

PSP TITLE PAGE

Project Title: **PROPOSAL TO CONDUCT AN ASSESSMENT OF DELTA
LEVEE IMPACTS AND AQUATIC HABITAT UTILIZATION BY THE
NON-NATIVE CHINESE MITTEN CRAB (*ERIOCHEIR SINENSIS*) IN
SACRAMENTO, SOLANO, AND CONTRA COSTA COUNTIES.**

Contact Information:

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 Dr. Douglas Conklin, UC Davis

Type of Organization/Tax Status: Sole Proprietorship, Private For-Profit Business

Tax Identification Number: FIN 68-036-0044



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

April 15, 1999

RE: PROPOSAL TO CONDUCT AN ASSESSMENT OF DELTA LEVEE IMPACTS AND AQUATIC HABITAT UTILIZATION FOR THE NON-NATIVE CHINESE MITTEN CRAB (*ERIOCHEIR SINENSIS*) IN SOLANO, SACRAMENTO AND CONTRA COSTA COUNTIES.

Dear Sir or Madam:

May Consulting Services is pleased to provide CALFED with the attached 1999 Ecosystem Restoration Plan (ERP) Proposal Solicitation Response Package. We propose to conduct a phased two-year Delta levee impact assessment and aquatic habitat utilization survey for the nonindigenous crustacean *Eriocheir sinensis* (Chinese mitten crab). The species has proliferated widely since its initial collection from the south Bay in winter 1992 (Halat, 1997), and threatens to adversely impact the ecology, industry, and infrastructure of the San Francisco Bay-Delta region.

Among many immediate concerns, juvenile Chinese mitten crabs commonly burrow in soft substrates, and thereby may result in broadscale destabilization of fragile levee systems throughout the Central Valley and Delta waterways. This present threat to levee integrity, and implications for associated aquatic communities, is central to our proposed research. The proposed project elements are each compatible with CALFED 1999 ERP Strategic Plan 'Visions for Reducing or Eliminating Stressors' (Vol. I, pp. 419-424, 460-469), and the CALFED 1999 Long-Term Levee Protection Plan (Phase 2 Report; Sections 1,3, 8-10)

This proposed project comprises four principal elements:

- Element 1. Habitat Utilization Survey
- Element 2. Levee Burrowing Study
- Element 3. Levee Population Study
- Element 4. Shallow Channel Trap Survey

If you have questions regarding this proposal, or require additional information, please contact our Project Manager, Mr. Brian Blease, at (650) 757-5180. We look forward to your reply.

Sincerely,

Loran May, President
May Consulting Services

PSP COVER SHEET

Proposal Title: **PROPOSAL TO CONDUCT AN ASSESSMENT OF DELTA
LEVEE IMPACTS AND AQUATIC HABITAT UTILIZATION BY
THE INVASIVE CHINESE MITTEN CRAB (*ERIOCHEIR
SINENSIS*) IN SACRAMENTO, SOLANO, AND CONTRA
COSTA COUNTIES.**

Applicant Name: May Consulting Services

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Amount of funding requested: \$87,415.00
June 1999 to June 2001

Indicate the topic for which you are applying (check only one box):

- | | |
|--|--|
| <input type="checkbox"/> Fish Passage/Fish Screens | <input checked="" type="checkbox"/> Introduced Species |
| <input type="checkbox"/> Habitat Restoration | <input type="checkbox"/> Fish Management/Hatchery |
| <input type="checkbox"/> Local Watershed Stewardship | <input type="checkbox"/> Environmental Education |
| <input type="checkbox"/> Water Quality | |

Does the project address a specified Focused Action? X yes no

What county or counties is the project located in? Sacramento, Solano, Contra Costa

Indicate the geographic area of your proposal (check only one box):

- | | |
|--|--|
| <input type="checkbox"/> Sacramento River Mainstream | <input type="checkbox"/> Suisun Marsh and Bay |
| <input type="checkbox"/> Sacramento Tributary | <input type="checkbox"/> North Bay/ South Bay |
| <input type="checkbox"/> San Joaquin Mainstream | <input type="checkbox"/> Landscape (entire Bay-Delta
watershed) |
| <input type="checkbox"/> San Joaquin Tributary | <input type="checkbox"/> Other |
| <input checked="" type="checkbox"/> Delta | |
| <input type="checkbox"/> East Side Tributary | |

Indicate the primary species which the proposal addresses (check all that apply):

- | | |
|--|---|
| <input type="checkbox"/> San Joaquin and East Side Delta tributaries Fall-run chinook salmon | <input type="checkbox"/> Winter-run chinook salmon |
| <input type="checkbox"/> Spring-run chinook salmon | <input type="checkbox"/> Late fall-run chinook salmon |
| <input type="checkbox"/> Fall-run chinook salmon | <input type="checkbox"/> Delta smelt |
| <input type="checkbox"/> Longfin smelt | <input type="checkbox"/> Splittail |
| <input type="checkbox"/> Steelhead trout | <input type="checkbox"/> Green sturgeon |
| <input type="checkbox"/> Striped bass | <input type="checkbox"/> Migratory birds |
| <input type="checkbox"/> All chinook species | <input checked="" type="checkbox"/> Other: <u>Chinese mitten crab</u> |
| <input type="checkbox"/> All anadromous salmonids | |

Specify the ERP strategic objective and target(s) that the project addresses. Include page numbers from February 1999 version of ERP Volume I and II:

VOLUME 1

Halt spread of potentially harmful aquatic species: Plan Goal 5, Objective 4, pp. 461-465.

Long-term Delta Levee Protection Plan: Revised Phase II Report, Section 3, pp. 3-2.

Develop focused control efforts for introduced species: Plan Goal 5, Objective 9, pp. 467.

Maintain signal crayfish fishery: Plan Goal 3, Priority Group II Objective 2, pp. 414-416.

VOLUME 2

Reducing Invasive Species Stressor; Sacramento-San Joaquin Delta Mgmt. Zone, pp. 81.

Reducing Invasive Species Stressor; Suisun Marsh/North SF Bay Mgmt. Zone, pp. 135.

Indicate the type of applicant (check only one box):

- | | |
|---|---|
| <input type="checkbox"/> State agency | <input type="checkbox"/> Federal agency |
| <input type="checkbox"/> Public/Nonprofit joint venture | <input type="checkbox"/> Nonprofit |
| <input type="checkbox"/> Local government/district | <input type="checkbox"/> Other: |
| <input checked="" type="checkbox"/> Private party | |
| <input type="checkbox"/> University | |

Indicate the type of project:

- | | |
|--|---|
| <input type="checkbox"/> Planning | <input type="checkbox"/> Implementation |
| <input type="checkbox"/> Monitoring | <input type="checkbox"/> Education |
| <input checked="" type="checkbox"/> Research | |

By signing below the applicant declares the following:

- 1.) The truthfulness of all representations in their proposal;
- 2.) The individual signing the form is entitled to submit the application on behalf of the applicant (if the applicant is an entity or organization); and
- 3.) The person submitting the application has read and understood the conflict of interest and confidentiality discussion in the PSP (Section 2.4) and waives any and all rights to privacy and confidentiality of the proposal on behalf of the applicant, to the extent as provided in the Section.

Printed name of applicant

LORAN MAY ' BRIAN BLENSE

Signature of applicant

[Signature]

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I. EXECUTIVE SUMMARY

May Consulting Services proposes to conduct a two-year levee impact assessment and aquatic habitat utilization survey for the nonindigenous crustacean species *Eriocheir sinensis* (Chinese mitten crab) in the San Francisco Bay-Delta region. The Chinese mitten crab is endemic to coastal and riverine habitats of southeast China and the Korean peninsula. Unlike many other decapods, the Chinese mitten crab is a catadromous species, rearing in the freshwater tributaries of bays and estuaries and returning to brackish waters for reproduction. In its native range, Chinese mitten crab are commonly found hundreds of miles inland along the Yangtze River (Veldhuizen, 1998).

The Chinese mitten crab was introduced to the North Sea and Baltic countries during the early mid-1900's, following the opening of increasingly intensive shipping between Europe and east-Asia. Historical reports record aggressive population expansions into a variety of estuarine and aquatic habitats across much of coastal Europe, Great Britain, and Scandinavia (Panning, 1938). Although these invasive populations are not well studied, they are reported to have widely compromised regional fisheries, industry, and infrastructure integrity (Ingle, 1986), and are suspected to have disrupted the associated aquatic communities in these parts of the world.

The Chinese mitten crab was first collected in California from south San Francisco Bay in winter of 1992 (Halat, 1997). The species has since exhibited its remarkable proclivity for widespread invasion and colonization of suitable aquatic habitats. Numerous reports have confirmed a pronounced local proliferation. These reports suggest a current Chinese mitten crab distribution throughout much of the San Francisco Bay, Estuary, and Delta ecosystems, extending well into the Central Valley and beyond (Hieb et al, 1998).

The threat of an established Chinese mitten crab population within the San Francisco Bay-Delta spurs a series of important scientific, economic, and environmental questions for the region. This invasive species has many potentials for adversely impacting the ecology, economy, and safety of the San Francisco Bay-Delta. Among the principal concerns are potentially adverse impacts the Chinese mitten crab may have upon commercial fishing operations (Panning, 1938; Müller et al, 1998), habitat restoration/enhancement projects (ERP, 1999), native fisheries restoration/salvage efforts (Hieb, 1997), water management infrastructure (e.g. levee systems), and ecological processes essential to productive shoreline and benthic aquatic communities.

Several of these adverse potentials were sharply realized in 1998, including widespread gear and catch damage reports by commercial shrimp and crayfish harvesters, mechanical and infrastructural damage reported by the Tracy Fish Facility (USBR, pers. comm.), and operations interference at several south Bay power stations and Delta transfer projects.

Of immediate concern is the possibility that juvenile Chinese mitten crab in the Central Valley and Delta may destabilize the fragile levee systems. Several published reports originating from Europe and Great Britain (Ingle, 1986; Panning, 1938) have detailed incidences of accelerated embankment erosion and levee failure attributed to the natural burrowing behaviors of juvenile Chinese mitten crab. This present threat to the long-term integrity of our Delta levees, and the many important biological implications, is centrally addressed by our proposed research.

The four proposed project elements are as follows:

- Element 1. Habitat Utilization Survey
- Element 2. Levee Burrowing Study
- Element 3. Levee Population Study
- Element 4. Shallow Channel Trap Survey

We propose to conduct a focused assessment of Delta levee impacts and habitat utilization surveys for burrowing juvenile Chinese mitten crab at multiple field stations within the San Francisco Bay-Delta ecosystem. Field stations are to be located in Sacramento, Solano, and Contra Costa Counties, and will be situated within the Suisun marsh and along the salinity gradient between Suisun Marsh and Georgiana Slough, near Walnut Grove, CA (see Figure 2). Sampling is to follow a monthly calendar beginning in July, 1999, and is proposed for completion in July, 2001.

The principal project objectives are:

- describe evident habitat associations and preferences exhibited by burrowing juvenile Chinese mitten crabs;
- quantify the severity of Chinese mitten crab burrowing impacts along multiple embankment types and determine the erosivity of these burrows;
- measure present population features and record shifts to population structures through two successive annual cycles;
- identify specific behavioral or life-history features which may accommodate strategic control efforts to minimize realized damages to Delta levees.

