No specific site operations and maintenance costs, other than monitoring costs, are associated with an in-bay disposal site. In-bay monitoring costs have been estimated to range from $560,000 to $1.7 million per year based on estimates prepared by the Corps and the Regional Water Quality Control Board, respectively. Estimates of annual in-bay site monitoring costs were based on a midpoint estimate of $1.1 million for various monitoring activities (e.g., annual site surveys, topographic studies, and management and reporting activities). These costs are not reflected in the unit cost estimates, as they are a fixed cost per year. They are reflected in the total costs, however, and are apportioned among the work types by the relative amount of material each work type contributes to in-bay disposal.

Ocean Disposal: This analysis did not include site development costs for ocean disposal, as the site is currently operational.

No specific site operations and maintenance costs, other than monitoring costs, are associated with an ocean disposal site. Estimates of annual ocean site monitoring costs were based on an estimate of $600,000 per year for various monitoring activities (e.g., footprint mapping, mapping/benthic report, sediment chemistry, seabird/marine mammal regional surveys, midwater fish regional surveys). These costs are not reflected in the unit cost estimates, as they are a fixed cost per year. They are reflected in the total costs, however, and are apportioned among the work types by the relative amount of material each work type contributes to ocean disposal.

Tidal Wetlands Restoration: Costs associated with disposal to tidal wetlands restoration sites includes initial site preparation costs, annual site operations costs, and annual site monitoring costs.

Initial site preparation costs include land acquisition costs; construction costs; and engineering, design, environmental, planning, and construction management costs. The following assumptions were used to derive the estimated $0.60-$1.21 per cubic yard estimate of costs for initial site preparation.

- Land acquisition costs assume a cost of $1,500-$3,900 per acre for the purchase of agricultural lands in the northern parts of the Bay Area. Unit costs were derived by assuming that 23 wetland sites with very high and moderately high potential for restoration would be used as dredge disposal sites and could accommodate 67.9 mcy of dredge material. These sites would comprise approximately 9,267 acres, resulting in an estimated unit costs of $0.20 - $0.53 per cubic yard (Gahagan & Bryant Associates 1994a.)

- Site construction costs were based on a study of potential wetland restoration sites prepared by Gahagan & Bryant Associates (1994b). Construction costs for the Hamilton Army Airfield wetland restoration site and the North Point property restoration site were used to derive unit cost estimates. Construction costs for the Hamilton Army Airfield site, which would have a capacity of 6.96 mcy, are estimated to total almost $4 million, or $0.33/cy. Construction costs for the North Point property site, with a capacity of 3.02 mcy, would total $990,000, or $0.57/cy. (Olejniczak pers. comm.)

- Planning, environmental assessment/impact report, engineering, design, and construction management costs were assumed to total 20% of site construction costs. Units costs were based on the construction costs for the Hamilton Army Airfield ($0.07/cy) and North Point property sites ($0.11/cy) (Olejniczak pers. comm.).

- No mitigation costs were assumed. It is assumed that one of only those sites with few or no seasonal wetlands would be chosen for tidal wetland restoration.

Annual site operations and maintenance costs were estimated to range from $0.02 to $0.03 per cubic yard based on annual costs and capacities estimated for the Hamilton Army Airfield ($40,000) and North Point property ($30,000) sites (Olejniczak pers. comm.). Site development costs do not include government costs for regulatory oversight and permit approval.

Annual monitoring costs will depend on the number of wetland restoration sites developed. Total monitoring costs were estimated using the following assumptions and methods:

- The San Francisco Bay Conservation and Development Commission estimated a monitoring cost of approximately $70,000 per year per site (SFBCDC, LTMS Management Strategy - Draft). Typically monitoring was estimated to extend for 15 years.

- For the No Action alternative and Alternative 1, total monitoring costs for tidal wetland rehabilitation was estimated to be $4.2 million over the 50 year planning period. This is based on the projected number and timing of projects under the Low Scenario in (20% of dredged material to UWR) developed in Appendix A (Larson memo re: distribution to UWR)

- For Alternatives 2 and 3, total monitoring costs were estimated to equal $10.5 million over the 50 year planning period. This is based on the projected number and timing of projects estimated in the Medium Scenario (50% of dredged material to UWR) developed in Appendix A (Larson memo re: distribution to UWR)

- Monitoring costs could vary among projects, depending on the intensity of the monitoring program.

