

*San Francisco Bay:
Natural Processes
& Cultural Impacts*

Doris Sloan and Tod Fletcher, editors

Senior Seminar
Environmental Sciences Group Major
University of California, Berkeley
Berkeley, CA 94720

June 1986

ACKNOWLEDGMENTS

The members of the 1986 Senior Seminar wish to thank the following people for contributing their time and assistance to this project:

Kipp Baron, graduate student, Zoology Department, University of California, Berkeley, California

David F. Belk, Supervisor, Hazardous Waste Management, Environmental Health and Safety, University of California, Berkeley, California.

Rick Bennett, Farm Advisor, U.C. Cooperative Extension, Santa Rosa, California

Jeffrey S. Blanchfield, Chief Planner, San Francisco Bay Conservation and Development Commission, San Francisco, California

Leo Brewer, Professor, Department of Chemistry, University of California, Berkeley, California

Jean Chapman, Biology Instructor, Solano Community College, Suisun City, California

Dr. Howard Cogswell, Ornithologist, Audubon Society, Hayward, California

Harvey Doner, Professor of Soil Chemistry, University of California, Berkeley, California

Don C. Erman, Professor, Department of Forestry, University of California, Berkeley, California

Anabelle Falconn, Assistant Project Manager, Santa Fe Land Improvement Co., San Francisco, California

Leora Feeney, Student Assistant Wildlife Biologist, California Department of Fish and Game, Yountville, California

David Gan, Public Health Microbiologist, California Department of Health Services, Berkeley, California

Richard Grasseti, Planner, City of Richmond, Richmond, California

Mable Green, Laboratory Assistant, Department of Public Health, University of California, Berkeley, California

Michael Hanemann, Professor, Department of Agriculture and Resource Economics, University of California, Berkeley, California

Tom Harvey, Wildlife Biologist, U.S. Fish and Wildlife Service, Newark, California

Robert Hickman, Enforcement Officer, San Francisco Bay Conservation and Development Commission, San Francisco, California

Bruce Jacobsen, Staff Research Assistant, Department of Sanitary Engineering, University of California, Berkeley, California

Mary Lee Jefferds, Director, East Bay Regional Park District, Oakland, CA.

Greg Karras, Research Associate, Citizens for a Better Environment, San Francisco, California

Paul Kelly, Wildlife Biologist, California Department of Fish and Game, Yountville, California

Larry Kolb, Assistant Executive Officer, Regional Water Quality Control Board, Oakland, California

Judith K. Lemons, Assistant to Congresswoman Sala Burton, Washington, D.C.

Angela Manapis, Laboratory Manager, Department of Public Health, University of California, Berkeley, California

Steve McAdam, Assistant Executive Director, San Francisco Bay Conservation and Development Commission, San Francisco, California

Bob Merrill, Permit Analyst, San Francisco Bay Conservation and Development Commission, San Francisco, California

Karen Miller, Fish and Wildlife Biologist, U.S. Fish and Wildlife Service, Sacramento, California
Tom Morrison, Science Research Associate, College of Chemistry, University of California, Berkeley, California
Barry Nelson, Program Director, Save San Francisco Bay Association, Berkeley, California
Terri Pencovic, Fish and Wildlife Biologist, U.S. Fish and Wildlife Service, Sacramento, California
Alan R. Pendleton, Executive Director, San Francisco Bay Conservation and Development Commission, San Francisco, California
David H. Peterson, Research Oceanographer, U.S. Geological Survey, Menlo Park, California
Dr. Margaret Race, Science Policy Analyst, Agricultural Experiment Station, University of California, Berkeley, California
Michael Renslow, Manager, Pacific Aerial Surveys, Oakland, California
Vincent H. Resh, Professor, Department of Entomology, University of California, Berkeley, California
Ed Roberts, Co-Director, Bair Island Project, San Francisco Bay Bird Observatory, Alviso, California
Randall S. Rossi, Planning, Environmental and Regulatory Coordinator, Port of San Francisco, San Francisco, California
Joan Seear, Laboratory Assistant, Department of Biology, University of California, Berkeley, California
Joan Vilms, Executive Director, Sonoma Land Trust, Santa Rosa, California
Nancy Wakeman, Permit Chief, San Francisco Bay Conservation and Development Commission, San Francisco, California
Zach Willey, Senior Economist, Environmental Defense Fund, Berkeley, California
Pete S. Williams, Assistant Superintendent, Quality and Environmental Control Division, Chevron, U.S.A., Richmond, California
Marcella Winters, Laboratory Assistant, Department of Public Health, University of California, Berkeley, California

