

Project Title and Applicant Name:

Title: Evaluation of the Potential Effects of Shallow-Water Habitat on Water Temperature Within the Sacramento - San Joaquin Delta

Applicant: Hanson Environmental, Inc.

Project Description and Primary Biological/Ecological Objectives: A potential conflict exists within the CALFED and Category III programs in which the creation of shallow-water habitat for fisheries within the Delta exacerbates the stresses on Chinook salmon, steelhead, and other coldwater species, resulting from exposure to elevated water temperature. The objectives of the proposed project are (1) to determine the effect of shallow-water habitat on receiving water body temperatures, (2) to develop a technical base for evaluating the thermal contribution of shallow-water habitat based upon specific parameters (e.g., surface area), and (3) to provide quantifiable data which can be used, in part, as the basis for developing design criteria for shallow-water habitat that minimizes or avoids adverse effects on water temperatures in areas used as rearing and migratory corridors for juvenile and adult Chinook salmon and steelhead. Areas selected for temperature monitoring will be based on their geographic location to include both the Sacramento and San Joaquin sides of the Delta.

Approach/Tasks/Schedule: The proposed scope of work and schedule will include:

- Completion of the analysis of data collected during spring 1997 and the sampling design for subsequent monitoring - November, 1997;
- Distribution of the draft documentation report, preliminary analyses and conclusions, and proposed sampling design for scientific review - November, 1997 - January, 1998;
- Deployment of the spring temperature monitoring network - March, 1998;
- Retrieval of spring water temperature monitoring results - July, 1998;
- Deployment of fall temperature monitoring network - August, 1998;
- Retrieval of fall water temperature monitoring results - November, 1998;
- Final draft documentation report and preliminary recommendations for shallow-water habitat design criteria with respect to thermal loading - January, 1999;
- Scientific peer review of the draft report and recommendations - January - March, 1999; and
- Completion of the final documentation report and recommendations - April, 1999.

Justification for Project and Funding By CALFED: A potential conflict exists within the CALFED and Category III programs in which the creation of shallow-water habitat for fisheries within the Delta exacerbates the stresses on Chinook salmon, steelhead, and other coldwater species, resulting from exposure to elevated water temperature. Water

temperature within both the Sacramento and San Joaquin river systems has been identified by CALFED as a significant stressor.

Reductions in the availability of shallow-water habitat has also been identified as a significant stressor adversely affecting the quality and availability of suitable habitat for a variety of fish, invertebrates, and wildlife inhabiting the Bay-Delta system. A number of projects have been identified which are specifically designed to increase the acreage of free-flowing, tidally inundated shallow-water areas. Although these shallow-water areas are expected to create additional habitat, they may also contribute to additional thermal loading to the aquatic environment.

Virtually no data exists for use in evaluating the potential effect of additional shallow-water habitat on water temperature within the lower Sacramento and San Joaquin rivers and Delta. Seasonal water temperatures, particularly during the late spring (April - June) period of juvenile emigration and during the late summer - early fall (August - October) period of adult immigration, are of particular concern. Additional thermal loading associated with shallow-water areas may increase the frequency and magnitude of these adverse temperature conditions.

Budget Costs and Third Party Impacts: The cost for the proposed project, including all equipment, data management, analysis, and reporting is \$75,000.00. There are no third party impacts associated with the proposed project.

Applicant Qualifications: The proposed project would be performed by Hanson Environmental, Inc. under the direct supervision of Dr. Charles H. Hanson. Dr. Charles Hanson has been involved in evaluating the effects of elevated water temperature on Chinook salmon and steelhead for over 25 years. Dr. Hanson has supervised and managed large thermal effects studies, designed to evaluate the physical dynamics and biological response of fish resulting from exposure to elevated water temperatures associated with thermal power plant discharges within the Sacramento - San Joaquin Delta, San Francisco Bay, Puget Sound, Chesapeake Bay, and the Potomac River.

Monitoring and Data Evaluation: A detailed experimental and sampling design for monitoring the effects of shallow-water habitat on adjacent channel water temperature will be implemented as part of the proposed project. The monitoring program and techniques used in evaluating thermal loading will be made available for technical peer review by project work teams within the Interagency Ecological Program (IEP) and by other scientists involved in the CALFED program, evaluations of similar shallow-water wetland projects, and other interested scientific investigators.

