



DWR WAREHOUSE

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July 25, 1997

CALFED Bay-Delta Program Office
1416 Ninth Street
Suite 1155
Sacramento, California 95814

To Whom It May Concern:

McLaren/Hart is pleased to submit ten copies of the proposal entitled "Measuring Chemicals and Indicators of Health in Delta Fish and Assessing the Risks of Accumulated Chemicals" to the CALFED Bay-Delta Program for consideration in response to the Request for Proposal for Category III funding.

If you have any questions, or need further information, please call me at (510) 748-5603.

Sincerely,

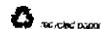
Patrick Sheehan, Ph.D.
Managing Principal Health Scientist

Enclosure

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I-003100

SECTION I: EXECUTIVE SUMMARY

F1-141

Project Title: Measuring Chemicals and Indicators of Health in Delta Fish and Assessing the Risks of Accumulated Chemicals
Applicant: McLaren/Hart 97 JUL 29 PM 1:42

Project Description and Primary Objectives

CALFED has identified improving water quality and enhancing fish population in the Delta a program goal, yet no substantive data are available on the accumulation of chemicals in fish in the Delta on which specific water quality improvement programs could be developed and their success evaluated. The proposed study is designed to measure the levels of toxic and persistent chlorinated organic chemicals and trace metals in sport and forage fish from the Delta region and biochemical and histological indicators of exposure and effects in these fish. These data will be used to characterize chemical concentrations in fish, to evaluate fish health, and to assess the risk the chemicals pose to fish populations, wildlife and human consumers of fish from the Delta. The study objectives are to:

1. Characterize the concentrations of a selected suite to toxic chemicals in fish;
2. Evaluate the general condition of sampled fish based on a morphological examination and measure of biochemical and histological indicators;
3. Assess the risks that accumulated chemicals may pose to fish populations;
4. Assess the risks that accumulated chemicals may pose to human consumers of sport fish; and
5. Assess the risks that accumulated chemicals may pose to piscivorous wildlife populations.

Approach/Tasks/Schedule

The proposed study is designed to gather a substantial amount and wide variety of chemical and indicator data for fish in the Delta by collecting and analyzing a small number of individuals of important sport and forage fish species and bivalves from 12 geographically dispersed locations in the region. These data will be evaluated to characterize local and regional water quality issues, indicators of fish health, and potential risks posed by chemical exposures within the Delta ecosystem fish-based food web. The Scope of Work includes the following tasks:

Task 1	Presampling Preparation
Task 2	Sample Collection
Task 3	Fish Condition Analysis
Task 4	Biomarker and Histopathological Analysis
Task 5	Chemical Analysis
Task 6	Evaluation of Fish Condition Data
Task 7	Evaluation of Biomarker and Histopathological Data
Task 8	Evaluation of Chemical Data
Task 9	Preliminary Assessment of Risks
Task 10	Report Preparation

All tasks are scheduled to begin and be completed in 1998. Sampling is scheduled to begin in June and will be timed to limit potential for impacts on salmon populations at specific locations. Analyses and data evaluations will follow sample collection and will be completed by the end of November and a report of results will be completed by the end of the year.

Justification for Project and Funding by CALFED

The proposed study addresses one of the key factors, exposure to chemical contaminants, which may affect the success of CALFED in meeting its goal of enhancing the populations of chinook salmon and other important fish species in the Delta. Chemical concentration in fish represent an indicator of water quality in the Delta, a measure of the exposure the fish has incurred and levels of chemicals to which piscivorous wildlife and human consumers of Delta fish may be exposed. These critical data are currently unavailable and are needed to assess the risks posed by chemicals in fish and to provide a basis for focusing chemical control measures and evaluating their success.

Budget Costs and Third Party Impacts

The estimated cost for implementing the project is \$364,150. This project will provide useful data to CALFED, the Central Valley Water Quality Control Board (CVRWQCB), San Francisco Bay Regional Water Quality Control Board (SFRWQCB), State Water Resource Control Board (SWRCB), California EPA Office of Environmental Health and Hazard Assessment (OEHHA), California Department of Fish and Game (CDFG) and U.S. Environmental Protection Agency (USEPA). No negative impacts on third parties are expected.

Applicant Qualifications

McLaren/Hart, Inc. (M/H) has conducted cost-effective and successful investigations, risk assessments and restorations at more than 100 aquatic sites in the United States including more than 20 sites in California and sites in the Central Valley and San Francisco Bay Regions. The ChemRisk Division of M/H is recognized for its ecological and human health risk assessment capabilities and its evaluations of chemical exposures of aquatic organisms, wildlife, and humans using habitat at complex contaminated sites. M/H subcontractors, Applied Marine Sciences (AMS) and the Water Pollution Control Laboratory (WPCL) have demonstrated expertise in evaluating the effects of chemicals on fish and the analysis of chemicals in fish tissues, respectively.

Monitoring and Data Evaluation

The project will constitute a first year monitoring of chemicals in fish for the Toxic Substances Monitoring Program. Data from the proposed study will be used to statistically characterize the concentration of chemicals of interest in Delta fish, characterize the exposure and effects of chemicals on the fish and to assess the potential risks of the accumulated chemicals on piscivorous wildlife and human consumers of fish.

Local Support/Coordination with Other Programs/Compatibility with CALFED Objectives

The objectives of the proposed study are supported by California environmental agencies. The proposed study is compatible with CALFED Water Quality Committee and the Ecosystem Restoration Committee objectives to improve water quality and sustainable fish populations in the Delta. The study will provide useful data for the CVRWQCB, SWRCB, OEHHA, and USEPA to identify specific water quality concerns and assess the potential risks associated with the accumulation of chemicals in fish in the Delta region. The proposed study will provide data on chemicals in fish which is compatible with, and of equivalent quality to, that collected as part of the Toxic Substance Monitoring Program, Sacramento Watershed Monitoring Program, and San Francisco Bay Regional Monitoring Program.

