environment, on the specific disposal or reuse site, and on the kind of end use for which the dredged material will be used. Impacts associated with increased traffic volumes, noise, and use of the transportation systems themselves (e.g., increased repairs to roadways heavily used by trucks) may all occur under certain circumstances. Specific transportation methods, any significant impacts associated with their use, and new facilities (such as roads, railways, or channels) that may be needed to support a particular disposal or reuse site must therefore be evaluated on a case-by-case basis.

Similarly, project-specific mitigation measures would have to be developed for any adverse effects identified. Site- and project-specific assessments of these kinds are outside the scope of this programmatic Policy EIS/EIR. However, there are general differences between the placement environments. The general transportation-related impacts of high, medium, and low volumes of dredged material placement in each disposal environment are summarized in Table 6.1-4 and discussed in detail in the following sections. No transportation-related benefits are expected to occur under any scenario; a "negligible benefit" rating (0) has therefore been assigned in all categories in Table 6.1-4.

6.1.4.1 Ocean Disposal

SF-DODS

Dredged material disposed at SF-DODS would almost always be transported via large-capacity (4,000- to 5,000-cy capacity) bottom-dump barges towed by ocean-going tugs. This system is a very effective method of transporting large quantities of dredged material in terms of vessel traffic and related impacts, because no rehandling is required (dredged material is placed directly into the barges at the dredging site) and a minimum number of vessel trips is needed overall. This in turn minimizes the potential for collisions and resulting spills, compared to transportation of dredged material for disposal at in-Bay sites. However, the potential for inclement weather to result in spillage, or loss of a barge and its load, are higher for vessels outside the Golden Gate compared to vessels that remain within the Estuary. In addition, radar coverage by the U.S. Coast Guard's Vessel Traffic System (VTS) does not extend all the way to SF-DODS.

Barges used to transport dredged material to SF-DODS may not be loaded so full that seas expected during the period of transit to the disposal site could cause spillage of the dredged material. In addition, vessels may not depart from San Francisco Bay for the SF-DODS when waves exceed 18 feet. Because of these provisions of the site designation rulemaking, and the low expected disposal frequencies at the site (an average of approximately two disposal events per day, see section 6.1.1.1), transportation- related impacts of ocean disposal at SF-DODS are expected to be negligible under each of the high, medium, and low overall volume scenarios — a "negligible risk/impact" rating (0) in Table 6.1-4.

Table 6.1-4. Potential Benefits and Impacts Associated with Transportation Systems, by Placement Environment and Disposal Volume

Placement Environment	*Transportation Systems Benefits (a)*			*Transportation Systems Impacts/Risks (b)*		
	High Volume	*Medium Volume*	*Low Volume*	*High Volume*	*Medium Volume*	*Low Volume*
Ocean	0	0	0	0	0	0
In-Bay	0	0	0	0	0	0
Upland/Wetland Reuse						
Habitat Restoration	0	0	0	0	0	0
Levee Maintenance	0	0	0	-3	-3	0
Rehandling Facility	0	0	0	-3	-3	0

Notes: a. Benefits: +3 = High Benefit
+2 = Moderate Benefit
+1 = Low Benefit
0 = Negligible Benefit
b. Impacts/Risks: -3 = High Risk/Impact
-2 = Moderate Risk/Impact
-1 = Low Risk/Impact
0 = Negligible Risk/Impact

San Francisco Bar Channel Site

The disposal site for material dredged from the San Francisco Bar channel is immediately adjacent to the channel itself, so transport distance and any associated transportation-related effects are minimized. Dredging by the COE is conducted with a self-propelled hopper dredge, which is also a very effective method that does not require any rehandling. Since no changes to management of this site are proposed or anticipated under any of the LTMS scenarios, no adverse effects are expected.

6.1.4.2 In-Bay Disposal

Like ocean disposal, the transportation of dredged material to in-Bay disposal sites is relatively efficient and effective. Both hopper dredges and bottom-dump barges are used, and rehandling is not required. However, overall vessel traffic within the Estuary is much higher than outside the Golden Gate. In addition, a much higher frequency of disposal is associated with in-Bay sites, in part because smaller-capacity barges are often used and because dredging sites are nearer. Together, these result in additional trips to the disposal site and faster turnaround times from the dredging site, and ultimately higher-frequency disposal site use. Therefore transportation to and use of the existing unconfined aquatic disposal sites in the Estuary represents greater vessel traffic volume-related risks than does ocean disposal. However, the number of collisions, breakaways, and groundings involving barges and tugs, even under existing conditions (high in-Bay disposal), has historically been small (see section 4.2.5.1), so this risk is considered to be minor. At the same time, weather-related risks are less overall than for ocean disposal. Overall, transportation-related impacts of in-Bay disposal under each of the high, medium, and low volume scenarios are therefore considered to be negligible (0), as shown in Table 6.1-4.

6.1.4.3 Disposal at Upland/Wetland/Reuse Sites

There is a potential for a variety of transportation-related adverse impacts associated with placement of dredged material at upland, wetland, or reuse sites. Impacts are primarily related to the need to rehandle the dredged material prior to its final placement, and to the logistics of accessing many upland/wetland/reuse sites.

In some cases, rehandling and access problems can be minimized, for example, when the dredging site is within pumping distance of the final placement or reuse site, hydraulic dredging can eliminate the need for rehandling. However, when sediments are dredged from locations within the Estuary that are far from the final placement area, they must initially be placed in a barge, then transported to an offloading facility where the dredged material is removed from the barge and handled separately to transport it to the disposal or reuse site. If barge access is available near the final disposal or reuse site, the dredged material can be pumped directly to the site fairly efficiently. However, if barge access is not possible near the final placement site, another intermediate rehandling step is needed (such as dewatering the material at a rehandling site prior to its excavation and transport to the final placement site).

When additional rehandling is necessary, traffic-related issues may become a first-order concern. Typically, dredged material can be brought to a rehandling facility relatively efficiently by barge. However, once dried, the material is generally excavated (using routine construction machinery such as bulldozers and front-end loaders) and placed into surface vehicles (trucks or train cars, depending on the location of the rehandling facility and the final placement site). While barges (even "small" shallow-draft barges that only carry 1,000 cy) are relatively efficient at moving large volumes of dredged material without causing other traffic-related impacts, trucks are particularly inefficient in this regard. A medium-size dump truck with a capacity of 10 cy would need to make 200 round trips to move one typical 2,000-cy barge-load of dredged material. Movement of large quantities of dredged material by truck therefore has the potential to generate substantial traffic-related impacts including increased traffic volumes, noise, emissions, and impacts to the transportation system itself (e.g., increased roadway repairs). Such impacts may be significant on a site-specific basis.

If the dredged material is moved by rail, the level of impact would be somewhere between the impacts of barging and the impacts of trucking.

