OWENS VALLEY

PM_{10} PLANNING AREA

DEMONSTRATION OF ATTAINMENT

STATE IMPLEMENTATION PLAN

Dr. Ellen Hardebeck, Air Pollution Control Officer
Great Basin Unified Air Pollution Control District
157 Short Street
Bishop, California 93514

(760) 872-8211
FAX - (760) 872-6109

Principal Authors: Duane Ono and Theodore Schade

Contributors: Bill Cox, Ellen Hardebeck, Liisa Haubrich, Grace Holder, Mark Keisler, Christopher Lanane, Jim Parker, Jim Paulus, Ken Richmond (MFG), Christopher Rumm, Carla Scheidlinger, and Mike Slates.

The authors gratefully acknowledge the enormous contributions of all the Great Basin Unified Air Pollution Control District staff and contract employees, who have worked for over a decade on research and development of fugitive dust control measures at Owens Lake.

Preface

- **Declaration of Donna Leavitt, Clerk of the Great Basin Unified Air Pollution Control District Governing Board**
- **Resolution #97-05 Certifying the Environmental Impact Report**
- **Resolution #97-06 Approving the State Implementation Plan**
- **Board Order #070297-04 to implement SIP control measures is included in Section 8-2 of the SIP.**

DECLARATION
OF
DONNA LEAVITT

I, Donna Leavitt, declare as follows:

1. I am the Clerk of the Governing Board of the Great Basin Unified Air Pollution Control District. The District is a unified air pollution control district consisting of Inyo, Mono, and Alpine counties in the State of California.

2. At least thirty days before the July 2, 1997 public hearing of the Great Basin Unified Air Pollution Control District Governing Board on adoption of the Attainment Demonstration State Implementation Plan for the Owens Valley PM10 Planning Area, I served the notice of the public hearing in the form attached hereto as Exhibit A, and a copy of the May 1997 Draft Attainment Demonstration State Implementation Plan, on the Administrator of the United States Environmental Protection Agency, through the appropriate regional office, by sending on May 28, 1997 true copies thereof in an envelope addressed to Ms. Felicia Marcus, the Regional Administrator for Region IX, via Federal Express Priority Overnight Delivery.

3. At least thirty days before the July 2, 1997 public hearing of the Great Basin Unified Air Pollution Control District Governing Board on adoption of the Attainment Demonstration State Implementation Plan for the Owens Valley PM10 Planning Area, I served the notice of the public hearing of the Governing Board of the Great Basin Unified Air Pollution Control District Board in the form attached hereto as Exhibit A, and a copy of the May 1997 Draft Attainment Demonstration State Implementation Plan, on each local air pollution control agency significantly impacted, by sending on May 28, 1997 true copies thereof in an envelope addressed to Mr. Thomas Paxson, the Air Pollution Control Officer of the Kern County Air Pollution Control District, via Federal Express Priority Overnight Delivery.

4. At least thirty days before the July 2, 1997 public hearing of the Great Basin Unified Air Pollution Control District Governing Board on adoption of the Attainment Demonstration State Implementation Plan for the Owens Valley PM10 Planning Area, I served the notice of the public hearing of the Governing Board of the Great Basin Unified Air Pollution Control District Board in the form attached hereto as Exhibit A, and a copy of the May 1997 Draft Attainment Demonstration State Implementation Plan, on the California State Air Resources Board, by sending on May 28, 1997 true copies thereof in an envelope addressed to Mr. Michael Kenny, its Executive Officer, via Federal Express Priority Overnight Delivery.

5. At least thirty days before the July 2, 1997 public hearing of the Great Basin Unified Air Pollution Control District Governing Board on adoption of the Attainment

Demonstration State Implementation Plan for the Owens Valley PM10 Planning Area, I served the notice of the public hearing of the Governing Board of the Great Basin Unified Air Pollution Control District Board in the form attached hereto as Exhibit A, and a copy of the May 1997 Draft Attainment Demonstration State Implementation Plan, on the City of Los Angeles and the Department of Water & Power of the City of Los Angeles, by sending on May 28, 1997 true copies thereof in an envelope addressed to Mr. Gerald Gewe, the Department's Director of Water Resources, via Federal Express Priority Overnight Delivery.

6. At least thirty days before the July 2, 1997 public hearing of the Great Basin Unified Air Pollution Control District Governing Board on adoption of the Attainment Demonstration State Implementation Plan for the Owens Valley PM10 Planning Area, I caused to be published the text of the notice of the public hearing of the Governing Board of the Great Basin Unified Air Pollution Control District Board in the form attached hereto as Exhibit A, in the Inyo Register, a newspaper of general circulation in the County of Inyo, California; in the Review Herald, a newspaper of general circulation in Mono County, California,; and in the Tahoe Daily Tribune, a newspaper of general circulation in El Dorado County, California (a county adjacent to Alpine County, California, which has no newspaper of general circulation). Copies of the original proofs of such publication are attached hereto as Exhibit B.

7. At least thirty days before the July 2, 1997 public hearing of the Great Basin Unified Air Pollution Control District Governing Board on adoption of the Attainment Demonstration State Implementation Plan for the Owens Valley PM10 Planning Area, I caused to be published in the Inyo Register, a newspaper of general circulation in the County of Inyo, California, the county wherein the entire Owens Valley PM10 Planning Area is situated, a large display advertisement setting forth date, time and place of the public hearing, in form of Exhibit C attached.

8. At least thirty days before the July 2, 1997 public hearing of the Great Basin Unified Air Pollution Control District Governing Board on adoption of the Attainment Demonstration State Implementation Plan for the Owens Valley PM10 Planning Area, and continuously through the date of the public hearing, a copy of the May 1997 Draft Attainment Demonstration State Implementation Plan for the Owens Valley PM10 Planning Area was made available for public inspection at the District's main office at 157 Short Street, Bishop, California, which office is located in Inyo County, California, the region in which the entire Owens Valley PM10 Planning Area, and the affected source, are located.

9. On June 18, 1997, I sent a copy of the notice of the public hearing of the Governing Board of the Great Basin Unified Air Pollution Control District Board in the form attached hereto as Exhibit D, to each and every addressee shown in the list attached hereto as Exhibit E via the United States Postal Service, postage prepaid.

I declare that the foregoing is true under penalty of perjury. Done at Bishop, Inyo County, California, this 14th day of July, 1997.

Donna Leavitt
Donna Leavitt

EXHIBIT A
NOTICE OF PUBLIC HEARING

PUBLIC NOTICE

PUBLIC HEARING ON THE OWENS VALLEY PM-10 PLANNING AREA DEMONSTRATION OF ATTAINMENT STATE IMPLEMENTATION PLAN AND DRAFT ENVIRONMENTAL IMPACT REPORT

The Great Basin Unified Air Pollution Control District (GBUAPCD) will consider certification of the proposed Final Environmental Impact Report (EIR) and adoption of the proposed final Owens Valley PM-10 Planning Area Demonstration of Attainment State Implementation Plan (SIP) at a public hearing which will be held during the regular meeting of the District's Governing Board on Wednesday, July 2, 1997 at 10:00 a.m. in the Inyo County Board of Supervisors Room at the Inyo County Administrative Center, 224 North Edwards Street, Independence, California. At that meeting, the Board will also consider a proposal to identify Best Available Control Measures (BACM) for Owens Lake and to adopt guidelines for staff to apply the Environmental Protection Agency's (EPA) Natural Events Policy.

The proposed final SIP includes an analysis of the particulate matter (PM-10) air pollution in Southern Owens Valley and provides a control strategy to bring the area into attainment with the National Ambient Air Quality Standards (NAAQS) for particulate matter by December 31, 2001. The SIP identifies the dry bed of Owens Lake as the source of 99% of the particulate emissions, and requires the City of Los Angeles to apply shallow flooding, managed vegetation, and gravel to approximately 35 square miles of the lakebed.

The proposed BACM determination defines shallow flooding, managed vegetation and gravel as the best available control measures for Owens Lake. The Natural Events Policy guidelines define "unusually high winds" for the Owens Valley Planning area as 40 mph hourly average at 10 meters height.

The proposed final SIP is available for inspection at the District Office at 157 Short Street, Bishop, California, 93514. Interested parties may call 872-8211 to have a copy mailed. The proposed final SIP supersedes the March 1997 Draft SIP. Written comments should be addressed to Ellen Hardebeck, Air Pollution Control Officer, at that address, and should be received by June 19, 1997 to be included in the packet of materials sent to District Board members. In addition, members of the public will have an opportunity to submit written comments or make oral statements at the public hearing.

EXHIBIT B
PROOFS OF PUBLICATION

Proof of Publication

(2015.5 C.C. P.)

STATE OF CALIFORNIA,
COUNTY OF INYO

I am a citizen of the United States and a resident of the County aforesaid: I am over the age of eighteen years, and not a party to or interested in the above-entitled matter. I am the principal clerk of the printer of the

Inyo Register

a newspaper of general circulation, published in

County of Inyo, and which newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Inyo, State of California, under date of Oct. 5, 1953, Case Number 5414; that the notice, of which the annexed is a printed copy (set in type not smaller than nonpareil), has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to wit:

May 22
June 26

all in the year 19 97

I certify (or declare) under penalty of perjury that the foregoing is true and correct.

Dated at Bishop, California,

this 22 day of May 19 97

Katherine [signature]

Signature

This space is for County Clerk's Filing Stamp

RECEIVED
JUN 26 1997
GREAT BASIN
UNIFIED APCD

Proof of Publication of

Notice of Public Hearing

Paste Clipping of Notice SECURELY in this Space

PUBLIC NOTICE
PUBLIC HEARING ON THE OWENS VALLEY PM-10 PLANNING AREA

DEMONSTRATION OF ATTAINMENT STATE IMPLEMENTATION PLAN AND DRAFT ENVIRONMENTAL IMPACT REPORT

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(IR: May 22, June 26, 1997-4519c)

Proof of Publication

(2015.5 C.C.P.)