Monitoring costs for habitat restoration are not reflected in the unit cost estimates, as they are a fixed cost per year. They are reflected in the total costs, however, and are apportioned among the work types by the relative amount of material each work type contributes to tidal wetland disposal.

The unit disposal costs shown in Table 6 for wetlands restoration disposal assume that total costs will vary in direct relationship to the volume of dredge material placed at wetland restoration sites and that unit costs will not vary as additional sites are developed for disposal.

Levee Rehabilitation: In general, site development and monitoring costs for levee rehabilitation dependent on the number of levee miles rehabilitated, not on the volume of

material placed. For this analysis, estimates were based on a cost study conducted by Gahagan & Bryant Associates (1994a), which assumed that a midrange quantity of 26.4 mcy of dredge material will be used for levee rehabilitation of 297 miles of levees over the 50-year planning period, or an average of 89,000 cy per levee mile.

This represents a point estimate, as individual levee projects will require varying amounts of material. The unit disposal costs shown in Table 6 for levee rehabilitation disposal assume that unit costs are the same for disposal volumes of less than 26.4 mcy, and that total costs will vary in direct relationship to the volume of dredge material placed at levee rehabilitation sites. Actual unit costs could be significantly higher or lower than those estimated here.

Initial site preparation costs include site construction costs, and engineering, design, environmental, planning, and construction management costs. The following assumptions were used to derive the estimated costs ranging from $1.84 to $2.21 per cubic yard for initial site preparation.

- Site construction costs of $147,000 per levee mile were assumed based on site costs developed for Jersey Island levee rehabilitation work.

- Planning, environmental assessment/impact report, engineering, design, and construction management costs were assumed to range from approximately $15,000 to $50,000 per levee mile based on cost estimates developed for Jersey Island.

No annual site operations and maintenance costs were assumed for disposal to levee sites. These costs would be assigned to levee project costs rather than dredging and disposal project costs.

Staff at the San Francisco Bay Conservation and Development Commission estimated annual monitoring costs for short- and long-term monitoring to range from approximately $24,000 to $35,000 per levee mile, or $0.27 to $0.39 per cubic yard.

Rehandling for Landfill Cover: Disposal-related costs shown in Table 6 associated with use of dredge material for landfill cover apply to development and operation of a rehandling facility site. Site-related costs borne by landfill sites would presumably be part of the ongoing costs of the landfill operation and would not be considered costs associated with dredging and disposal activities.

Costs associated with use of a rehandling facility as part of disposal to a landfill includes initial site preparation and annual site operations costs.

Initial site preparation costs include those for land acquisition; construction; engineering, design, environmental, planning and construction management; and mitigation. The following assumptions were used to derive the cost estimate of $0.51-$1.18 per cubic yard for initial site preparation.

- Land acquisition costs assume a cost of $1,500-$3,900 per acre for the purchase of

agricultural lands in the northern parts of the Bay Area. Acquisition costs were amortized over 50 years at 8%, resulting in an amortized cost of $123-$319 per acre. Unit costs of $0.05-$0.14 per cubic yard were then derived by dividing per-acre costs by an assumed capacity of 2,304 cubic yards of space per acre. (Olejniczak pers. comm.)

- Site construction costs were based on a study of potential rehandling facility sites prepared by Gahagan & Bryant Associates (1994b). Unit costs of $0.09 per cubic yard were developed based on estimated amortized annual construction costs of $100,000 for the Mare Island site, which would have an annual capacity of 1.1 mcy, and annual costs of $90,000 for the Rio Vista Airport Borrow Pit site, with an annual capacity of 1.0 mcy. (Olejniczak pers. comm.)

- Planning, environmental assessment/impact report, engineering, design, and construction management costs were assumed to total 20% of site construction costs. Units costs were based on the estimated construction costs for the Mare Island and Rio Vista Airport Borrow Pit rehandling facility sites. (Olejniczak pers. comm.)

- Mitigation costs were derived from mitigation costs estimated for the Leonard Ranch and Cargill sites included as part of Gahagan & Bryant Associates' assessment of rehandling facilities. Mitigation costs for these two sites were amortized over 50 years and then divided by their assumed capacities to derive unit costs ranging from $0.35 to $0.93 per cubic yard. (Olejniczak pers. comm.)