Baseline biological information generated by this proposed research may help to direct future population management and control actions in the region. Baseline information is critically needed by Delta Fish Facilities, Reclamation Districts, Water Districts, the U.S. Army Corps of Engineers, local farmers and ranchers, and others responsible for ensuring the long-term integrity of the Delta levee system. This project has support from Delta ranchers (see Attachments) and local representatives of the Department of Water Resources, Delta Protection Commission, Department of Fish and Game, University of California, and California State University. Moreover, this proposed research anticipates no adverse or third party impacts, and is entirely consistent with the CALFED Bay-Delta Program's 1999 Strategic Plan for Ecosystem Restoration.

MAY Consulting Services is an environmental consulting firm specializing in biological resource planning, habitat studies, and environmental permitting. *Our mission is to provide high quality biological resource information to assist government agencies, land managers, landowners, and land developers in making informed decisions about environmental resource and conservation issues.*

II. PROJECT DESCRIPTION

a. Proposed Scope of Work May Consulting Services proposes to conduct a two-year phased field investigation for burrowing juvenile Chinese mitten crabs at several locations along the San Francisco Estuary and inland Delta waterways. Field stations will be situated along the salinity gradient between the Suisun marsh and the Georgiana Slough, near Walnut Grove, CA. The primary objective of our proposed research to determine the aquatic habitat preferences of Chinese mitten crabs; to describe spatial and temporal features for the juvenile population; and to assess burrowing impacts along several different embankment types.

This proposed project is scheduled for completion in two phases. Phase 1 is scheduled to begin in late-June 1999, and includes tasks for establishing sampling stations, developing sampling methods, and conducting indicated Y1 research. Phase 2 includes Y2 research, monitoring, and data evaluation, and is scheduled to begin in June 2000. Field studies will follow a monthly sampling calendar (contingent on local tides and bulk water releases), and are proposed for completion in late-June, 2001, at which time a Final Project Report will be produced.

The principal project objectives are:

- a) identify the common embankment types (e.g., lined, earthen, rip-rap), macrophyte associations, and other habitat features associated with burrowing juvenile *E. sinensis*;
- b) determine the design, placement, and densities of *E. sinensis* burrows across Delta embankments, and study factors which may influence/regulate burrowing behaviors;
- c) quantify the degree to which *E. sinensis* burrowing adversely alters embankments and/or has jeopardized local levee stability or permanence;
- d) characterize *E. sinensis* population structures at selected field stations, and measure seasonal variations in population features through two annual recruitment cycles;
- e) describe evident biological interactions between established juvenile *E. sinensis* subgroups and seasonally migrating and recruiting individuals; and
- f) investigate additional behavioral, population, habitat, and life-history features which may render the species vulnerable to effective management strategies.

ELEMENT 1. HABITAT UTILIZATION SURVEY

The proposed Habitat Utilization Survey is intended to characterize the specific habitats inhabited by the Chinese mitten crab. Findings will help to locate and predict areas prone to further invasion/occupation, and may detect means for developing an effective management program for the species. This element is scheduled to proceed throughout phases 1 & 2. The assessment involves extensive fieldwork and requires detailed vegetation analyses and substrate sampling. Project scientists will construct non-permanent simple quadrats (2m²) and line transects (10m), and will utilize an array of standard field sampling equipment to achieve the stated objectives (e.g., salinometer/refractometer, calipers, hand trowels, meter tapes, thermometers, etc.). Each of the designated field stations will be assessed for the presence of Chinese mitten crabs and their burrows. Specific physical and biological measurements will be taken regularly, as described below. Descriptive habitat information compiled for field stations having moderate to high Chinese mitten crab burrowing activity will be made available to individuals, agencies, and organizations interested in studying and managing the spread of this non-native species.

The proposed Habitat Utilization Study will gather data for the following habitat parameters:

water quality	hydrologic regime
levee construction	macrophyte associations
substrate type	community composition

ELEMENT 2. Levee Burrowing Study

The proposed Levee Burrowing Study is intended to characterize structural aspects of Chinese mitten crab burrows, to assist with predicting impacts this introduced species may have upon levee integrity. This project element is scheduled to proceed from winter to spring in both phases 1 & 2. The study involves extensive fieldwork and will require additional laboratory time. Project scientists will construct non-permanent simple quadrats (2m²), and will employ various standard sampling techniques to assess structural, spatial, and density features of Chinese mitten crab burrows. The specific determinations to be made are described below. Additionally, twenty castings of arbitrarily selected Chinese mitten crab burrows will be prepared from marine resin (Griffis, 1991; Mayou et al. 1968). Burrows will be injected and allowed to harden for 24-hours. All castings will be extracted from the embankment and rinsed clean. Burrow design and dimensions will be evaluated, and burrow volumes calculated using displacement measures at the SFSU and UCD laboratories.

The proposed Levee Burrowing Study will measure the listed burrow features:

burrow design	burrow placement
burrow dimensions	burrow volume
burrow density	erosivity considerations

ELEMENT 3. LEVEE POPULATION STUDY

The proposed Levee Population Study is intended to profile the existing Chinese mitten crab population to provide baseline information on migration, recruitment, and population structures (age/sex class data) for this species. This Element is scheduled to proceed throughout Phases 1 & 2, involves extensive fieldwork, and may require specimen collections and additional laboratory time. Project scientists will construct non-permanent 10m line transects monthly, and will employ various standard field sampling techniques to assess population structures for Chinese mitten crab subgroups at designated field stations. The time-series population information retrieved from this study will provide important baseline biological information on several aspects of Chinese mitten crab recruitment and migration, and may support future management and control efforts in the Delta and watershed.

This proposed Levee Population Study will investigate the listed population features:

- abundance estimates
- sex frequency analyses
- size/age class analyses
- time-series analyses

ELEMENT 4. SHALLOW CHANNEL TRAP SURVEY

The proposed Shallow Channel Trap Survey is intended to investigate normal crab behaviors in search of useful clues for developing effective management and control strategies. Element 4 is scheduled to proceed in the early quarters of project Phases 1 & 2, and will involve several field stations selected for their accessibility and suitability to this particular investigation. Pit-fall traps (12-inch diameter) will be emplaced to subtidal substrate across adjacent shallow water channels at low-tides. Traps will be recovered at the subsequent low-tide (as possible) and the contents evaluated. This trap survey will produce useful information on the normal habits and diurnal behaviors of Chinese mitten crab within shallow Delta tributaries, and will yield additional information regarding benthic Delta community dynamics.

This proposed Shallow Channel Trap Survey will investigate the listed behavioral/biological features for Chinese mitten crab subgroups at designated stations:

diurnal activity	channel population structure
individual ranges	benthic faunal associations
spatial distributions	age-class resource partitioning

b. Location and/or Geographic Boundaries of the Project:

Multiple project sampling stations are to be established within the Suisun marsh and Delta watershed. All phase elements are anticipated for completion on public lands, with the exception of a Georgiana Slough study-site located on private property to which we have been granted access (see Attachments). Field stations will be situated along the salinity gradient between the Suisun marsh (Montezuma and Hill Sloughs) and the Georgiana Slough, near Andrus Island at Walnut Grove, CA. This proposed research will therefore involve only field stations within the Solano, Sacramento, and Contra Costa Counties (see Figure 1). May Consulting Services has notified the respective Boards of Supervisors and Planning Departments of our intent to submit this CALFED proposal (see Attachments).

Mitten Crab / Sampling Area

May Consulting Services April 1999

Sampling Area



0 0.5 1 Miles

Map produced by DWR CENTRAL DISTRICT - FLOOD PROTECTION AND GIS DIVISION
SCALE: 1:100,000, 50x50 minute series: NADA, LOD, SAN FRANCISCO, 1999
unprojected LAT, LONG. Map
By Marc Comandore

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III. ECOLOGICAL/BIOLOGICAL BENEFITS

a. Ecological/Biological Objectives:

May Consulting Services anticipates that completion of the four proposed project elements will yield baseline scientific information widely useful to those depending on functioning Delta systems. As a primary benefit, findings are likely to be beneficial for future management and control efforts in the Estuary and watershed. Baseline biological studies are critically needed by Delta Fish Facilities, Reclamation Districts, Regional Water Agencies, the U.S. Army Corps of Engineers, local farmers and property owners. This research has support from representatives of Department of Water Resources, Delta Protection Commission, Department of Fish and Game, California State University, and the University of California. Findings will be made available to the academic community and other interested parties. Quarterly Summary Reports will update CALFED of project developments and status.

The primary ecological/biological objectives targeted by our proposed project, as outlined in the CALFED Bay-Delta Program's 1999 ERP Strategic Plan, are as follows:

- Nonindigenous Species Control - by undertaking much needed baseline biological research on the aggressively invasive Chinese mitten crab; providing pertinent information for minimizing adverse impacts to industry and infrastructure, and leading to potential management or control strategies;
- Levee and Channel Integrity – by supporting collective efforts to maintain long-term Delta levee stability, to protect industry and communities, and to reduce losses of habitat for dependent aquatic plant and wildlife species;
- Ecosystem Quality – by supporting activities that improve riparian habitat, increase or improve fisheries habitat and passage, restore wetlands, and restore natural stream morphology affecting downstream flow and dependent species.

The primary Stressor identified for this Project is the 'Invasive Aquatic Organism' Stressor, detailed in the CALFED 1999 ERP Strategic Plan. The Chinese mitten crab poses many direct threats, some similar to those posed by other introduced organisms in the San Francisco Bay-Delta. Moreover, the high abundance of Chinese mitten crabs collected in winter 1998 from Bay area tributaries indicates this crustacean species may have inordinately strong potential for further compromising local industries and ecosystems.

The specific scientific questions addressed by this proposed Project will generate means for quantifying impacts by Chinese mitten crab upon Delta levee stability, and target population characteristics, specific behaviors, and life-history features as a deductive means for development of effective management programs and predictive models for this invasive population. The two-year extended field sampling approach outlined in this proposal is a proven means for efficiently achieving the identified objectives.

b. Linkages:

Each proposed Project Element is compatible with the CALFED Bay-Delta Program's 1999 Ecosystem Restoration Plan. Several 'Visions for Reducing or Eliminating Stressors', detailed in the CALFED 1999 ERP Strategic Plan (pp. 419-424, 460-469), are specifically addressed by this proposal. Matters related to the maintenance and long-term stability of Delta levees, as detailed in the revised CALFED 1999 Long-Term Levee Protection Program (Sections 1,3, 8-10), are also specifically investigated.

Findings from this proposed two-year Project will serve the wide array of interests involved with Bay-Delta resource management and levee maintenance, and may prove useful towards developing controls for this invasive aquatic organism. Both interim and final results may be presented at appropriate scientific seminars and conferences.

CALFED 1999 ERP Strategic Plan Linkages addressed by this proposed Project include:

VOLUME 1

- Halt spread of potentially harmful aquatic species: Goal 5, Objective 4, pp. 461-465
- Long-term Delta Levee Protection Plan: Phase II Revised Report (Section 1,3,8-10)
- Develop focused control efforts for introduced species: Goal 5, Objective 9, pp. 467
- Maintain signal crayfish fishery: Goal 3, (Priority Group II), Objective 2, pp. 414-416

VOLUME 2

- Reducing Invasive Species Stressor: Sacramento-San Joaquin Delta Mgmt. Zone, pp.81
- Reducing Invasive Species Stressor: Suisun Marsh/North SF Bay Mgmt. Zone, pp.135

c. System-Wide Ecosystem Benefits:

In the absence of solid baseline biological information, efforts to manage nonindigenous species tend generally to be costly and ineffective. Findings from the proposed research will complement directed studies, including research by Department of Fish and Game, U.S. Fish and Wildlife Service, and broadly funded CALFED projects. Baseline biological findings may also provide indirect system-wide ecosystem benefits, by providing much needed information for controlling this aggressive and disruptive species across the inland Delta waterways. Findings from this proposed Project may therefore support numerous projects of Delta habitat preservation, restoration, and enhancement, and can help steer future efforts in the Bay-Delta region.