The following assessment assumes that all of the SUAD-class dredged material that would go to rehandling facilities or to levees under any (high, medium, or low) scenario would be moved (after dewatering) via 10-cy trucks, while material used for habitat restoration sites would be directly placed without rehandling. (Larger [20+]-cy dump trucks are available; however, they could not be used in all cases because of access limitations at some disposal or reuse sites [such as many levees].) Two additional rehandling facilities are assumed to be needed at high overall placement volumes, and one at medium volumes (none would be needed at low volumes, so negligible additional transportation-related impacts would be expected). The assessment is considered to represent a worst reasonable case. Identified transportation-related impacts would be less, for example, if larger-volume trucks, or other higher-volume transportation methods such as rail cars, were used for some or all of the material or if more (smaller) rehandling facilities were used so that peaks in truck traffic could be staggered, and so that traffic would not all be focused on one or two locations.

At high overall UWR placement volumes (80 percent of all SUAD material, or about 190 mcy), 66 percent of the material (~125 mcy, or 2.5 mcy per year on average) would be placed directly into habitat restoration sites. The 14 percent going to levees (an average of ~500,000 cy per year) would be handled by barge, and the remaining 20 percent (~760,000 cy per year) would be rehandled via trucks. Allowing for 20 percent shrinkage as a result of drying, a total of 60,800 ten-cy truck loads per year would be required to move the resulting 608,000 cy of dredged material from the assumed two new rehandling facilities to final placement sites. If these two rehandling facilities had similar capacities such that each handled half this overall volume (~304,000 cy per year each), approximately 30,000 round-trip truck loads per year would occur at each site. This equates to an average of approximately 83 additional round trips per day, or approximately 3.5 trips per hour, every day of the year. However, truck traffic could actually be much higher than this at times, because the dredged material would generally be excavated and transported in batches after sufficient drying had occurred. The drying process can take several months, after which removal of the material would take place as quickly as possible in order to make room at the facility for the next batch of dredged material. It would be reasonable to expect that, during periods when the dredged material is being excavated and removed from the rehandling facility, average truck volumes could temporarily triple to as much as approximately 250 round trips per day or 10 round trips per hour, from each rehandling site. The potential traffic-related impacts of this volume of truck traffic, coming from each rehandling facility, could be significant depending on the location of and existing transportation system serving the specific rehandling sites.

At medium volumes going to upland, wetland, or reuse sites, one additional rehandling facility could produce the same worst-case traffic-related impacts as noted above, but at one site rather than two. The impacts associated with that one site could be significant depending on the location of the site and the existing transportation system serving it. Therefore, a "high risk/impact" rating (-3) is assigned in Table 6.1-4 under both the high and medium volume categories for levee maintenance and rehandling facilities. However, habitat restoration is rated as "0" because it is assumed that rehandling is not necessary. It should be noted that actual impacts may differ dramatically, depending on the number of sites and how they are operated. One larger facility could have very different effects compared to several smaller facilities that, overall, handled the same volume of material. Project-specific evaluations would be required to determine whether impacts would be significant, and to identify any mitigation measures necessary to avoid or minimize them.

Since no new rehandling facility would be needed at low volumes of UWR placement or disposal, no additional traffic-related impacts would be expected, and a negligible risk/impact" rating (0) is indicated.

6.1.5 Air Quality Comparisons

The following is a presentation of air quality impacts that could occur from low, medium, and high volume disposal activities at generic placement environments within the San Francisco Bay Area. Air quality impacts from associated dredging activities are not discussed here, but are presented in combination with disposal activities related to the four project alternatives in section 6.2.4.

Information on disposal activities was obtained from EPA staff (personal communication, B. Tuden, J.Katz, and B. Ross 1995) and from environmental documentation of similar activities within the San Francisco Bay region, including the Oakland Harbor SEIR/S (USACE and Port of Oakland 1994), the Richmond Harbor Draft SEIS/EIR (USACE and Port of Richmond 1995), and the John F. Baldwin Navigation Channel Deepening Project ADEIR/S (USACE and Contra Costa County 1995). Emission inventories were estimated for each disposal scenario and based on existing and future operational assumptions. Factors that could affect the emissions calculated for each disposal scenario and measures that would reduce significant emissions are also discussed.

Emission factors used to calculate disposal equipment emissions were obtained from *Compilation of Air*

Pollution Emission Factors, AP-42, Vols. I and II (USEPA 1985 and 1993c), EMFAC7F (ARB 1993b), and special studies on vessel emissions conducted for the ARB (1984). Documentation of equipment usage and emission calculations associated with each disposal scenario can be found in Appendix O.

It is assumed that all sediments would be uncontaminated and suitable for disposal. Therefore, the impact of toxic pollutants that could be released to the atmosphere from dry dredging sediments (fugitive dust) was not analyzed in this EIS/EIR.

6.1.5.1 Impact Significance Criteria

Criteria to determine the significance of air quality impacts are based on federal, state, and local air pollution standards and regulations. Impacts would be considered significant if proposed emissions

1. Increase ambient pollutant levels from below to above the NAAQS or CAAQS;
2. Substantially contribute to an existing or projected air quality standard violation,
3. Are inconsistent with emission growth factors contained in the
   (a) Clean Air Plan (CAP),
   (b) O_3 Maintenance Plan, or
   (c) CO Maintenance Plan (inconsistent projects include those exceeding the land use and population forecasts used to generate future emissions in these plans),
4. Exceed the de minimis thresholds that trigger a conformity determination subsequent to Section 176(c) of the CAA (100 tons per year of VOC or NO_x), or
5. Exceed the following thresholds that the BAAQMD uses for CEQA purposes to determine the significance of operational activities: 80 pounds per day or 15 tons per year of reactive organic gases (ROG), NO_x, or PM_{10} (BAAQMD 1995).

Since the overwhelming majority of the LTMS program would occur within the BAAQMD, the thresholds listed in criterion 5 above have been chosen to determine project significance.

The BAAQMD no longer uses emission thresholds to evaluate the significance of construction emissions. To analyze the relative level of proposed emissions, the operational thresholds in item 5 above are used at this time. However, the BAAQMD requires the implementation of feasible PM_{10} control measures to ensure that fugitive dust emissions remain insignificant from construction activities. These control measures include the following, depending on the size of the project area.

Basic Control Measures. The following controls should be implemented at all construction sites.

- Water all active construction areas at least twice daily.
- Cover all trucks hauling soil, sand, and other loose material *or* require all trucks to maintain at least 2 feet of freeboard (the space between top of load and top edge of truck bed).
- Pave, apply water three times daily, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction sites.
- Sweep daily (with water sweepers) all paved access roads, parking areas and staging areas at construction sites.
- Sweep streets daily (with water sweepers) if visible soil material is carried onto adjacent public streets.

Enhanced Control Measures. The following measures should be implemented at construction sites greater than 4 acres in area.