STATE OF CALIFORNIA,
COUNTY OF INYO

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years, and not a party to or interested in the above-entitled matter. I am the principal clerk of the printer of the

Review—Herald

a newspaper of general circulation, published in

Mammoth Lakes,

County of Mono. The Lakes District Review was adjudicated Dec. 18, 1975, as a newspaper of general circulation for the town of Mammoth Lakes, CA. The Mono Herald was adjudicated Oct. 23, 1953 as a newspaper of general circulation for Mono County, CA. The notice, of which the annexed is a printed copy (set in type not smaller than nonpareil), has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dated, to wit:

May 29

all in the year 19 97

I certify (or declare) under penalty of perjury that the foregoing is true and correct.

Dated at Bishop, California,

this 29 day of May 1997

Katherine [signature]

Signature

This space is for the County Clerk's Filing Stamp

Proof of Publication of Notice of Public Hearing

Paste Clipping of Notice SECURELY in this Space

Public Notices **Public Notices** **Public Notices**

**PUBLIC NOTICE
PUBLIC HEARING ON THE OWENS VALLEY PM-10 PLANNING AREA DEMONSTRATION OF ATTAINMENT STATE IMPLEMENTATION PLAN AND DRAFT ENVIRONMENTAL IMPACT REPORT**

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(RH: May 29, 1997-8579c)

RECEIVED
MAY 30 1997
GREAT BASIN
UNIFIED APCD

AFFIDAVIT OF PUBLICATION

GREAT BASIN UNIFIED
AIR POLLUTION CONTROL
DISTRICT
ATTN: DONNA LEAVITT
157 SHORT STREET, STE 6
BISHOP, CA 93514

STATE OF CALIFORNIA
County of El Dorado

I am a citizen of the United States and a resident of the County foresaid; I am over eighteen years, and not a part to or interested in the above entitled matter, I am the principal clerk of the printer of the Tahoe Daily Tribune, a newspaper of general circulation, printed and published Monday through Friday in the City of South Lake Tahoe, County of El Dorado, and which newspaper has been adjudicated a newspaper of general circulation by the Superior Court of the County of El Dorado, State of California under the date March 6, 1970, Case Number 18569, that the notice of which the annexed is a printed copy (set in type not smaller than six (6) point), has been published in each regular and entire issue of said newspaper and not in any supplemental therefore on the following dates, to wit:

JUNE 2, 1997

I certify under penalty, that the foregoing is true and correct.

Dated at South Lake Tahoe, California this:

2nd Day of June 1997

Signed: ____________________
Erin Wiseman- Legal Clerk

PUBLIC NOTICE
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TDT JUNE 2, 1997

EXHIBIT C
DISPLAY ADVERTISEMENT

proposed agreement offers some long-term protections for the valley.

During the past quarter century, DWP has completed two Environmental Impact Report (EIRs) to try to prove its groundwater pumping was not having an adverse effect on the Owens Valley's environment. However, neither EIR was acceptable to the courts, so DWP has sought to negotiate a pact with the county in the hope that the Court of Appeals would accept an agreement put forward by telephoning each other to find out what was going on. James and Bruce — the county's legal counsel — were just a few miles from Sacramento when they got the news by cellphone. They were traveling back to Inyo on Wednesday. The county's special legal adviser, Tony Rossmann, was just about to board a plane from San Franciso when he got the news. Now, all parties involved are anxiously awaiting further instructions from the Court of Appeals.

cover all four days of the shows.

To purchase tickets, stop by the Tri-County Fairgrounds ticket booth, located just outside the Mike Boothe Memorial Arena. Questions about tickets, call the Mule Days Committee, 872-4263.

See the Saturday issue of The Inyo Register *for details on additional weekend events.*

Schedule of Events

For a complete listing of arena and fairgrounds events, pick up an Official 1997 Mule Days Souvenir Program, available at most area merchants, the Mule Days Office at the Tri-County Fairgrounds or from official souvenir vendors. For complete show results and information on upcoming events, pick up a copy of The Mule Days Register, *published daily by Register Review Publishing Company, May 22-25. It's available at the fairgrounds, the arts and crafts faire at Bishop City Park (starting Friday), and selected local merchants.*

Thursday, May 22

7 a.m. and 9 a.m. — Third Annual Golf Tournament, Bishop Country Club.

8 a.m. — Morning mule shows, Tri-County Fairgrounds.

9 a.m. — Robert Miller Clinic, Tri-County Fairgrounds.

12 noon — Afternoon mule shows, Tri-County Fairgrounds.

5 p.m. — Opening Night Supper,

Friday, May 23

8 a.m. — Morning mule shows, Tri-County Fairgrounds.

1 p.m. — Afternoon mule shows, Tri-County Fairgrounds; Auction, East Arena, Tri-County Fairgrounds.

6 p.m. — Evening mule shows, Tri-County Fairgrounds

9 p.m.-1 a.m. — Family dance featuring Monte Mills and the Lucky Horseshoe Band, Charles Brown Auditorium, Tri-County Fairgrounds.

Saturday, May 24

9 a.m. — Arts and Crafts Faire opens, Bishop City Park.

9 a.m.-4 p.m. — Clothesline Display, Bishop City Park.

10 a.m. — Mule Days parade down Main Street.

12-1 p.m. — Musicians Tom Ball & Kenny Sultan, Arts and Crafts Faire stage, Bishop City Park.

1 p.m. — Grand Entry, followed by afternoon mule shows, Tri-County Fairgrounds.

1-2 p.m. —River, Arts and Crafts Faire stage, Bishop City Park.

2-2:30 p.m. — Presentation of Arts Gold Medal Awards, Arts and Crafts Faire stage, Bishop City Park.

2:30-4 p.m. — Square Pegs, Arts and Crafts Faire stage, Bishop City Park.

4-5 p.m. — Musicians Tom Ball & Kenny Sultan, Arts and Crafts Faire stage, Bishop City Park.

5-6 p.m. — Rush Creek & Blue Sierra, Arts and Crafts Faire stage, Bishop City Park.

6 p.m. — Arts and Crafts Faire closes for day.

7:30 p.m. — Evening mule shows, Tri-County Fairgrounds.

Sunday, May 25

7-11 a.m. — Bishop Lions Club Pancake Breakfasts, two locations: Bishop City Park and Tri-County Tri-County Fairgrounds.

8 a.m. — Morning mule shows, Tri-County Fairgrounds.

9 a.m. — Arts and Crafts Faire opens, Bishop City Park.

EXHIBIT D
NOTICE OF PUBLIC HEARING SENT TO MAILING LIST

_llen Hardebeck
Control Officer

GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT

157 Short St. Suite #6 - Bishop, CA 93514
(619) 872-8211

June 18, 1997

TO: OWENS LAKE INTERESTED PARTIES

FROM: ELLEN HARDEBECK, APCO *EH*

RE: PUBLIC HEARING ON THE OWENS VALLEY PM-10 PLANNING AREA DEMONSTRATION OF ATTAINMENT STATE IMPLEMENTATION PLAN AND ENVIRONMENTAL IMPACT REPORT

The Great Basin Unified Air Pollution Control District (GBUAPCD) will consider certification of the proposed Final Environmental Impact Report (EIR) and adoption of the proposed final Owens Valley PM-10 Planning Area Demonstration of Attainment State Implementation Plan (SIP) at a public hearing which will be held during the regular meeting of the District's Governing Board on Wednesday, July 2, 1997 at 10:00 a.m. in the Inyo County Board of Supervisors Room at the Inyo County Administrative Center, 224 North Edwards Street, Independence, California. At that meeting, the Board will also consider a proposal to identify Best Available Control Measures (BACM) for Owens Lake and to adopt guidelines for staff to apply the Environmental Protection Agency's (EPA) Natural Events Policy. Members of the public will have an opportunity to submit written comments or make oral statements at the public hearing.

The proposed final SIP includes an analysis of the particulate matter (PM-10) air pollution in Southern Owens Valley and provides a control strategy to bring the area into attainment with the National Ambient Air Quality Standards (NAAQS) for particulate matter by December 31, 2001. The SIP identifies the dry bed of Owens Lake as the source of 99% of the particulate emissions, and requires the City of Los Angeles to apply shallow flooding, managed vegetation, and gravel to approximately 35 square miles of the lakebed.

The proposed BACM determination defines shallow flooding, managed vegetation and gravel as the best available control measures for Owens Lake for the purposes of applying the Environmental Protection Agency's Natural Events Policy. The proposed guidelines define "unusually high winds" for the Owens Valley Planning area as 40 mph hourly average at 10 meters height.