Data gathered during this proposed Project will be made available to other Chinese mitten crab researchers, and to related projects and studies in the Bay area. Several currently funded programs generate and benefit from scientific information on invasive aquatic species, including the Sacramento-San Joaquin Delta Breached Levee Wetland Survey, the US Fish and Wildlife Services' Anadromous Fish Restoration Program, the IEP Estuarine and Marine Fish Survey, local watershed stewardship programs, and irrigation districts. Cooperative exchanges for scientific results are presently established with many local agencies (DFG, DWR, USBR, etc), and the Project Manager throughout the investigation will undertake continuing outreach.

d. Compatibility with Non-Ecosystem Objectives:

The proposed Project has additional benefits and is compatible with CALFED Non-Ecosystem Objectives. The proposed research will produce scientific information that may benefit many important CALFED 1999 ERP Strategic Plan objectives, principally including those supporting Delta water-supply reliability and levee system integrity.

Findings from the proposed habitat utilization studies may benefit and support risk assessment and impact evaluations by the Department of Water Resources, and may facilitate improved daily operations at many Delta Water Districts. Similarly, resource managers and local commercial fishermen can directly apply population information to specific concerns affecting their livelihoods and pursuits. Findings may prove beneficial for estimating related community affects, such as resource competition or potential seasonal variations in Delta crayfish production influenced by the Chinese mitten crab. All direct and indirect Project benefits are achieved without conflict to the CALFED 1999 ERP Strategic Plan.

e. Additional Benefits:

It is also anticipated that findings from the proposed research will satisfy the culminating requirements for a master degree for Brian Blease (SFSU, 2000), and may be extended to form the basis of a doctoral dissertation project for Mr. Blease (UC Davis). The thesis and dissertation will each be made available to interested parties through the respective academic institutions. Results and analyses from this proposed Project, and related research, will also be submitted for publication to relevant professional journals, and may be presented at scientific seminars.

IV. TECHNICAL FEASIBILITY AND TIMING

a. Technical Feasibility:

The proposed Project has widespread support, an experienced research and management team, is consistent with CALFED 1999 ERP Strategic Plan Objectives, and is complementary to numerous related studies and ongoing Bay-Delta research and conservation programs. The proposed research approach has been carefully considered and is technically feasible. Successful field investigations have used quite similar approaches, including work done through 1997 and 1998 by the Department of Fish and Game, the Interagency Ecological Program, and by three University colleagues. These shorter-term studies have provided pertinent baseline information for this introduced species (Halat, 1997; IEP Newsletters, Autumn 1997-Winter 1998). Our program will follow many scientific methods employed in these earlier Chinese mitten crab studies, and in related Bay-Delta crustacean research (Fiorillo, 1994). This Project will also be facilitated by academic advisors and may recruit student assistants at SFSU and UCD campuses.

b. Other Project Alternatives Considered

The proposed Project approach is proved to be a suitable means for investigating the identified objectives. Recent studies that have employed similar project designs have collected some of the same forms of pertinent baseline biological data for the Chinese mitten crab as we propose to collect. Our proposed Project methods are certain to render valuable information on Delta levee impacts for a variety of embankment types, and will record additional population, behavioral, and habitat data for juvenile Chinese mitten crabs occupying habitats along the salinity gradient between Suisun marsh and the Georgiana Slough. We have confidence in the chosen methods and shall proceed with field investigations as outlined in this proposal.

c. CEQA/NEQA Compliance and Project Permitting

The proposed Project will support key natural resource restoration and management actions in the Delta that are expressed in several existing NEPA and CEQA planning documents, including the CALFED Ecosystem Restoration Program Plan, and the California Department of Fish and Game Lower Mokelumne River Management Plan. No required CEQA or NEPA documentation is anticipated for the proposed Project. With the exception of the Georgiana Slough study-site, no additional written approvals from landowners are expected to be required. We do anticipate needing to obtain and comply with the California Department of Fish and Game's Scientific Collector Permit and Restricted Species Permit (application materials are currently under review at DFG).

d. Timing Constraints

Implementation for the proposed Project Elements is time-dependent, and may be complicated by various factors, including daily tidal fluctuations and bulk water releases into the Bay-Delta. Sampling efforts in particular may be affected by complications due to Chinese mitten crab life-cycle or population features, or by station access difficulties. Phases 1 & 2 will be initiated in early summer months. Each Phase will likely be terminated by events linked with winter rainfall and high flows.

V. MONITORING AND DATA COLLECTION METHODOLOGY

a. Biological/Ecological Objectives: Important questions pertaining to levee system protection, water-quality and management, ecosystem function, aquatic habitat conservation, and introduced species biology and control are addressed in this proposed Project. The central biological/ecological objectives addressed are outlined in Section IIIa.

b. Data Collection, Evaluation Approach, and Monitoring: Project Elements are organized so as to focus sampling efforts in the four principal field investigations (Elements 1-4). Three of these field studies are fully integrated (Elements 1-3), whereas Element 4 is an independent field survey. Monitoring parameters and data evaluation methods are presented in Table 2. Paired hypotheses link the respective Project Elements to serial tests of generated null hypotheses (N_0 = no difference); expected outcomes are presented as alternative hypotheses (N_A).

Element 1 Habitat Utilization Survey

N_0 = distributions and densities of Chinese mitten crabs are random and diffuse within the Suisun marsh, and along the sampling gradient, and no evident habitat associations or preferences are detectable.

N_A = Chinese mitten crabs exhibit detectable and environmentally linked Delta distribution and density patterns; habitat associations are indicative of specific Chinese mitten crab preferences for discernible ecological features.

Element 2 Levee Burrowing Study

N_0 = Delta levees are not altered, damaged, or otherwise impacted by the presence of Chinese mitten crab; levee and substrate type, burrow design, burrow placement, burrow density, crab behaviors, or additional features associated with Chinese mitten crab burrowing, do not correlate with the realized damages to Delta embankments;

N_A = Delta levees are directly impacted by differentially concentrated subgroups of Chinese mitten crab; Delta regions with abundant juvenile Chinese mitten crab experience increased rates of substrate erosion, embankment destabilization, and ecosystem disturbance; burrow design, levee construction, specific burrowing behaviors, and the burrow density do contribute significantly to localized levee deterioration.

Element 3 Levee Population Study

N_0 = Improved knowledge of Chinese mitten crab population characteristics does not facilitate efforts to develop management strategies; extensive field records for juvenile population structures, and time-series investigations of seasonal variability to these population features, will not produce useful scientific data for applications to future population control practices; field descriptions of evident biological interactions between established juvenile subgroups and seasonally recruiting individuals are not useful for resource/levee impact analyses.

N_A = Baseline biological investigations and targeted field sampling studies of Chinese mitten crab habitat usage, diurnal behaviors, population structures, and recruitment cycles does reveal information on accommodative life-history features which can be exploited during future development for effective control practices in Delta systems.

Element 4 Shallow Channel Trap Survey

N_0 = Baseline biological information retrieved from the streambeds and channels adjacent to regions having burrowing Chinese mitten crabs does not provide information useful in the development of control methods, nor does this information serve to increase scientific knowledge of Chinese mitten crab biology, ecology, behavior, diurnal activity, community interactions, or ecosystem associations; improved scientific knowledge for this invasive organism will not benefit landowners, agencies, or private parties.

N_A = Baseline physical and biological information retrieved from streams and channels adjacent to selected Project field stations will assist with determinations of population and community features, and will prove important for future management, research, and potential control programs for the Chinese mitten crab.

Table 2. Monitoring and Data Collection Information

BIOLOGICAL/ECOLOGICAL OBJECTIVES:			
HYPOTHESIS/QUESTIONS TO BE EVALUATED:	MONITORING PARAMETERS AND DATA COLLECTION APPROACH:	DATA EVALUATION APPROACH:	COMMENTS/ DATA PRIORITY
Levee Impacts & Habitat Utilization: Evaluation of levee damages; habitat preferences; community associations.	Stations will be selected in the first month of the project and will be monitored according to Schedule; data on the designated habitat and levee aspects will be collected by means of extensive fieldwork using standard sampling methods.	Biostatistical evaluations; academic review; resource agency inputs.	High Priority
Levee Burrows: design, density, placement; comparison of bank types; substrate removal and erosion considerations.	Direct field studies for Chinese mitten crab burrows located at selected stations will be made to accomplish the stated objectives.	Biostatistical evaluations; academic review; resource agency inputs.	High Priority
Population Survey: structural and temporal surveys for the burrowing juvenile Chinese mitten crab population.	Direct field studies shall be conducted for abundance estimates, size/age class structure, sex-frequencies; temporal and spatial population aspects; juvenile recruitment analyses; associated behavior and life-history studies.	Biostatistical evaluations; academic review; agency inputs.	High Priority
Shallow Channel Survey: benthic community dynamics; resource partitioning; individual range; recruitment and related behaviors; site fidelity and burrow occupation info.	Field trapping study in channels and streambeds adjacent to the designated sampling stations; traps will be collected and evaluated for information concerning the Chinese mitten crab's life-history, behavior, and relationship to the Delta shoreline and aquatic communities.	Biostatistical evaluations; academic review; agency inputs.	Moderate Priority

VI. LOCAL INVOLVEMENT

This proposed Project has received endorsement and cooperation from a variety of individuals and resource agencies interested in scientific findings from this Project (see Attachments). Our proposed research has support from local landowners and farmers, and from professional representatives at California Department of Water Resources, Sacramento Delta Protection Commission, California Department of Fish and Game, California State University in San Francisco, and the University of California in Davis. The California Department of Water Resources, Delta reclamations districts, and their engineers will provide relevant information, access to study sites, and assistance throughout this proposed project.

VII. COST

a. Total Budget:

The identified total CALFED budgeted costs calculated for each project element listed in the Proposed Scope of Work, are itemized in the Total Budget Table (see Table 3).

b. Quarterly Budget:

The identified CALFED budgeted costs, calculated as quarterly base costs for each project element listed in the Scope of Work, are itemized in the Quarterly Budget Table (see Table 4).

c. Proposed Schedule

Habitat assessments and population surveys for the proposed Phase 1 sampling will be initiated in late-June, 1999. Monthly sampling will continue through the winter or early-Spring, 2000 (access and sampling conditions are influenced by inclement weather and increased water flow in the Delta). As sampling access improves the following spring, Phase 2 sampling is scheduled to begin, and shall proceed through respective seasons terminating in June, 2001. The Task Schedule by Project Element Table (see Table 5) provides a breakdown of this proposed schedule.

d. Incremental Funding Options

Each project phase comprises a single four-quarter cost cycle. Expenses projected for Phase 2 are reduced by the amount expended in Phase 1 for nonrecurring equipment purchases (e.g., refractometer, sampling tools, field supplies). Each Phase is separable also by seasonal sampling effort, due to expected sampling complications during high water flows. Our objective is to compile uninterrupted monthly data throughout the two annual cycles. However, sampling will likely be inhibited during high rainfall and runoff months (mid-February thru mid-Spring). Bulk data analyses and specimen evaluations shall occur during these terms.

Element 1 (Juvenile Habitat Utilization Study), Element 2 (Levee Burrowing Study and Field Station Monitoring), and Element 3 (Levee Population Study and Field Station Monitoring) are interdependent and inseparable, and should therefore not be funded incrementally. Element 4 (Shallow Channel Trap Survey), however, is an independent technical study and could be separated from the larger project without compromising data from the other elements.