- All "Basic" control measures listed above.
- Hydroseed or apply (non-toxic) soil stabilizers to inactive construction areas (previously graded areas inactive for 10 days or more).
- Enclose, cover, water twice daily or apply (non-toxic) soil binders to exposed stockpiles (dirt, sand, etc.).
- Limit traffic speeds on unpaved roads to 15 mph.
- Install sandbags or other erosion control measures to prevent silt runoff to public roadways.

- Replant vegetation in disturbed areas as quickly as possible.

Optional Control Measures. The following control measures are strongly encouraged at construction sites that are large in area, located near sensitive receptors, or which for any other reason may warrant additional emissions reductions.

- Install wheel washers for all exiting trucks, or wash off the tires or tracks of all trucks and equipment leaving the site.
- Install wind breaks, or plant trees/vegetative wind breaks at windward side(s) of construction areas.
- Suspend excavation and grading activity when winds (instantaneous gusts) exceed 25 mph.
- Limit the area subject to excavation, grading and other construction activity at any one time.

6.1.5.2 Ocean Disposal

The main sources of emissions that would occur from ocean disposal of dredged sediments include diesel-powered tugboats, barge equipment, and support vessels. Assumptions used in the analysis include the following: (1) 2,300 horsepower tugboats would transport dredged sediments in 5,000 cy bottom-dumping barges, with an equivalent dry sediment load of 4,000 cy; (2) the transport distance from the dredging to ocean disposal site would be 71 nautical miles, which is the average of the high and low values assumed in the EPA project cost analysis (EPA 1995); (3) average tugboat speed would be 6 knots; (4) all equipment would operate 22 hours per day; and (5) all three disposal volume scenarios would be completed within 1 year.

Summaries of daily and total emissions that would occur from low, medium, and high ocean disposal scenarios are provided in tables 6.1-5 and 6.1-6, respectively. As shown in Table 6.1-5, daily emissions for each disposal scenario would exceed the BAAQMD emission thresholds for ROG, NO_x, and PM_{10}. These emissions would therefore be significant.

Table 6.1-5. Daily Emissions for Low/Medium/High Volume Disposal Scenarios at Proposed Placement Environments

Placement Environment/ Disposal Volume	DAILY EMISSIONS (POUNDS)						
	TOG	*ROG*	*CO*	*NO_x*	*SO_2*	*PM*	*PM_{10}*
Ocean							
Low/Medium/High	302	290	470	2,704	189	218	209
In-Bay							
Low	26	25	19	160	12	5	3
Medium/High	121	117	171	1,021	72	74	69
Habitat Restoration							
Low/Medium/High	147	141	327	1,640	113	86	76
Levee Restoration							
Low/Medium/High	229	220	741	3,324	230	174	155
Rehandling Facility							
Low	0	0	0	0	0	0	0
Medium/High	288	277	700	2,823	196	191	175
BAAQMD Emission Thresholds		**80**		**80**			**80**

Feasible measures to reduce significant emissions would include (1) retard injection timing of diesel-powered equipment for NO_x control, and (2) use of reformulated diesel fuel to reduce ROG and SO_2 (a precursor to PM_{10}) . Retarding injection timing by two degrees would reduce NO_x emissions by about 15 percent from diesel-powered equipment. Although retarding injection timing by more than 2 degrees would further reduce NO_x emissions, it would adversely affect fuel consumption. Use of reformulated fuel (ARB diesel fuel) would reduce ROG and SO_2 emissions by 15 and 64 percent, respectively, from diesel-powered equipment (Southwest Research Institute 1991).

Table 6.1-6. Total Emissions and Emission Factors per Unit Volume for Low/Medium/High Volume Disposal Scenarios at Proposed Placement Environments

Placement Environment/ Disposal Volume	TOTAL EMISSIONS (TONS)						
	TOG	*ROG*	*CO*	*NO_x*	*SO_2*	*PM*	*PM_{10}*
Ocean							
Low	13.57	13.03	21.16	121.64	8.49	9.80	9.41
Medium	32.57	31.27	50.78	291.93	20.37	23.52	22.58
High	51.57	49.51	80.41	462.21	32.25	37.24	35.75
In-Bay							
Low	2.15	2.06	1.59	13.22	0.98	0.38	0.25
Medium	5.63	5.41	7.11	44.62	3.17	2.90	2.66
High	9.11	8.75	12.63	76.03	5.35	5.41	5.08
Habitat Restoration							
Low	3.17	3.04	7.04	35.33	2.43	1.85	1.64
Medium	8.39	8.06	18.65	93.59	6.45	4.91	4.34
High	13.95	13.39	31.01	155.57	10.71	8.17	7.21
Levee Restoration							
Low	4.77	4.58	15.45	69.31	4.79	3.63	3.22
Medium/High	5.77	5.54	18.69	83.81	5.79	4.40	3.90
Rehandling Facility							
Low	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Medium	6.53	6.27	18.48	53.20	3.61	4.80	4.51
High	13.14	12.87	37.93	109.20	7.40	9.84	9.25
Placement Environment/ Disposal Volume	TONS OF EMISSIONS PER 100,000 cy MATERIAL						
	TOG	*ROG*	*CO*	*NO_x*	*SO_2*	*PM*	*PM_{10}*
Ocean							
Low/Medium/High	1.36	1.30	2.12	12.16	0.85	0.98	0.94
In-Bay							
Low	0.21	0.21	0.16	1.32	0.10	0.04	0.03
Medium	0.24	0.23	0.30	1.86	0.13	0.12	0.11
High	0.24	0.23	0.33	2.00	0.14	0.14	0.13
Habitat Restoration							
Low/Medium/High	0.56	0.53	1.24	6.20	0.43	0.33	0.29
Levee Restoration							
Low/Medium/High	1.11	1.07	3.59	16.12	1.11	0.85	0.75
Rehandling Facility							
Low	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Medium/High	1.72	1.65	4.86	14.00	0.95	1.26	1.19

Emissions from ocean disposal are highly dependent on transport distance and barge capacity. An increase or decrease in transport distance would produce a corresponding change in emissions. The larger the barge, the fewer the number of trips required to dispose of a given volume of dredged sediments. Fewer barge trips would correspondingly minimize the emissions from tugboats, the main contributors to ocean disposal emissions.

Table 6.1-6 also presents emissions that would occur from the disposal of 100,000 cy of sediment at an ocean site. In comparison to disposal at the other placement environments, ocean disposal would rank in the median for emissions produced per disposal unit volume. This is due to the long transport distance to the disposal site, resulting in an extensive amount of tug boat emissions.

Disposal emissions would be spread over a large portion of the Bay Area, between the dredging site and offshore waters. Additionally, since disposal emission sources would be mobile, pollutant impacts in a localized area would not be large enough to exceed any ambient air quality standard.