Local Support/Coordination with other Programs/Compatibility with CALFED Objectives: The proposed project directly addresses the CALFED objective of increasing shallow-water habitat while minimizing and avoiding water temperature stresses on salmon and steelhead. Coordination with other projects will be accomplished through peer review of study plans and finding by IEP and other scientists.

**Proposal for
Evaluation of the Potential Effects of Shallow-Water Habitat on Water
Temperature Within the Sacramento - San Joaquin Delta**

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Type of Organization and Tax Status: Private

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Hanson Environmental, Inc.

Financial Contact: Charles H. Hanson
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Participants: Hanson Environmental, Inc.
KDH Biological Resource Consultation
White Environmental

Project Group: Services

1. Project Description

a. **Project Description and Approach:** A potential conflict exists within the CALFED and Category III programs in which the creation of shallow-water habitat for fisheries within the Delta exacerbates the stresses on Chinook salmon, steelhead, and other coldwater species, resulting from exposure to elevated water temperature. The objectives of the proposed project are (1) to determine the effect of shallow-water habitat on receiving water body temperatures, (2) to develop a technical base for evaluating the thermal contribution of shallow-water habitat based upon specific parameters (e.g., surface area), and (3) to provide quantifiable data which can be used, in part, as the basis for developing design criteria for shallow-water habitat that minimizes or avoids adverse effects on water temperatures in areas used as rearing and migratory corridors for juvenile and adult Chinook salmon and steelhead.

Areas selected for temperature monitoring will be based on their geographic location to include both the Sacramento and San Joaquin sides of the Delta. Additional consideration will be given to selecting areas having a range of characteristics including, but not limited to, surface area, water depths, and flushing characteristics to provide a technical foundation for evaluating alternative shallow-water habitat design characteristics.

b. **Location and/or Geographic Boundaries of Project:** A potential conflict exists within the CALFED and Category III programs in which the creation of shallow-water habitat for fisheries within the Delta exacerbates the stresses on Chinook salmon, steelhead, and other coldwater species, resulting from exposure to elevated water temperature. The proposed project will include water temperature monitoring within and adjacent to shallow-water habitats within the lower Sacramento and San Joaquin rivers and Delta. Habitats will be selected for monitoring on the Sacramento River between Walnut Grove and Chipps Island, including areas adjacent to Lindsay and Cache sloughs. Areas along the San Joaquin River selected for monitoring will be within the reach from Stockton to Chipps Island.

c. **Expected Benefits:** The expected benefits of the project include (1) the synthesis and evaluation of data collected during the spring at existing shallow-water habitat areas, representing a range of habitat characteristics and a resulting determination of the impact, if any, of each area on seasonal water temperatures within immediately adjacent channels, and (2) technical data which can be used as a basis for developing design criteria for future shallow-water habitat that will minimize or avoid significant increases in water temperature that would adversely affect rearing and/or migration of juvenile and adult Chinook salmon and steelhead.

d. **Background and Biological/Technical Justification:** Water temperature within both the Sacramento and San Joaquin river systems has been identified by

CALFED as a significant stressor. Exposure of salmon and steelhead to elevated temperatures contributes to both sublethal chronic stress and acute mortality for fry rearing within the Delta, smolts and yearlings during emigration, and adults during upstream spawning migration.

Reductions in the availability of shallow-water habitat has also been identified as a significant stressor adversely affecting the quality and availability of suitable habitat for a variety of fish, invertebrates, and wildlife inhabiting the Bay-Delta system. The loss of shallow-water habitat, through reclamation, levee construction, and channelization has substantially altered the environmental conditions and habitat quality of the Bay-Delta system. A number of projects have been identified which are specifically designed to increase the acreage of free-flowing, tidally inundated shallow-water areas. Although these shallow-water areas are expected to create additional habitat, they may also contribute to additional thermal loading to the aquatic environment. Shallow-water areas, such as many of those being designed, would increase water residence time and increase the surface area of water exposed to solar radiation. Solar radiation (air temperature) and residence time are the two principal factors influencing water temperatures within the Delta.

Virtually no data exist for use in evaluating the potential effect of additional shallow-water habitat on water temperature within the lower Sacramento and San Joaquin rivers and Delta. Water temperatures measured currently within the Delta are frequently at or above levels stressful for juvenile and adult salmon and steelhead. Seasonal water temperatures, particularly during the late spring (April - June) period of juvenile emigration and during the late summer - early fall (August - October) period of adult immigration, are of particular concern. Additional thermal loading associated with shallow-water areas may increase the frequency and magnitude of these adverse temperature conditions.