Brief technical and financial reports will be submitted for CALFED as required. Quarterly Progress Reports will summarize the previous quarter's activities and will provide the next quarter's proposed Schedule for Continuing Program Activities.

VIII. COST SHARING

No cost-sharing is proposed for this Project. Cooperating engineers at the Department of Water Resources and at several Delta reclamations districts have graciously agreed to provide information and assistance throughout this project, and will provide access to prospective Delta study sites affected by the Chinese mitten crab.

Table 3. Total Budget (CALFED funds only)

ELEMENT/ TASK NAME	DIRECT LABOR HOURS	DIRECT SALARY AND BENEFITS	SERVICE CONTRACTS	MATERIAL AND ACQUISITION COSTS	MISC. AND OTHER DIRECT COSTS	OVER-HEAD AND INDIRECT COSTS	TOTAL COST
Element 1. Juvenile Habitat Utilization Study							
1.1 Establish Habitat Study Stations	80	\$3,200.00		\$500.00	\$50.00	\$375.00	\$4,125.00
1.2 Perform Juvenile Habitat Assessments							
a) Conduct Vegetation Analyses	50	\$2,000.00		\$100.00		\$210.00	\$2,310.00
b) Conduct Substrate Analyses	30	\$2,000.00		\$50.00		\$205.00	\$2,255.00
d) Conduct Hydrologic Analyses	30	\$1,200.00		\$50.00		\$125.00	\$1,375.00
1.3 Perform Station Monitoring	30	\$1,200.00		\$200.00		\$140.00	\$1,540.00
Subtotal Element 1	220	\$9,600.00		\$900.00	\$50.00	\$1,055.00	\$11,605.00
Element 2. Levee Burrowing Study and Field Station Monitoring							
2.1 Establish Levee Study Stations	80	\$3,200.00		\$125.00	\$50.00	\$337.50	\$3,712.50
2.2 Conduct Burrow Assessments	100	\$4,000.00		\$100.00		\$410.00	\$4,510.00
2.3 Conduct Erosivity Studies	160	\$6,400.00		\$750.00		\$715.00	\$7,865.00
2.4 Conduct Structural Studies	50	\$2,000.00		\$50.00		\$205.00	\$2,255.00
2.4 Perform Levee Station Monitoring	160	\$6,400.00		\$750.00		\$715.00	\$7,865.00
Subtotal Element 2	550	\$22,000.00		1,775.00	\$50.00	\$2,382.50	\$26,207.50
Element 3. Levee Population Study and Field Station Monitoring							
3.1 Establish Population Study Stations	80	\$3,200.00		\$125.00	\$50.00	\$337.50	\$3,712.50
3.2 Conduct Population Assessments	80	\$3,200.00		\$50.00		\$325.00	\$3,575.00
3.3 Perform Juvenile Recruitment Analyses	200	\$8,000.00		\$750.00		\$875.00	\$9,625.00
3.4 Perform Population Station Monitoring	200	\$8,000.00		\$750.00		\$875.00	\$9,625.00
Subtotal Element 3	560	\$22,400.00		\$1,675.00	\$50.00	\$2,412.50	\$26,537.50
Element 4. Shallow Channel Trap Study							
3.1 Establish Channel Study Stations	40	\$1,600.00		\$150.00		\$175.00	\$1,925.00
3.2 Perform Channel Trapping Studies	160	\$6,400.00		\$500.00		\$690.00	\$7,590.00
Subtotal Element 4	200	\$8,000.00		\$650.00	\$0.00	\$865.00	\$9,515.00
Project Management Task	320	\$12,800.00			\$750.00		\$13,550.00
GRAND TOTAL - CALFED	1850	\$74,800.00		\$5,000.00	\$900.00	\$6,715.00	\$87,415.00

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Table 4. Quarterly Budget

	PHASE I				PHASE II				TOTAL BUDGET
	Quarterly Budget Jul-Sept 1999	Quarterly Budget Oct-Dec 1999	Quarterly Budget Jan-Mar 2000	Quarterly Budget Apr-Jun 2000	Quarterly Budget Jul-Sept 2000	Quarterly Budget Oct-Dec 2000	Quarterly Budget Jan-Mar 2001	Quarterly Budget Apr-Jun 2001	
Element 1. Levee Habitat Utilization Study									
1.1 Establish Habitat Study Stations	\$3,125.00	\$ 00	\$ 00	\$ 00	\$1,000.00	\$ 00	\$ 00	\$ 00	\$4,125.00
1.2 Perform Habitat Assessments	\$1,000.00	\$1,000.00	\$970.00	\$ 00	\$1,000.00	\$1,000.00	\$970.00	\$ 00	\$5,940.00
1.3 Perform Station Monitoring	\$ 00	\$256.67	\$256.67	\$256.66	\$ 00	\$256.67	\$256.67	\$256.66	\$1,540.00
Element 2. Levee Burrowing Study and Field Station Monitoring									
2.1 Establish Levee Study Stations	\$2,712.50	\$ 00	\$ 00	\$ 00	\$1000.00	\$ 00	\$ 00	\$ 00	\$3,712.50
2.2 Conduct Burrow Assessments	\$ 00	\$751.66	\$751.67	\$751.67	\$ 00	\$751.66	\$751.67	\$751.67	\$4,510.00
2.3 Conduct Erosivity Studies	\$ 00	\$ 00	\$1,966.25	\$1,966.25	\$ 00	\$ 00	\$1,966.25	\$1,966.25	\$7,865.00
2.4 Conduct Structural Studies	\$ 00	\$1,127.50	\$ 00	\$ 00	\$ 00	\$1,127.50	\$ 00	\$ 00	\$2,255.00
2.5 Perform Station Monitoring	\$ 00	\$1,310.84	\$1,310.83	\$1,310.83	\$ 00	\$1,310.84	\$1,310.83	\$1,310.83	\$7,865.00
Element 3. Levee Population Study and Field Station Monitoring									
3.1 Establish Population Study Stations	\$2,212.50	\$ 00	\$ 00	\$ 00	\$1500.00	\$ 00	\$ 00	\$ 00	\$3,712.50
3.2 Conduct Population Assessments	\$ 00	\$595.84	\$595.83	\$595.83	\$ 00	\$595.84	\$595.83	\$595.83	\$3,575.00
3.3 Perform Recruitment Analyses	\$ 00	\$ 00	\$2,406.25	\$2,406.25	\$ 00	\$ 00	\$2,406.25	\$2,406.25	\$9,625.00
3.4 Perform Station Monitoring	\$ 00	\$1,604.17	\$1,604.17	\$1,604.16	\$ 00	\$1,604.17	\$1,604.17	\$1,604.16	\$9,625.00
Element 4. Shallow Channel Trap Study									
3.1 Establish Channel Study Stations	\$ 00	\$ 00	\$962.50	\$ 00	\$ 00	\$ 00	\$962.50	\$ 00	\$1,925.00
3.2 Perform Channel Trap Studies	\$ 00	\$ 00	\$1,897.50	\$1,897.50	\$ 00	\$ 00	\$1,897.50	\$1,897.50	\$7,590.00
Project Management Task	\$1,693.75	\$1,693.75	\$1,693.75	\$1,693.75	\$1,693.75	\$1,693.75	\$1,693.75	\$1,693.75	\$13,550.00
TOTALS	\$10,743.75	\$8,340.43	\$14,415.42	\$12,482.90	\$6,193.75	\$8,340.43	\$14,415.42	\$12,482.90	\$87,415.00

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Table 5a. Task Schedule Presented By Program Element

PHASE I: JULY 1999 - JULY 2000

ELEMENT	TASK	START DATE (MO/YR)	COMP DATE (MO/YR)
Element 1.0: Habitat Utilization Survey		7/99	7/00
Task 1.1	Establish Habitat Study Stations	7/99	11/99
Task 1.2	Perform Habitat Assessments	10/99	4/00
subtask 1.2a	Conduct Vegetation Analyses	10/99	4/00
subtask 1.2b	Conduct Substrate Analyses	10/99	4/00
subtask 1.2c	Conduct Hydrologic Analyses	9/99	11/99
Task 1.3	Perform Station Monitoring	11/99	7/00
Task 1.4	Evaluate Habitat Study Findings	5/00	7/00
Element 2.0: Levee Burrowing Study		7/99	7/00
Task 2.1	Establish Levee Study Stations	9/99	11/99
Task 2.2	Perform Burrow Assessments	10/99	7/00
subtask 2.2a	Conduct Spatial Studies	4/00	7/00
subtask 2.2b	Conduct Density Surveys	11/99	7/00
Task 2.3	Conduct Structural Studies	4/00	7/00
Task 2.4	Conduct Erosivity Studies	1/00	4/00
Task 2.5	Perform Station Monitoring	11/99	7/00
Task 2.6	Evaluate Levee Study Findings	4/00	7/00
Element 3.0: Levee Population Study		7/99	7/00
Task 3.1	Establish Pop. Study Stations	7/99	11/99
Task 3.2	Perform Population Assessments	11/99	7/00
subtask 3.2a	Conduct Initial Population Study	11/99	1/00
subtask 3.2b	Conduct Successive Pop. Evals.	2/00	7/00
Task 3.3	Perform Recruitment Analyses	2/00	7/00
Task 3.4	Perform Station Monitoring	11/99	7/00
Task 2.6	Evaluate Pop. Study Findings	2/00	7/00
subtask 2.6a	Evaluate Initial Findings	2/00	4/00
subtask 2.6b	Evaluate Series Findings	5/00	7/00
Element 4.0: Shallow Channel Trap Survey		1/00	7/00
Task 4.1	Establish Channel Study Stations	12/99	2/00
Task 4.2	Perform Trapping Studies	2/99	6/00
subtask 4.2a	Conduct Initial Survey	2/99	4/00
subtask 4.2b	Conduct Successive Surveys	4/00	6/00
Task 4.3	Evaluate Trap Study Findings	2/99	7/00
subtask 4.3a	Evaluate Initial Findings	4/00	5/00
subtask 4.3b	Evaluate Series Findings	6/00	7/00

Table 5b. Task Schedule Presented By Program Element

PHASE II: JULY 2000 - JULY 2001

ELEMENT	TASK	START DATE (MO/YR)	COMP DATE (MO/YR)
Element 1.0: Habitat Utilization Survey		7/00	7/01
Task 1.1	Confirm Habitat Study Stations	7/00	11/00
Task 1.2	Perform Habitat Assessments	10/900	4/01
subtask 1.2a	Conduct Vegetation Analyses	10/00	4/01
subtask 1.2b	Conduct Substrate Analyses	10/00	4/01
subtask 1.2c	Conduct Hydrologic Analyses	9/00	11/00
Task 1.3	Perform Station Monitoring	11/00	7/01
Task 1.4	Evaluate Habitat Study Findings	5/01	7/01
Element 2.0: Levee Burrowing Study		7/00	7/01
Task 2.1	Confirm Levee Study Stations	9/00	11/00
Task 2.2	Perform Burrow Assessments	10/00	7/01
subtask 2.2a	Conduct Spatial Studies	4/01	7/01
subtask 2.2b	Conduct Density Surveys	11/00	7/01
Task 2.3	Conduct Erosivity Studies	1/01	4/01
Task 2.4	Perform Station Monitoring	11/00	7/01
Task 2.5	Evaluate Levee Study Findings	4/01	7/01
Element 3.0: Levee Population Study		7/00	7/01
Task 3.1	Confirm Pop. Study Stations	7/00	11/00
Task 3.2	Perform Population Assessments	11/00	7/01
subtask 3.2a	Conduct Y2 Initial Pop. Study	11/00	1/01
subtask 3.2b	Conduct Successive Pop. Evals.	2/01	7/01
Task 3.3	Perform Recruitment Analyses	2/01	7/01
Task 3.4	Perform Station Monitoring	11/00	7/01
Task 3.5	Evaluate Pop. Study Findings	2/01	7/01
subtask 3.5a	Evaluate Y2 Initial Findings	2/01	4/01
subtask 3.5b	Evaluate Y2 Series Findings	5/01	7/01
Element 4.0: Shallow Channel Trap Survey		2/01	7/01
Task 4.1	Establish Y2 Study Stations	2/01	4/01
Task 4.2	Perform Trapping Studies	2/01	7/01
subtask 4.2a	Conduct Y2 Initial Survey	2/01	4/01
subtask 4.2b	Conduct Successive Surveys	4/01	6/01
Task 4.3	Evaluate Trap Study Findings	2/01	7/01
subtask 4.3a	Evaluate Y2 Initial Findings	4/01	5/01
subtask 4.3b	Evaluate Y2 Series Findings	6/01	7/01