Emissions from ocean disposal would generally occur on the waters of the San Francisco Bay and offshore regions. Since there are no sensitive receptors in this region, ocean disposal would not impact this portion of the population. Ocean disposal would be the least threatening to sensitive receptors of all the proposed placement environments. Definitive impacts to sensitive receptors would be considered at the project-specific EIS/EIR level and not in this programmatic EIS/EIR.

6.1.5.3 In-Bay Disposal

The main sources of emissions that would occur from in-Bay disposal of dredged sediments include diesel-powered tugboats, barge equipment, a hopper dredge, and support vessels. Assumptions used in the analysis that differ from those used for ocean disposal include the following: (1) a hopper dredge, with a capacity of 4,000 cy (dry sediment basis), would transport 1 mcy of sediment to the disposal site. The remaining sediments for the medium and high analyses would be transported by 1,050 horsepower tugboats that tow 2,500 cy bottom-dumping barges, with an equivalent dry sediment load of 2,000 cy, and (2) the transport distance from the dredging to in-Bay disposal site would be 13.5 nautical miles, which is the average of the high and low values assumed in the EPA project cost analysis (USEPA 1995).

Summaries of daily and total emissions that would occur from low, medium, and high in-Bay disposal scenarios are provided in Tables 6.1-5 and 6.1-6, respectively. As shown in Table 6.1-5, daily emissions from the low volume scenario would exceed the BAAQMD emission threshold for NO_x. The medium/high volume scenarios would exceed both the NOx and ROG BAAQMD emission thresholds. Consequently, these emissions would be significant.

Feasible measures to reduce NO_x and ROG emissions from the proposed action would be the same as those mentioned in section 6.1.5.2: (1) the use of injection timing retard would reduce NO_x emissions by about 15 percent from diesel-powered equipment and (2) the use of reformulated diesel fuel would reduce ROG emissions by 15 percent.

Emissions from in-Bay disposal are highly dependent on sediment transport distance and barge capacity. An increase or decrease in transport distance would produce a corresponding change in emissions. The larger the barge, the fewer the number of trips required to dispose of a given volume of sediments. Fewer barge trips would minimize emissions from tugboats, the main contributors to in-Bay disposal emissions. Table 6.1-6 also presents emissions that would occur from the disposal of 100,000 cy of sediment at an in-Bay location. In comparison to disposal at other placement environments, in-Bay disposal would produce the least amount of emissions per disposal unit volume. This is due to the short transport distance to the disposal site and the quick unloading technique of bottom-dumping barges.

Emissions from in-Bay disposal would generally occur on the waters of the San Francisco Bay. Consequently, these emissions would occur at a considerable distance from any sensitive receptor and would not be expected to adversely impact this portion of the population. Definitive impacts to sensitive receptors would be considered at the project-specific EIS/EIR level and not in this programmatic EIS/EIR.

Disposal emissions would be spread over a large portion of the Bay Area, between the dredging site and in-Bay disposal location. Additionally, since disposal emission sources would be mobile, pollutant impacts in a localized area would not be large enough to exceed any ambient air quality standard.

6.1.5.4 Upland/Wetland Disposal

Habitat Restoration

The main sources of emissions that would occur from disposal of dredged sediments at habitat restoration locations include diesel-powered tugboats used for sediment transport, barge equipment, support vessels, hydraulic pumps to off-load dredged sediments, and booster pumps to transport sediments by pipeline to disposal sites. Assumptions used in the analysis that differ from those used for in-Bay disposal include the following: (1) the transport distance from dredging to habitat restoration disposal sites would be 15 nautical miles, which is the average distance from the dredging centroid of the Bay to potential habitat restoration sites (LTMS 1994e); (2) one 1,500-horsepower hydraulic pump would be used to unload sediments at a rate of 1,210 cy per hour; and (3) two 1,500-horsepower booster pumps would assist in transporting sediments 15,000 feet by pipeline to the disposal site. Although not assumed in the analysis, disposal activities could include use of earth-moving equipment, such as bulldozers, scrapers, or graders for site preparation and/or sediment handling. However, these sources would contribute a small percentage of the total emissions associated with disposal at habitat restoration sites (USACE and Port of Oakland 1994; USACE and Port of Richmond 1995; and USACE and Contra Costa County 1995).

Summaries of daily and total emissions that would occur from low, medium, and high habitat restoration disposal scenarios are provided in Tables 6.1-5 and 6.1-6, respectively. As shown in Table 6.1-5, daily emissions for each disposal scenario would exceed the BAAQMD emissions thresholds for ROG and NO_x. These emissions would therefore be significant.

Feasible measures to reduce NO_x and ROG emissions from the proposed action would be the same as those mentioned in section 6.1.5.2: (1) the use of injection timing retard would reduce NO_x emissions by about 15 percent from diesel-powered equipment and (2) the use of reformulated diesel fuel would reduce ROG emissions by 15 percent.

Emissions from habitat restoration disposal are highly dependent on sediment transport distance, barge capacity, and sediment pumping distance from an unloading facility. An increase or decrease in transport distance would produce a corresponding change in tugboat emissions. The larger the barge, the fewer the number of trips required to dispose of a given volume of dredged sediments. Fewer barge trips would minimize emissions from tugboats, the main contributors to habitat restoration disposal emissions. The distance from the unloading facility to the disposal site would determine if pipeline booster pumps would be required for sediment disposal. The analysis assumes that a booster pump would be required for every 5,000 feet of pipeline beyond the unloading facility. Since these pumps are usually diesel-powered and average about 1,500 horsepower, they are substantial emission sources. Limiting the distance required to pump sediments would minimize emissions from these sources. If feasible, electrification of these large stationary pumps would be a substantial mitigation measure.

Table 6.1-6 also presents emissions that would occur from the disposal of 100,000 cy of sediment at a habitat restoration site. In comparison to disposal at the other placement environments, habitat restoration disposal would produce the second lowest amount of emissions per disposal unit volume. This is largely due to a relatively short transport distance to the disposal site, which minimizes tug boat emissions.

Emissions of PM_{10} in the form of wind-blown dust could occur if site preparation requires earth-moving of dry soils. However, implementation of the BAAQMD PM_{10} control measures would ensure that fugitive dust emissions remain insignificant. Handling and disposal of sediments would not produce any fugitive dust, due to a high water content. Most soils from levees that remain exposed to the atmosphere eventually would be covered with vegetation and would produce a minimal amount of fugitive dust.

Odor impacts could be an issue from habitat restoration if dredged sediments contain sulfide compounds or decomposing organic matter that are exposed to the atmosphere. However, it is not expected that disposal activities would generate significant odor impacts, especially since most of the sediments would be placed directly underwater. Historically, handling of dredged sediments in the San Francisco Bay region has generated only minimal complaints from the public (USACE and Port of Oakland 1994; USACE and Port of Richmond 1995; and USACE and Contra Costa County 1995). This has been due to the relatively small amounts of sulfide and organic compounds found in the sediments and an adequate distance between where sediments were handled and the nearest population, which enabled odors to sufficiently disperse. Generally, the greatest potential for odor impacts would occur during sediment drying activities, where sediments are turned for maximum exposure to the atmosphere. However, this activity would not occur during habitat restoration.

