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MEMORANDUM

TO: Bart Christensen, P.E.
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FROM: Michael J. Anderson, Ph.D.
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DATE: February 19, 1999

SUBJECT: SALTON SEA: PUBLIC HEALTH ISSUES ASSOCIATED WITH PROPOSED RESTORATION ALTERNATIVES
PCA: 95102

Introduction

On February 9, 1999, toxicologists Dr. Michael Anderson (HERD), Dr. David Siegel (Office of Environmental Health Hazard Assessment), and Dr. Marilyn Underwood (Department of Health Services) attended a meeting on public health issues associated with planned restoration of the Salton Sea. The meeting was held in Indio, California at the Riverside County Administration Building. Other attendees included representatives from Riverside County, Cal/EPA, the U.S. Geological Survey, the California Office of Border Health, the University of Redlands, the Central Valley Water District, the Bureau of Indian Affairs, and the Torres Martinez Tribal Council. The toxicologists were invited via departmental requests solicited by Mr. Bart Christensen (Cal/EPA).

The purpose of the meeting was to address public health issues pursuant to National Environmental Policy Act (NEPA)/California Environmental Quality Act (CEQA) guidelines. Primary source water of the Salton Sea include agricultural run-off from the Imperial Valley and from the New River and Alamo River (originating in Mexico). In addition to agricultural run-off, the New River also receives untreated sewage and industrial wastes from Mexico. Because of these inputs over the last 40 to 60 years, it is highly likely that agricultural, industrial, and domestic contaminants have and will continue to be deposited and concentrated in the Salton Sea. Therefore, the toxicologists focused their comments and recommendations on public health risks resulting from exposure to site-associated contaminants if sea levels drop (an outcome of several restoration alternatives) and if contaminated sediments are exposed. Public health risks also may increase if an active sport fishery is reestablished. Based on the selected restoration alternative, biota may be more or less likely to accumulate organic and inorganic contaminants. In addition, if a restoration alternative includes potential inputs of contaminants into the Salton Sea or potential outputs of contaminants from the Salton Sea, public health and environmental risks must be addressed during the NEPA/CEQA process.

This memorandum includes recommendations for identifying and assessing potential public health risks associated with exposure to Salton Sea contaminants. As discussed in the meeting, public health risks associated with disease agents (e.g., bacterial/viral/parasitic) and vector agents (e.g., mosquitos) may be as or more important than contaminants in evaluating risk, but they are not discussed here. The recommendations expressed in the memorandum are based on the meeting of February 9, 1999 and a review of the draft excerpt (Section 15, Public Health and Environmental Hazards) from the document *Salton Sea EIS/EIR Methodology Report* dated January 5, 1999 and prepared by the Salton Sea Science Subcommittee.

Basic Information Needs for Assessing Risk Posed by Proposed Restoration Alternatives

A major restoration issue to be considered the Salton Sea Science Subcommittees is the reduction of salinity in the Salton Sea in order to maintain a healthy ecosystem, a sustainable fishery, and recreational use. During the February 9 meeting, several restoration alternatives were presented by the Salton Sea Science Subcommittee, including:

- Pumping Salton Sea Water to Gulf of California and importing water through the Yuma area.
- Pumping Salton Sea Water to Gulf of California and importing treated waste water from San Diego.
- Creating a South Pond Dike System.

- Constructing a desalting plant (including or not including solar salt ponds) with outflow to the Gulf of California.

The toxicologists were asked to comment on how each of the proposed alternatives may affect public health. In response, the toxicologists constructed a table which was reproduced by Don Park of the County of Riverside and is attached to this memorandum. The table presents the toxicologists' preliminary qualitative evaluation of potentially significant human exposure pathways (e.g., exposure through dermal contact, ingestion, or inhalation) resulting from direct contact with contaminated sediments, water, and/or air particulates. Secondary exposure pathways were also evaluated, including consumption of contaminated fish or wildlife inhabiting the Salton Sea. They also recommended the evaluation of a "no action" alternative for purposes of scaling and evaluating public health risks.