SECTION II: TITLE PAGE

Title of Project: Measuring Chemicals and Indicators of Health in Delta Fish and Assessing the Risks of Accumulated Chemicals

Applicant: McLaren/Hart

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Type of Organization: Environmental Consulting

Tax Status: Corporation

Tax Classification Number: 942433310

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Collaborators: Applied Marine Sciences (Fish collection and biomarkers analyses)
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Water Pollutants Control Laboratory (Chemical Analysis)
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David Crane
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RFP Project Type: Other Services

SECTION III: PROJECT DESCRIPTION

A. Project Description and Approach

Water quality is one of the key factors identified by CALFED that influences the success of fish populations in the Sacramento-San Francisco Delta. The accumulation of chemicals in fish represents an index of their exposure. Chemicals accumulated in fish may directly affect the exposed fish populations or indirectly affect piscivorous wildlife and sport fishermen that consume these fish. There are currently three programs focused on measuring chemical residues in fish: 1) the Toxic Substances Monitoring Program; 2) the Sacramento Watershed Program; and 3) the San Francisco Bay Regional Monitoring Program, however, none of these programs includes fish from the Delta. This study proposes to fill this critical data gap. The proposed study will provide baseline data on the concentrations of persistent chemicals and measures of biomarkers in the tissues of fish from the Delta, a screening assessment of the potential risk accumulated chemical in fish pose to sampled fish populations, piscivorous wildlife and human consumers of sport fish. The model for the design of a longer-term monitoring program of chemicals in fish in the Delta to assess the success of future water quality improvement programs and to support CALFED restoration projects.

The proposed study has five primary objectives which are to:

- 1) Characterize the concentrations of a selected set of persistent organic chemicals and trace metals in the tissues of forage and sport fish;
- 2) Evaluate the general condition of sampled fish based on a morphological examination and measurement of biochemical histological indicators;
- 3) Assess the risks that accumulated tissue levels of chemicals may pose to fish populations;
- 4) Assess the risks that accumulated chemicals may pose to human consumers of sport fish from the Delta; and
- 5) Assess the risks that accumulated chemical may pose to piscivorous wildlife foraging on fish from the Delta.

To provide cost-effective monitoring to meet the multiple objectives described above, the proposed study is designed to gather a substantial amount and a wide variety of data from an intensive analyses of a relatively small number of fish of representative species. Samples of four fish species and one bivalve will be collected from 12 locations during the summer of 1998. The fish will be examined externally and internally for morphological abnormalities including tumors. Tissue samples will be analyzed for biomarkers of exposure and histological evidence of effects. Liver and the muscle fillet tissue from sport fish, whole forage fish and the soft tissue of bivalves will be chemically analyzed for PCBs, nine chlorinated pesticides and three trace metals (mercury, arsenic and selenium) previously identified as chemicals of potential concern in the Central Valley and San Francisco Bay regions. These data will be entered into an electronic database, statistically characterized and used to assess the health of the fish populations, and potential risks of chemical exposures to fish, piscivorous wildlife, and anglers. A complete report of final results and electronic database will be provided at the completion of the study. The specific features of the proposed study and supporting rationale are described below.

Species to be Sampled

Sport Fish

Striped Bass
(*Roccus saxatilis*)
White Catfish
(*Ameirus catus*)
Largemouth Bass

Forage Fish

Splittail
(*Pogonichthys macrolepidotus*)
Inland Silverside
(*Menidia beryllina*)
Sacramento Sucker

Bivalves

Asiatic Clams
(*Potamocorbula amurensis*)
(*Corbicula manilensis*)

Species to be Sampled (continued)

<i>(Micropterus salmoides)</i>	<i>(Catostomus occidentalis)</i>
White Sturgeon	Tule Perch
<i>(Acipenser transmontanus)</i>	<i>(Hysterocarpus traski)</i>
	Threadfin Shad
	<i>(Dorosoma pentense)</i>

Justification

The sport fish proposed for sampling are either top predators or important bottom feeders in the Delta or its primary tributaries. Striped Bass and White Sturgeon (as a surrogate for the Green Sturgeon) are species of special interest to the CALFED program. Historical data on chemicals in tissues are currently available for White Catfish and Largemouth Bass as part of the Toxic substances Monitoring Program for the Central Valley Region (SWRCB, 1995). The forage fish species proposed for sampling are important prey for piscivorous wildlife in the Delta food web. Splittail are priority species for the CALFED program. Asiatic clams are immobile accumulators of chemicals and an important food source for bottom feeding fish such as White Sturgeon.

Sampling Locations

Delta Tributaries Locations - Colusa Drain, Sacramento River (Hood), Mokelumne River (Rancho Marina), San Joaquin River (Vernalis and Stockton)

Delta Locations - Prospect Slough, Cache Slough, Sacramento River (Rio Vista and Isleton), Old River (Discovery Bay), Middle River (Bull Frog Landing), San Joaquin River (Antioch)

Justification

These locations represent agricultural and municipal source areas and tributaries at the edge of the Delta and are geographically distributed locations across the Delta. Delta locations are adjacent to major source areas within the Delta and include tidal aquatic, instream aquatic and emergent wetland habitats identified by CALFED as providing substantial ecosystem benefits to fish species.

Parameters to be Measured

Fish Condition Observations

Fish will be examined externally and internally for abnormal conformation, organ appearance, tumors and parasites. The approach and methods used will be consistent with those of the National Biological Services Biomonitoring of Environmental Status and Trends Program (NBS, 1995).

Biomarker and Histopathological Analysis

The two most widely used indicators of chemical exposure and effects in fish are the induction of P450 enzymes (Stegeman and Kloepper-Sams, 1987) and histopathological alteration of tissues (Hinton et al., 1992). Both are sensitive to alteration or induction by chemical exposure, and positive assay results indicate increased risk of effects. Because they indicate increased risk to the population, they serve as important bridges between measured body burdens in the fish and their effects. Spies and Rice (1988) have linked induction of P450 in starry flounder in San Francisco Bay to inhibition of reproductive success. Biomarker and histopathological analysis will be conducted on the liver, gill and kidney of fish from each collection site.

Chemicals in Tissues

Concentrations of the listed chemicals will be measured in the liver, fillet and whole fish tissues.