Annual site operations and maintenance costs were estimated to range from $0.35 to $0.39 per cubic yard based on annual costs estimated at $390,000 for the Mare Island and Rio Vista Airport Borrow Pit rehandling sites. This includes monitoring actitivies. These costs were spread over the assumed capacities of these sites to derive the unit cost estimate. (Olejniczak pers. comm.)

The unit disposal costs shown in Table 6 for landfill cover disposal assume that total costs will vary in direct relationship to the volume of dredge material used for landfill cover and that unit costs will not vary as additional rehandling sites are developed for disposal.

TOTAL COST ESTIMATES FOR PLACEMENT ENVIRONMENT ALTERNATIVES

Total cost estimates were prepared for each of the four placement environment alternatives using the volumes shown in Table 3, the distribution of material among the three work categories shown in Table 5b, and the range of unit costs shown in Tables 6 and 7. Table 12 presents estimates of the cumulative costs of dredging and disposing of 237 mcy of material over the 50-year study period. Table 12 and Figures 1 and 2 provide summaries of average annual and cumulative costs, respectively. As mentioned above, monitoring costs for ocean, in-bay, and tidal wetland disposal are included in the total costs for each alternative, and allocated among the work categories by the relative percentage each category contributes to the placement environment.

The amount of variation in total costs that could occur varies across the scenarios because of the differences in volumes assigned to the different placement environments and the range in unit costs associated with each placement environment. The ranges associated with the unit costs roughly represent the potential variation in the total cost estimates for the alternatives.

The total variation between the lowest and highest total cost estimate (low end of No Action to high end of Alternative 3) is $1.93 billion over 50 years, or approximately $38.6 million annually. The difference between the lowest and highest estimated costs among the action alternatives, however, is $219.8 - $544.6 million over 50 years, or approximately $4.4 - 10.9 million annually. Among all the alternatives, including No Action, the low end of the highest cost alternative (Alternative 3) is lower than the high end of No Action.

These estimates of total costs are likely to be higher than actual costs due to many of the assumptions that were made in deriving the unit costs.

Table 12: Estimates of Total Costs, by Alternative and Work Category ($000) \a

ALTERNATIVE	Low Estimate	High Estimate
NO ACTION		
Maintenance	883.36	1481.89
New Work	222.07	372.12
Small	207.47	503.75
TOTAL	**1312.91**	**2357.76**
ALTERNATIVE 1		
Maintenance	1086.85	1734.87
New Work	267.41	426.70
Small	233.78	539.48
TOTAL	**1588.03**	**2701.06**
ALTERNATIVE 2		
Maintenance	1116.96	2006.16
New Work	282.32	492.22
Small	227.71	553.58
TOTAL	**1626.99**	**3051.96**
ALTERNATIVE 3		
Maintenance	1250.42	2147.21
New Work	310.93	522.66
Small	246.46	575.80
TOTAL	**1807.81**	**3245.67**

Notes:

a\ Total costs are derived from the unit costs presented in Tables 5 and 6, the assumed volumes presented in Table 2, and the relative distribution among the work categories as shown in Table 1.

b\ Total costs for In-bay disposal include the cost of monitoring. Monitoring costs are estimated by EPA and SFBCDC to equal on average $1.11 million per year, or $55 million over 50 years. Costs were allocated among the work categories according to the relative percentage of attributed to each work category.

c\ Total costs for Ocean disposal include the cost of monitoring. Monitoring costs were estimated by EPA and SFBCDC to equal on average $600,000 per year, or $30 million over the 50 year planning period. Costs were allocated among the work categories according to the relative percentage of attributed to each work category.

d\ Total costs for Tidal Wetland disposal include costs for site monitoring. Monitoring costs for Tidal Wetland restoration sites were estimated by SFBCDC to be $70,000 per year per project, with an average monitoring period of 15 years. Estimates of total monitoring costs were based on the number and timing of wetland site development estimated by SFBCDC. Total monitoring costs over the 50 years are estimated to equal $4.2 million for No Action and Alternative 1, and $10.5 million for Alternatives 2 and 3. Costs were allocated among the work categories according to the relative percentage of attributed to each work category.