The May 1997 Draft SIP, the March 1997 Draft SIP, the proposed final EIR and Response to Comments, the Draft EIR, and the proposed Natural Events/BACM document are available for inspection at the District Office at 157 Short Street, Bishop, California 93514. Interested parties may call 760-872-8211 to have copies mailed. The May 1997 Draft SIP supersedes the March 1997 Draft SIP. If you have any questions, call Ellen Hardebeck at 760-872-8211

EXHIBIT E
MAILING LIST OF NOTICE OF PUBLIC HEARING

Bd members

Tim Alpers
Mono County/District Boards
P. O. Box 263
Lee Vining CA 93541

Ruth & Dolph Amster
1418 Synor Avenue
Ridgecrest CA 93555

Keith Andrews
P. O. Box 1079
Lone Pine CA 93545

Linda Arcularius
Inyo County/District Board
Rt 2, Box 24A
Bishop CA 93514

Larry Armstrong
291 Lakeview
Lone Pine CA 93545

Ralph T. Asdel
Star Rt Box K17
Big Pine CA 93513

Roy Ashburn
Kern County Supervisor
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Ridgecrest CA 93555

Mark Bagley
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Bishop CA 93514

Todd Bean
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Lone Pine CA 93545

Steven Blum
Office of Chief Counsel
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Sacramento CA 95814

Colleen Bracken
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Ridgecrest CA 93555

Keith Bright
Drawer V
Independence CA 93526

Ruth Brown
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Hoy Buell
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Arroyo Grande CA 93421-6510

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Eunice Caffee
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Dave Calkins
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Orinda CA 94563

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Ridgecrest CA 93555

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Don Christenson
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Markleville CA 96120

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Soquel CA 95073

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Mammoth Lakes CA 93546

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Bishop CA 93515

Francis Fretcher
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Bishop CA 93514

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Markleeville CA 96120

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Lone Pine CA 93545

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Bob Gracey
Inyo County Supervisor
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Cartago CA 93549

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Big Pine CA 93513

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Ridgecrest CA 93555

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Cartago CA 93520

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Ridgecrest CA 93555

Bruce Ivey
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Palm Springs CA 92262

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Ridgecrest CA 93555

Mr. & Mrs. G. L. Johnson
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Ridgecrest CA 93555

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Bishop CA 93514

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Richard Knox
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Bishop CA 93515

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Mission Viejo CA 92692

Bryson Kratz
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Bishop CA 93514

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Olancha CA 93549

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Andrea Lawrence
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& Ms. Barbara Malloch Leitner
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Orinda CA 94563

Mykle Loftus
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Richard Lopez
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Keeler CA 93530

Mary Lundstrom
731 Howell Avenue
Ridgecrest CA 93555

Richard MacMillen
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Bishop CA 93514

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Keeler CA 93530

Rick Maddux
P.O. Box 712
Lone Pine CA 93545

William Manning
P.O. Box 513
Big Pine CA 93513

Mitch Markota
1217 Tamarisk
Ridgecrest CA 93555

Frederick Marr
Cousel to Timbisha Shoshone of D.V.
314 West Line St., Suite J
Bishop CA 93515

Rick McCoy
P.O. Box 128
June Lake CA 93529

Denise McEntee
213 S. Forest Knoll
Ridgecrest CA 93555

Elaine Mead
7611 Brown Road
Inyokern CA 93527

Robert E. Michener
Inyo County Supervisor
3117 Tumbleweed Rd.
Bishop CA 93514

Andrew Morin
P.O. Box 24
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RESOLUTION NO. 97-05

RESOLUTION OF THE GOVERNING BOARD OF THE GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT CERTIFYING A FINAL ENVIRONMENTAL IMPACT REPORT FOR THE OWENS VALLEY PM_{10} PLANNING AREA DEMONSTRATION OF ATTAINMENT STATE IMPLEMENTATION PLAN AND INCORPORATED BOARD ORDER

For reasons detailed below, the Governing Board of the Great Basin Unified Air Pollution Control District (the "Governing Board") certifies that the Final Environmental Impact Report ("FEIR") prepared for the Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan and Incorporated Board Order (collectively, "Attainment Demonstration SIP") has been completed in compliance with the California Environmental Quality Act ("CEQA") (Pub. Res. Code, §21000, *et seq.*); that the Governing Board has reviewed and considered the information and analysis contained in the FEIR; and that the FEIR reflects the independent judgment of the Great Basin Unified Air Pollution Control District (the "District").

WHEREAS, pursuant to the federal Clean Air Act Amendments of 1990, the State of California is required to submit to the Administrator of the United States Environmental Protection Agency a State Implementation Plan for the Owens Valley Planning Area that demonstrates timely attainment of the National Ambient Air Quality Standards ("NAAQS") for PM_{10}, defined as particulate matter having an aerodynamic diameter of a nominal 10 microns or less; and

WHEREAS, the Great Basin Unified Air Pollution Control District is the body vested by law with the authority and responsibility to develop and adopt the Attainment Demonstration State Implementation Plan for the Owens Valley PM_{10} Planning Area, and to submit the Attainment Demonstration SIP to the State Air Resources Board for its approval and submittal to the U.S. Environmental Protection Agency Administrator on behalf the State of California; and

WHEREAS, the District prepared a Draft Attainment Demonstration SIP to comply with the requirements of state and federal air quality law; and

WHEREAS, the District determined that adoption of the proposed Attainment Demonstration SIP and incorporated order was a "project" as defined by CEQA, which requires the preparation and review of an Environmental Impact Report ("EIR"); and

WHEREAS, the District determined that it was the appropriate public agency to act as Lead Agency under CEQA to prepare, circulate, and certify the EIR; and

WHEREAS, the District in January, 1997 issued its Notice of Preparation of an EIR, inviting interested agencies and members of the public to participate in the review of the Attainment Demonstration SIP under CEQA; and

WHEREAS, the District prepared the Draft EIR, supported by third-party consultants with the District remaining responsible for managing the preparation of the EIR and subjecting the contractor's drafts to its own independent review and analysis; and

WHEREAS, a Draft EIR on the Attainment Demonstration SIP was prepared and released for 45 days of public review and comment beginning on March 25, 1997, and ending on May 9, 1997; and

WHEREAS the District circulated the March 1997 Draft Attainment Demonstration SIP for public review and comment on March 25, 1997, for a 45-day public review period ending on May 9, 1997; and

WHEREAS, in addition to receiving written comments on the Draft EIR, the District conducted two public workshops (morning and evening) on the Draft EIR and the Draft Attainment Demonstration SIP on April 16, 1997 in Bishop, California, and at these workshops answered questions and solicited further input from the public and interested governmental agencies on the Draft EIR and the Draft Attainment Demonstration SIP; and

WHEREAS, the District adequately responded to all timely comments on the Draft EIR after providing interested agencies and members of the public the opportunity to comment on the Draft EIR; and

WHEREAS, the District revised drafts of the Final Environmental Impact Report ("FEIR") in response to comments raised by interested agencies and members of the public on the Draft EIR and the March 1997 Draft State Implementation Plan; and

WHEREAS, on June 20, 1997, the District released the FEIR for the Attainment Demonstration SIP, that included: the Draft EIR incorporated by reference; revisions and clarifications to the Draft EIR made in response to comments received from other agencies and the public on the Draft EIR; a list of all individuals, entities, and governmental agencies that commented on the Draft EIR; and copies of all comments received on the Draft EIR and individual responses to those comments; and

WHEREAS, the FEIR (including the Draft EIR) provides detailed environmental evaluations of the Proposed Project as defined therein, the no project alternative, and six project alternatives; and

WHEREAS, the Governing Board has reviewed the FEIR in its entirety, and has determined that the FEIR for the Attainment Demonstration SIP meets all the requirements for certification under CEQA and reflects the independent judgment of the District;

NOW, THEREFORE, BE IT RESOLVED by the Governing Board of the Great Basin Unified Air Pollution Control District as follows:

1. It is hereby certified that the FEIR for the Attainment Demonstration SIP has been completed in compliance with CEQA;

2. It is hereby certified that this FEIR has been presented to the Governing Board of the Great Basin Unified Air Pollution Control District, which has reviewed and considered the information and analysis contained therein;

3. It is hereby certified that this FEIR reflects the independent judgment of the Great Basin Unified Air Pollution Control District;

4. This certification does not represent project approval or disapproval and does not constitute final action by the Great Basin Unified Air Pollution Control District.

APPROVED AND ADOPTED by the Governing Board of the Great Basin Unified Air Pollution Control District this 2nd day of July, 1997, by the following vote:

AYES: Arcularius, Dorame, Gansberg, Lawrence, Ronci, Watson and Zellmer

NOES: None

ABSTAIN: None

ABSENT: None

David Watson
Chairman, Governing Board

ATTEST:

Donna Leavitt
Clerk of the Board

RESOLUTION NO. 97-06

RESOLUTION OF THE GOVERNING BOARD OF THE GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT ADOPTING THE OWENS VALLEY PM_{10} PLANNING AREA DEMONSTRATION OF ATTAINMENT STATE IMPLEMENTATION PLAN AND INCORPORATED BOARD ORDER, AND ADOPTING A MITIGATION MONITORING AND REPORTING PLAN, AND MAKING FINDINGS OF FACT.

WHEREAS, in Resolution 97-05, which is incorporated by reference herein, the Governing Board of the Great Basin Unified Air Pollution Control District ("Governing District") certified that the Final Environmental Impact Report ("FEIR") prepared for the Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan and Incorporated Board Order (collectively, "Attainment Demonstration SIP") has been completed in compliance with California Environmental Quality Act ("CEQA"); that the Governing Board has reviewed and considered the information and analysis contained in the FEIR; and that the FEIR reflects the independent judgment of the Great Basin Unified Air Pollution Control District (the "District");

WHEREAS, prior to the Governing Board's action certifying the FEIR, the District and its consultants analyzed the environmental impacts of the Attainment Demonstration SIP, and solicited input from the public and interested agencies, as is described in detail in Resolution 97-05;

WHEREAS, the FEIR identified certain significant effects on the environment that, absent the adoption of mitigation measures, would be caused by the City of Los Angeles' compliance with the Attainment Demonstration SIP;

WHEREAS, the District is required, pursuant to the California Environmental Quality Act ("CEQA") (Pub. Resources Code, § 21000 *et seq.*), to adopt all feasible mitigation measures or feasible project alternatives that can substantially lessen or avoid any significant impacts on the environment associated with a project to be approved, such as the Attainment Demonstration SIP;

WHEREAS, the Findings of Fact adopted as Exhibit A to this Resolution demonstrate that all of the significant impacts on the environment associated with the Attainment Demonstration SIP can be avoided through the adoption of feasible mitigation measures;