Based on very limited information, the toxicologists subjectively ranked their degree of concern (i.e., number of "+" marks) for each potential exposure pathway (see attached table). Alternatives that will result in sea level drop (e.g., the "no action" alternative) were ranked as of more concern, since the potential for human exposure to contaminated sediments, water, and air particulates will be greater. Alternatives that will not result in sea level drop were scored as of less concern, since the potential for human exposure may be reduced. The degree of concern posed by exposure to indirect (secondary) pathways, such as the consumption of fish and wildlife inhabiting the Salton Sea, will depend on whether the lake supports a vigorous fish and wildlife population. Alternatives that include new inputs of relatively contaminant-free fresh water to the Salton Sea should decrease contaminant loadings in fish (e.g., selenium); alternatives that do not include inputs of fresh water may not reduce contaminant loadings in fish. Based on discussions at the meeting on February 9, it was clear that increasing salinity levels would eventually kill-off the fishery in the Salton Sea, hence the human-fish secondary exposure pathway would be eliminated under the "no action" alternative.

As shown in the table and as discussed above, restoration alternatives may have significant public health benefits or significant public health risks. For purposes of assessing contaminant risks, HERD recommends that the following information be collected for <u>each</u> proposed restoration alternative, plus the no action alternative:

1. Current and predicted contaminant loadings under each alternative in sediment, water, and biota of the Salton Sea; including the identification of toxic "hot spots" if present or predicted.

2. Sea level change and areal extent of exposed sediments.

3. Air particulate transport and air particulate contaminant concentrations based on areal extent of exposed sediments.

4. Current and potential human activities (e.g., residential, recreational, occupational, and construction worker) within and surrounding the Salton Sea.

5. Contaminant transport to and deposition in areas outside of the Salton Sea resulting from each selected restoration alternative (e.g., discharges into the Gulf of California).

6. Contaminant transport and deposition in the Salton Sea resulting from each selected restoration alternative (e.g., importing treated sewage from the city of San Diego).

Acquisition of this information will be necessary for any subsequent discussions of public health risks and for the preparation of a scoping assessment work plan (see below).

Comments on Section 15 of the Draft Salton Sea Restoration EIS/EIR Methodology Report

Overall

Based on the complexity of the site and of the proposed alternatives, the information provided in the document appears overly generic and will require more specific and comprehensive information. HERD recommends that elements of a scoping assessment work plan (discussed below) be incorporated into the final document. The significance criteria (presented in Section 15.3), designed to determine if a restoration alternative would have a significant impact to public health, are generally acceptable. Recommended revisions to the criteria are discussed below.

Risk posed by each restoration alternative must be rigorously evaluated and the evaluation must be used, in conjunction with other factors (e.g., cost, feasibility, project benefits), to select an appropriate alternative. Given the scope of the proposed alternatives discussed at the February 9 meeting, HERD does not agree that quantitative risk assessment will not be anticipated (see Section 15.4). Since human health risks must be evaluated in accordance with federal, state, and local regulations and guidelines, it is extremely unlikely that a quantitative risk assessments will not be required to support and justify the selection of a proposed alternative.

General Comments

Section 15.1: Introduction/Resource Description

A. Potential radiological source areas should be identified and discussed. Physical hazards also should include flooding.

B. In the first sentence of the third paragraph, the phrase "...consumers of fish.." should be expanded to include other potential biota that could be possibly consumed now or in the future (e.g., following restoration), including algae, shellfish, and waterfowl. The third paragraph also should address the issue of off-site transport of brine, selenium, or any other chemical constituents from the Salton Sea and the associated environmental impacts. As we discussed in the February 9 meeting, disease transmission and vector issues should be discussed as having potential public health/environmental impacts.

Section 15.2: Data Sources

The search for and evaluation of available data sources concerning contamination of the Salton Sea, human health standards, risk assessment, applicable and relevant and appropriate requirements (ARARs), and responsible state and federal agencies represents a critical components of the EIS/EIR investigation. Other than generic statements, this section contains no specific references to any information sources that will be consulted in the development of the EIS/EIR. This is a major deficiency that should be rectified before a final document is prepared.