Emissions from habitat restoration disposal would occur on the waters of the San Francisco Bay and within the restoration site, generally a considerable distance from sensitive receptors. The proximity of sensitive receptors to the restoration site must be considered to ensure that impacts to this portion of the population remain insignificant. Factors to consider include wind patterns, the distance between emissions sources and sensitive receptors, and the potential for fugitive dust and odors. Definitive impacts to sensitive receptors would be considered at the project-specific EIS/EIR level and not in this programmatic EIS/EIR.

Disposal emissions would be spread over a large portion of the Bay Area, between the dredging site and disposal location. Additionally, since the majority of disposal emission sources would be mobile, pollutant impacts in a localized area would not be large enough to exceed any ambient air quality standard.

Levee Restoration

The main sources of emissions that would occur from disposal of dredged sediments for levee restoration include diesel-powered tugboats used for sediment transport, barge equipment, support vessels, a clamshell crane used to unload dredged sediments, and earth-moving equipment used for final placement of sediments onto levees. Assumptions used in the analysis that differ from those used for habitat restoration disposal include the following: (1) the transport distance from dredging to levee sites would be 40.3 nautical miles, which is the average distance from the dredging centroid of the Bay to potential levee restoration sites; (2) one 5,000-horsepower clamshell crane would be used to unload sediments at a rate of 550 cy per hour; and (3) two bulldozers, one scraper, and one grader would handle sediments on the levees. Although not assumed in the analysis, transport of sediments to levees could occur by truck. This form of transportation would generate a similar amount of emissions per unit volume of sediment as barge transport.

Summaries of daily and total emissions that would occur from low, medium, and high levee restoration disposal scenarios are provided in Tables 6.1-5 and 6.1-6, respectively. As shown in Table 6.1-5, daily emissions for each disposal scenario would exceed the BAAQMD emissions thresholds for ROG, NO_x, and PM_{10}. These emissions would therefore be significant.

Feasible measures to reduce ROG, NO_x and SO_2 emissions from the proposed action would be the same as those mentioned in section 6.1.5.2: (1) the use of injection timing retard would reduce NO_x emissions by about 15 percent from diesel-powered equipment and (2) the use of reformulated diesel fuel would reduce ROG and SO_2 emissions by 15 and 64 percent, respectively, from diesel-powered equipment.

Emissions from levee restoration are highly dependent on sediment transport distance, barge capacity, and the clamshell crane used to unload sediments. An increase or decrease in transport distance would produce a corresponding change in tugboat emissions. The larger the barge, the fewer the number of trips required to dispose of a given volume of dredged sediments. Fewer barge trips would minimize emissions from tugboats. Use of a larger clamshell crane to unload sediments would somewhat improve the efficiency of the transfer process from barge to levee, compared to a smaller crane. This would result in fewer emissions. However, this piece of equipment would remain the largest contributor to emissions during disposal activities. If feasible, electrification of the clamshell crane would substantially mitigate emissions during levee restoration.

Table 6.1-6 also presents emissions that would occur from the disposal of 100,000 cy of sediment for levee restoration. In comparison to disposal at the other placement environments, disposal for levee restoration would produce the second highest amount of emissions per disposal unit volume. This is due to a relatively long transport distance to the disposal site and a slower unloading rate for the clamshell crane, compared to hydraulic off-loading at a habitat restoration location.

Emissions of PM_{10} in the form of wind-blown dust could occur during site preparation and levee construction. However, implementation of the BAAQMD PM_{10} control measures would ensure that fugitive dust emissions remain insignificant. Handling and disposal of sediments would not produce any fugitive dust, due to a high water content. Most sediments from levees that remain exposed to the atmosphere eventually would be covered with vegetation and would produce a minimal amount of fugitive dust.

Odor impacts could be an issue from levee restoration disposal if dredged sediments contain sulfide compounds or decomposing organic matter that are exposed to the atmosphere. However, it is not expected that disposal activities would generate significant odor impacts, based on the history of dredging and disposal activities in the San Francisco Bay region. This has been due to the relatively small amounts of sulfide and organic compounds found in the sediments and an adequate distance between where sediments were handled and the nearest population, which enabled odors to sufficiently disperse. Generally, the greatest potential for odor impacts would occur during sediment drying activities, where sediments are turned for maximum exposure to the atmosphere. However, this activity would not occur during levee restoration.

Emissions from levee restoration disposal would occur on the waters of the San Francisco Bay and within the restoration site, generally a considerable distance from sensitive receptors. The proximity of sensitive receptors to the restoration site must be considered to ensure that impacts to this portion of the population remain insignificant. Factors to consider include the potential for fugitive dust, odors, wind patterns, and the distance between emissions sources and sensitive receptors. Definitive impacts to sensitive receptors would be considered at the project-specific EIS/EIR level and not in this programmatic EIS/EIR.

Levee restoration disposal emissions would be spread over a large portion of the Bay Area, between the dredging site and disposal location. Emissions would be the most concentrated near the clamshell crane, since this source would generate the largest amount of emissions for this disposal activity and it would be quasi-stationary. Site-specific analyses would be required to determine if emissions in proximity to the clamshell crane would potentially exceed any ambient air quality standard. Since the remaining disposal emission sources would be mobile, pollutant impacts in a localized area from these sources would not be large enough to exceed any ambient air quality standard and would therefore be insignificant.

Rehandling Facility

The main sources of emissions that would occur from disposal of dredged sediments at rehandling facilities include diesel-powered tugboats used for sediment transport, barge equipment, support vessels, hydraulic pumps to unload dredged sediments, booster pumps to transport sediments by pipeline to disposal sites, use of earth-moving equipment for site preparation and sediment handling, and use of trucks to transport sediments from rehandling facilities to landfills. Assumptions used in the analysis that differ from those used for habitat restoration disposal include the following: (1) the transport distance from dredging to rehandling facility disposal sites would be 19 nautical miles, which is the average distance from the dredging centroid of the Bay to potential rehandling sites; (2) two bulldozers and one scraper would handle sediments at the rehandling facility; (3) two front-end loaders would load dry sediments into 10-cy capacity haul trucks; (4) two bulldozers, one scraper, and one grader would handle sediments at the landfill; (5) the one-way distance from the rehandling facility to the landfill would be 12 miles; and (6) the volume of sediments transported to landfill sites was reduced 20 percent from the amount placed in a rehandling facility to take into account shrinkage due to drying. Although not assumed in the analysis, earth-moving equipment would be used for site preparation and construction of containment levees and interior dikes.