WHEREAS, the Governing Board has determined, for reasons set forth in Exhibit A hereto and described in the FEIR, that the Attainment Demonstration SIP is superior to all feasible project alternatives, that feasible project alternatives would not reduce any potentially significant and unavoidable impact of the Attainment Demonstration SIP to less-than-significant levels; and that the No Project Alternative, which would avoid these impacts, would fail to achieve most of the objectives and benefits of the Attainment Demonstration SIP;

WHEREAS, the Governing Board is required by Public Resources Code Section 21081.6, subdivision (a), to adopt a mitigation monitoring and reporting program to ensure that the mitigation measures adopted by the District are actually carried out;

WHEREAS, the final Mitigation Monitoring and Reporting Program for the Attainment Demonstration SIP has been prepared, and is adopted as Exhibit B to this resolution;

NOW, THEREFORE, BE IT RESOLVED by the Governing Board of the Great Basin Unified Air Pollution Control District as follows:

1. Through this Resolution, the Governing Board hereby reaffirms each of its findings and resolutions made in Resolution 97-05 which is incorporated herein by reference and approves and adopts the Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan and Incorporated Board Order, which approval and adoption are effective immediately;

2. Through this Resolution, which incorporates by reference and adopts the Mitigation Monitoring and Reporting Program included as Exhibit B to this Resolution, the Governing Board has satisfied its obligations pursuant to Public Resources Code section 21081.6, subdivision (a);

3. By adopting this Resolution, including the exhibits attached hereto, the Governing Board has satisfied its obligations pursuant to Public Resources Code section 21081 and California Code of Regulations, title 14, section 15091, in that the Governing Board has made one or more of the following findings with respect to the significant or potentially significant effects of the Attainment Demonstration SIP: (a) Changes or alterations have been required in, or incorporated into the Attainment Demonstration SIP which mitigate or avoid many of the significant environmental effects thereof as identified in the FEIR; (b) Some changes or alterations are within the responsibility and jurisdiction of another public agency and such changes have been, or can and should be, adopted by that other agency; (c) Specific economic, legal, social, technological, or other considerations make infeasible the mitigation measures or alternatives identified in the environmental impact report. Based upon these findings and the information contained in the record, the Governing Board concludes that the adoption of the Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan and Incorporated Board Order will not cause to occur any significant adverse effect on the physical environment.

APPROVED AND ADOPTED by the Governing Board of the Great Basin Unified Air Pollution Control District this 2nd day of July, 1997, by the following vote:

AYES: Arcularius, Dorame, Gansberg, Lawrence, Ronci and Zellmer

NOES: Watson

ABSTAIN: None

ABSENT: None

David Watson
Chairman, Governing Board

ATTEST:

Donna Leavitt,
Clerk of the Governing Board

Attachments: Exhibit A - Findings of Fact
Exhibit B - Mitigation Monitoring and Reporting Program

RESOLUTION 97-06, EXHIBIT A

OWENS VALLEY PM_{10} PLANNING AREA
DEMONSTRATION OF ATTAINMENT STATE IMPLEMENTATION PLAN

FINDINGS OF FACT UNDER THE PROVISIONS OF CALIFORNIA HEALTH AND SAFETY CODE SECTION 42316(a),

FINDINGS OF FACT ON GENERAL ENVIRONMENTAL ISSUES,

FINDINGS OF FACT ON SIGNIFICANT ENVIRONMENTAL IMPACTS OF THE PROPOSED PROJECT,

FINDINGS OF FACT ON PROJECT ALTERNATIVES,

AND OTHER FINDINGS OF FACT

RELATED DOCUMENTATION:

JULY 2, 1997 DEMONSTRATION OF ATTAINMENT STATE IMPLEMENTATION PLAN
MARCH 25, 1997 DRAFT ENVIRONMENTAL IMPACT REPORT
JUNE 18, 1997 FINAL ENVIRONMENTAL IMPACT REPORT
(STATE CLEARINGHOUSE NUMBER 96122077)

PROJECT FILES MAY BE REVIEWED AT:

GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT
157 SHORT STREET, BISHOP, CALIFORNIA 93514
(760) 872-8211

JULY 2, 1997

Resolution 97-06, Exhibit A - Findings of Fact Relating to the Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan

<u>Document Contents</u>

Introduction and Purpose

Findings of Fact Under the Provisions of California Health and Safety Code § 42316(a)

Findings of Fact on General Environmental Issues

Findings of Fact on Significant Impacts of the Proposed Project

- Geology and Soils
- Hydrology and Water Resources
- Meteorology and Air Quality
- Vegetation Resources
- Wildlife Resources
- Cultural Resources
- Visual Resources
- Noise
- Land Use
- Transportation
- Economic and Social Impacts
- Public Health and Safety/Risk of Upset
- Significant Impacts Conclusion

Findings of Fact on the Project Alternatives

- Alternative A - Low Volume Water Use: Groundwater
- Alternative A1 - Low Volume Water Use: Surface Water
- Alternative B - Moderate Volume Water Use: Groundwater
- Alternative B1 - Moderate Volume Water Use: Surface Water
- Alternative C - No Water Use
- Alternative D - Managed Low Volume Water Use: Groundwater
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- Alternative E - High Volume Water Use: Surface Water
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- Alternatives Conclusion

Other Findings of Fact

INTRODUCTION AND PURPOSE

The proposed *Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan* (SIP) (GBUAPCD 1997c) is a "project" as defined by the California Environmental Quality Act (CEQA) (Public Resources Code Section 21000 *et. seq.*). The Great Basin Unified Air Pollution Control District (GBUAPCD) is the lead agency for the project and, therefore, has prepared an Environmental Impact Report (EIR) pursuant to the requirements of CEQA and the CEQA Guidelines. The Draft EIR was circulated to public agencies and the public for a 45-day review and comment period. Pursuant to the requirements of CEQA, the EIR describes the Proposed Project and affected environment; it identifies, analyzes and evaluates the potential significant environmental impacts that may result from the Proposed Project; it identifies measures to mitigate adverse environmental impacts; and it identifies and compares the merits of project alternatives.

CEQA Guidelines require a public agency's decision makers to consider the information in the EIR along with other information that may be presented to the GBUAPCD when deciding whether to approve the Proposed Project. The Final EIR sets forth the information to be considered in the GBUAPCD Governing Board's evaluation of benefits and potential impacts to the environment resulting from the implementation of the SIP.

The EIR for the proposed SIP identified potential adverse environmental impacts in the following areas: meteorology and air quality, vegetation resources, wildlife resources, cultural resources and transportation. It was concluded in the Final EIR that no significant adverse impacts will remain after implementation of feasible mitigation measures.

This document presents findings to be made by the GBUAPCD Governing Board prior to approval of the project pursuant to the requirements of CEQA and the CEQA Guidelines. CEQA requires the GBUAPCD to make certain written findings explaining how it has dealt with each alternative and each significant environmental impact identified in the Draft EIR and Final EIR (GBUAPCD 1997a and GBUAPCD 1997b). The GBUAPCD may find that:

- changes or alterations have been required in or incorporated into the project to avoid or substantially lessen the significant environmental effects identified in the Draft EIR/Final EIR;
- such changes or alterations are within the purview and jurisdiction of another agency and have been or should be adopted by that agency; or
- specific economic, social or other considerations make infeasible the mitigation measures or project alternatives identified in the Draft EIR/Final EIR and Mitigation Monitoring and Reporting Program (MMRP).

Each of these findings are supported by substantial evidence in the administrative record. Evidence from the Draft EIR, Final EIR, MMRP and elsewhere in the record of proceedings are relied upon to meet these criteria.

This document summarizes the significant environmental impacts of the Proposed Project and project alternatives and describes how these impacts are to be mitigated. An MMRP will be adopted concurrently with these findings (Exhibit B). The MMRP sets forth a program to ensure that required environmental impact mitigation measures are properly implemented.

References:

GBUAPCD. 1997a. *Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan Draft Environmental Impact Report.* Calif. State Clearinghouse Number 96122077. March 25, 1997.

GBUAPCD. 1997b. *Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan Final Environmental Impact Report.* Calif. State Clearinghouse Number 96122077. June 18, 1997.

GBUAPCD. 1997c. *Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan.* July 2, 1997.

Findings of Fact Under the Provisions of California Health and Safety Code Section 42316(a)

On the basis of substantial evidence in the record, and for the reasons set forth in that certain *Staff Report To The Board: Compliance Of The Owens Valley PM_{10} Planning Area Demonstration Of Attainment State Implementation Plan Control Measures With Requirements Of Health & Safety Code Section 42316(a)* dated June, 1997, which is hereby incorporated herein by this reference, the Governing Board of the GBUAPCD makes the following findings:

- **Finding 1:** The GBUAPCD Governing Board finds that there are violations of the state and federal ambient air quality standards for PM_{10} in the Owens Valley PM_{10} Planning Area.

- **Finding 2:** The GBUAPCD Governing Board finds that the dry bed of Owens Lake causes and contributes to the violations of the state and federal ambient air quality standards for PM_{10} in the Owens Valley PM_{10} Planning Area.

- **Finding 3:** The GBUAPCD Governing Board finds that the water diversions of the City of Los Angeles have uncovered essentially all of the dust source areas on the dry lake bed, thus causing and contributing to violations of the state and federal ambient air quality standards for PM_{10} in the Owens Valley PM_{10} Planning Area.

- **Finding 4:** The GBUAPCD Governing Board finds that shallow flooding, managed vegetation, and gravel, as required by the *Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan*, will mitigate the air quality impacts caused by the City of Los Angeles' water diversions.

- **Finding 5:** The GBUAPCD Governing Board finds that shallow flooding, managed vegetation, and gravel, as required by the *Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan*, are reasonable control measures for the dust-producing areas on Owens Lake.

- **Finding 6:** The GBUAPCD Governing Board finds that the control measures required by the *Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan* do not affect the right of the City to produce, divert, store or convey water.

- **Finding 7:** The GBUAPCD Governing Board finds the control measures required by the *Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan* can be completed by December 31, 2001 as indicated in the schedule set forth in the Plan.