Section 15.3: Significance Criteria

A. The phrase "human health risk(s)" is used in a number of bulleted significance criteria. This section should include some description of potential human exposure scenarios. For example, human exposure could occur under several possible scenarios, including residential, recreational, occupational, and construction activities. A residential scenario could include the construction of homes on former Salton Sea bed sediments. Recreational scenarios could include fishing (including fish consumption) and boating on the lake or visiting a sea front park. An occupational scenario might include assessment of the living quarters or residence of a park ranger or docent. A construction worker scenario could include dike construction and the potential exposure to contaminated sediments. Other potential land uses of former sea bed sediments (e.g., conversion to agricultural fields) or potential water uses (e.g., sustaining a commercial fishery or an aquaculture operation) that could create secondary human exposure pathways (e.g., via bioaccumulation) should be evaluated. The above scenarios represent plausible present or future human activity patterns in and around the Salton Sea.

B. Significance criteria should also address (1) impacts from an alternative that requires the importation of potentially contaminated water into the Salton Sea, (2) impacts from disease agents (pathogens) and vector agents, and (3) impacts from flooding.

C. In the last paragraph of this section a "significant" impact is defined and mitigation measures are discussed. For contaminants, HERD recommends that, as appropriate, both qualitative and quantitative risk assessment be used to differentiate "significant" from "less significant" impacts.

Section 15.4: Assessment Methods

As stated above, HERD does not agree that quantitative risk assessment will not be anticipated for evaluating the proposed restoration alternatives. An approach for evaluating chemical contaminant risk and hazard is presented in the following section of this memorandum.

Recommendations for Assessing Public Health Risks from Potential Exposure to Salton Sea Contaminants

The toxicologists were struck by the complexity and scope of proposed restoration alternatives. HERD highly recommends that risk assessment be used as an integral tool for identifying potential health risks associated with each alternative and evaluating potential impacts to public health. The risk assessment results should be integrated within the decision framework used to ultimately select and implement a proposed alternative. HERD recommends a phased risk assessment approach that includes decision points for identifying data gaps, filling data gaps, and decision points for proceeding to or exiting subsequent assessment phases.

A general risk assessment approach recommended by HERD is provided below. More detailed and specific guidance is contained in the references cited below.

Phase I. Scoping Assessment

The major goal of a scoping assessment is to define the problem. Recommended inputs into the scoping assessment include:

- historical information, including possible chemicals or their degradation products deposited into or surrounding the Salton Sea

- site conceptual models, including identification of potential human exposure pathways (e.g., dermal, inhalation, ingestion), potential contaminant transport pathways, and potentially contaminated media (e.g., air, surface water, ground water, soil, sediment and

biota)

- potential human exposure scenarios (based on the ramifications of the proposed alternative)

- Salton Sea air, water, soil, and sediment chemical concentration data (historical, recently collected, or predicted by modeling).

Usual outputs of the scoping assessment include the identification of data gaps (e.g., chemical concentration data), the appropriateness and useability of available chemical concentration data for risk assessment, the selection of chemicals of concern (COCs), and the identification of extant exposure pathways. A major focus of the scoping assessment, particularly for the Salton Sea, should be the identification of chemical concentration data gaps and the identification of appropriate air, water, soil, and sediment transport models for predicting the impacts of each restoration alternative. A qualitative evaluation of potential exposure pathways should be conducted. If no potential exposure pathways exist, the risk assessment process should terminate at this phase. If potential exposure pathways exist, the risk assessment process should proceed to screening assessment.

Phase II. Screening Assessment

The second phase of the risk assessment process should be a quantitative screening assessment of available chemical concentration data and data collected following the scoping assessment. COCs identified in air, water, soil, sediments, and food chain sources are compared to conservative benchmarks for protection of human health. If risk or hazard is identified after the screening assessment, HERD recommends that a formal quantitative risk assessment be conducted.

Phase III. Formal Quantitative Risk Assessment

The final phase of the risk assessment process should involve quantitative risk assessment. The quantitative risk assessment will:

- reduce uncertainty generated during the Phase II screening assessment

- integrate risks across multiple exposure pathways

- establish appropriate site use (e.g., recreational use only) before and after the selected alternative

- justify appropriate mitigation measures and the degree to which they are protective of

human health.

For purposes of protecting public health and evaluating risk, HERD recommends that the residential use scenario (e.g., a sea front home) be included in each risk assessment associated with a potential restoration alternative.

Risk Assessment Guidance

Variety of state and federal risk assessment guidance is available that expands upon the approach presented above. HERD recommends the following:

FEDERAL

U.S. Environmental Protection Agency, 1989. Risk Assessment Guidance for Superfund. Volume 1. Human Health Evaluation Manual. Part A. December 1989.