A pilot study was initiated during 1997 to collect detailed water temperature information to evaluate the potential effects of shallow-water habitat on water temperature. The pilot study included water temperature monitoring (at 24-minute intervals) continuously from late April through mid July at six sampling locations along the lower San Joaquin River (Stockton - Antioch) and at seven sampling locations within and immediately adjacent to Big Break (a relatively large shallow-water habitat). The resulting data will allow detailed comparisons of the seasonal pattern, daily pattern, and hourly differences in water temperatures in response to such factors as tidal hydraulics and flows within the lower San Joaquin River. The data can be used to determine the magnitude of temperature differences within Big Break and the influence, if any, of thermal loading to Big Break on water temperatures within Dutch Slough and the lower San Joaquin River. These temperature recorders have been retrieved and the data downloaded. Temperature recorders were calibrated, both before and after deployment, to allow for precise evaluation of differences in water temperature among locations for use in statistical

analysis of potential thermal loading created by Big Break (the incremental increase in water temperature - ΔT) in addition to evaluation of the absolute temperature conditions.

e. **Proposed Scope of Work:** The proposed scope of work will include:

- Compilation and analysis of water temperature monitoring data collected during the spring 1997 within the lower San Joaquin River and Big Break shallow-water habitat;
- Graphical and statistical analysis of the 1997 data to evaluate changes in water temperature between the lower San Joaquin River and Dutch Slough, and temperatures at various locations within Big Break at 24-minute intervals to take into account tidal hydraulics to evaluate the affect, if any, of shallow-water habitat within Big Break on receiving water temperatures;
- Prepare a technical documentation report for scientific peer review on the spring 1997 studies, recommendations for further modification or refinement of the experimental and sampling design of the program, and the identification of specific water temperature monitoring locations associated with other shallow-water habitat areas;
- Deploy 60 continuous water temperature monitoring units (data recorded at 24-minute intervals), allocated among the shallow-water habitats and adjacent channel areas to quantify the effects of each shallow-water habitat area on receiving water temperatures during the spring (March - June) and fall (August - October), 1998;
- Compile all water temperature monitoring results in both tabular and graphic format, and test for significant differences in receiving water temperatures resulting from adjacent shallow-water habitat;
- Evaluate the general characteristics of each of the shallow-water habitat areas monitored for use in developing generic design criteria that will reduce or avoid adverse effects of shallow-water habitat on receiving water body temperature;
- Prepare a draft compilation and documentation report, including all water temperature monitoring data in electronic format, for scientific peer review by representatives of the Interagency Ecological Program (IEP), State and Federal resource agencies, and other interested parties;
- Prepare a final documentation report, including specific conclusion regarding the magnitude of temperature effects resulting from shallow-water habitat and

recommendations regarding specific design criteria to avoid potentially significant adverse effects associated with future habitat projects.

f. ***Monitoring and Data Evaluation:*** A detailed experimental and sampling design for monitoring the effects of shallow-water habitat on adjacent channel water temperature will be implemented as part of the proposed project. The monitoring program and techniques used in evaluating thermal loading will be made available for technical peer review by project work teams within the Interagency Ecological Program (IEP) and by other scientists involved in the CALFED program, evaluations of similar shallow-water wetland projects, and other interested scientific investigators.

Data collected as part of this project will follow standard procedures and protocols, and will be subject to periodic quality assessment checks. Data will be maintained and managed in electronic format for subsequent use in data analysis and evaluation. Sampling methods and the selection of measurement locations will be subject to review as part of the overall experimental design and sampling plan. Data will be compiled, analyzed, and documented in technical reports provided to CALFED, IEP, and other interested parties. All data collected will be made available for independent analysis.

g. ***Implementability:*** The proposed project can be implemented quickly, with no permit requirements or potential adverse environmental impacts. The only obstacle regarding implementation of the proposed project results from potential vandalism or failure to relocate temperature recorders. The location of each temperature recorder deployed will be identified using a Global Positioning System (GPS), which can subsequently be used in relocating exact positions. Temperature recorders will be secured using small-diameter steel wire or cables to maintain position. Multiple recorders will be placed at strategic and critical monitoring locations to provide redundancy in the event of instrument loss or mechanical failure. All required temperature monitoring equipment and computerized software support is available.