Chlorinated Organics

DDT (total)
PCBs (congeners and aroclors)
Aldrin
Chlordane
Dieldrin
Endrin
Heptachlor
Heptachlor epoxide
Lindane
Hexachlorocyclohexane
Endosulfan
Toxaphene

Trace Elements

Mercury
Selenium
Arsenic

Justification

These chemicals were previously identified as chemicals of interest by the CVRWQCB and SWRCB for the Toxic Substances Monitoring Program. The SFBRWQCB has identified selenium, mercury, PCBs, DDT, dieldrin and chlordane as chemicals (chemical groups) of concern in Bay fish. Mercury, PCB, DDT, chlordane and toxaphene were identified as chemicals of concern by the CALFED Water Quality Committee.

Data Evaluation

Morphological, histological and biomarker results will be summarized in an electronic database and compared to reported data on background incidence of these anomalies to assess fish condition. Concentrations of chemicals in whole fish and fish livers will be summarized in an electronic database, characterized statistically, and compared to critical tissue residue levels for these chemicals in fish reported in the literature. The evaluation approach will follow that described by McCarty et al (1992) and Rand et al (1995). Concentrations of chemicals in fish fillets will be summarized in an electronic database and compared to maximum tissue residue levels for the protection of human consumers of fish to assess potential risks to anglers (SWRCB, 1995). Concentrations of chemicals in whole forage fish will be compared to tissue residue target levels for the protection of piscivorous wildlife to assess potential risks to wildlife. This evaluation will follow the methods described by ChemRisk (1997).

B. Location of the Project

The project is focused on the Sacramento-San Joaquin Delta and its primary tributaries. Proposed locations for fish monitoring are shown in Figure 1 and are listed above. They include locations in Yolo, Solano, Sacramento, San Joaquin and Contra Costa counties representing the Yolo Basin, San Joaquin Basins and Delta Basin.

C. Expected Benefits

The proposed study will provide baseline data on chemical residues and indicators of health in fish in the Delta and a screening evaluation of the significance of the accumulated chemicals on fish and the wildlife and human consumers of fish. The proposed study is focused on fish, the aquatic community of primary interest to CALFED during the early implementation phase of restoration projects, including some of the priority species (White Sturgeon for the Green Sturgeon and Splittail) and other species of interest (Striped Bass) as well as other ecologically and recreationally important fish species in the Delta. The study is focused on three of the seven habitat types of interest to CALFED; tidal perennial aquatic, instream aquatic and emergent

wetlands. The study will characterize chemicals in fish to identify water quality concerns in the Delta Basin and to provide a basis for assessing the effects of future water quality improvement projects. The study will also provide a screening level evaluation of the risks posed by accumulated chemicals to Delta fish populations and human and wildlife consumers of Delta fish. It is expected that the data from the proposed study would be of considerable value: 1) the CALFED Water Quality Committee and CVRWQCB in focusing further water quality studies and control programs; 2) the CALFED Ecosystem Restoration Committee, CDFG, and U.S. Fish and Wildlife Service in evaluating the risks of chemical exposures to fish and piscivorous wildlife populations in the Delta; and 3) OEHHA and the USEPA in evaluating chemical exposures to human consumers of fish from the Delta.

D. Background and Technical Justification

The Delta provides habitat to many fish species, several of which are the focus of the CALFED Ecosystem Restoration Program. The Delta has for years received chemical inputs from various municipal, industrial and agricultural sources. The Toxic Substances Monitoring Program reports concentrations of arsenic, chlordane, DDT and PCBs in fish in the Sacramento and San Joaquin Rivers upstream of the Delta exceeding Maximum Tissue Residue Levels for the protection of human consumers of fish (SWRCB, 1995). The Bay Protection and Toxic Cleanup Program has reported PCBs, mercury, DDT, and dieldrin in fish in the San Francisco Bay at levels which may be of concern. Chemicals accumulated in fish may affect the fish and the consumers of these fish. However, there are no historical or current monitoring programs measuring the levels of chemicals in fish from the Delta. The proposed monitoring study is intended to fill this critical data gap by providing essential baseline data on chemical concentrations in fish tissue. Such data will be used to identify Delta wide and local water quality issues and the chemicals which may pose significant risks to fish and wildlife and human consumers of fish from the Delta. There are no indications that current monitoring programs such as the Toxic Chemicals Monitoring Program or San Francisco Bay Fish Contamination Committee Regional Monitoring Program currently have an interest in or plans to extend their current monitoring activities into the Delta region covered by the proposed study. The proposed monitoring study is a new project, however, it is modeled after ongoing programs, such as the Toxic Substance Monitoring Program, and will employ similar sampling, analytical and quality assurance procedures and a model for future Delta fish monitoring.

E. Proposed Scope of Work

The proposed monitoring program is designed to be implemented in five phases:

- Phase I Presampling Preparation
- Phase II Sample Collection
- Phase III Sample Preparation and Analysis
- Phase IV Data Evaluation and risk Assessment
- Phase V Report Preparation

The specific tasks constituting each phase of the monitoring program are described below.

Phase I

Task 1 - Presampling Preparation

Prior to implementing the monitoring program, any necessary changes in the study design to make it more useful to CALFED and agency users of the data, and/or necessary modifications to the collection permit currently held by AMS to make it acceptable to CDFG will be made. We believe this would require one meeting each between M/H and CALFED, CVRWQCB and CDFG staff.

Phase II

Task 2 - Sample Collection

Three individual samples of each top predator (striped bass or largemouth bass) and bottom foraging (sturgeon, white catfish) sport fish, within the legal size range, 9 to 15 individuals each of two species of forage fish, 4 to 8 inches in length, and approximately 100 Asiatic clams will be collected, if available, at each of the 12 sampling locations. Fish will be collected by one or several methods (hook and line, seine, trawl, gill net, electroshocker) as suited to the species and habitat being sampled and the specifications of the collection permit. Clams will be collected with a surface sediment grab sampler. Samples will be collected by AMS and M/H staff.