Our thanks to Eric Mills for typing the manuscripts.

STATEMENT ABOUT THE AUTHORS

This study has been completed by seniors in the Environmental Sciences group major at the University of California, Berkeley. The Environmental Sciences major offers three fields of specialization -- biological science, physical science, and social science -- from which each student selects an area of concentration. In their senior year, students in the major participate in a year-long group study. Preparing this report provides Environmental Sciences students with the opportunity to examine practical environmental problems while gaining experience in field work, general research practices, and group dynamics.

This year's analysis of San Francisco Bay is particularly timely. There is now a growing awareness that the health of the Bay is directly threatened by a variety of human activities, including water diversions, discharges of toxics, and development of wetlands. These activities are taking place within and affecting a complex environment which is not yet well-understood scientifically--the Bay "system," with its broad bays, narrow straits, high tidal fluctuations, highly seasonal river flows, and diverse marginal habitats. Through selected site studies, analyses of water quality, soil toxicity, sedimentation, and investigations of economic and regulatory issues, this report provides an overview of natural processes within the Bay and the impacts of our culture upon it.

The report was edited by Doris Sloan and Tod Fletcher, and the frontispiece was prepared by Jeff Dhont. The following students contributed to this report:

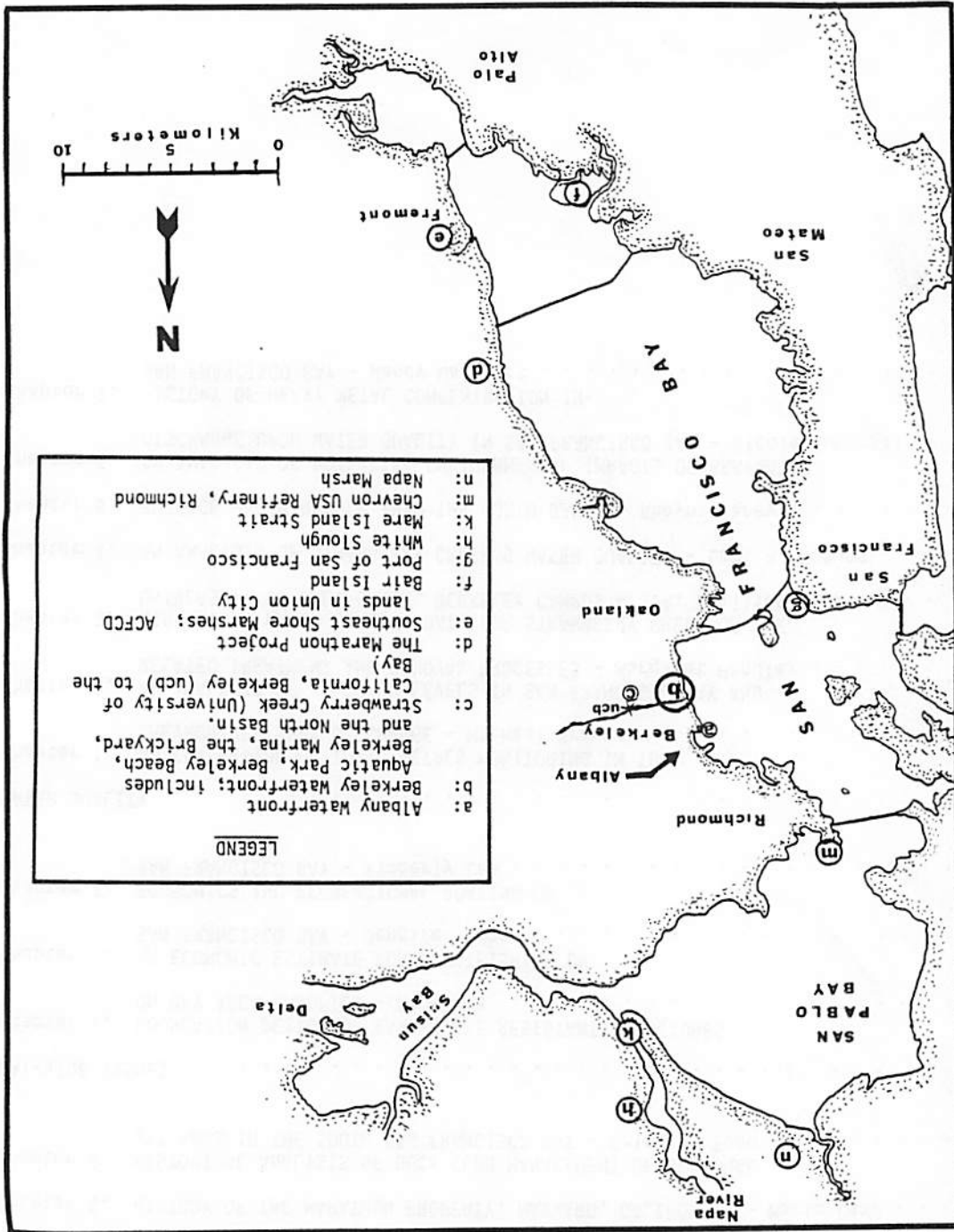
Debbie Anderson	Nancy Kum
Nora Barlow	Rheyne Laney
Alex Battaglia	Maria Laxo
John Thomas Bentivoglio	Kimberly Lee
Deborah L. Bisio	Janet MacDonell
Michael Brauer	J.A. Phillips
Lori A. Cheung	Deborah A. Reagan
Jennifer Cohen	Diana Roth