- **Finding 8:** The GBUAPCD Governing Board finds that the time period for implementation is a reasonable period to complete the implementation of the control measures.

- **Finding 9:** The GBUAPCD Governing Board makes each and every of the above findings on the basis of substantial evidence in the record. The GBUAPCD is the custodian of the materials which constitute the record of proceedings upon which the decision to approve the Proposed Project is based. These materials are located at the District's offices at 157 Short Street, Bishop, California 93514.

FINDINGS OF FACT ON GENERAL ENVIRONMENTAL ISSUES

- **Finding 10:** The GBUAPCD Governing Board finds that a Notice of Preparation of the Draft EIR was sent to all responsible agencies, trustee agencies, the State Clearinghouse in the Office of Planning and Research and to all persons who have filed a written requests for notices. Said Notice was also posted for 30 days in the office of the Inyo County Clerk.

- **Finding 11:** The GBUAPCD Governing Board finds that during the preparation of the Draft EIR, some forecasting of future actions, events and impacts was necessary and that the GBUAPCD used its best efforts to discover and disclose all that it reasonably could.

- **Finding 12:** The GBUAPCD Governing Board finds that the Draft EIR was prepared with the appropriate degree of specificity and technical detail required to allow a thorough understanding of the Proposed Project, the affected environment and the probable environmental impacts of the Proposed Project on the environment.

- **Finding 13:** The GBUAPCD Governing Board finds that it has exercised its election under Public Resources Code Section 21083.2(j) to comply with other applicable law for the assessment of potential cultural and archaeological resources, and not to apply to the provisions of Public Resources Code Section 21083.2.

- **Finding 14:** The GBUAPCD Governing Board finds that documents and information incorporated into the EIR by reference are available to the public at the GBUAPCD office in Bishop, California and that incorporated documents and information incorporated into the EIR by reference are summarized in the EIR.

- **Finding 15:** The GBUAPCD Governing Board finds that a Notice of Completion of the Draft EIR was filed with the State Office of Planning and Research upon completion of the Draft EIR.

- **Finding 16:** The GBUAPCD Governing Board finds that public notice of availability of the Draft EIR was given by:
  (a) posting notice in the office of the Inyo County Clerk for 30 days,
  (b) by posting notice both on the project site and off-site in the vicinity of the project,
  (c) by publishing notice at least one time in the *Inyo Register*, a newspaper of general circulation in the area affected by the Proposed Project,
  (d) by direct mailing notice to a list of interested persons and agencies maintained by GBUAPCD, and

(e) by direct mailing notice to every public agency that has jurisdiction by law with respect to the project, every city and county that borders on Inyo County and all federal, state, and local agencies that exercise authority over resources that may be affected by the proposed Project.

- **Finding 17:** The GBUAPCD Governing Board finds that a 45-day public review period was held to solicit comments on the Draft EIR from members of the public and other public agencies.

- **Finding 18:** The GBUAPCD Governing Board finds that two public workshops regarding the Draft EIR were held on April 16, 1997, which was during the public review period.

- **Finding 19:** The GBUAPCD Governing Board finds that there has been an evaluation and response to all comments on environmental issues received during the 45-day public comment period.

- **Finding 20:** The GBUAPCD Governing Board finds that a Final EIR was prepared for the Proposed Project consisting of the Draft EIR, comments received on the draft EIR, responses to comments received and a list of persons, organizations and public agencies that submitted comments.

- **Finding 21:** The GBUAPCD Governing Board finds that, as a result of the comments received and the responses to these comments contained in the Final EIR, no new significant environmental impacts have been identified and no new mitigation measures are proposed to be implemented.

- **Finding 22:** The GBUAPCD Governing Board finds that upon evaluation of late comments received after the public comment period, no new significant environmental impacts have been identified and no new mitigation measures are proposed to be implemented.

- **Finding 23:** The GBUAPCD Governing Board finds that, as a result of comments received during and after the public comment period and responses to these comments and revisions made to the EIR, the Final EIR contains no "significant new information" as that term is defined under CEQA, and that, consequently, no recirculation of the EIR is required.

- **Finding 24:** The GBUAPCD Governing Board makes each and every of the above findings on the basis of substantial evidence in the record. The GBUAPCD is the custodian of the materials which constitute the record of proceedings upon which the decision to approve the Proposed Project is based. These materials are located at the District's offices at 157 Short Street, Bishop, California 93514.

FINDINGS OF FACT ON SIGNIFICANT IMPACTS OF THE PROPOSED PROJECT

This section identifies the findings on significant impacts of the Proposed Project, as identified in the Draft EIR/Final EIR by issue area.

GEOLOGY AND SOILS

The EIR discusses the Proposed Project's impacts on geology and soils in Section 5-1 of the EIR.

Impact: As explained in Section 5-1 of the EIR, the environmental impacts to geology and soils were found to be less-than-significant.

- **Mitigation Measures:** No mitigation measures are required for impacts to geology and soils.

- **Finding 25: No mitigation measures are required**. The GBUAPCD Governing Board finds that the Proposed Project will not create any unavoidable significant adverse geologic hazards, adverse geology or adverse soil impacts. The GBUAPCD Governing Board finds that mitigation measures are not required because the Proposed Project causes no significant environmental impacts to geology and soils.

HYDROLOGY AND WATER RESOURCES

The EIR discusses the Proposed Project's impacts on hydrology and water resources in Section 5-2 of the EIR.

Impact: As explained in Section 5-2 of the EIR, the environmental impacts to hydrology and water resources were found to be less-than-significant.

- **Mitigation Measures:** No mitigation measures are required for impacts to hydrology and water resources.

- **Finding 26: No mitigation measures are required**. The GBUAPCD Governing Board finds that the Proposed Project will not create any unavoidable significant adverse hydrologic impacts or significant adverse impacts to water resources. The GBUAPCD Governing Board finds that mitigation measures are not required because the Proposed Project causes no significant environmental impacts to hydrology and water resources.

METEOROLOGY AND AIR QUALITY

The EIR discusses the Proposed Project's impacts on meteorology and air quality in Section 5-3 of the EIR.

Impact 5-3.1: As explained in Section 5-3 of the EIR, the Construction of the roadways, berms and pipelines would generate fugitive PM_{10} emissions and pollutants from vehicle exhaust, which could affect air quality. This is a potentially significant environmental impact.

- **Mitigation Measure 5-3.1:** Fugitive dust emissions will be controlled through the application of Best Available Control Measures (BACM) for fugitive dust emissions from unpaved roads and construction will comply with GBUAPCD Rules 400 and 401. This may include, but would not be limited to, use of chemical soil stabilizers, surface coverings, water trucks and water sprays.

- **Finding 27: Mitigation Measure is feasible and required.** The GBUAPCD Governing Board finds that Mitigation Measure 5-3.1 is feasible and reduces the impact on air quality to a less-than-significant level by reducing construction-related fugitive dust emissions.

- **Finding 28:** With the exception of Impact 5-3.1, the GBUAPCD Governing Board finds that the Proposed Project will not create any additional unavoidable significant adverse impacts to meteorology and air quality. With the exception of Mitigation Measure 5-3.1, the GBUAPCD Governing Board finds that additional air quality mitigation measures are not required because the Proposed Project causes no additional significant environmental impacts to meteorology and air quality.

VEGETATION RESOURCES

The EIR discusses the Proposed Project's impacts on vegetation resources in Section 5-4 of the EIR.

Impact 5-4.1: As explained in Section 5-4 of the EIR, the Proposed Project will convert 121 acres of Transmontane Alkaline Meadow (TAM) to unvegetated dry playa and standing water on the playa. This is a potentially significant environmental impact.

- **Mitigation Measure 5-4.1:** A total of 121 acres of TAM shall be established and maintained to replace vegetation lost as a result of fugitive dust control measure implementation and operation. The TAM will be vegetated to achieve species diversity and percent cover comparable to the TAM lost as a result of direct or indirect impacts. A minimum of 89 acres along the eastern edge of the managed vegetation control measure area will be set aside and established as TAM. The balance of replacement TAM may be established in the shallow flood control area. If at least 32 acres of TAM is not established and maintained in the shallow flood area, a total of at least 121 acres of TAM shall be established and maintained in the managed vegetation area.

- **Finding 29: Mitigation Measure is feasible and required.** The GBUAPCD Governing Board finds that Mitigation Measure 5-4.1 is feasible and reduces the impact on vegetation resources to a less-than-significant level by replacing the Transmontane Alkaline Meadow lost as a result of the Proposed Project.

__Impact 5-4.2__: As explained in Section 5-4 of the EIR, the Proposed Project will expand distribution of exotic pest plants within the Owens Valley PM_{10} study area. This is a potentially significant environmental impact.

- **Mitigation Measure 5-4.2:** Areas subject to shallow flooding and managed vegetation control measures will be surveyed annually after measure implementation to identify locations where exotic pest plants have encroached into the project area. Where exotic pest plants are identified as a result of annual monitoring, an exotic pest plant control program will be developed and implemented to eradicate exotic pest plants and noxious weeds. The control program will be accomplished through an appropriate combination of biological, mechanical and chemical control methods. The program will focus on the early removal of plants and, to the extent possible, will be coordinated with other control programs undertaken in Inyo County to ensure the most effective utilization of resources.

- **Finding 30: Mitigation Measure is feasible and required.** The GBUAPCD Governing Board finds that Mitigation Measure 5-4.2 is feasible and reduces the impact on vegetation resources to a less-than-significant level by preventing the expanded distribution of exotic pest plants within the Owens Valley PM_{10} study area.

__Impact 5-4.3__: As explained in Section 5-4 of the EIR, the Proposed Project will result in the loss of habitat potentially occupied by sensitive species of plants. This is a potentially significant environmental impact.