Phase III

Task 3 - Fish Condition Analysis

Fish will be weighed, measured, and then examined externally and internally for tissue and organ anomalies, tumors and other evidence of disease and parasites. Examination methods will be consistent with those used by the NBS for the Biomonitoring of Environmental Status and Trench Program (NBS, 1995). Examinations will be performed by AMS.

Task 4 - Biomarker and Histopathological Analysis

For three representatives of each fish species collected at each of the 12 locations and a total of 144 samples, biomarker and histological analyses will be performed. The level of induction of P450 enzymes and incidence of histopathology anomalies will be measured in the liver, gill and kidney tissue of each fish according to the method described in Spies et al. (1995). Analysis will be performed by AMS.

Task 5 - Chemical Analysis

A total of 13 samples of tissue from each of the 12 sampling locations, or a total of 156 samples, will be analyzed for the chlorinated organic chemicals and trace metals previously listed. This represents the analysis of one composite sample of liver and muscle fillet tissue from the two species of sport fish, three composite samples of whole fish for two species of forage fish and three replicate composite samples of clam tissues. Fish tissue also will be analyzed for lipid content. The analyses will be conducted by the Water Pollution Control Laboratory using standard USEPA methods, and appropriate quality assurance/quality control procedures including blank, spike, duplicate and standard tissue reference material analyses.

Phase IV

Task 6 - Evaluation of the Fish Condition Data

Data from the examination of fish condition will be entered into an electronic data base and the incidence of specific anomalies in Delta fish will be compared to literature reports on the incidence of these anomalies in other fish populations.

Task 7 - Evaluation of Biomarker and Histopathological Data

Biomarkers and histopathological data will be entered into an electronic database, statistically characterized and compared to literature data on these markers of exposure and effect.

Task 8 - Evaluation of Chemical Data

Chemical data for fish and shellfish tissues will be entered into an electronic data base and statistically characterized. For sport fish, concentrations will be characterized by species and foraging habit for the region as a whole, to account for the wide range of individuals of these species. For the less wide ranging forage fish and immobile clam, concentrations will be characterized by species and location to evaluate taxonomic and locations specific differences.

Task 9 - Preliminary Assessment of Risks

Potential risks posed by exposures to the chemicals in fish tissues will be assessed for fish populations, piscivorous wildlife populations and human fish consumers using USEPA risk assessment methods. These assessments will be screening level evaluations based on comparing tissue concentrations of specific chemicals with no effect, or risk-specific levels, estimated from published toxicity data and assume exposure patterns.

Phase V

Task 10 - Report Preparation

A final report of study methods, results and risk assessments will be prepared and submitted to CALFED. We anticipate that the report would be complete within 60 days of receipt of all data and by the end of 1998.

F. Monitoring and Data Evaluation

The proposed project is, to a large extent, a single year of a fish tissue monitoring program. The sampling and analytical approaches proposed to measure levels of chemicals in fish are consistent with those used in ongoing fish tissue monitoring programs such as the Toxic Substances Monitoring Program, Sacramento Watershed Monitoring Program, and San Francisco Bay Region Monitoring Program. The assessment methods proposed to evaluate risks to fish and wildlife populations and human fish consumer are consistent with those currently used by the U.S. EPA, Cal EPA, and the SWRCB. Toxicity reference values for specific chemicals will be taken from the peer-reviewed literature and agencies guidance. If the data and evaluations from the proposed study are sufficient and compelling, then these will be written as a manuscript for publication at the cost of the investigation.

G. Implementability

The monitoring study will be conducted in accordance with relevant laws and regulations, and in a manner protective of threatened and endangered species in the Delta region. The collection permit currently held by AMS will be modified as necessary to meet CDFG requirements for sampling. Fish sampling will be scheduled, in as far as possible, to limit impacts on salmon when they are in the tributaries and Delta.