Summaries of daily and total emissions that would occur from low, medium, and high disposal scenarios at a rehandling facility are provided in Tables 6.1-5 and 6.1-6, respectively. As shown in Table 6.1-5, daily emissions for each disposal scenario would exceed the BAAQMD emissions thresholds for ROG, NO_x, and PM_{10}. These emissions would therefore be significant.

Feasible measures to reduce ROG, NO_x and SO_2 emissions from the proposed action would be the same as those mentioned in section 6.1.5.2: (1) the use of injection timing retard would reduce NO_x emissions by about 15 percent from diesel-powered equipment and (2) the use of reformulated diesel fuel would reduce ROG and SO_2 emissions by 15 and 64 percent, respectively, from diesel-powered equipment.

Emissions from rehandling facility disposal activities are highly dependent on sediment transport distance, barge capacity, sediment pumping distance from the unloading site, and the transport distance from the facility to a landfill. An increase or decrease in transport distance would produce a corresponding change in tugboat emissions. The larger the barge, the fewer the number of trips required to dispose of a given volume of dredged sediments. Fewer barge trips would minimize emissions from tugboats, the main contributors to rehandling facility disposal emissions. The distance from the unloading site to the rehandling facility would determine if pipeline booster pumps would be required for sediment disposal. Since these pumps are usually diesel-powered and average about 1,500 horsepower, they are substantial emission sources. Limiting the distance required to pump sediments would minimize emissions from these sources. If feasible, electrification of large stationary pumps would be a substantial mitigation measure.

Table 6.1-6 also presents emissions that would occur from the disposal of 100,000 cy of sediment at a rehandling facility. In comparison to disposal at the other placement environments, disposal at this location would produce the highest amount of emissions per disposal unit volume. This is mainly due to the extensive equipment usage required to handle the sediments at the rehandling facility, then transport the material to the landfill for its final placement. In cases where dredged sediment is used as a replacement source for cover at an existing landfill, emissions from loading trucks, transport to the landfill, and final placement on the landfill should be netted out of the final emissions total for this placement environment. Otherwise, since these emissions would already be occurring at these facilities, they would be erroneously double counted in the analysis. Assuming this is the case, emissions per unit volume from disposal at a rehandling facility would be only slightly higher than emissions from habitat restoration.

Emissions of PM_{10} in the form of wind-blown dust would occur during earth-moving activities related to site preparation and sediment handling. Disposal of sediments would not produce any fugitive dust, due to a high water content. Once sediments begin to dry, operation of earth-moving equipment on these sediments could generate minor amounts of fugitive dust. Additionally, loading sediments into trucks would be a minor source of dust emissions, since sediments would have a relatively moderate water content. If sediments are dry enough to emit dust emissions, trucks could be covered and/or loads sprayed with water so that dust would not be generated during transport of the sediments to landfill sites. Implementation of BAAQMD PM_{10} control measures would ensure that fugitive dust emissions remain insignificant.

Odor impacts could be an issue at rehandling landfill facilities if dredged sediments contain sulfide compounds or decomposing organic matter that are exposed to the atmosphere. However, it is not expected that disposal activities would generate significant odor impacts, based on the history of dredging and disposal activities in the San Francisco Bay region. This has been due to the relatively small amounts of sulfide and organic compounds found in the sediments and an adequate distance between where sediments were handled and the nearest population, which enabled odors to sufficiently disperse. Generally, the greatest potential for odor impacts would occur during the sediment drying activities, where sediments are turned for maximum exposure to the atmosphere. If an issue, this impact could be mitigated at rehandling facilities by decreasing the number of times that earth-moving equipment turn sediments.

Emissions from rehandling facility disposal activities would occur on the waters of the San Francisco Bay, within the rehandling site, along the truck route from the facility to the landfill, and within the landfill. Except for the haul truck routes, these locations are generally a considerable distance from sensitive receptors. The proximity of sensitive receptors to the rehandling and landfill sites must be considered to ensure that impacts to this portion of the population remain insignificant. Factors to consider include the potential for fugitive dust, odors, wind patterns, and the distance between emissions sources and sensitive receptors. Definitive impacts to sensitive receptors would be considered at the project-specific EIS/EIR level and not in this programmatic EIS/EIR.

Disposal emissions would be spread over a large portion of the Bay Area, between the dredging site, the rehandling facility, and the landfill location. Additionally, since the majority of disposal emission sources would be mobile, pollutant impacts in a localized area would not be large enough to exceed any ambient air quality standard.

6.1.6 Archaeological and Cultural Resource Comparisons

There are no known archaeological or cultural resources at the existing ocean or in-Bay disposal sites. Therefore, no impacts or benefits are expected at any placement volume at any of these aquatic sites. However, there is the potential to affect archaeological or cultural resources that may exist at upland or wetland reuse sites. The risk of encountering such resources increases with increasing overall volumes of upland or wetland placement. However, whether such encounters would result in significant impacts or benefits cannot be predicted at this programmatic level of analysis. All upland or wetland reuse projects would need to conduct the appropriate level of coordination with the State Historic Preservation Office, and conduct surveys as necessary, prior to construction of any new facilities. If significant resources are present, options for avoiding or mitigating any impacts would have to be explored on a site-specific basis.

6.1.7 Summary of Benefits and Impacts by Placement Environment

Table 6.1-7 is a summary of the potential benefits and impacts/risks associated with relative volumes of dredged material placed in each environment. It summarizes the discussions and associated tables in sections 6.1.1 through 6.1.6. It is intended to allow the reader to see the ratings of the benefits and impacts/risks for the placement environments together for comparative purposes.

The table shows that in-Bay and ocean disposal of dredged material has no benefits and has some impacts/risks, particularly with disposal of high volumes. Placement in the UWR environment has significant benefits but also has risks. The impacts/risks are greatest with high placement volumes and decrease with medium placement volumes because sensitive areas can more easily be avoided due to fewer projects. Please refer to the previous sections for detailed discussion of the ratings.

6.1.8 Final Alternatives Carried Forward for Consideration

Based upon the results of the "generic analysis" presented above, the LTMS agencies have eliminated from further consideration any alternative that includes a "high" overall placement volume in any one environment. These include Preliminary Alternative C (Emphasize Ocean Disposal) and Preliminary Alternative F (Emphasize Upland/Wetland Reuse). In the case of the upland/wetland/reuse placement environment in particular, there is the potential for substantial adverse environmental impacts from high placement volumes. Continued high disposal volumes at in-Bay sites would also represent a degree of risk to

Table 6.1-7. Summary of Potential Benefits and Impacts by Placement Environment and Disposal Volume
(page 1 of 2)