Jeff A. Dhont	Nicole Somorjai
Rebecca Dowdakin	Margaret Tanner
Michele Emerson	Beth Touchette
Erica N. Fono	Rob Tuma
Margaret Handley	Wendy Walfoort
Erin Hughes	

TABLE OF CONTENTS

Acknowledgments	i
Statement About the Authors	iii
SECTION I. REGULATORY ISSUES	1
Chapter 1. THE CORPS OF ENGINEERS SAN FRANCISCO DISTRICT'S REGULATORY ENFORCEMENT PROGRAM: A CASE FOR LEGAL ACTION - John Thomas Bentivoglio	1
Chapter 2. COMPLIANCE WITH THE SAN FRANCISCO BAY CONSERVATION AND DEVELOPMENT COMMISSION'S PERMIT AND CEASE-AND-DESIST ORDER CONDITIONS - Debbie Anderson	13
SECTION II. SITE STUDIES - NORTH BAY	21
Chapter 1. PROPOSAL OF A NON-TIDAL ESTUARINE CIRCULATION MECHANISM OF SEDIMENT TRANSPORT AT MARE ISLAND STRAIT - Jeffrey A. Dhont	21
Chapter 2. AGRICULTURE IN THE NAPA MARSH AND ITS IMPACT ON THE NORTH BAY ECONOMY - Deborah A. Reagan	37
Chapter 3. BENTHIC INVERTEBRATE SURVEY AT WHITE SLOUGH, VALLEJO, CALIFORNIA - Beth Touchette	47
SECTION III. CENTRAL BAY SITE STUDIES	59
Chapter 1. METAL CONTAMINATION IN SOIL AT AQUATIC PARK - Janet MacDonell	59
Chapter 2. METAL POLLUTION LEVELS IN THE BRICKYARD - Deborah L. Bisio	67
Chapter 3. DEVELOPMENT OF THE PORT OF SAN FRANCISCO: THE OBJECTIVES OF THE PORT COMMISSION - Nancy Kum	77
Chapter 4. ANALYSIS OF GRAIN SIZE OF THE BERKELEY BEACH - Nora Barlow	85
Chapter 5. THE HISTORY OF BERKELEY BEACH - Margaret Tanner	93
Chapter 6. CRITIQUE OF FUTURE DEVELOPMENT PROPOSALS FOR THE ALBANY WATERFRONT - Michele Emerson	103
SECTION IV. SOUTH BAY SITE STUDIES	111
Chapter 1. EROSION OF SALT MARSHES ALONG THE EAST SHORE OF SAN FRANCISCO BAY - Erin Hughes	111
Chapter 2. HISTORY OF LAND USE ON BAIR ISLAND - Diana Roth	121
Chapter 3. THE ALAMEDA COUNTY FLOOD CONTROL DISTRICT SEASONAL WETLANDS IN UNION CITY: A QUESTION OF ACTION - Alex Battaglia	131
Chapter 4. A CENSUS OF AVIFAUNA ON THE SITE OF THE MARATHON PROJECT IN HAYWARD, CALIFORNIA - Rebecca Dowdakin	137