IX. APPLICANT QUALIFICATIONS

MAY Consulting Services is an environmental consulting firm specializing in biological resource planning, studies, and permitting. The firm was founded in 1995 by Loran May, president and sole proprietor. *Our mission is to provide high quality biological resource information to assist government agencies, land managers, landowners, and land developers in making informed decisions about environmental resource issues.*

Project Manager and Primary Researcher Brian Blease has developed the proposed project, and will coordinate scheduled field investigations and laboratory evaluations through both Phases (1999-2001). Mr. Blease is a marine biologist and water-quality specialist, and has extensive experience working cooperatively with regulatory agencies, academic institutions, and public and private concerns. Mr. Blease specializes in chemical fate investigations, groundwater protection, and toxicological analyses of agricultural, industrial, and non-point source pollutants to aquatic and coastal marine ecosystems. His experience combines strong technical knowledge in water-quality, invertebrate zoology, and aquatic/estuarine community ecology, with 8 years of professional experience in environmental health and safety compliance, biological resource consultation, and education-outreach programs.

Mr. Blease is also an Environmental Health Specialist registered with the California Department of Health Service. He has worked directly with landowners and commercial growers, and has assisted with the development and implementation of integrated management strategies for California pests and nuisance vectors (aquatic and terrestrial invertebrates). Mr. Blease completed his undergraduate studies at UC Santa Cruz in 1988, and is presently a graduate student at San Francisco State University. We anticipate the findings from this proposed research will satisfy culminating requirements for Mr. Blease's master degree thesis, and may be extended to provide the research basis for a UC Davis doctoral project.

Principal-In-Charge Loran May will be responsible for Project oversight and quality control. Ms. May is a senior botanist and wetland ecologist with more than 12 years of experience managing and conducting botanical and wetlands ecological studies throughout California. Ms. May specializes in regional resource planning and in resolving environmental issues concerning endangered species, wetlands, and other sensitive resources. Ms. May has worked closely with many diverse interest groups, including farmers, ranchers, environmentalists, and agency regulators. She recently developed and coordinated, and is currently implementing the San Joaquin Resource Conservation District's Vernal Pool Education and Outreach Program, funded by Environmental Protection Agency and NRCS Grants. This program is now a model for similar vernal pool conservation programs currently being implemented within Resource Conservation Districts of Merced and Sacramento Counties. Ms. May graduated from Humboldt State University in 1985.

X. LITERATURE CITED

- 1999 CALFED Bay-Delta Program Ecosystem Restoration Strategic Plan. Visions for Eliminating Stressors. Vol. 1; pp. 419-424, 460-469
- 1999 CALFED Bay-Delta Program Ecosystem Restoration Strategic Plan. Ecological Management Zone Visions. Vol. 2; pp. 54-115, 120-155, 158-196, 444-455.
- 1999 CALFED Bay-Delta Program Long Term Levee Protection Plan. Phase 2 Report (February 1999 revision). Sections 1,3, 8-10.
- Fiorillo, A.F. 1994. Effects of Crab Burrowing on Growth of *Spartina* in San Francisco Bay. Master Thesis Dissertation. Department of Biology. San Francisco State University. San Francisco, California, USA.
- Griffis, R.B.; T.H. Suchanek 1991. A model of burrow architecture and trophic models in thalassinidean shrimp (Decapoda: Thalassinidea). Mar. Ecol. Prog. Ser. 79: 171-183.
- Halat, K.M. 1997. The distribution and abundance of the Chinese mitten crab (*Eriocheir sinensis*) in Southern San Francisco Bay, 1995-1996. Master Thesis Dissertation. Department of Entomology. University of California. Berkeley, California, USA.
- Heib, K. 1997. Interagency Ecological Program for the Sacramento-San Joaquin Estuary Newsletter. Vol. 10(1): 14-15
- Heib, K. 1997. Interagency Ecological Program for the Sacramento-San Joaquin Estuary Newsletter. Vol. 10(4):
- Heib, K. 1998. Interagency Ecological Program for the Sacramento-San Joaquin Estuary Newsletter. Vol. 11(2):
- Heib, K.; L. Miller and J. Orsi. 1998. Critter pollution in California. Outdoor California. 59(3): 4-5.
- Ingle, R.W. 1986. The Chinese mitten crab *Eriocheir sinensis* H. Milne Edwards -- a contentious immigrant. The London Naturalist 65:101-105.
- Panning, A. 1939. The Chinese mitten crab. Annual Report Smithsonian Institute, 1938. pp. 361-375.
- Mayou, T.V.; J.D. Howard and K.L. Smith. 1968. Techniques for sampling tracks, trails, burrows and bioturbate textures in unconsolidated sediments. Geol. Soc. Amer., Special Paper No. 121, pp. 665-666.
- Veldhuizen, T.; K. Heib. 1998. What difference can one crab make? The ongoing tale of the Chinese mitten crab and the San Francisco Estuary. Outdoor California. 59(3): 19-22.

ATTACHMENT A. LETTERS OF SUPPORT

DEPARTMENT OF WATER RESOURCES

CENTRAL DISTRICT
3251 S STREET
SACRAMENTO, CA 95816-7017



April 14, 1999

Mr. Brian A. Blease
May Consulting Services
Post Office Box 1156
Walnut Grove, California 95690

Dear Mr. Blease:

The AB 360 Delta Levees Program is very supportive of your CALFED Category III project entitled, *Proposal to Conduct an Assessment of Delta Levee Impacts and Aquatic Habitat Utilization for the Non-Native Chinese Mitten Crab (Eriocheir Sinensis) in Solano, Sacramento, and Contra Costa Counties, April 1999*. Our Program is extremely concerned about the impacts to the levee system of the Delta from the burrowing habitats of the Chinese mitten crab. We have recently received increasing numbers of reports from reclamation district engineers of crabs being present and burrowing into the levees within the islands and tracts of the Delta.

The products from your study should help identify mitigation and control strategies for protecting the Delta's levees. Without this levee system, the unique and valuable Delta, as we know it today, would become a vast inland sea. Should you have any questions or if we can be of assistance to your investigation, please call me at (916) 227-7567 or Jim Martin of my staff at (916) 227-7581.

Sincerely,

A handwritten signature in black ink, appearing to read "Curt Schmutte".

Curt Schmutte, Chief
Flood Protection and Geographic
Information Branch

WILSON LAND LIMITED

P.O. Box 248 • Walnut Grove, CA 95690

April 15, 1999

Ms. Loran May
Mr. Brian Blease
May Consulting Services
P.O. Box 1156
Walnut Grove, CA 95690

RE: PERMISSION TO CONDUCT THE PROPOSED CHINESE MITTEN CRAB
RESEARCH PROJECT ON ANDRUS ISLAND, GEORGIANA SLOUGH

Dear Ms. May and Mr. Blease:

We have reviewed your proposal to conduct an assessment of and aquatic habitat utilization and Delta levee impacts resulting from the non-native invasive species, Chinese mitten crab (*Ertocheir sinensis*) on Andrus Island along the Georgiana Slough.

We hereby grant you permission to conduct this research on my Andrus Island property Parcel No. 156-0010-067-0000 & Parcel No. 156-0010-053-0000, and further grant permission to enter this property for the sole purpose of conducting this research from 3-01-99 to 3-01-2002.

In addition, we offer our full support and cooperation to your project.

Sincerely,



Daniel Wilson
Partner

RECLAMATION DISTRICT
2111

Dead Horse Island

P.O. Box 248 Walnut Grove, CA 95690 (916) 776-1701

April 15, 1999

Ms. Loran May
Mr. Brian Blease
May Consulting Services
PO Box 1156
Walnut Grove, CA 95690

:

**RE: SUPPORT OF THE PROPOSED CHINESE MITTEN CRAB RESEARCH
PROJECT**

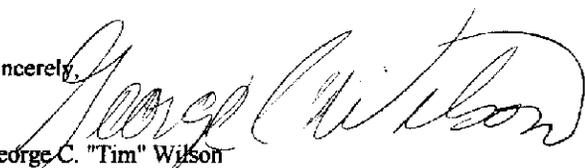
Dear Ms. May and Mr. Blease:

Reclamation District 2111 has reviewed your proposal to conduct an assessment of Delta levee impacts resulting from the non-native invasive species, Chinese mitten crab, and offers you our full support of this project.

We have noted the presence of the Chinese mitten crab as far up the Delta system as Dead Horse and Andrus Islands, and are concerned that the species may have potentially severe impacts on our levee maintenance programs, as well as planned habitat restoration and enhancement projects within our District. Research projects such as yours are critical to finding ways to control the spread of this aggressive invasive species, and control the damage the species may cause to our District's levees.

Your proposed research is critical to understanding and controlling this invasive species. The project is consistent with CALFED's stated objectives to control nonnative species, as expressed in the Bay-Delta Program's draft strategic plan. I am therefore pleased to offer you our full support and cooperation of your proposed project, and encourage other Reclamation Districts to support your efforts as well.

Sincerely,



George C. "Tim" Wilson
President

GCW:lme



MAY Consulting Services

P.O. Box 1156 ~ Walnut Grove, CA 95690
phone: (916) 776-2500 fax: (916) 776-1541

County of Contra Costa
ATTN: Board of Supervisors

RE: PROPOSAL TO CONDUCT AN ASSESSMENT OF DELTA LEVEE IMPACTS AND AQUATIC HABITAT UTILIZATION FOR THE NON-NATIVE CHINESE MITTEN CRAB (*ERIOCHEIR SINENSIS*) IN SOLANO, SACRAMENTO AND CONTRA COSTA COUNTIES.

Dear Sir or Madam,

This letter is to inform you of May Consulting Services' intent to submit a CALFED grant proposal for research to be conducted at several stations on public lands within Contra Costa County. The proposed two-year project is scheduled to begin in July 1999, and will proceed in two phases through July 2001.

We propose to conduct a dual-phased Delta levee impact assessment and aquatic habitat utilization survey for the nonindigenous crustacean *Eriocheir sinensis* (Chinese mitten crab). The species has proliferated widely since its initial collection from south San Francisco Bay in winter 1992, and threatens to adversely impact local fisheries, industry, and the sustained health and safety of the San Francisco Bay-Delta region.

Among several immediate concerns, established Chinese mitten crab in the waterways of the Central Valley and Delta may result in broadscale destabilization of fragile levee systems. This present threat to levee integrity, and implications for associated aquatic communities, is central to our proposed research. Each of the proposed project elements are compatible with the CALFED 1999 ERP Strategic Plan 'Visions for Reducing or Eliminating Stressors', and the CALFED 1999 Long-Term Levee Protection Plan. This proposed project includes the following four principal elements:

- Element 1. Habitat Utilization Survey
- Element 2. Levee Burrowing Study
- Element 3. Levee Population Study
- Element 4. Shallow Channel Trap Survey

Should you have questions regarding this notice, or require additional information, please contact our Project Manager and Principal Researcher, Brian Blease, at (650) 757-5180.