LEGEND:
● SAMPLING LOCATION

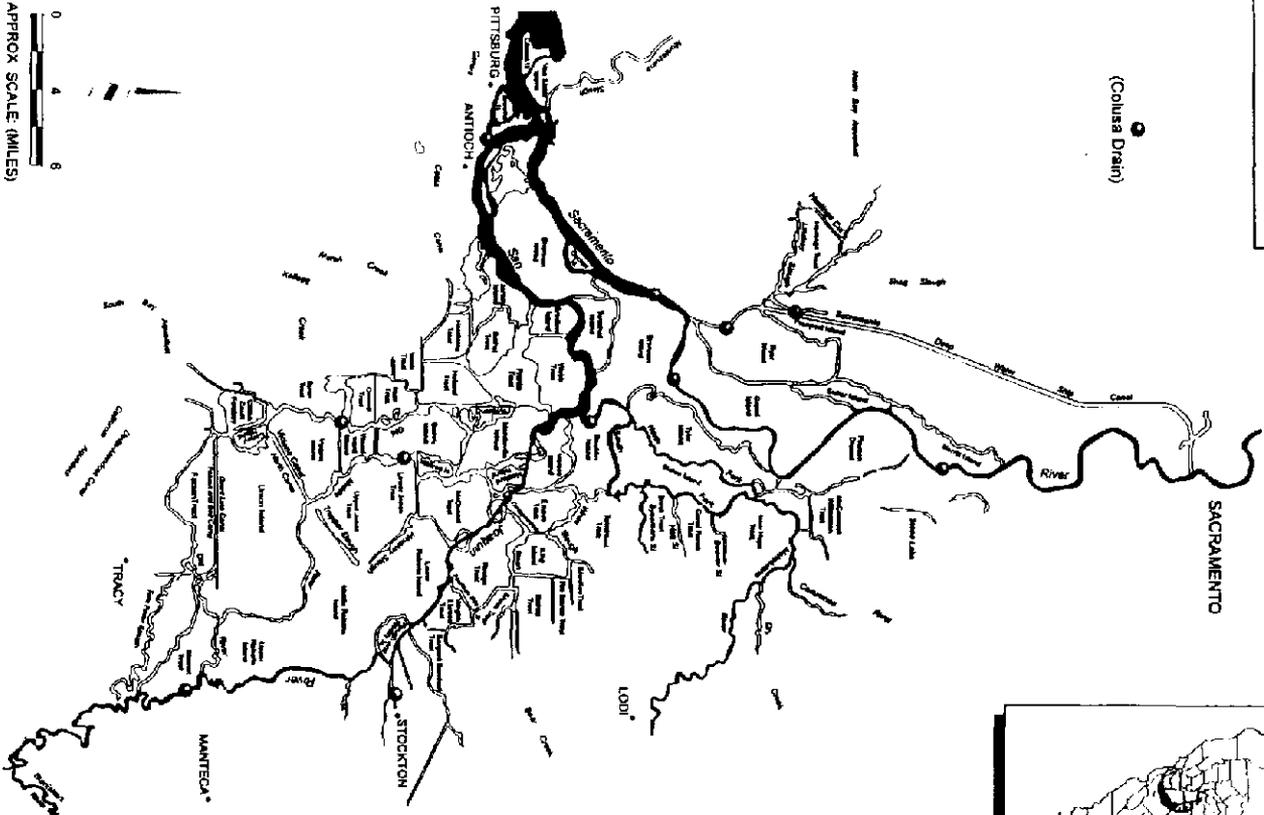


FIGURE 1

PROPOSED FISH SAMPLING
LOCATIONS IN THE DELTA REGION



ChemRisk
A Division of MCL/STP/HAZ

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IV. COSTS AND SCHEDULE TO IMPLEMENT PROJECT

A. Budget Costs

The estimated costs for implementing the proposed project are summarized in Table 1. Cost estimates are provided for each of the tasks described in the Proposed Scope of Work. M/H projected hours and rates are described as directed in the cost breakdown table. Cost for sampling, analysis and evaluation provided by AMS and the WPCL are identified as service contracts. These estimates were checked for cost competitiveness. Pricing assumes the contract will be a cost plus fixed fee arrangement. Direct salaries shown are average wage and benefit rates for labor classes and are used for the purpose of estimating costs. Actual salaries of persons used in this project will be billed for tasks. All other direct costs (service materials and miscellaneous costs) includes a 10% fee. We request all project costs be funded from Category III funds.

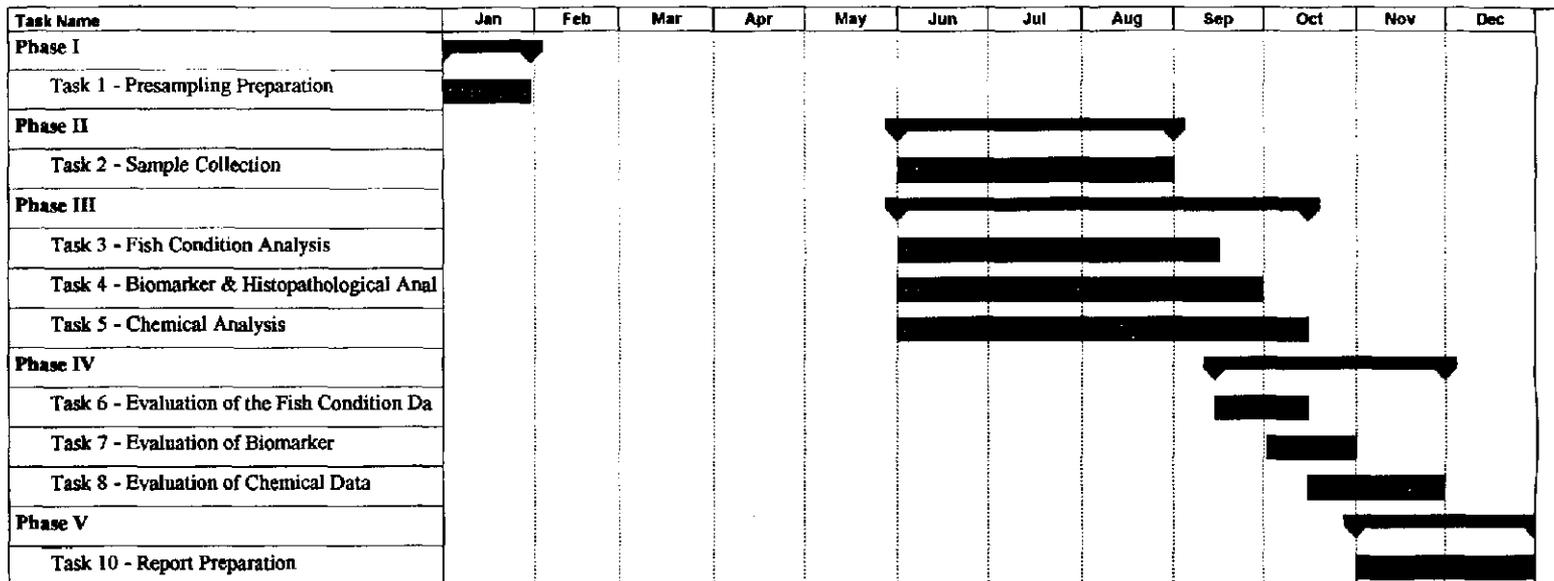
B. Schedule Milestones

The start and completion dates for the 10 project tasks are identified in Figure 2. We anticipate that the project would be staffed immediately on acceptance of the scope of work and completion of contracting arrangements. Sampling is scheduled to begin in June 1998 and would be completed by the end of August. Sample preparation and analysis will immediately follow sample collection and the full suite of analysis for a sample will be completed within 45 days of its collection. All analyses will be completed by September 15. All data evaluation and risk assessments will be completed by November 15. The final report will be prepared and submitted by December 22, 1998.

We request that payments be made upon completion of each task. A one page progress report will be submitted along with the invoice for the task.

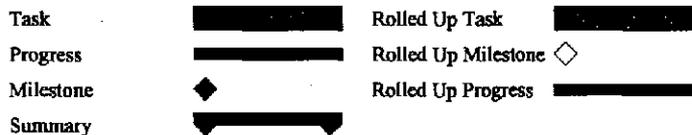
C. Third Party Impacts

No negative impacts to third parties are anticipated with the proposed project. We believe there could be benefits achieved by coordinating sampling for this study with other program collecting fish in the Delta.