2. **Costs and Schedule to Implement Proposed Project**

a. ***Budget Costs:*** The cost for the proposed project, including all equipment, data management, analysis, and reporting is \$75,000.00. Costs include \$6,000 for supplies and equipment, and \$69,000 for labor and professional services.

b. **Schedule Milestones:** Schedule milestones include:

- Completion of the analysis of data collected during spring 1997 and the sampling design for subsequent monitoring - November, 1997;
- Distribution of the draft documentation report, preliminary analyses and conclusions, and proposed sampling design for scientific review - November, 1997 - January, 1998;
- Deployment of the spring temperature monitoring network - March, 1998;
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- Scientific peer review of the draft report and recommendations - January - March, 1999; and
- Completion of the final documentation report and recommendations - April, 1999.

c. **Third Party Impacts:** There are no third party impacts associated with the proposed project.

3. Applicant Qualifications

a. **Overview of Team:** The proposed project would be performed by Hanson Environmental, Inc. under the direct supervision of Dr. Charles H. Hanson. Deployment, retrieval, database management, and data summaries will be performed by Brenna Bemis and Dennis Hood. Assistance in the development of the experimental design and sampling program, and statistical analysis of the resulting information will be provided by Charles White.

b. **Responsibilities of Personnel:** **Charles H. Hanson** will be responsible for supervising all aspects of the proposed project. Dr. Hanson will oversee the development of the sampling and experimental design, data analysis, development of recommendations for design criteria, and preparation of documentation reports. Dr. Hanson will also be responsible for contract administration and management of budgets, effort allocation, scheduling, and project management.

Brenna Bemis will be responsible for temperature monitoring, instrument deployment and retrieval, data downloading, verification of instrument calibration results, data summarization and analysis. Ms. Bemis will also participate in the supervision of preparation of draft and final documentation reports.

Dennis Hood will be responsible for assisting Ms. Bemis in instrument deployment and retrieval, the selection of specific water temperature monitoring locations, and preparation of draft and final documentation reports.

Charles White will serve as a scientific advisor to the project, assisting in the identification of specific temperature monitoring locations included as part of the overall sampling and experimental design, data analysis and hypothesis testing, input to the development of recommendations regarding shallow-water habitat design criteria, and peer review of the technical documentation reports.

c. **Relevant Experience of Key Personnel:** **Dr. Charles Hanson** has been involved in evaluating the effects of elevated water temperature on Chinook salmon and steelhead for over 25 years. Dr. Hanson has supervised and managed large thermal effects studies, designed to evaluate the physical dynamics and biological response of fish resulting from exposure to elevated water temperatures associated with thermal power plant discharges within the Sacramento - San Joaquin Delta, San Francisco Bay, Puget Sound, Chesapeake Bay, and the Potomac River. Dr. Hanson has had extensive involvement in fisheries and water quality studies performed on the Sacramento - San Joaquin rivers and Delta, and has been involved in the development of several projects designed to enhance the availability of shallow-water habitat.

Ms. Bemis and Mr. Hood were involved in the spring, 1997 water temperature monitoring pilot study. Ms. Bemis assisted in the deployment and retrieval of temperature monitoring equipment, instrument downloading, data management, and the design and development of the expanded monitoring and evaluation program.

Charles White has participated in biological and water temperature monitoring studies within the Bay-Delta system since 1978. Mr. White has supervised numerous studies to evaluate thermal plume dynamics and the influence of elevated water temperature discharges on receiving water body temperatures. Mr. White has extensive experience in water temperature monitoring instrumentation and the analysis and interpretation of results from water temperature monitoring studies.

4. Compliance with Standard Terms and Conditions

Hanson Environmental has reviewed the Standard Terms and Conditions, and does not take exception to the conditions. A copy of the Non-Discrimination Compliance Statement is attached. Hanson Environmental, Inc., although a small business, does not have a letter certifying approval from the Office of Small and Minority Businesses.

NONDISCRIMINATION COMPLIANCE STATEMENT

COMPANY NAME

Hanson Environmental, Inc.

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

CERTIFICATION

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

OFFICIAL'S NAME

Charles H. Hanson

DATE EXECUTED

July 28, 1997

EXECUTED IN THE COUNTY OF

Contra Costa

PROSPECTIVE CONTRACTOR'S SIGNATURE

PROSPECTIVE CONTRACTOR'S TITLE

Principal

PROSPECTIVE CONTRACTOR'S LEGAL BUSINESS NAME

Hanson Environmental, Inc.

Agreement No. _____

Exhibit _____

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

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

Are you claiming preference as a small business?

_____ Yes* X No

*Attach a copy of your certification approval letter.