Sincerely,


Loran May, President



MAY Consulting Services

P.O. Box 1156 ~ Walnut Grove, CA 95690
phone: (916) 776-2500 fax: (916) 776-1541

County of Contra Costa
ATTN: Department of Planning and Community Development

RE: PROPOSAL TO CONDUCT AN ASSESSMENT OF DELTA LEVEE IMPACTS AND AQUATIC HABITAT UTILIZATION FOR THE NON-NATIVE CHINESE MITTEN CRAB (*ERIOCHEIR SINENSIS*) IN SOLANO, SACRAMENTO AND CONTRA COSTA COUNTIES.

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This letter is to inform you of May Consulting Services' intent to submit a CALFED grant proposal for research to be conducted at several stations on public lands within Contra Costa County. The proposed two-year project is scheduled to begin in July 1999, and will proceed in two phases through July 2001.

We propose to conduct a dual-phased Delta levee impact assessment and aquatic habitat utilization survey for the nonindigenous crustacean *Eriocheir sinensis* (Chinese mitten crab). The species has proliferated widely since its initial collection from south San Francisco Bay in winter 1992, and threatens to adversely impact local fisheries, industry, and the sustained health and safety of the San Francisco Bay-Delta region.

Among several immediate concerns, established Chinese mitten crab in the waterways of the Central Valley and Delta may result in broadscale destabilization of fragile levee systems. This present threat to levee integrity, and implications for associated aquatic communities, is central to our proposed research. Each of the proposed project elements are compatible with the CALFED 1999 ERP Strategic Plan 'Visions for Reducing or Eliminating Stressors', and the CALFED 1999 Long-Term Levee Protection Plan. This proposed project includes the following four principal elements:

- Element 1. Habitat Utilization Survey
- Element 2. Levee Burrowing Study
- Element 3. Levee Population Study
- Element 4. Shallow Channel Trap Survey

Should you have questions regarding this notice, or require additional information, please contact our Project Manager and Principal Researcher, Brian Blease, at (650) 757-5180.

Sincerely,

Loran May, President



MAY Consulting Services

P.O. Box 1156 ~ Walnut Grove, CA 95690
phone: (916) 776-2500 fax: (916) 776-1541

County of Sacramento
ATTN: Board of Supervisors

RE: PROPOSAL TO CONDUCT AN ASSESSMENT OF DELTA LEVEE IMPACTS AND AQUATIC HABITAT UTILIZATION FOR THE NON-NATIVE CHINESE MITTEN CRAB (*ERIOCHEIR SINENSIS*) IN SOLANO, SACRAMENTO AND CONTRA COSTA COUNTIES.

Dear Sir or Madam,

This letter is to inform you of May Consulting Services' intent to submit a CALFED grant proposal for research to be conducted at several stations on public lands within Sacramento County. The proposed two-year project is scheduled to begin in July 1999, and will proceed in two phases through July 2001.

We propose to conduct a dual-phased Delta levee impact assessment and aquatic habitat utilization survey for the nonindigenous crustacean *Eriocheir sinensis* (Chinese mitten crab). The species has proliferated widely since its initial collection from south San Francisco Bay in winter 1992, and threatens to adversely impact local fisheries, industry, and the sustained health and safety of the San Francisco Bay-Delta region.

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Sincerely,


Loran May, President



MAY Consulting Services

P.O. Box 1156 ~ Walnut Grove, CA 95690
phone: (916) 776-2500 fax: (916) 776-1541

County of Sacramento

ATTN: Department of Planning and Community Development

RE: PROPOSAL TO CONDUCT AN ASSESSMENT OF DELTA LEVEE IMPACTS AND AQUATIC HABITAT UTILIZATION FOR THE NON-NATIVE CHINESE MITTEN CRAB (*ERIOCHEIR SINENSIS*) IN SOLANO, SACRAMENTO AND CONTRA COSTA COUNTIES.

Dear Sir or Madam,

This letter is to inform you of May Consulting Services' intent to submit a CALFED grant proposal for research to be conducted at several stations on public lands within Sacramento County. The proposed two-year project is scheduled to begin in July 1999, and will proceed in two phases through July 2001.

We propose to conduct a dual-phased Delta levee impact assessment and aquatic habitat utilization survey for the nonindigenous crustacean *Eriocheir sinensis* (Chinese mitten crab). The species has proliferated widely since its initial collection from south San Francisco Bay in winter 1992, and threatens to adversely impact local fisheries, industry, and the sustained health and safety of the San Francisco Bay-Delta region.

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Should you have questions regarding this notice, or require additional information, please contact our Project Manager and Principal Researcher, Brian Blease, at (650) 757-5180.

Sincerely,


Loran May, President



MAY Consulting Services

P.O. Box 1156 ~ Walnut Grove, CA 95690
phone: (916) 776-2500 fax: (916) 776-1541

County of Solano
ATTN: Board of Supervisors

RE: PROPOSAL TO CONDUCT AN ASSESSMENT OF DELTA LEVEE IMPACTS AND AQUATIC HABITAT UTILIZATION FOR THE NON-NATIVE CHINESE MITTEN CRAB (*ERIOCHEIR SINENSIS*) IN SOLANO, SACRAMENTO AND CONTRA COSTA COUNTIES.

Dear Sir or Madam,

This letter is to inform you of May Consulting Services' intent to submit a CALFED grant proposal for research to be conducted at several stations on public lands within Solano County. The proposed two-year project is scheduled to begin in July 1999, and will proceed in two phases through July 2001.

We propose to conduct a dual-phased Delta levee impact assessment and aquatic habitat utilization survey for the nonindigenous crustacean *Eriocheir sinensis* (Chinese mitten crab). The species has proliferated widely since its initial collection from south San Francisco Bay in winter 1992, and threatens to adversely impact local fisheries, industry, and the sustained health and safety of the San Francisco Bay-Delta region.

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Should you have questions regarding this notice, or require additional information, please contact our Project Manager and Principal Researcher, Brian Blease, at (650) 757-5180.

Sincerely,

Loran May, President

ATTACHMENT B.
COMPLIANCE WITH STANDARD TERMS AND CONDITIONS



MAY Consulting Services

P.O. Box 1156 ~ Walnut Grove, CA 95690
phone: (916) 776-2500 fax: (916) 776-1541

County of Solano

ATTN: Department of Planning and Community Development

RE: PROPOSAL TO CONDUCT AN ASSESSMENT OF DELTA LEVEE IMPACTS AND AQUATIC HABITAT UTILIZATION FOR THE NON-NATIVE CHINESE MITTEN CRAB (*ERIOCHEIR SINENSIS*) IN SOLANO, SACRAMENTO AND CONTRA COSTA COUNTIES.

Dear Sir or Madam,

This letter is to inform you of May Consulting Services' intent to submit a CALFED grant proposal for research to be conducted at several stations on public lands within Solano County. The proposed two-year project is scheduled to begin in July 1999, and will proceed in two phases through July 2001.

We propose to conduct a dual-phased Delta levee impact assessment and aquatic habitat utilization survey for the nonindigenous crustacean *Eriocheir sinensis* (Chinese mitten crab). The species has proliferated widely since its initial collection from south San Francisco Bay in winter 1992, and threatens to adversely impact local fisheries, industry, and the sustained health and safety of the San Francisco Bay-Delta region.

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Should you have questions regarding this notice, or require additional information, please contact our Project Manager and Principal Researcher, Brian Blease, at (650) 757-5180.

Sincerely,


Loran May, President

Table D-1: Standard Contract Clauses and Related Proposal Submittal Requirements

Item ²	Standard Clauses and Proposal Requirements ³	Services, Consulting, Preconstruction, Research ¹					Public Works, Construction ¹				
		State	Federal	Public	Non-profit	Private	State	Federal	Public	Non-profit	Private
4100	Contracts With Public Entities			C					C		
4099	Service & Consultant Service Contracts with Nonpublic Entity				C	C				C	C
4099a	Additional Standard Clauses		C	C	C	C		C	C	C	C
4187	Interagency Agreements	C					C				
4247	Contracts with United States		C					C			
4197	General Conditions for Public Works Contracts								C	C	C
4196	Insurance Requirements								C	C	C
18	Nondiscrimination Construction Contract Specifications								C	C	C
4021	Bidders Bond or other Security (if contract value > \$107,000) ⁴									P	P
19	Nondiscrimination Compliance				P	P				P	P
807	Payment Bond								C	C	C
156	Performance Bond								C	C	C
4206	Non Collusion Affidavit								P	P	P
4186	Small Business Preference				P	P				P	P
n/a	Proof of Contractor's License									P	P
n/a	Certificate of Insurance								C	C	C

Legend: P = Submitted with Proposal.
C = Submitted or compliance required before or at time of final contract.

¹State: State of California agencies, including State (California) Universities. Federal: Federal agencies. Public: Public entities, such as city, county, other local government entities, resource conservation districts, and out-of-state public universities. Non-profits must also be registered with Department of General Services.

²Item numbering refers to documents following this table.

³All contract terms and standard clauses apply to any subcontracts made by Contractor.

⁴Types of security include cashiers check, cash, certified check, or bidder's bond in an amount equal to 10 percent of the proposal amount.

**STANDARD CLAUSES -
SERVICE & CONSULTANT SERVICE CONTRACTS FOR \$5,000 & OVER WITH NONPUBLIC ENTITIES**

Workers' Compensation Clause. Contractor affirms that it is aware of the provisions of Section 3700 of the California Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that Code, and Contractor affirms that it will comply with such provisions before commencing the performance of the work under this contract.

National Labor Relations Board Clause. In accordance with Public Contract Code Section 10296, Contractor declares under penalty of perjury that no more than one final, unappealable finding of contempt of court by a federal court has been issued against the Contractor within the immediately preceding two-year period because of Contractor's failure to comply with an order of a federal court which orders Contractor to comply with an order of the national Labor Relations Board.

Nondiscrimination Clause. During the performance of this contract, the recipient, Contractor and its subcontractors shall not deny the contract's benefits to any person on the basis of religion, color, ethnic group identification, sex, age, physical or mental disability, nor shall they discriminate unlawfully against any employee or applicant for employment because of race, religion, color, national origin, ancestry, physical handicap, mental disability, medical condition, marital status, age (over 40), or sex. Contractor shall insure that the evaluation and treatment of employees and applicants for employment are free of such discrimination. Contractor shall comply with the provisions of the Fair Employment and Housing Act (Government Code Section 12900 et seq.), the regulations promulgated thereunder (California Administrative Code, Title 2, Sections 7285.0 et seq.), the provisions of Article 9.5, Chapter 1, Part 1, Division 3, Title 2 of the Government Code (Government Code Sections 11135 - 11139.5), and the regulations or standards adopted by the awarding State agency to implement such article. Contractor or recipient shall permit access by representatives of the Department of Fair Employment and Housing and the awarding State agency upon reasonable notice at any time during the normal business hours, but in no case less than 24 hours' notice, to such of its books, records, accounts, other sources of information and its facilities as said Department or Agency shall require to ascertain compliance with this clause. Recipient, Contractor and its subcontractors shall give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other agreement. The Contractor shall include the nondiscrimination and compliance provisions of this clause in all subcontracts to perform work under the contract.