Placement Environment	*Benefits* *			*Impacts/Risks* *		
	High Volume	*Medium Volume*	*Low Volume*	*High Volume*	*Medium Volume*	*Low Volume*
Water Quality						
Ocean	0	0	0	-1	0	0
In-Bay	0	0	0	-2	-1	0
Upland/Wetland Reuse						
Habitat Restoration	+2	+2	+1	-1	0	0
Levee Maintenance	0	0	0	-1	-1	-1
Rehandling Facility	0	0	0	-1	0	0
Fish and Wildlife Habitat						
Ocean	0	0	0	-1	0	0
In-Bay	0	0	0	-2	-1	0
Upland/Wetland Reuse						
Habitat Restoration	+3	+2	+1	-3	-1	0
Levee Maintenance	0	0	0	0	0	0
Rehandling Facility	0	0	0	-1	0	0
Special Status Species						
Ocean	0	0	0	-1	0	0
In-Bay	0	0	0	0	0	0
Upland/Wetland Reuse						
Habitat Restoration	+3	+2	+1	-1	0	0
Levee Maintenance	0	0	0	0	0	0
Rehandling Facility	0	0	0	0	0	0

* Potential Benefits: +3 = High Benefit; +2 = Moderate Benefit; +1 = Low Benefit; 0 = Negligible Benefit.
Potential Impacts or Risks: - 3 = High Impact; - 2 = Moderate Impact; - 1 = Low Impact; 0 = Negligible Impact.

Table 6.1-7. Summary of Potential Benefits and Impacts by Placement Environment and Disposal Volume
(page 2 of 2)

Placement Environment	*BENEFITS* *			*IMPACTS/RISKS* *		
	High Volume	*Medium Volume*	*Low Volume*	*High Volume*	*Medium Volume*	*Low Volume*
Transportation Systems						
Ocean	0	0	0	0	0	0
In-Bay	0	0	0	0	0	0
Upland/Wetland Reuse						
Habitat Restoration	0	0	0	-3	-3	0
Levee Maintenance	0	0	0	-3	-3	0
Rehandling Facility	0	0	0	-3	-3	0
Air Quality						
Ocean	0	0	0	-3	-3	-3
In-Bay	0	0	0	-3	-3	-3
Upland/Wetland Reuse						
Habitat Restoration	0	0	0	-3	-3	-3
Levee Maintenance	0	0	0	-3	-3	-3
Rehandling Facility	0	0	0	-3	-3	-3

* Potential Benefits: +3 = High Benefit; +2 = Moderate Benefit; +1 = Low Benefit; 0 = Negligible Benefit.
Potential Impacts or Risks: - 3 = High Impact; - 2 = Moderate Impact; - 1 = Low Impact; 0 = Negligible Impact.

various resources dependent on the already-stressed Estuary system; however, a more significant concern is that the LTMS goal for environmental enhancement through beneficial reuse of dredged material could not be sufficiently realized at high in-Bay disposal volumes that treat the material as a waste instead of as a valuable resource. In the case of ocean disposal at high volumes, overall impacts and risks to the Estuary system would be reduced; but, as for in-Bay disposal at high volumes, very limited beneficial reuse of dredged material would mean that the LTMS goals could not be achieved.

An additional reason that high placement volumes in any one type of environment are eliminated from further consideration is that over-reliance on one form of disposal is unwise from both an economic and management standpoint. If a variety of sites is available, then unforeseen circumstances that may limit the available capacity in one disposal environment would be less likely to cause a serious disruption of dredging activity. Without a variety of sites available, many dredging projects could be delayed until new sites could be developed. This could result in significant navigational problems and, ultimately, in disruptions in the flow of commerce and impacts to the regional economy as a whole. In short, a variety of dredged material placement options is important insurance against a return to "mudlock" in the San Francisco Bay Area.

An exception to the complete elimination of high volumes in any placement environment is the No-Action alternative. No-Action, representing current conditions, includes high volumes of disposal at existing in-Bay sites. The No-Action alternative must be retained under both NEPA and CEQA for comparison with the final "action" alternatives.

Therefore, in addition to the No-Action alternative, the final "action" alternatives carried forward for consideration include the following:

Alternative 1: Emphasize Aquatic Disposal (minimal upland/wetland reuse). This alternative includes medium in-Bay disposal, medium ocean disposal, and low upland/wetland reuse. This is the same as Preliminary Alternative B described in Chapter 5.

Alternative 2: Balance Upland/Wetland Reuse and In-Bay Disposal (minimal ocean disposal). This alternative includes medium in-Bay disposal, low ocean disposal, and medium upland/wetland reuse. This is the same as Preliminary Alternative D described in Chapter 5.

Alternative 3: Balance Upland/Wetland Reuse and Ocean Disposal (minimal in-Bay disposal). This alternative includes low in-Bay disposal, medium ocean disposal, and medium upland/wetland reuse. This is the same as Preliminary Alternative E described in Chapter 5.

The differences among these alternatives are shown in Figure 6.1-1. The final "action" alternatives each provide for a diversity of dredged material placement sites, and they each would provide a degree of beneficial reuse. They differ in terms of the relative emphasis on each placement environment, and they address the full range of distributions that are possible using combinations of medium and low volumes among the three placement environments. Each of them has a reasonable expectation of being implementable in the San Francisco Bay Area (although they differ in the degree to which they can be implemented immediately). Each of the final "action" alternatives also include all of the common "companion policies" described in Chapter 5 that mitigate or obviate some of the adverse effects that could otherwise occur.

6.1.9 Summary Matrix: Benefits and Impacts/Risks of the Final Alternatives Compared to the Environmental Criteria in the Preceding Generic Analysis

The final alternatives are compared using the environmental evaluation criteria discussed in the generic analysis, in the summary below, and in Table 6.1-8. Please see sections 6.1.1 through 6.1.6 for a detailed discussion.

All of the action alternatives including the preferred alternative have no benefit for the ocean environment and negligible impacts on the ocean environment, with the exception of the impact on air quality. The impact on air quality from disposal in the ocean is considered high for all of the alternatives because they would all result in exceedances of BAAQMD emissions thresholds. However, since emission sources would be mobile, impacts in a localized area would not be large enough to exceed any ambient air quality standard.

All of the action alternatives, particularly the preferred alternative, would benefit the in-Bay environment by reducing the overall volume of dredged material being