DISTRIBUTION OF COSTS AMONG FEDERAL AND NON-FEDERAL SPONSORS

Distinguishing between changes in dredging/disposal costs that would be borne by the federal government versus non-federal local sponsors has important implications for the impact of overall cost changes on local firms and agencies. The proportion of total costs that would be the responsibility of the federal government versus non-federal project sponsors was estimated for each alternative by applying the following assumptions that simplify existing federal cost-sharing policies.

Overall, this analyis assumes that allocations of federal funding will meet projected cost increases in accordance with current laws and policies. However, it is possible that federal funding may not increase to meet higher dredging and disposal costs. If federal allocations for dredging operations and maintenance (O&M) in the region remain fixed, the Corps would have to prioritize its O&M work, or may balance increased costs with decreases in funds to other projects or sectors. These shifts would change the relative proportion of costs born by local sponsors, or could change the frequency and amount of dredging overall.

In-Bay and Ocean Disposal

Approximately 90% of major maintenance dredging is either dredged by the federal government (ACE, USCG, or USN) or is eligible for federal cost-sharing. For that 90% of material, the federal government was assumed to cover 100% of all costs, through cost-sharing funds, military budget allocations, and federal agency expenditures on disposal site development and monitoring. Local sponsors were assumed to pay 100% of the costs for dredging and disposing the remaining 10% of material generated by major non-federal dredging.

Approximately 90% of the material generated by New Work is eligible for federal cost sharing. The remaining 10% comes from the non-federal portions of new work projects, such as deepening berths and loading facilities. This is actually a high estimate: existing or proposed new work projects estimate that 2-8% of the material will come from berths. For that 90% of dredged material, the federal government was assumed to cover 75% of total costs and non-federal sponsors were assumed to be responsible for the remaining 25% of costs. For the remaining 10% of material, local sponsors were assumed to cover 100% of the total costs.

Federally authorized channels account for approximately 60% of small dredging projects (depths less than 12 ft below MLLW). It is assumed that the federal government would cover 100% of the dredging and disposal costs for that material. Other small dredging sponsors (such as marinas and homeowners associations) are assumed to pay 100% of the total costs for the remaining 40% of dredged material. This analysis assumes continued federal funding for dredging of shallow-draft recreational channels. It is important to note, however, that these projects do not have a high budgetary priority, so increases in costs, and potential decreases in available federal funding, may delay or preclude federal operations and maintenance on these channels. In that instance, local sponsors may have to bear a greater proportion of the cost of continued maintenance.

Disposal to Upland Sites

For disposal to upland, wetland, and reuse (UWR) sites (i.e., tidal wetlands restoration sites, levee restoration sites, and landfill sites), the federal government was assumed to pay for the proportion of costs represented by the least-cost alternative. For the purposes of this analysis, costs associated with disposal to the ocean site were assumed to represent least-cost conditions. It was assumed that the estimated percentage distribution to the in-bay site (between 20-40% of total material) represents the environmentally-acceptable capacity of the in-bay site. Once that capacity is reached, federal cost-sharing funds would then be allocated according to the next least-costly alternative, which is assumed to be ocean disposal. It must be noted, however, that depending on the project, upland disposal may actually qualify as the least cost alternative after in-bay site capacity is reached. In that case, total costs to both federal and non-federal sponsors would actually be lower than those calculated here.

Dredging and disposal costs above the least-cost condition were assumed to be entirely born by non-federal sponsors. In addition, all site development and management costs were assumed to be born by the local sponsor, except for in-bay and ocean disposal, in which case monitoring costs were allocated according to the relative percentage of material generated by federal activities (this actually overstates the cost to local sponsors, as the federal and local governments will pay for monitoring at these sites). The same federal/non-federal volume and cost-sharing allocations assumed above were then applied to calculate the total federal and non-federal costs of upland disposal.

The resulting estimates of federal and non-federal costs, presented in Table 13, are rough approximations of the distributions of future dredging and disposal costs. Many factors determine the actual split of costs between the federal government and local project sponsors. These costs should only be used to assess the relative change in federal and non-federal costs across the LTMS alternatives.