- **Mitigation Measure 5-4.3:** Prior to final siting of project infrastructure in shadscale scrub and TAM, a focused pre-construction survey will be conducted during optimal flowering period for Owens Valley checkerbloom, Inyo County mariposa lily, Booth's evening primrose, Kern County evening primrose, Ripley's cymopterus, Mono buckwheat, sand linanthus and Nevada oryctes. Final infrastructure alignments will be reconfigured as necessary to avoid populations of sensitive plant species if they are detected as a result of directed surveys.

- **Finding 31: Mitigation Measure is feasible and required.** The GBUAPCD Governing Board finds that Mitigation Measure 5-4.3 is feasible and reduces the impact on vegetation resources to a less-than-significant level by preventing the loss of habitat potentially occupied by sensitive species of plants.

- **Finding 32:** With the exception of Impacts 5-4.1, 5-4.2 and 5-4.3, the GBUAPCD Governing Board finds that the Proposed Project will not create any additional unavoidable significant adverse impacts to vegetation resources. With the exception of Mitigation Measures 5-4.1, 5-4.2 and 5-4.3, the GBUAPCD Governing Board finds that additional vegetation resource mitigation measures are not required because the Proposed Project causes no additional significant environmental impacts to vegetation resources.

WILDLIFE RESOURCES

The EIR discusses the Proposed Project's impacts on wildlife resources in Section 5-5 of the EIR.

<u>**Impact 5-5.2**</u>**:** As explained in Section 5-5 of the EIR, the Proposed Project will result in the loss of 121 acres of the dry Transmontane Alkaline Meadow sub-community which provides habitat for sensitive species of invertebrates, birds, and mammals. This is a potentially significant environmental impact.

- **Mitigation Measure 5-5.2:** A total of 121 acres of TAM shall be established and maintained to replace the alkali skipper and Owens Valley tiger beetle habitat lost as a result of fugitive dust control measure implementation and operation. The TAM will be vegetated to achieve species diversity and percent cover comparable to the TAM lost as a result of direct or indirect impacts. A minimum of 89 acres along the eastern edge of the managed vegetation control measure area will be set aside and established as TAM. The balance of replacement TAM may be established in the shallow flood control area. If at least 32 acres of TAM is not established and maintained in the shallow flood area, a total of at least 121 acres of TAM shall be established and maintained in the managed vegetation area. Surface water hydrology will replicate the existing conditions in areas lost as a result of project implementation. The revegetation area will be monitored until successful colonization of these species is demonstrated. <u>Note:</u> The 121 areas of TAM to be established as mitigation for this impact is not in addition to the TAM required under Mitigation Measure 5-4.1; these measures may be combined such that the same 121 acres of created TAM mitigates both impacts.

- **Finding 33: Mitigation Measure is feasible and required.** The GBUAPCD Governing Board finds that Mitigation Measure 5-5.2 is feasible and reduces the impact on wildlife resources to a less-than-significant level by replacing the Transmontane Alkaline Meadow lost as a result of the Proposed Project.

<u>Impact 5-5.3</u>: As explained in Section 5-5 of the EIR, the construction of buried water transmission pipeline in Transmontane Alkaline Meadow habitat during the breeding season for northern harrier has the potential to result in loss of occupied nesting habitat. This is a potentially significant environmental impact.

- **Mitigation Measure 5-5.3:** Potential impacts on nesting northern harriers in TAM shall be avoided and reduced to below the level of significance by scheduling the construction of project infrastructure outside the breeding season of the northern harrier (mid-March to mid-September). If the breeding season cannot be avoided, surveys shall be conducted, prior to construction, within and adjacent to the two acres of TAM projected to be impacted. If northern harriers are observed within the area that would be impacted, construction will be sited so as to avoid nesting individuals of this species.

- **Finding 34: Mitigation Measure is feasible and required.** The GBUAPCD Governing Board finds that Mitigation Measure 5-5.3 is feasible and reduces the impact on wildlife resources to a less-than-significant level by preventing the potential loss of northern harrier nesting habitat.

<u>Impact 5-5.4</u>: As explained in Section 5-5 of the EIR, the construction of infrastructure improvements in Shadscale Scrub habitat during the breeding season of LeConte's thrasher and loggerhead shrike has the potential to result in loss of occupied nesting habitat. This is a potentially significant environmental impact.

- **Mitigation Measure 5-5.4:** Potential impacts on LeConte's thrasher and loggerhead shrike would be avoided and reduced below the level of significance by scheduling construction of all improvements in Shadscale Scrub in the vicinity of suitable nesting habitat outside of the breeding season for these species (mid-January to late July). If the breeding season cannot be avoided, surveys in the areas in which construction would take place would be conducted and areas containing breeding individuals will be avoided.

- **Finding 35: Mitigation Measure is feasible and required.** The GBUAPCD Governing Board finds that Mitigation Measure 5-5.4 is feasible and reduces the impact on wildlife resources to a less-than-significant level by preventing the loss of potential LeConte's thrasher and loggerhead shrike nesting habitat.

<u>Impact 5-5.5</u>: As explained in Section 5-5 of the EIR, the construction, operation and maintenance of the Proposed Project would result in a 49 percent reduction of potentially suitable unvegetated playa nesting habitat for western snowy plover. This is a potentially significant environmental impact.

- **Mitigation Measure 5-5.5:** A western snowy plover breeding habitat restoration program shall be established. The restoration program shall include the following actions:

  (a) A pre-construction directed survey for breeding snowy plovers at Owens Lake will be undertaken during the breeding season in the year proceeding implementation of PM_{10} control measures. The directed survey will be undertaken in accordance with the protocol established for the District's 1996 survey. The pre-construction survey will include all known or expected nesting areas at Owens Lake. The purpose of the survey will be to census: number and location of adults, number and location of juveniles, numbers and location of chicks, and locations of nests or expected nests.

  (b) The maintenance of a viable breeding population for western snowy plovers is dependent on accessibility to suitable foraging habitat. A pre-construction survey to delineate the distribution of suitable foraging habitat in and adjacent to areas where PM_{10} Control Measures will be implemented will be undertaken in the year immediately proceeding project implementation. Suitable foraging habitat will include all areas supporting ephydrids. Density of March 10, 1997 ephydrids can be used as a measure of the quality of habitat. The results of directed surveys will be used as the basis for performance criteria in evaluating the quality of foraging habitat created as a result of project implementation.

  (c) Ground disturbing activities associated with the implementation of shallow flooding, managed vegetation, gravel and associated development and infrastructure will not be undertaken in known or expected nesting areas identified as a result of the pre-construction survey for breeding snowy plovers during the breeding season, between March 15 and August 31.

  (d) Construction avoidance measures to protect nesting and foraging habitat for western snowy plovers will be exercised when ground-disturbing activities associated with construction of shallow flooding, managed vegetation, gravel and associated development must be undertaken between March 15 and August 31. A qualified wildlife biologist shall survey work areas that approach known or expected nesting areas identified during the pre-construction survey. A 500-foot-radius buffer areas will be established to protect all known or expected nesting sites and the associated foraging areas. The wildlife biologist will delineate these areas with survey flag (or other comparable measures) to ensure that they are avoided during construction.

  (e) Post-construction surveys shall be undertaken in the first, second, third, fifth, tenth, fifteenth, twentieth, and twenty-fifth years following implementation of water-based control measures. The results of the post-construction surveys will be analyzed in relation to pre-construction surveys and results for control sites established as part of the overall monitoring program for the project. Where the monitoring program indicates that western snowy plover population numbers are declining as a result of implementation and maintenance of the PM_{10} Control Measures, habitat restoration shall be undertaken to compensate for reduced numbers of potential nesting sites that occur as a result of the control measures that displace nesting sites. Sufficient breeding habitat restoration shall be undertaken to maintain population levels at sites on the east side of Owens Lake consistent with the average population numbers established as a result of the 1996 and 1997 directed surveys.

- **Finding 36: Mitigation Measure is feasible and required.** The GBUAPCD Governing Board finds that Mitigation Measure 5-5.5 is feasible and reduces the impact on wildlife resources to a less-than-significant level by mitigating for the loss of potentially suitable nesting habitat for western snowy plover.

- **Finding 37:** With the exception of Impacts 5-5.2, 5-5.3, 5-5.4 and 5-5.5, the GBUAPCD Governing Board finds that the Proposed Project will not create any additional unavoidable significant adverse impacts to wildlife resources. With the exception of Mitigation Measures 5-5.2, 5-5.3, 5-5.4 and 5-5.5, the GBUAPCD Governing Board finds that additional wildlife resource mitigation measures are not required because the Proposed Project causes no additional significant environmental impacts to wildlife resources.

CULTURAL RESOURCES

The EIR discusses the Proposed Project's impacts on cultural resources in Section 5-6 of the EIR.

Impact 5-6.1: As explained in Section 5-6 of the EIR, prehistoric cultural resources could be damaged or destroyed as a result of ground disturbance and flooding associated with the implementation and operation of the Proposed Project. This is a potentially significant environmental impact.

- **Mitigation Measure 5-6.1a:** Prior to any ground disturbance in the area identified as GB JSA-1, additional research and test excavation will be undertaken to determine whether this prehistoric resource is significant. If it is determined that this resource meets the significance criteria established for the Proposed Project in the EIR, it will be subjected to a data recovery program consisting of archaeological excavation to retrieve the important data from the site.

- **Mitigation Measure 5-6.1b:** Prior to any ground disturbance in areas identified as sensitive for prehistoric resources, archaeological surveys will be conducted to locate and record prehistoric resources. If the surveys result in identification of resources that cannot be avoided, additional research or test excavations, where appropriate, will be undertaken to determine whether the resource(s) are significant. Significant resources that cannot be avoided will be subjected to data recovery program consisting of archaeological excavation to retrieve the important site data. For resources that may be located within U.S. Army Corps of Engineers (Corps) jurisdictional areas, and subject to an MOA, this inventory, evaluation and treatment process will be coordinated with the Corps to ensure that the work conducted will also comply with Section 106 of the National Historic Preservation Act.