Statement of Compliance. The Contractor's signature affixed hereon and dated shall constitute a certification under penalty of perjury under the laws of the State of California that the Contractor has, unless exempted, complied with the nondiscrimination program requirements of Government Code Section 12990 and Title 2, California Code of Regulations, Section 8103.

Performance Evaluation. For consulting service agreements, Contractor's performance under this contract will be evaluated after completion. A negative evaluation will be filed with the Department of General Services.

Availability of Funds. Work to be performed under this contract is subject to availability of funds through the State's normal budget process.

Audit Clause. For contracts in excess of \$10,000, the contracting parties shall be subject to the examination and audit of the State Auditor for a period of three years after final payment under the contract. (Government Code Section 8546.7).

Payment Retention Clause. Ten percent of any progress payments that may be provided for under this contract shall be withheld per Public Contract Code Sections 10346 and 10379 pending satisfactory completion of all services under the contract.

Reimbursement Clause. If applicable, travel and per diem expenses to be reimbursed under this contract shall be at the same rates the State provides for unrepresented employees in accordance with the provisions of Title 2, Chapter 3, of the California Code of Regulations. Contractor's designated headquarters for the purpose of computing such expenses shall be: _____

May Consulting Services
14528 Andrus Island Road
Walnut Grove, CA 95690

Disabled Veteran Business Enterprise Participation Requirement Audit Clause. Contractor or vendor agrees that the awarding department or its delegates will have the right to review, obtain, and copy all records pertaining to performance of the contract. Contractor or vendor agrees to provide the awarding department or its delegate access to its premises, upon reasonable notice, during normal business hours for the purpose of interviewing employees and inspecting and copying such books, records, accounts, and other material that may be relevant to a matter under investigation for the purpose of determining compliance with Public Contract Code Section 10115 et seq. Contractor or vendor further agrees to maintain such records for a period of three (3) years after final payment under the contract. Title 2 CCR Section 1896.75.

Priority Hiring Considerations. For contracts in excess of \$200,000, the Contractor shall give priority consideration in filling vacancies in positions funded by the contract to qualified recipients of aid under Welfare and Institutions Code Section 11200. (Public Contract Code Section 10353).

Drug-Free Workplace Certification. By signing this contract, the Contractor or grantee hereby certifies under penalty of perjury under the laws of the State of California that the Contractor or grantee will comply with the requirements of the Drug-Free Workplace Act of 1990 (Government Code Section 8350 et seq.) and will provide a drug-free workplace by taking the following actions:

1. Publish a statement notifying employees that unlawful manufacture, distribution, dispensation, possession, or use of a controlled substance is prohibited and specifying actions to be taken against employees for violations.
2. Establish a Drug-Free Awareness Program to inform employees about all of the following:
 - (a) The dangers of drug abuse in the workplace.
 - (b) The person's or organization's policy of maintaining a drug-free workplace.
 - (c) Any available counseling, rehabilitation and employee assistance programs, and
 - (d) Penalties that may be imposed upon employees for drug abuse violations.
3. Every employee who works on the proposed contract or grant:
 - (a) Will receive a copy of the company's drug-free policy statement, and
 - (b) Will agree to abide by terms of the company's statement as a condition of employment on the contract or grant.

This contract or grant may be subject to suspension of payments or termination, or both, and the Contractor or grantee may be subject to debarment if the department determines that: (1) the Contractor or grantee has made a false certification, or (2) the Contractor or grantee violates the certification by failing to carry out the requirements noted above.

Antitrust Claims. In submitting a bid to a public purchasing body, the bidder offers and agrees that if the bid is accepted, it will assign to the purchasing body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, materials, or services by the bidder for sale to the purchasing body pursuant to the bid. Such assignment shall be made and become effective at the time the purchasing body tenders final payment to the bidder. See Government Code Section 4552.

If an awarding body or public purchasing body received, either through judgment or settlement, a monetary recovery for a cause of action assigned under this chapter, the assignor shall be entitled to receive reimbursement for actual legal costs incurred and may, upon demand, recover from the public body any portion of the recovery, including treble damages, attributable to overcharges that were paid by the assignor but were not paid by the public body as part of the bid price, less the expenses incurred in obtaining that portion of the recovery. See Government Code Section 4553.

Upon demand in writing by the assignor, the assignee shall, within one year from such demand, reassign the cause of action assigned under this part if the assignor has been or may have been injured by the violation of law for which the cause of action arose and (a) the assignee has not been injured thereby, or (b) the assignee declines to file a court action for the cause of action. See Government Code Section 4554.

Americans With Disabilities Act. By signing this contract, Contractor assures the state that it complies with the Americans With Disabilities Act (ADA) of 1990, (42 U.S.C. 12101 et seq.), which prohibits discrimination on the basis of disability, as well as all applicable regulations and guidelines issued pursuant to the ADA.

Corporate Qualifications To Do Business in California. Contractor must be currently qualified to do business in California as defined by the Revenue & Taxation Code, Section 23101 unless exempted. Both domestic and foreign corporations (those incorporated outside of California) must be in good standing in order to be qualified to do business in California.

May Consulting Services
P.O. Box 1156
Walnut Grove, CA 95690

Former State Employees: a) For the two-year period from the date he or she left State employment, no former State officer or employee may enter into a contract in which he or she engaged in any of the negotiations, transactions, planning, arrangements or any part of the decision-making process relevant to the contract while employed in any capacity by any State agency. b) For the twelve-month period from the date he or she left State employment, no former State officer or employee may enter into a contract with any State agency if he or she was employed by that State agency in a policy-making position in the same general subject area as the proposed contract within the twelve-month period prior to his or her leaving State service.

Agreement No. _____

Exhibit B

May Consulting Services
14528 Andrus Island Road
Walnut Grove, CA 95690

ADDITIONAL STANDARD CLAUSES

Recycled Materials. Contractor hereby certifies under penalty of perjury that 5 (enter value or "0" here) percent of the materials, goods and supplies offered or products used in the performance of this Agreement meets or exceeds the minimum percentage of recycled material as defined in Sections 12161 and 12200 of the Public Contract Code.

Severability. If any provision of this Agreement is held invalid or unenforceable by any court of final jurisdiction, it is the intent of the parties that all other provisions of this Agreement be construed to remain fully valid, enforceable, and binding on the parties.

Governing Law. This Agreement is governed by and shall be interpreted in accordance with the laws of the State of California.

Y2K Language. The Contractor warrants and represents that the goods or services sold, leased, or licensed to the State of California, its agencies, or its political subdivisions, pursuant to this Agreement are "Year 2000 compliant." For purposes of this Agreement a good or service is Year 2000 compliant if it will continue to fully function before, at, and after the Year 2000 without interruption and, if applicable, with full ability to accurately and unambiguously process, display, compare, calculate, manipulate, and otherwise utilize date information. This warranty and representation supersedes all warranty disclaimers and limitations and all limitations on liability provided by or through the Contractor.

Child Support Compliance Act. For any Agreement in excess of \$100,000, the Contractor acknowledges in accordance therewith, that:

1. The Contractor recognizes the importance of child and family support obligations and shall fully comply with all applicable state and federal laws relating to child and family support enforcement, including, but not limited to, disclosure of information and compliance with earnings assignment orders, as provided in Chapter 8 (commencing with Section 5200) of Part 5 of Division 9 of the Family Code; and
2. The Contractor, to the best of its knowledge, is fully complying with the earnings assignment orders of all employees and is providing the names of all new employees to the New Hire Registry maintained by the California Employment Development Department.

NONDISCRIMINATION COMPLIANCE STATEMENT

STD. 18 (REV. 3-82) P&C

COMPANY NAME

MAY CONSULTING SERVICES

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.

OFFICIAL'S NAME

LORAN MAY

DATE EXECUTED

APRIL 15, 1999

EXECUTED IN THE COUNTY OF

SACRAMENTO, CA

PROSPECTIVE CONTRACTOR'S SIGNATURE

PROSPECTIVE CONTRACTOR'S TITLE

PRESIDENT

PROSPECTIVE CONTRACTOR'S LEGAL BUSINESS NAME

MAY CONSULTING SERVICES

**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* No

*Attach a copy of your certification approval letter.

FIN 68-036-0044

DEPARTMENT OF GENERAL SERVICES

Office of Small and Minority Business

1531 I Street, Second Floor

Sacramento, CA 95814-2016



SB APP 19970606

June 6, 1997

REF# 0016506
 MAY CONSULTING SERVICES
 P O BOX 1156
 WALNUT GROVE CA 95690

Dear Business Person:

The Office of Small and Minority Business (OSMB) congratulates your firm on becoming a certified small business. This formal certification entitles you to a five percent bidding preference on state government contracts according to the Small Business Procurement and Contract Act.

Your small business certification applies ONLY to the following industry groups(s) within the designated business type(s):

Business Type	Roman Numeral	Industry Group Name
SERVICE	iv	Architects, Engineers and Survey Services
SERVICE	v	Consulting, Management and Public Relations

Certification
 Effective

06/06/1997

06/06/1997

Your firm's small business certification expires **06/30/2000**.

Annual Submission Requirement

To maintain your small business certification status, gross receipts for your firm and any affiliate(s) must be submitted at the end of each fiscal year. Proof of annual receipts may be submitted in the form of either:

1. An audited financial statement, or
2. A copy of the **ENTIRE SIGNED** Federal tax return(s) (FTRs) as filed with the Internal Revenue Service (IRS).
3. If the FTR for the most recently completed tax year has not yet been filed with the IRS, submit an original notarized Affidavit of Income (AI). (See enclosed AI and instructions). A copy of the signed tax filing extension must accompany the AI if the filing due date has passed.

Note: All AIs must be replaced with the corresponding **ENTIRE SIGNED** FTR(s) by the tax filing due date or by the filing extension's expiration date, whichever occurs first.

Prompt Payment Program

The Prompt Payment Act encourages state agencies to pay invoices on a timely basis to certified service and commodity small businesses and recognized nonprofit organizations. Prompt payment is reinforced by adding interest penalties for late payments. The program includes the use of a rubber stamp to alert state agencies of a firm's certified small business or nonprofit organization's status.

Only certified service and commodity small business firms actively working with the state may participate in the Prompt Payment Program. Construction firms' compensation on late/unpaid progress payments is addressed in Public Contract Code, Section 10261.5.

To receive a prompt payment stamp, the following **three items must be submitted** to the OSMB:

1. A written rubber stamp request. Include the applicant firm's name, OSMB Reference number, and your current mailing address.
2. A copy of a current state contract or purchase order soliciting services from the applicant.
3. A \$15.00 check or money order made payable to the Department of General Services.

Reporting Business Changes

Your firm's business information must remain current with the OSMB or your certification status may be subject to suspension and subsequent revocation.

All changes in business name, structure or ownership requires submission of a new "Small Business and/or Disabled Veteran Business Enterprise Certification Application" (STD. 812). Address and/or telephone number changes must be submitted in writing or fax and must be signed by an owner/officer.

Proof of Eligibility

Maintain this original certification letter for future business needs. To demonstrate your firm's small business eligibility, include a copy of this letter in your state contract bid submittals.

Certification Renewal

A renewal application will be mailed to you prior to the expiration of your small business certification. However, should you not receive an application, please call us so that you may timely renew your certification.

If you have any questions, please contact me at (916) 322-3422, or by e-mail fduke@dgs.ca.gov. **Please have a copy of this letter and the STD.812 booklet when you call.** The OSMB offers various programs to further participation in state contracting. For more information regarding these programs, you may visit our Internet website at www.dgs.ca.gov/osmb, or call our OSMB Telephone Information System at (916) 322-5060.