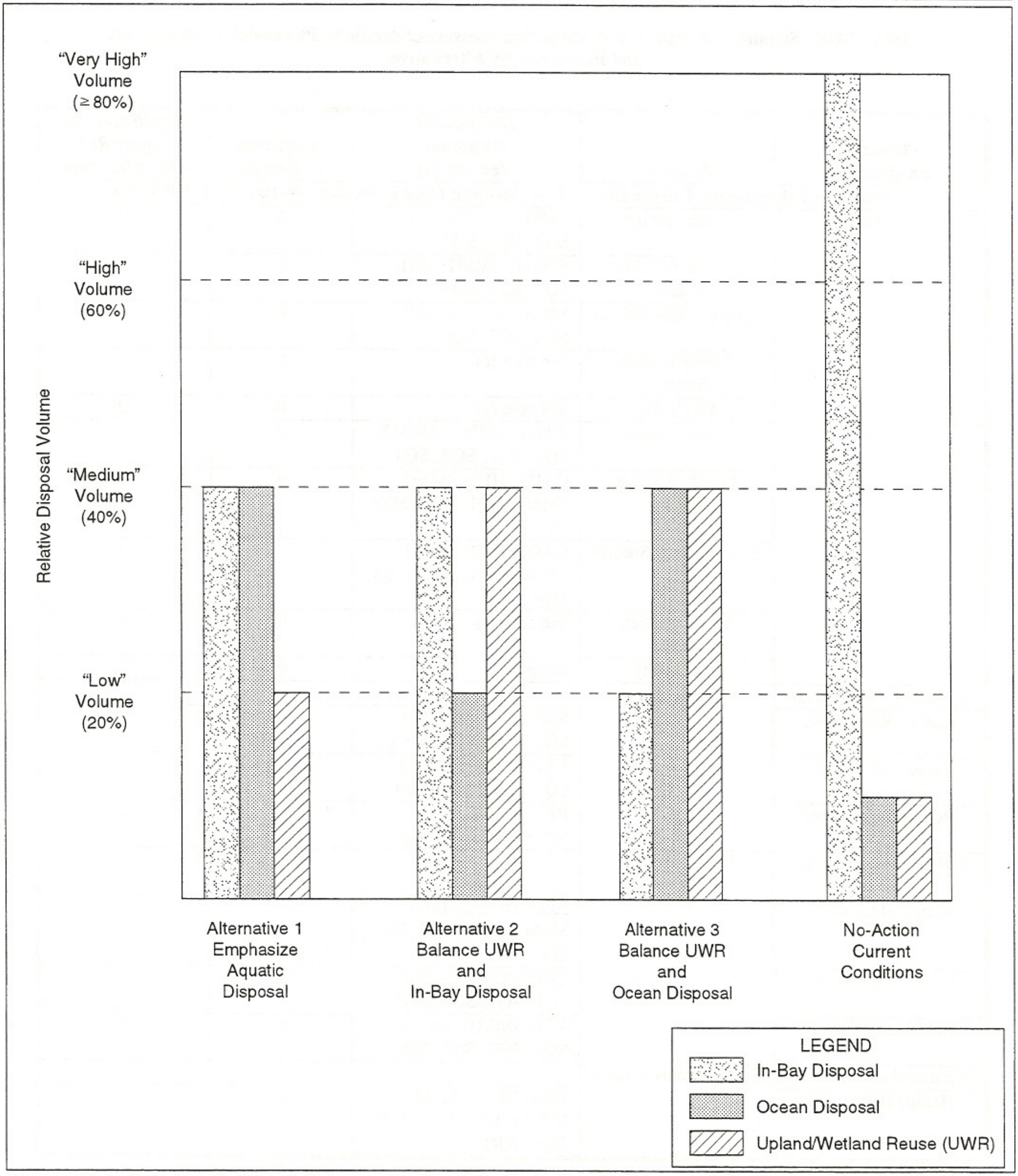

Figure 6.1-1. Relative Sediment Volumes Destined for Each Type of Placement Environment under the Various LTMS Alternatives

Table 6.1-8. Summary of Policy-Level Mitigation Measures Specific to Placement Environments and Resources, by Alternative

Placement Environment	*Resource*	*Policy-Level Mitigation Measure (a)*	*Significance of Benefit*	*Significance of Impact/Risk After Mitigation*
Alternative 1 — Medium Ocean, Medium In-Bay, Low UWR (cont'd)				
Levee Maintenance		LR1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4	0	0
Rehandling Facility		RF1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4	0	0
Upland/Wetland Reuse	Transportation Systems			
Habitat Restoration		SMM1, SMM2	0	0
Levee Maintenance		LR1; SMM1, SMM2; see note (c)	0	0
Rehandling Facility		RF1; SMM1, SMM2; see note (c)	0	0
Upland/Wetland Reuse	Air Quality	See note (c)	0	-3
Alternative 2 (Balance In-Bay Disposal and UWR) — Low Ocean, Medium In-Bay, Medium UWR				
Ocean	Water Quality	SMM1, SMM2; SQ1, SQ2, SQ3, SQ4	0	0
	Fish & Wildlife Habitat	SMM1, SMM2; SQ1, SQ2, SQ3, SQ4	0	0
	Special Status Species	SMM1, SMM2; SQ1, SQ2, SQ3, SQ4	0	0
	Transportation Systems	See note (c)	0	0
	Air Quality	See note (c)	0	-3
In-Bay	Water Quality	CAD1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4	0	-1
	Fish & Wildlife Habitat	CAD1; HP2; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4	0	-1
	Special Status Species	CAD1; HP2; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4	0	0
	Transportation Systems	See note (c)	0	0
	Air Quality	See note (c)	0	-3
Upland/Wetland Reuse	Water Quality			
Habitat Restoration		SMM1, SMM2; SQ1, SQ2, SQ3, SQ4; WR1	+2	0
Levee Maintenance		LR1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4	0	-1
Rehandling Facility		RF1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4	0	0

Table 6.1-8. Summary of Policy-Level Mitigation Measures Specific to Placement Environments and Resources, by Alternative

Placement Environment	*Resource*	*Policy-Level Mitigation Measure (a)*	*Significance of Benefit*	*Significance of Impact/Risk After Mitigation*
Alternative 2 — Low Ocean, Medium In-Bay, Medium UWR (cont'd)				
Upland/Wetland Reuse	Fish & Wildlife Habitat			
Habitat Restoration		HC1, HC2; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4; WR1	+2	-1
Levee Maintenance		LR1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4	0	0
Rehandling Facility		RF1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4	0	0
Upland/Wetland Reuse	Special Status Species			
Habitat Restoration		HC1, HC2; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4; WR1	+2	0
Levee Maintenance		LR1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4	0	0
Rehandling Facility		RF1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4	0	0
Upland/Wetland Reuse	Transportation Systems			
Habitat Restoration		See note (c)	0	0
Levee Maintenance		See note (c)	0	-3
Rehandling Facility		See note (c)	0	-3
Upland/Wetland Reuse	Air Quality	See note (c)	0	-3
Alternative 3 (Balance Ocean Disposal and UWR) — Medium Ocean, Low In-Bay, Medium UWR				
Ocean	Water Quality	SMM1, SMM2; SQ1, SQ2, SQ3, SQ4	0	0
	Fish & Wildlife Habitat	SMM1, SMM2; SQ1, SQ2, SQ3, SQ4	0	0
	Special Status Species	SMM1, SMM2; SQ1, SQ2, SQ3, SQ4	0	0
	Transportation Systems	See note (c)	0	0
	Air Quality	See note (c)	0	-3
In-Bay	Water Quality	CAD1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4	0	0
	Fish & Wildlife Habitat	CAD1; HP2; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4	0	0
	Special Status Species	CAD1; HP2; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4	0	0