1-003112

Figure 2
Measuring Chemicals and Indicators of Health in Delta
and Assessing the Risk of Accumulated Chemicals



1-003112

Table I
Cost Breakdown Table

Project Phase and Task	Title	Direct Labor Hours	Direct Salary and Benefits	Overhead Labor (General Admin and Fee)	Sub Total Labor	Service Contracts	Miscellaneous and Other Direct Costs	Total Cost
Phase I								
Task 1- Presampling Preparation	Chief Principal Health Scientist	16	\$83	\$252	\$4,027		\$198	\$4,225
	Applied Marine Sciences					\$2,002		\$2,002
	Total Task 1							\$6,227
Phase II								
Task 2- Sample Collection	Aquatics Senior Technician	144	\$22	\$67	\$9,627		\$1,939	\$11,566
	Applied Marine Sciences					\$21,470		\$21,470
	Total Task 2							\$33,036
Phase III								
Task 3- Fish Condition Analysis	Assistant Environmental Scientist	40	\$20	\$59	\$2,360		\$71	\$2,430
	Applied Marine Sciences					\$5,069		\$5,069
	Total Task 3							\$7,499
Task 4- Biomarker and Histopathological Analysis	Chief Principal Health Scientist	2	\$83	\$252	\$503		\$15	\$518
	Assistant Environmental Scientist	4	\$20	\$59	\$236		\$7	\$243
	Applied Marine Sciences					\$66,000		\$66,000
	Total Task 4							\$66,761
Task 5- Chemical Analysis	Chief Principal Health Scientist	2	\$83	\$252	\$503		\$15	\$518
	Assistant Environmental Scientist	16	\$20	\$59	\$944		\$28	\$972
	DFG Water Pollution Control Lab					\$165,594		\$165,594
	Total Task 5							\$167,085
Phase IV								
Task 6- Evaluation of Fish Condition Data	Chief Principal Health Scientist	2	\$83	\$252	\$503		\$15	\$518
	Senior Health Scientist	12	\$40	\$122	\$1,463		\$44	\$1,507
	Assistant Environmental Scientist	40	\$20	\$59	\$2,360		\$71	\$2,430
	Secretary	56	\$17	\$51	\$2,863		\$86	\$2,949
	Applied Marine Sciences					\$2,101		\$2,101
	Total Task 6							\$9,505
Task 7- Evaluation of Biomarker and Histopathological Data	Chief Principal Health Scientist	6	\$83	\$252	\$1,510		\$45	\$1,555
	Assistant Environmental Scientist	48	\$20	\$59	\$2,831		\$85	\$2,916
	Applied Marine Sciences					\$1,777		\$1,777
	Total Task 7							\$6,248
Task 8- Evaluation of Chemical Data	Chief Principal Health Scientist	16	\$83	\$252	\$4,027		\$121	\$4,148
	Senior Health Scientist	48	\$40	\$122	\$5,852		\$176	\$6,027
	Assistant Environmental Scientist	80	\$20	\$59	\$4,719		\$142	\$4,861
	Total Task 8							\$15,036

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Table 1
Cost Breakdown Table

Project Phase and Task	Title	Direct Labor Hours	Direct Salary and Benefits	Overhead Labor (General Admin and Fee)	SubTotal Labor	Service Contracts	Miscellaneous and Other Direct Costs	Total Cost
Task 9- Preliminary Assessment of Risks	Chief Principal Health Scientist	20	\$83	\$252	\$5,034		\$151	\$5,185
	Senior Health Scientist	60	\$40	\$122	\$7,314		\$219	\$7,534
	Associate Health Scientist	80	\$26	\$79	\$6,292		\$189	\$6,481
	Assistant Environmental Scientist	100	\$20	\$59	\$5,899		\$177	\$6,076
	Secretary	40	\$17	\$51	\$2,045		\$61	\$2,106
	Total Task 9							\$27,381
Phase V								
Task 10- Report Preparation	Chief Principal Health Scientist	16	\$83	\$252	\$4,027		\$121	\$4,148
	Senior Health Scientist	40	\$40	\$122	\$4,876		\$146	\$5,023
	Associate Health Scientist	48	\$26	\$79	\$3,775		\$113	\$3,888
	Assistant Environmental Scientist	80	\$20	\$59	\$4,719		\$142	\$4,861
	Secretary	20	\$17	\$51	\$1,022		\$31	\$1,053
	Applied Marine Sciences					\$6,400		\$6,400
	Total Task 10							\$25,372
Total Project Cost								\$364,149

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V. APPLICANT QUALIFICATIONS

M/H will act as the prime contractor on the proposed project. McLaren/Hart will provide staff and resources to manage all technical and administrative aspects of the project. They will provide interface with the Category III contracting entity and will coordinate implementation of the project with subcontractors, AMS and WPCL. M/H staff will contribute technically to the fish sampling, fish condition analysis, data evaluation, risk assessment and report preparation tasks.

M/H and its ChemRisk Division have successfully completed contaminant investigations, human health and ecological risk assessments and restoration projects at more than 100 sites with aquatic habitat across the United States including evaluations at more than 20 locations in California and sites in the San Francisco Bay and Central Valley. Many of the studies have included fish sampling, the analysis of chemical in fish tissue and the assessment of risk to fish, wildlife, and human populations. M/H has recently completed two multiyear fish tissue monitoring programs in contaminated estuaries. Virtually all of M/H's assessments have been accepted by regulatory agencies. In addition, M/H staff, in the conducting of these assessments, have made a substantial contribution to the development of contaminant evaluation and risk assessment methods and data.

AMS, as subcontractor to M/H, will be responsible for fish sampling, fish condition analysis and biomarker and histopathological analyses. AMS staff have unique skills in the evaluation of exposure and effects of chemicals on fish. They have pioneered the use of biomarkers to assessing the exposure of fish to chlorinated organic chemicals and petroleum hydrocarbons. They have conducted numerous evaluations of the effects of chemicals on fish populations in the San Francisco Bay region. AMS currently manages the Regional Monitoring Program for toxic contaminants in the San Francisco Bay. These unique skills and experiences make AMS an important and irreplaceable member of the project team.