SUMMARY

This report provides estimates for the costs of dredging and dredged material disposal associated with the alternatives developed for the LTMS . These estimates could vary considerably and may not correspond with costs for particular projects or other scenarios. Possible variations in the unit costs are explained in the descripion of the individual factors that could affect the estimated costs. Total costs are affected by both the factors affecting unit costs and also by the simplifying assumptions explained on page 2. Some of the possible variations to consider include:

- Total costs for Alternatives 2 and 3 are likely to be lower than those presented here. Both alternatives have a goal of 40% of dredged material going to upland/wetland reuse. This analysis assumes that this percentage is possible over the entire 50 year planning period. In reality, it will likely take several years to develop both the policy framework to encourage increased UWR and to develop actual sites capable of accepting that amount of material.

- Increased experience with UWR development and disposal could shift unit costs and total development costs down over the long term. This analysis assumes current dredging,

Table 13: Estimate of Federal versus Non-Federal Costs, by Alternative

	Low Range			High Range		
Alternative	Fed	Non Fed	Total	Fed	Non Fed	Total
No Action						
Maintenance	762.25	121.11	883.36	1219.08	262.80	1481.89
New Work	170.52	51.55	222.07	279.59	92.53	372.12
Small	121.74	85.73	207.47	297.69	206.05	503.75
Total	1054.51	258.40	1312.91	1796.37	561.39	2357.76
Alternative 1						
Maintenance Work	935.40	151.45	1086.85	1409.50	325.37	1734.87
New Work	188.60	78.81	267.41	291.17	135.54	426.70
Small Dredger Work	136.69	97.09	233.78	317.69	221.79	539.48
Total	1260.68	327.35	1588.03	2018.36	682.69	2701.06
Alternative 2						
Maintenance	902.39	214.58	1116.96	1410.78	595.38	2006.16
New Work	188.75	93.57	282.32	291.40	200.81	492.22
Small Dredger	130.82	96.90	227.71	317.97	235.61	553.58
Total	1221.95	405.04	1626.99	2020.16	1031.81	3051.96
Alternative 3						
Maintenance	1022.50	227.92	1250.42	1537.73	609.48	2147.21
New Work	200.98	109.95	310.93	299.12	223.53	522.66
Small Dredger	142.07	104.40	246.46	331.30	244.50	575.80
Total	1365.55	442.26	1807.81	2168.15	1077.52	3245.67

Notes:

Cost share based on unit costs presented in Tables 4 and 5, volume estimates from Table 4, and relative distribution among work categories from Table 5b. Federal/non-federal cost shares estimated according to methodology explained in text.

testing, and development costs for all the placement environments.

- In addition, this analysis is based on the current regulatory and financial framework. Possible cost mitigation measures, such as allowing high-cost dredgers first access to low-cost disposal sites, could reduce the total costs for any of the options.

These cost estimates should be used as a relative, not absolute, measure of the costs associated with each alternative. They are meant to be descriptive.

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Description of Gahagan & Bryant Estimating Model and Model Output

DRAFT

Description of Estimating Model:

The model is proprietary in nature. The principals and associates of Gahagan & Bryant Associates, Inc. (GBA) have gained their knowledge and expertise by having worked in the dredging industry with Gagahan Dredging Corporation (founded in 1896) in addition to other Contractors. As consultants, GBA maintains their familiarity with current dredging practices and available plant through participation in various professional organizations such as WEDA and AAPA in addition to working for municipal, government and industry clients. The cost estimating model currently in use by GBA is extensive in nature and represents how a dredging contracting firm would prepare a bid for a construction contract. The input data used for the model is proprietary and is continuously updated based on market conditions and information gathered through consulting practice.

The cost estimating model calculates the total and unit cost to dredge, transport and place (or dispose) dredged material. The model uses operating, ownership, and production rates to calculate total project costs and unit costs.

Operating costs of the selected pieces of Contractor plant are developed on a per-month basis. These costs are proprietary in origin. Additionally, operating costs are developed that consider labor and benefits, and are based on the current local union agreement.

Ownership costs are developed on a per-month basis for each piece of contractor plant. The values used are present day purchase prices and represent current replacement costs. "Industry. Market Factors" refer to an evaluation of the state of the competition in the market place. This allows for a discretionary adjustment to be made to the computed ownership costs.