- **Finding 38: Mitigation Measures are feasible and required.** The GBUAPCD Governing Board finds that Mitigation Measures 5-6.1a and 5-6.1b are feasible and reduce the impact on cultural resources to a less-than-significant level by preventing the damage or destruction of significant prehistoric cultural resources.

- **Finding 39:** With the exception of Impact 5-6.1, the GBUAPCD Governing Board finds that the Proposed Project will not create any additional unavoidable significant adverse impacts to cultural resources. With the exception of Mitigation Measures 5-6.1a and 5-6.1b, the GBUAPCD Governing Board finds that additional cultural resource mitigation measures are not required because the Proposed Project causes no additional significant environmental impacts to cultural resources.

VISUAL RESOURCES

The EIR discusses the Proposed Project's impacts on visual resources in Section 5-7 of the EIR.

Impact: As explained in Section 5-7 of the EIR, the environmental impacts to visual resources were found to be less-than-significant.

- **Mitigation Measures:** No mitigation measures are required for impacts to visual resources.

- **Finding 40: No mitigation measures are required.** The GBUAPCD Governing Board finds that the Proposed Project will not create any significant unavoidable adverse visual impacts. The GBUAPCD Governing Board finds that mitigation measures are not required because the Proposed Project causes no significant environmental impacts to visual resources.

NOISE

The EIR discusses the Proposed Project's noise impacts in Section 5-8 of the EIR.

Impact: As explained in Section 5-8 of the EIR, the environmental impacts caused by noise from the Proposed Project were found to be less-than-significant.

- **Mitigation Measures:** No mitigation measures are required for impacts caused by noise from the Proposed Project.

- **Finding 41: No mitigation measures are required.** The GBUAPCD Governing Board finds that the Proposed Project will not create any unavoidable significant adverse noise impacts. The GBUAPCD Governing Board finds that mitigation measures are not required because the Proposed Project causes no significant noise-related environmental impacts.

LAND USE

The EIR discusses the Proposed Project's land use impacts in Section 5-9 of the EIR.

Impact: As explained in Section 5-9 of the EIR, the environmental impacts to land use caused by the Proposed Project were found to be less-than-significant.

- **Mitigation Measures:** No mitigation measures are required for impacts caused by noise from the Proposed Project.

- **Finding 42: No mitigation measures are required.** The GBUAPCD Governing Board finds that the Proposed Project will not create any unavoidable significant adverse land use impacts. The GBUAPCD Governing Board finds that mitigation measures are not required because the Proposed Project causes no significant noise-related environmental impacts.

TRANSPORTATION

The EIR discusses the Proposed Project's transportation impacts in Section 5-10 of the EIR.

Impacts 5-10.5 and 5-10.6: As explained in Section 5-10 of the EIR, increased hazards on the roadway network would occur as a result of hauling gravel to the lake bed. This is a potentially significant environmental impact.

- **Mitigation Measures 5-10.5 and 5-10.6:** Warning lights and signs shall be installed by CalTrans at any side road entrances or overweight vehicle crossings constructed on SR 136 or SR 190 that would be used by delivery trucks hauling gravel from sites above the highways. Lights and signs should be installed along the highways on either side of the crossings to warn motorists that there may be large, slow-moving trucks ahead. If CalTrans requires installation of traffic signals at the crossings, the warning signs and lights could be used in conjunction with the signals. Installation and funding of these safety devices shall be the responsibility of the City of Los Angeles. This measure shall be made a condition of project approval and shall be implemented prior to the commencement of gravel hauling operations.

- **Finding 43: Mitigation Measures are feasible and required.** The GBUAPCD Governing Board finds that Mitigation Measures 5-10.5 and 5-10.6 are feasible and reduce the transportation-related impacts to a less-than-significant level by reducing roadway hazards occurring as a result of hauling gravel to the lake bed.

Impact 5-10.8: As explained in Section 5-10 of the EIR, implementation of the Proposed Project would damage public roadway surfaces through hauling gravel to the lake bed. This is a potentially significant environmental impact.

- **Mitigation Measure 5-10.8:** All public roadways damaged by gravel hauling shall be repaired as required to maintain safe operating conditions throughout the gravel hauling period, as well as at the end of this period. Upon completion of gravel hauling operations, roadways shall be repaired to pre-project conditions. This measure shall be made a condition of the approvals to extract and haul gravel and shall be performed throughout the gravel hauling period.

- **Finding 44: Mitigation Measure is feasible and required.** The GBUAPCD Governing Board finds that Mitigation Measure 5-10.8 is feasible and reduces the transportation-related impacts to a less-than-significant level by reducing roadway hazards caused by damaged road surfaces.

- **Finding 45:** With the exception of Impacts 5-10.5, 5-10.6 and 5-10.8, the GBUAPCD Governing Board finds that the Proposed Project will not create any additional unavoidable significant adverse transportation-related impacts. With the exception of Mitigation Measures 5-10.5, 5-10.6 and 5-10.8, the GBUAPCD Governing Board finds that additional transportation-related mitigation measures are not required because the Proposed Project causes no additional significant transportation-related environmental impacts.

ECONOMIC AND SOCIAL IMPACTS

The EIR discusses the Proposed Project's economic and social impacts in Section 5-11 of the EIR.

Impact: As explained in Section 5-11 of the EIR, the economic and social environmental impacts caused by the Proposed Project were found to be less-than-significant.

- **Mitigation Measures:** No mitigation measures are required for economic and social impacts caused by the Proposed Project.

- **Finding 46: No mitigation measures are required.** The GBUAPCD Governing Board finds that the Proposed Project will not create any unavoidable significant adverse economic or social impacts. The GBUAPCD Governing Board finds that mitigation measures are not required because the Proposed Project causes no significant economic or social environmental impacts.

PUBLIC HEALTH AND SAFETY/RISK OF UPSET

The EIR discusses the Proposed Project's public health and safety and risk of upset impacts in Section 5-12 of the EIR.

Impact: As explained in Section 5-12 of the EIR, the environmental impacts to public health and safety and risk of upset caused by the Proposed Project were found to be less-than-significant.

- **Mitigation Measures:** No mitigation measures are required for public health and safety or risk of upset impacts caused the Proposed Project.

- **Finding 47: No mitigation measures are required.** The GBUAPCD Governing Board finds that the Proposed Project will not create any unavoidable significant adverse public health and safety or risk of upset impacts. The GBUAPCD Governing Board finds that mitigation measures are not required because the Proposed Project causes no significant public health and safety or risk of upset environmental impacts.

SIGNIFICANT IMPACTS CONCLUSION

- **Finding 48:** The GBUAPCD Governing Board finds that mitigation measures have been developed in the Final EIR to reduce, to a less-than-significant level, the adverse environmental impacts caused by implementing the Proposed Project.

- **Finding 49:** The GBUAPCD Governing Board finds that all mitigation measures identified in the Final EIR shall hereby be adopted and incorporated into the Proposed Project and shall be implemented as set forth in the Mitigation Monitoring and Reporting Program to be adopted by the Governing Board.

- **Finding 50:** The GBUAPCD Governing Board makes each and every of the above findings on the basis of substantial evidence in the record. The GBUAPCD is the custodian of the materials which constitute the record of proceedings upon which the decision to approve the Proposed Project is based. These materials are located at the District's offices at 157 Short Street, Bishop, California 93514.

FINDINGS OF FACT ON THE PROJECT ALTERNATIVES

This section identifies the findings on the project alternatives, as identified in the Draft EIR and Final EIR. The description of project alternatives and the analysis of their environmental impacts is contained in Chapter 7 of the EIR.

- **Finding 51:** The GBUAPCD Governing Board finds that Section 7-1.3 of the EIR adequately discusses, evaluates and eliminates from further consideration alternative PM_{10} control measures such as, surface compaction, chemical salt modification, chemical stabilizers, sprinkler systems, lowering the shallow groundwater table, alternative surface coverings, riparian corridors, an attainment extension and an attainment waiver under the EPA's Natural Event Policy.

- **Finding 52:** The GBUAPCD Governing Board finds that section 7-1.2 of the EIR adequately discusses and evaluates the environmental impacts caused by alternative control measures such as, tilling, salt flats, unconfined deep flooding, sand fences and tree row wind breaks.

ALTERNATIVE A - LOW VOLUME WATER USE: GROUNDWATER

- **Finding 53:** The GBUAPCD Governing Board finds that section 7-3 of the EIR adequately describes Alternative A and discusses and evaluates its environmental impacts.

- **Finding 54:** The GBUAPCD Governing Board finds that Alternative A does not avoid any adverse environmental impact of the Proposed Project that is significant after mitigation.

- **Finding 55:** The GBUAPCD Governing Board finds that Alternative A has significant adverse environmental impacts not associated with the Proposed Project, including the adverse effects of land subsidence and local groundwater drawdown.

- **Finding 56:** The GBUAPCD Governing Board finds that Alternative A employs certain control measures, such as tilling, salt flats and sand fences, that do not have as high a level of scientifically-demonstrable effectiveness on Owens Lake as the control measures employed by the Proposed Project. Therefore, this alternative does not satisfy a basic objective of the project, namely, that of having a high technical likelihood of success without substantial delays.

ALTERNATIVE A1 - LOW VOLUME WATER USE: SURFACE WATER

- **Finding 57:** The GBUAPCD Governing Board finds that section 7-3 of the EIR adequately describes Alternative A1 and discusses and evaluates its environmental impacts.

- **Finding 58:** The GBUAPCD Governing Board finds that Alternative A1 does not avoid any adverse environmental impact of the Proposed Project that is significant after mitigation.