The WPCL, as a subcontractor to M/H, will be responsible for the chemical analysis of fish tissues. As the laboratory for the Toxic Substances Monitoring Program in California, the WPCL is uniquely qualified and prepared to conduct the proposed chemical analyses. There is no other laboratory within the state that has as much experience in the preparation and analysis of fish samples as the WPCL.

The project organization is described in Figure 3.

Dr. Patrick Sheehan will serve as Project Manager. He will have direct responsibility for all operational aspects of the project including overall technical direction and ensuring that scheduling and budgetary constraints are met.

Dr. Sheehan is Practice Area Director for ChemRisk in the Western Region and National Practice Area Director for Ecological Risk Assessment for ChemRisk. He is responsible for developing projects, staff and methods for ChemRisk's ecological risk assessment group on a nationwide basis. Dr. Sheehan authored one of the first text books on ecotoxicology and has earned a national and international reputation as an ecologist/ecotoxicologist and ecological risk assessor. Dr. Sheehan has directed and provided oversight for human health and ecotoxicological risk assessments at numerous CERCLA and RCRA sites including some of the more high profile sites in the United States. He administers a variety of projects evaluating the risks of chemicals in soil, water, sediments and air. Studies directed by Dr. Sheehan have included benthic community assessments, toxicity testing, toxicity identification evaluations, risk allocation evaluations, wildlife exposure assessments, probabilistic uncertainty analyses and wetland evaluations. He has also developed new methods for measuring hexavalent chromium in air, evaluating leaching of chemicals from

soil to sweat on the skin, and assessing the probabilities of exposure to wildlife foraging occasionally in contaminated areas. He frequently interacts with local, state and federal regulatory agencies and has testified before government panels on risk assessment issues. Dr. Sheehan's assessments have produced accurate and representative characterization of exposures and risks, and subsequently have supported cost-effective remediation of contaminated sites and the permitting of innovative remediation technologies.

Mr. John Gold will act as Fish Sampling and Fish Condition Analysis Coordinator. He will be responsible for managing the logistical arrangements for sampling, coordinating sampling and sample handling activities in the field and for overseeing the analysis of fish conditions.

Mr. Gold has been involved in diverse marine biological studies for the past eleven years, with experience in nearshore, offshore, and laboratory investigations. Since joining AMS in November of 1993, Mr. Gold has been the primary investigator of transplanted bivalve condition for one of the country's largest estuarine monitoring programs, and is one of the lead field researchers investigating anthropogenic contaminant concentrations among resident bivalves at Point Reyes National Seashore. Mr. Gold is taking the lead role in assessing the suitability of *Ostrea lurida* (the native oyster on the west coast of North America) for bivalve bioaccumulation studies in San Francisco Bay. He was also responsible for collection and reporting NOAA National Status and Trends Mussel Watch Program, and is currently managing field sampling, laboratory analysis, and reporting for a sediment contamination investigation, and benthic habitat project effects assessment portion of an environmental impact document being produced for Marin County California.

Dr. Robert Spies will act as Biomarker and Histopathological Analysis Coordinator. He will oversee the preparation of tissue samples, biomarkers and histopathological analyses and the evaluation of those data.

Dr. Spies is president of AMS and a nationally know expert on the effects of chemicals on fish. Dr. Spies has studied the fate and effects of petroleum hydrocarbons in coastal ecosystems of California for over 20 years. He managed a major research program investigating the effects of organic contaminants and histopathological abnormalities on reproduction of stary founder in San Francisco Bay, a multidisciplinary study on the fate and effects of petroleum hydrocarbons from a natural petroleum seep, and a study on the hard-bottom communities in the Santa Maria Basin Oil Field development area. He was the Principal Investigator for a study of the occurrence of polynuclear aromatic hydrocarbons in the sediments in San Francisco Bay and in charge of a project applying accelerator mass spectrometry to marine ecology. Dr. Spies has investigated the fate of radionuclides in coastal and coral atoll ecosystems and investigated the accumulation of petroleum hydrocarbons by bivalves and the induction of P-450 enzymes in fish following a large oil spill in the San Francisco Bay. He has studied biochemical and physiological indicators of contaminant exposure in feral fish and investigated the effects of polynuclear aromatic compounds on striped bass. He has investigated the effects of DDT and PCB on reproduction of Kelp Bass in southern California, the effects of organic contaminants on biomarkers in San Francisco Bay flatfish, and has served as chief science advisor to the government on the Exxon Valdez oil spill.

Mr. David Crane will act as Chemical Analysis Coordinator. He will be responsible for the chemical analysis of fish tissue samples, the maintenance and documentation of quality assurance for the analyses and reporting of these data.

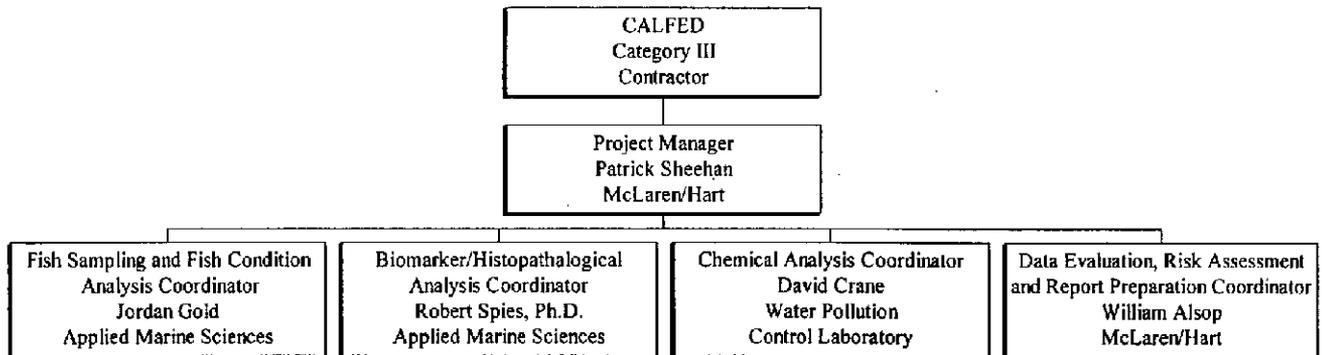
Mr. Crane has supervised the WPCL chemistry laboratory for three years and has over 17 years of experience in environmental analytical chemistry. He has a graduate degree in chemistry and extensive experience in the analysis of inorganic, synthetic organic, and petroleum hydrocarbon environmental pollutants including

several years of gas chromatography-mass spectrometry experience. He has presented findings in technical reports and a peer-reviewed publication. He has had formal training in QA/QC principles and procedures and in CLP laboratory auditing. He has coordinated several interlaboratory calibrations and represented the DFG laboratories at intercalibration workshops.