Production rates are based on observed operating characteristics of existing equipment similar to that equipment selected for the model. These rates are developed on a per month basis.

Combining the monthly costs with the monthly production rates results in a calculation of either the total cost or unit cost. The model uses a series of linked computerized spreadsheets for this accomplishment.

COST SUMMARY
MAINTENANCE DREDGING WITH DISPOSAL AT TIDAL WETLANDS WITH 10,000 FT. OF PIPELINE - SCENARIO 2
(21 CY Clamshell Dredge, with Lightly Loaded Scows, 20 N. Miles, Hydraulic Unloader and Boosters)

								Dredge	Transport	Placemer
Mobilization and Demobilization						$	627,000	176,668	221,642	228,69
Operating Costs										
1	Clamshell Dredge	1.00	Months @ $	268,211	268,211			268,211		
1	Hyd. Unloader	1.00	Months @ $	358,646	358,646					358,64
0	Booster Pump	1.00	Months @ $	144,040	0					
2	Towing Tug	1.00	Months @ $	224,232	448,464				448,464	
2	Tending Tug	1.00	Months @ $	80,840	161,680			80,840		80,84
1	Survey/Crewboat	1.00	Months @ $	43,039	43,039			43,039		
4	Dump Scows	1.00	Months @ $	6,250	25,000				25,000	
1	Shore Crew	1.00	Months @ $	140,555	140,555					140,555
1	Superv/Engrg	1.00	Months @ $	84,540	84,540			22,930	27,689	33,921
			Total Operating Costs			$	1,530,135	415,020	501,153	613,962
Ownership Costs										
1	Clamshell Dredge	1.00	Months @ $	171,079	171,079			171,079		
1	Hyd. Unloader	1.00	Months @ $	82,280	82,280					82,280
0	Booster Pump	1.00	Months @ $	16,255	0					0
2	Towing Tug	1.00	Months @ $	65,706	131,412				131,412	
2	Tending Tug	1.00	Months @ $	12,248	24,496			12,248		12,248
1	Survey/Crewboat	1.00	Months @ $	8,252	8,252			8,252		
4	Dump Scows	1.00	Months @ $	36,994	147,976				147,976	
			Total Ownership Costs		$ 565,495			191,579	279,388	94,528
	Market Factor @	50%					282,748	95,790	139,694	47,264
			Total Direct Costs			$	1,812,883	510,809	640,847	661,226
	Overhead @	15%					271,932	76,621	96,127	99,184
			Sub Total			$	2,084,815	587,431	736,974	760,410
	Contingency @	10%					208,482	58,743	73,697	76,041
	Profit @	15%					312,722	88,115	110,546	114,062
			Sub Total			$	2,606,019	734,288	921,217	950,513
	Bond @	0.5%					13,030	3,671	4,606	4,753
			Total Dredge Price			$	2,619,049	737,960	925,823	955,266
			2,619,049 Dredge Price $ / 436,000 Pay Cubic Yards/ Month			=	6.01 $/CY	1.69	2.12	2.19
			627,000 Mobilization Price $ / 1,500,000 Total Pay Cubic Yards			=	0.42 $/CY			

COST SUMMARY
MAINTENANCE DREDGING WITH DISPOSAL IN OCEAN - SCENARIO 2
(21 CY Clamshell Dredge, with Scows, 62 N. Miles)