U.S. Environmental Protection Agency, 1992. Supplemental Guidance to RAGS: Calculating the Concentration Term. May 1992.

U.S. Environmental Protection Agency, 1997. Exposure Factors Handbook. August, 1997.

STATE

Department of Toxic Substances Control, 1992. Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities. July 1992.

Department of Toxic Substances Control, 1994a. Preliminary Endangerment Assessment Guidance Manual.

Department of Toxic Substances Control, 1996. Guidance for Ecological Risk Assessment at Hazardous Waste Sites and Permitted Facilities. Part A: Overview. Part B: Scoping Assessment. July 4, 1996.

Department of Toxic Substances Control, 1997. Selecting Inorganic Constituents as Chemicals of Potential Concern at Risk Assessments at Hazardous Waste Sites and Permitted Facilities. February, 1997.

California Office of Environmental Health Hazard Assessment, 1994. Cancer Potency Slope Factor List. December 28, 1994.

WEB SITES

California Department of Toxic Substances Control.
http://www.calepa.ca.gov/dtsc/dtsc.htm

Human and Ecological Risk Division.
http://www.cwo.com/~herd1

California Office of Environmental Health Hazard Assessment.
http://www.calepa.cahwnet.gov/oehha

U.S. Environmental Protection Agency Region IX.
http://www.epa.gov/region9/

Conclusion

HERD commends the Salton Sea Science Subcommittee for its proactive approach of inviting agency toxicologists to comment on public health issues during the scoping of potential restoration alternatives. HERD strongly recommends that the Salton Sea Science Subcommittee prepare a scope of work and hire a consultant or other capable university or governmental entity to develop a Phase I scoping assessment work plan. The contractor should integrate its activities with all ecological, environmental, and engineering aspects of the proposed alternatives. For example, the contractor should work closely with the California Air Resources Board as they develop an air particulate risk assessment and in the integration of this information into an overall risk assessment. Finally, before a restoration alternative is adopted, the same basic approach for evaluating public health risks should be used to evaluate ecological risks. Creation or destruction of habitat, exposure of biota to toxic or bioaccumulative contaminants, and impacts on endangered species are critical issues that must be addressed in the NEPA/CEQA process.

Reviewed by: Michael Wade, Ph.D., D.A.B.T MJ Wade
Senior Toxicologist, HERD

cc: Jeff Wong, Ph.D., Chief, HERD

David Siegel, Ph.D., Chief, Hazardous Waste Toxicology Section, Office of Environmental Health Hazard Assessment

Marilyn Underwood, Ph.D., Staff Toxicologist, Department of Health Services

Attachment: Facsimile transmission from Don Park to Michael Anderson dated February 11, 1999.

CONTAMINANTS AND MICROBES

	Sediment Dermal	Sediment Ingestion	Sediment Inhalation	Water Dermal	Water Ingestion	Water Inhala-tion	Fish	Birds and Wildlife	Air Part. Dermal	Air Part. Ingestion	Air Part. Inhalation	Secon-dary Pathways	
No Action	+++ recreation (until they	++ recreation do not	residential recreation come- anymore)	++ contam- ++ recrea-	++ inants ++ tion		+ (-) rec. fish die res	+ (-) birds die	++ recrea-tion,	+++ farmers, other	++ nearby popu-lations	++	
Pump to Gulf;Import H2O from Yuma													
Pump to Gulf Import wastewater from San Diego (Coliform 10⁶; Hepatitis,contam-inates, no metals)	++	+	++	++++ microbe s + contam-	++++ microbes + inants		+ (-) fish get cleaner	+ (-) birds get cleaner		++			contribu-tion from domestic wastewater will be higher
South Pond Diking	construc- ++++ Long +	tion spoils +++ Term +	??? ++++				better in North + in South	contam-inants? no microbes	+ remove	silt pond on a	regular basis	monitor selenium	dry constructio N debris a problem
Desalting Plant Brines to Gulf	assumes ++++	no- additional +++	water ++++				better situation	better situation	++	+++	++	++	monitor fish
Desalting Plant Solar Ponds (no pecial exposures)													
Pump to Dry Lake	+	+	++										ground water contamina-tion ?
ump to Gulf							+ microbes contam-inates						