Mr. Bill Alsop will function as Data Evaluation, Risk Assessment and Report Preparation Coordinator. He will be responsible for managing the project data, the statistical characterization of these data, evaluation of risk to fish, wildlife and human consumers of fish and the preparation of the final report of study results.

Mr. Alsop is a Senior Health Scientist with the ChemRisk Division of McLaren/Hart in Alameda, California. In his position, Mr. Alsop is responsible for managing both human health and ecological risk assessment projects, as well as providing technical expertise on water quality related issues. He has over 20 years experience in environmental issues, and has been with the firm since 1995 providing ecological risk assessment services. Mr. Alsop has managed assessments for hazardous waste sites and permitting efforts. He has evaluated the effects of direct and food chain exposures to metals, chlorinated benzenes, pesticides, PCBs, and PAHs. Mr. Alsop has reviewed the ambient water quality criteria for dioxin for a number of states, and has provided comments to the USEPA and USEPA Science Advisory Board on the technical merits of the assumptions and methodologies used in the Great Lakes Water Quality Initiative, including the Tier II Values for the Protection of Aquatic Life. In addition, he has reviewed the proposed ecological risk assessment protocol document for permitting incinerators for the U.S. Army. His regulatory experience includes EPA Regions I through X and regulatory agencies in over twenty states including California (DTSC), New York (NYSDEC), Massachusetts (DEP), Minnesota (MPCA), and Louisiana (LDEQ). Mr. Alsop's project management experience ranges from endangered species assessments for a single chemical to a \$1.2 million ecological risk assessment of a 28,000-acre military facility as part of the Base Realignment and Closure (BRAC) process. His site experience includes U.S. Army facilities, pulp and paper mills, industrial manufacturing facilities, port facilities, landfills, Superfund sites, and RCRA facilities.

Figure 3
Project Organization



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I-003118

VI COMPLIANCE WITH STANDARD TERMS AND CONDITIONS

McLaren/Hart has reviewed Attachment D, Terms and Conditions and requests your consideration of the following proposed changes. Unless otherwise noted below, all other terms and conditions are acceptable as written.

Item 9, Indemnification: In the 5th and 6th lines, insert "Contractor's negligent" between the words "the performance". In the 7th and 8th lines, strike "Contractor in the" and replace with "Contractor's negligent".

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NONCOLLUSION AFFIDAVIT TO BE EXECUTED BY
BIDDER AND SUBMITTED WITH BID FOR PUBLIC WORKS

STATE OF CALIFORNIA)
COUNTY OF Alameda)ss

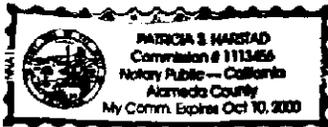
ELLIS A. WALLENBERG III., being first duly sworn, deposes and
(name)

says that he or she is VICE PRESIDENT of
(position title)

MCLAREN / HART, INC., ALAMEDA, CA. 94501
(the bidder)

the party making the foregoing bid that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and, further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

DATED: July 25, 1997 By Ellis A. Wallenberg III.
(person signing for bidder)



(Notarial Seal)

Subscribed and sworn to before me on
July 25th, 1997
Patricia S. Harstad
(Notary Public)

NONDISCRIMINATION COMPLIANCE STATEMENT

COMPANY NAME

MCLAREN HART, INC

The company named above (hereinafter referred to as "prospective contractor") hereby certifies, unless specifically exempted, compliance with Government Code Section 12990 (a-f) and California Code of Regulations, Title 2, Division 4, Chapter 5 in matters relating to reporting requirements and the development, implementation and maintenance of a Nondiscrimination Program. Prospective contractor agrees not to unlawfully discriminate, harass or allow harassment against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, disability (including HIV and AIDS), medical condition (cancer), age, marital status, denial of family and medical care leave and denial of pregnancy disability leave.

CERTIFICATION

I, the official named below, hereby swear that I am duly authorized to legally bind the prospective contractor to the above described certification. I am fully aware that this certification, executed on the date and in the county below, is made under penalty of perjury under the laws of the State of California.

ELLIS A. WALKENBERG III, VICE PRESIDENT

OFFICIAL'S NAME

7/25/97

DATE EXECUTED

Ellis A. Walkenberg III

EXECUTED IN THE COUNTY OF

Alameda, CA. 94501

PROSPECTIVE CONTRACTOR'S SIGNATURE

VICE PRESIDENT

PROSPECTIVE CONTRACTOR'S TITLE

MCLAREN HART, INC.

PROSPECTIVE CONTRACTOR'S LEGAL BUSINESS NAME

Agreement No. _____

Exhibit _____

**STANDARD CLAUSES --
SMALL BUSINESS PREFERENCE AND CONTRACTOR IDENTIFICATION NUMBER****NOTICE TO ALL BIDDERS:**

Section 14835, et. seq. of the California Government Code requires that a five percent preference be given to bidders who qualify as a small business. The rules and regulations of this law, including the definition of a small business for the delivery of service, are contained in Title 2, California Code of Regulations, Section 1896, et. seq. A copy of the regulations is available upon request. Questions regarding the preference approval process should be directed to the Office of Small and Minority Business at (916) 322-5060. To claim the small business preference, you must submit a copy of your certification approval letter with your bid.

Are you claiming preference as a small business?

_____ Yes*

X No

*Attach a copy of your certification approval letter.