							Dredge	Transport	Placement
Mobilization and Demobilization					$ 84,000		21,058	62,942	0
Operating Costs									
1	Clamshell Dredge	1.00	Months @ $	268,211	268,211		268,211		
0	Hyd. Unloader	1.00	Months @ $	434,486	0				0
0	Booster Pump	1.00	Months @ $	144,040	0				0
5	Towing Tug	1.00	Months @ $	224,232	1,121,160			1,121,160	
1	Tending Tug	1.00	Months @ $	80,840	80,840		80,840		
1	Survey/Crewboat	1.00	Months @ $	43,039	43,039		43,039		
7	Dump Scows	1.00	Months @ $	6,250	43,750			43,750	
0	Shore Crew	1.00	Months @ $	140,555	0				0
1	Superv/Engrg	1.00	Months @ $	84,540	84,540		21,289	63,251	0
			Total Operating Costs		$ 1,641,540		413,379	1,228,161	0
Ownership Costs									
1	Clamshell Dredge	1.00	Months @ $	171,079	171,079		171,079		
0	Hyd. Unloader	1.00	Months @ $	82,280	0				0
0	Booster Pump	1.00	Months @ $	16,255	0				0
5	Towing Tug	1.00	Months @ $	65,706	328,530			328,530	
1	Tending Tug	1.00	Months @ $	12,248	12,248		12,248		
1	Survey/Crewboat	1.00	Months @ $	8,252	8,252		8,252		
7	Dump Scows	1.00	Months @ $	36,994	258,958			258,958	
			Total Ownership Costs		$ 779,067		191,579	587,488	0
Market Factor @		50%				389,534	95,790	293,744	0
			Total Direct Costs		$ 2,031,074		509,169	1,521,905	0
Overhead @		15%				304,661	76,375	228,286	0
			Sub Total		$ 2,335,735		585,544	1,750,191	0
Contingency @		10%				233,574	58,554	175,019	0
Profit @		15%				350,360	87,832	262,529	0
			Sub Total		$ 2,919,669		731,930	2,187,738	0
Bond @		0.5%				14,598	3,660	10,939	0
			Total Dredge Price			$ 2,934,267	735,590	2,198,677	0
2,934,267 Dredge Price $ / 436,000 Pay Cubic Yards/ Month						6.73 $/CY	1.69	5.04	0.00
84,000 Mobilization Price $ / 1,500,000 Total Pay Cubic Yards						0.06 $/CY			

COST SUMMARY
MAINTENANCE DREDGING WITH DISPOSAL IN BAY - SCENARIO 2
(21 CY Clamshell Dredge, with Scows, 5 N. Miles)

								Dredge	Transport	Placem
Mobilization and Demobilization						$ 84,000		50,198	33,802	
Operating Costs										
1	Clamshell Dredge	1.00	Months @ $	268,211	268,211			268,211		
0	Hyd. Unloader	1.00	Months @ $	434,486	0					
0	Booster Pump	1.00	Months @ $	144,040	0					
1	Towing Tug	1.00	Months @ $	224,232	224,232				224,232	
1	Tending Tug	1.00	Months @ $	80,840	80,840			80,840		
1	Survey/Crewboat	1.00	Months @ $	43,039	43,039			43,039		
3	Dump Scows	1.00	Months @ $	6,250	18,750				18,750	
0	Shore Crew	1.00	Months @ $	140,555	0					
1	Superv/Engrg	1.00	Months @ $	84,540	84,540			52,195	32,345	
			Total Operating Costs			$ 719,612		444,285	275,327	
Ownership Costs										
1	Clamshell Dredge	1.00	Months @ $	171,079	171,079			171,079		
0	Hyd. Unloader	1.00	Months @ $	82,280	0					
0	Booster Pump	1.00	Months @ $	16,255	0					
1	Towing Tug	1.00	Months @ $	65,706	65,706				65,706	
1	Tending Tug	1.00	Months @ $	12,248	12,248			12,248		
1	Survey/Crewboat	1.00	Months @ $	8,252	8,252			8,252		
3	Dump Scows	1.00	Months @ $	36,994	110,982				110,982	
			Total Ownership Costs		$ 368,267			191,579	176,688	
Market Factor @		50%				184,134		95,790	88,344	
			Total Direct Costs			$ 903,746		540,074	363,671	
Overhead @		15%				135,562		81,011	54,551	
			Sub Total			$ 1,039,308		621,085	418,222	
Contingency @		10%				103,931		62,109	41,822	
Profit @		15%				155,896		93,163	62,733	
			Sub Total			$ 1,299,135		776,356	522,778	
Bond @		0.5%				6,496		3,882	2,614	
			Total Dredge Price				$ 1,305,631	780,238	525,392	

$$\frac{1{,}305{,}631 \text{ Dredge Price \$}}{436{,}000 \text{ Pay Cubic Yards/ Month}} = 2.99 \text{ \$/CY}$$

1.79 | 1.21

$$\frac{84{,}000 \text{ Mobilization Price \$}}{1{,}500{,}000 \text{ Total Pay Cubic Yards}} = 0.06 \text{ \$/CY}$$