	Chapter 5. HISTORY OF THE MARATHON PROPERTY, HAYWARD, CALIFORNIA - Maria Laxo	145
	Chapter 6. HISTORICAL ANALYSIS OF DUCK CLUB MANAGEMENT OF SEASONAL WETLANDS IN THE SOUTH SAN FRANCISCO BAY - Erica N. Fono	155
SECTION V.	BAY-WIDE ISSUES	165
	Chapter 1. FOUNDATION DESIGN OF EARTHQUAKE RESISTANT STRUCTURES ON BAY AREA LANDFILL - Rob Tuma	165
	Chapter 2. AN ECONOMIC ESTIMATE FOR SPORTFISHING ON SAN FRANCISCO BAY - Jennifer Cohen	177
	Chapter 3. ECONOMICS AND RECREATIONAL BOATING ON SAN FRANCISCO BAY - Kimberly Lee	185
SECTION VI.	WATER QUALITY	191
	Chapter 1. AN EVALUATION OF TOXIC METALS MONITORING IN THE CHEVRON REFINERY DISCHARGE - Michael Brauer	191
	Chapter 2. AN ANALYSIS OF SELENIUM LEVELS IN SAN FRANCISCO BAY AND RELATED TREATMENT AND REMOVAL PROCESSES - Margaret Handley	199
	Chapter 3. HISTORY OF WATER QUALITY DATA FOR STRAWBERRY CREEK OF THE UNIVERSITY OF CALIFORNIA, BERKELEY CAMPUS - J.A. Phillips	207
	Chapter 4. AN ANALYSIS OF STRAWBERRY CREEK'S WATER QUALITY - Lori A. Cheung	223
	Chapter 5. SURFACE WATER RUNOFF INTO THE NORTH BASIN - Rheyne Laney	235
	Chapter 6. AN ANALYSIS OF POTENTIAL ENVIRONMENTAL IMPACTS OF GRAYWATER DISCHARGE UPON WATER QUALITY IN SAN FRANCISCO BAY - Nicole Somorjai	247
	Chapter 7. HISTORY OF HEAVY METAL CONCENTRATION IN SAN FRANCISCO BAY - Wendy Walfoort	257

Map of San Francisco Bay System and study locations for this report.
 Source: U.S. Coast and Geodetic Survey Map, 1:125,000.



SECTION I

REGULATORY ISSUES

- Chapter 1. THE CORPS OF ENGINEERS SAN FRANCISCO DISTRICT'S
REGULATORY ENFORCEMENT PROGRAM: A CASE FOR
LEGAL ACTION - John Thomas Bentivoglio

- Chapter 2. COMPLIANCE WITH THE SAN FRANCISCO BAY CONSERVATION
AND DEVELOPMENT COMMISSION'S PERMIT AND CEASE-AND-
DESIST ORDER CONDITIONS - Debbie Anderson