Sincerely,



Flemming L. Duke
Certification Officer
Office of Small and Minority Business

ASSURANCES - NON-CONSTRUCTION PROGRAMS

Public reporting burden for this collection of information is estimated to average 15 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0040), Washington, DC 20503.

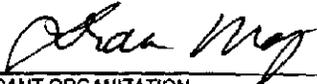
PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE OFFICE OF MANAGEMENT AND BUDGET. SEND IT TO THE ADDRESS PROVIDED BY THE SPONSORING AGENCY.

NOTE: Certain of these assurances may not be applicable to your project or program. If you have questions, please contact the awarding agency. Further, certain Federal awarding agencies may require applicants to certify to additional assurances. If such is the case, you will be notified.

As the duly authorized representative of the applicant, I certify that the applicant:

1. Has the legal authority to apply for Federal assistance and the institutional, managerial and financial capability (including funds sufficient to pay the non-Federal share of project cost) to ensure proper planning, management and completion of the project described in this application.
2. Will give the awarding agency, the Comptroller General of the United States and, if appropriate, the State, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to the award; and will establish a proper accounting system in accordance with generally accepted accounting standards or agency directives.
3. Will establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain.
4. Will initiate and complete the work within the applicable time frame after receipt of approval of the awarding agency.
5. Will comply with the Intergovernmental Personnel Act of 1970 (42 U.S.C. §§4725-4763) relating to prescribed standards for merit systems for programs funded under one of the 19 statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5 C.F.R. 900, Subpart F).
6. Will comply with all Federal statutes relating to nondiscrimination. These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin; (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C. §§1681-1683, and 1685-1686), which prohibits discrimination on the basis of sex; (c) Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. §794), which prohibits discrimination on the basis of handicap; (d) the Age Discrimination Act of 1975, as amended (42 U.S.C. §§6101-6107), which prohibits discrimination on the basis of age; (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255), as amended, relating to nondiscrimination on the basis of drug abuse; (f) the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L. 91-616), as amended, relating to nondiscrimination on the basis of alcohol abuse or alcoholism; (g) §§523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. §§290 dd-3 and 290 ee 3), as amended, relating to confidentiality of alcohol and drug abuse patient records; (h) Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§3601 et seq.), as amended, relating to nondiscrimination in the sale, rental or financing of housing; (i) any other nondiscrimination provisions in the specific statute(s) under which application for Federal assistance is being made; and, (j) the requirements of any other nondiscrimination statute(s) which may apply to the application.
7. Will comply, or has already complied, with the requirements of Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) which provide for fair and equitable treatment of persons displaced or whose property is acquired as a result of Federal or federally-assisted programs. These requirements apply to all interests in real property acquired for project purposes regardless of Federal participation in purchases.
8. Will comply, as applicable, with provisions of the Hatch Act (5 U.S.C. §§1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.

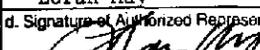
- 12345
- Will comply, as applicable, with the provisions of the Davis-Bacon Act (40 U.S.C. §§276a to 276a-7), the Copeland Act (40 U.S.C. §276c and 18 U.S.C. §874), and the Contract Work Hours and Safety Standards Act (40 U.S.C. §§327-333), regarding labor standards for federally-assisted construction subagreements.
3. Will comply, if applicable, with flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973 (P.L. 93-234) which requires recipients in a special flood hazard area to participate in the program and to purchase flood insurance if the total cost of insurable construction and acquisition is \$10,000 or more.
 1. Will comply with environmental standards which may be prescribed pursuant to the following: (a) institution of environmental quality control measures under the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order (EO) 11514; (b) notification of violating facilities pursuant to EO 11738; (c) protection of wetlands pursuant to EO 11990; (d) evaluation of flood hazards in floodplains in accordance with EO 11988; (e) assurance of project consistency with the approved State management program developed under the Coastal Zone Management Act of 1972 (16 U.S.C. §§1451 et seq.); (f) conformity of Federal actions to State (Clean Air) Implementation Plans under Section 176(c) of the Clean Air Act of 1955, as amended (42 U.S.C. §§7401 et seq.); (g) protection of underground sources of drinking water under the Safe Drinking Water Act of 1974, as amended (P.L. 93-523); and, (h) protection of endangered species under the Endangered Species Act of 1973, as amended (P.L. 93-205).
 12. Will comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. §§1271 et seq.) related to protecting components or potential components of the national wild and scenic rivers system.
 13. Will assist the awarding agency in assuring compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. §470), EO 11593 (identification and protection of historic properties), and the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. §§469a-1 et seq.).
 14. Will comply with P.L. 93-348 regarding the protection of human subjects involved in research, development, and related activities supported by this award of assistance.
 15. Will comply with the Laboratory Animal Welfare Act of 1966 (P.L. 89-544, as amended, 7 U.S.C. §§2131 et seq.) pertaining to the care, handling, and treatment of warm blooded animals held for research, teaching, or other activities supported by this award of assistance.
 16. Will comply with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. §§4801 et seq.) which prohibits the use of lead-based paint in construction or rehabilitation of residence structures.
 17. Will cause to be performed the required financial and compliance audits in accordance with the Single Audit Act Amendments of 1996 and OMB Circular No. A-133, "Audits of States, Local Governments, and Non-Profit Organizations."
 18. Will comply with all applicable requirements of all other Federal laws, executive orders, regulations, and policies governing this program.

SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL 	TITLE PRESIDENT, MAY CONSULTING SERVICES
APPLICANT ORGANIZATION MAY CONSULTING SERVICES	DATE SUBMITTED APRIL 15, 1999

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**APPLICATION FOR
FEDERAL ASSISTANCE**

OMB Approval No. 0348-0046

1. TYPE OF SUBMISSION: Application <input type="checkbox"/> Construction <input type="checkbox"/> Non-Construction		Preapplication <input type="checkbox"/> Construction <input checked="" type="checkbox"/> Non-Construction		2. DATE SUBMITTED APRIL 15, 1999	Applicant Identifier
				3. DATE RECEIVED BY STATE	State Application Identifier
				4. DATE RECEIVED BY FEDERAL AGENCY	Federal Identifier
5. APPLICANT INFORMATION					
Legal Name: LORAN MAY			Organizational Unit: MAY CONSULTING SERVICES		
Address (give city, county, State, and zip code): P.O. Box 1156 Walnut Grove, California 95690			Name and telephone number of person to be contacted on matters involving this application (give area code) LORAN MAY (916) 776-2500 BRIAN BLEASE (650) 757-5180		
6. EMPLOYER IDENTIFICATION NUMBER (EIN): 68 - 0360044			7. TYPE OF APPLICANT: (enter appropriate letter in box) <input checked="" type="checkbox"/> M		
8. TYPE OF APPLICATION: <input checked="" type="checkbox"/> New <input type="checkbox"/> Continuation <input type="checkbox"/> Revision If Revision, enter appropriate letter(s) in box(es) <input type="checkbox"/> <input type="checkbox"/> A. Increase Award B. Decrease Award C. Increase Duration D. Decrease Duration Other (specify):			A. State H. Independent School Dist. B. County I. State Controlled Institution of Higher Learning C. Municipal J. Private University D. Township K. Indian Tribe E. Interstate L. Individual F. Intermunicipal M. Profit Organization G. Special District N. Other (Specify) _____		
			9. NAME OF FEDERAL AGENCY: CALFED BAY-DELTA PROGRAM, PSP 1999		
10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER: TITLE: <input type="checkbox"/> - <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			11. DESCRIPTIVE TITLE OF APPLICANT'S PROJECT: Proposal to Conduct an Assessment of Delta Levee Impacts and Habitat Utilization by the non-Native Chinese Mitten Crab in Sacramento, Solano, and Contra Costa Counties, CA.		
12. AREAS AFFECTED BY PROJECT (Cities, Counties, States, etc.): Sacramento, Solano, Contra Costa Counties, CA					
13. PROPOSED PROJECT Research		14. CONGRESSIONAL DISTRICTS OF:			
Start Date 7/99	Ending Date 7/01	a. Applicant May Consulting Services		b. Project Chinese mitten crab Levee Impacts/Habitat Assessment: CALFED	
15. ESTIMATED FUNDING:		16. IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTIVE ORDER 12372 PROCESS?			
a. Federal	\$.00			
b. Applicant	\$.00			
c. State	\$.00			
d. Local	\$.00			
e. Other	\$.00			
f. Program Income	\$.00			
g. TOTAL	\$	\$87,415			
		a. YES. THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON: DATE _____ b. No. <input checked="" type="checkbox"/> PROGRAM IS NOT COVERED BY E. O. 12372 <input type="checkbox"/> OR PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW			
17. IS THE APPLICANT DELINQUENT ON ANY FEDERAL DEBT? <input type="checkbox"/> Yes If "Yes," attach an explanation. <input checked="" type="checkbox"/> No					
18. TO THE BEST OF MY KNOWLEDGE AND BELIEF, ALL DATA IN THIS APPLICATION/PREAPPLICATION ARE TRUE AND CORRECT, THE DOCUMENT HAS BEEN DULY AUTHORIZED BY THE GOVERNING BODY OF THE APPLICANT AND THE APPLICANT WILL COMPLY WITH THE ATTACHED ASSURANCES IF THE ASSISTANCE IS AWARDED.					
a. Type Name of Authorized Representative Loran May		b. Title President		c. Telephone Number (916) 776-2500	
d. Signature of Authorized Representative 				e. Date Signed April 15, 1999	

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Standard Form 424 (Rev. 7-97)
Prescribed by OMB Circular A-102

BUDGET INFORMATION - Non-Construction Programs						
SECTION A - BUDGET SUMMARY						
Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		Total (g)
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	
1. CALFED RFP		\$	\$	\$	\$	\$
2.						
3.						
4.						
5. Totals		\$	\$	\$	\$	\$ 87,415.00
SECTION B - BUDGET CATEGORIES						
Object Class Categories	CURRED		GRANT PROGRAM, FUNCTION OR ACTIVITY		Total	
	(1)	(2)	(3)	(4)	(5)	
a. Personnel	\$ 74,800.00	\$	\$	\$	\$	
b. Fringe Benefits						
c. Travel	\$3000.00					
d. Equipment	\$1000.00					
e. Supplies	\$1000.00					
f. Contractual						
g. Construction						
h. Other	\$900.00					
i. Total Direct Charges (sum of 6a-6h)	\$80,700					
j. Indirect Charges	\$6715.00					
k. TOTALS (sum of 6i and 6j)	\$ 87,415.00	\$	\$	\$	\$	
7. Program Income		\$	\$	\$	\$	

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SECTION C - NON-FEDERAL RESOURCES					
(a) Grant Program	(b) Applicant	(c) State	(d) Other Sources	(e) TOTALS	
8.	\$	\$	\$	\$	\$
9.					
10.					
11.					
12. TOTAL (sum of lines 8 - 11)	\$	\$	\$	\$	\$
SECTION D - FORECASTED CASH NEEDS					
	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
13. Federal	\$	\$	\$	\$	\$
14. Non-Federal					
15. TOTAL (sum of lines 13 and 14)	\$45,982.50				
SECTION E - BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT					
	(a) Grant Program	FUTURE FUNDING PERIODS (Years)			
		(b) First	(c) Second	(d) Third	(e) Fourth
16.	CALFED REP	\$ 41,432.50	\$	\$	\$
17.					
18.					
19.					
20. TOTAL (sum of lines 16-19)	\$ 41,432.50	\$	\$	\$	\$
SECTION F - OTHER BUDGET INFORMATION					
21. Direct Charges:	22. Indirect Charges:				
23. Remarks:					

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