- **Finding 59:** The GBUAPCD Governing Board finds that Alternative A1 employs certain control measures, such as tilling, salt flats and sand fences, that do not have as high a level of scientifically-demonstrable effectiveness on Owens Lake as the control measures employed by the Proposed Project. Therefore, this alternative does not satisfy a basic objective of the project, namely, that of having a high technical likelihood of success without substantial delays.

ALTERNATIVE B - MODERATE VOLUME WATER USE: GROUNDWATER

- **Finding 60:** The GBUAPCD Governing Board finds that section 7-4 of the EIR adequately describes Alternative B and discusses and evaluates its environmental impacts.

- **Finding 61:** The GBUAPCD Governing Board finds that Alternative B does not avoid any adverse environmental impact of the Proposed Project that is significant after mitigation.

- **Finding 62:** The GBUAPCD Governing Board finds that Alternative B has significant adverse environmental impacts not associated with the Proposed Project, including the adverse effects of land subsidence and local groundwater drawdown.

- **Finding 63:** The GBUAPCD Governing Board finds that Alternative B employs certain control measures, such as tilling and salt flats, that do not have as high a level of scientifically-demonstrable effectiveness on Owens Lake as the control measures employed by the Proposed Project. Therefore, this alternative does not satisfy a basic objective of the project, namely, that of having a high technical likelihood of success without substantial delays.

ALTERNATIVE B1 - MODERATE VOLUME WATER USE: SURFACE WATER

- **Finding 64:** The GBUAPCD Governing Board finds that section 7-4 of the EIR adequately describes Alternative B1 and discusses and evaluates its environmental impacts.

- **Finding 65:** The GBUAPCD Governing Board finds that Alternative B1 does not avoid any adverse environmental impact of the Proposed Project that is significant after mitigation.

- **Finding 66:** The GBUAPCD Governing Board finds that Alternative B1 has significant adverse environmental impacts not associated with the Proposed Project, including adverse impacts on available water resources.

- **Finding 67:** The GBUAPCD Governing Board finds that Alternative B1 employs certain control measures, such as tilling and salt flats, that do not have as high a level of scientifically-demonstrable effectiveness on Owens Lake as the control measures employed by the Proposed Project. Therefore, this alternative does not satisfy a basic objective of the project, namely, that of having a high technical likelihood of success without substantial delays.

ALTERNATIVE C - NO WATER USE

- **Finding 68:** The GBUAPCD Governing Board finds that section 7-5 of the EIR adequately describes Alternative C and discusses and evaluates its environmental impacts.

- **Finding 69:** The GBUAPCD Governing Board finds that Alternative C does not avoid any adverse environmental impact of the Proposed Project that is significant after mitigation.

- **Finding 70:** The GBUAPCD Governing Board finds that Alternative C uses more gravel than the Proposed Project. Alternatives that use more gravel than the Proposed Project do not satisfy a basic objective of the project, namely, that of being consistent with the State of California's obligations to preserve and enhance the public trust values associated with Owens Lake.

ALTERNATIVE D - MANAGED LOW VOLUME WATER USE: GROUNDWATER

- **Finding 71:** The GBUAPCD Governing Board finds that section 7-6 of the EIR adequately describes Alternative D and discusses and evaluates its environmental impacts.

- **Finding 72:** The GBUAPCD Governing Board finds that Alternative D does not avoid any adverse environmental impact of the Proposed Project that is significant after mitigation.

- **Finding 73:** The GBUAPCD Governing Board finds that Alternative D has significant adverse environmental impacts not associated with the Proposed Project, including the adverse effects of land subsidence and local groundwater drawdown.

- **Finding 74:** The GBUAPCD Governing Board finds that Alternative D employs certain control measures, such as tree rows and salt flats, that do not have as high a level of scientifically-demonstrable effectiveness on Owens Lake as the control measures employed by the Proposed Project. Therefore, this alternative does not satisfy a basic objective of the project, namely, that of having a high technical likelihood of success without substantial delays.

ALTERNATIVE D1 - MANAGED LOW VOLUME WATER USE: SURFACE WATER

- **Finding 75:** The GBUAPCD Governing Board finds that section 7-6 of the EIR adequately describes Alternative D1 and discusses and evaluates its environmental impacts.

- **Finding 76:** The GBUAPCD Governing Board finds that Alternative D1 does not avoid any adverse environmental impact of the Proposed Project that is significant after mitigation.

- **Finding 77:** The GBUAPCD Governing Board finds that Alternative D1 employs certain control measures, such as tree rows and salt flats, that do not have as high a level of scientifically-demonstrable effectiveness on Owens Lake as the control measures employed by the Proposed Project. Therefore, this alternative does not satisfy a basic objective of the project, namely, that of having a high technical likelihood of success without substantial delays.

ALTERNATIVE E - HIGH VOLUME WATER USE: SURFACE WATER

- **Finding 78:** The GBUAPCD Governing Board finds that section 7-7 of the EIR adequately describes Alternative E and discusses and evaluates its environmental impacts.

- **Finding 79:** The GBUAPCD Governing Board finds that Alternative E does not avoid any adverse environmental impact of the Proposed Project that is significant after mitigation.

- **Finding 80:** The GBUAPCD Governing Board finds that Alternative E has significant adverse environmental impacts not associated with the Proposed Project, including the adverse impacts on available water resources.

ALTERNATIVE F - NO PROJECT

- **Finding 81:** The GBUAPCD Governing Board finds that section 7-8 of the EIR adequately describes Alternative F and discusses and evaluates its environmental impacts.

- **Finding 82:** The GBUAPCD Governing Board finds that Alternative F does not avoid any adverse environmental impact of the Proposed Project that is significant after mitigation.

- **Finding 83:** The GBUAPCD Governing Board finds that Alternative F does not satisfy the basic purpose of the project relating to the timely attainment of the federal PM_{10} standard.

ALTERNATIVES CONCLUSION

CEQA requires the Draft EIR and Final EIR to include the description and evaluation of a reasonable range of feasible alternatives to the Proposed Project. If the Lead Agency concludes that the Proposed Project will cause one or more significant environmental impacts, then it is required to consider the alternatives and decide whether there is a feasible alternative project which both achieves the basic objectives of the Proposed Project, and reduces or avoids a significant environmental impact caused by the Proposed Project. If there is such an alternative, CEQA mandates that the Lead Agency may not approve the Proposed Project.

- **Finding 84:** The GBUAPCD Governing Board finds that the Draft EIR and Final EIR have described and evaluated a reasonable range of feasible alternatives to the Proposed Project that utilized a range of potential control measures and a range of natural resource quantities.

- **Finding 85:** The Draft EIR and Final EIR conclude that the Proposed Project will not cause any significant environmental impact after mitigation, therefore, the GBUAPCD Governing Board finds that none of the alternatives evaluated in the Draft EIR and Final EIR avoids an environmental effect of the Proposed Project which is significant after mitigation.

- **Finding 86:** The GBUAPCD Governing Board finds that by adopting the mitigation measures associated with the Proposed Project and incorporating the mitigation measures into the approval of the Proposed Project, that all of the Proposed Project's potential significant adverse environmental impacts are avoided and consequently, no project alternative avoids a significant environmental impact caused by the Proposed Project after mitigation measures are applied.

- **Finding 87:** The GBUAPCD Governing Board makes each and every of the above findings on the basis of substantial evidence in the record. The GBUAPCD is the custodian of the materials which constitute the record of proceedings upon which the decision to approve the Proposed Project is based. These materials are located at the District's offices at 157 Short Street, Bishop, California 93514.

OTHER FINDINGS OF FACT

- **Finding 88:** Based upon the fact that the Owens Valley PM_{10} Planning Area (Owens Valley) has been designated a serious non-attainment area by the USEPA, and that this area is required by the Clean Air Act Amendments of 1990 to attain the PM_{10} 24-hour standard by December 31, 2001, the GBUAPCD Governing Board finds that the adoption of the *Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan* and Order to Implement is necessary.

- **Finding 89:** Based upon the fact that Health and Safety Code Section 42316 allows the District to require the City of Los Angeles to undertake reasonable measures to mitigate the air quality impacts of the City's water-gathering activities, the GBUAPCD Governing Board finds that the District has the authority to adopt the *Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan* and Order to Implement.

- **Finding 90:** Based upon extensive public comment on the Plan, the GBUAPCD Governing Board finds that the Plan and Order are written clearly so that they can be easily understood by the persons affected.

- **Finding 91:** Based upon an examination of the legal and regulatory history of the Owens Valley PM_{10} Planning Area, and the above findings on the compatibility of the Plan and Order with Section 42316, the GBUAPCD Governing Board finds that the *Owens Valley PM_{10} Planning Area State Implementation Plan* and Order are consistent with existing statutes, court decisions, and state and federal regulations.

- **Finding 92:** Based upon the fact that state law delegates to the District the responsibility for control of stationary sources of air pollution, the GBUAPCD Governing Board finds that the *Owens Valley PM_{10} Planning Area State Implementation Plan* and Order do not duplicate an existing state or federal regulation.

- **Finding 93:** The GBUAPCD Governing Board references the Clean Air Act Amendments of 1990 and State of California Health and Safety Code Section 42316 as the laws that the District implements through the *Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan* and Order.

- **Finding 94:** The GBUAPCD Governing Board finds that reasonable notice of the Governing Board's intention to hold a public hearing to adopt the *Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan* was given in compliance with the provisions of Title 40 of the Code of Federal Regulations, Section 51.102.

- **Finding 95:** The GBUAPCD Governing Board finds that notice of the public hearing to adopt the *Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan* was published in the following newspapers more than 30 days in advance of the hearing: the *Inyo Register* (Inyo County), the *Review Herald* (Mono County) and the *Tahoe Daily Tribune* (for Alpine County).

- **Finding 96:** The GBUAPCD Governing Board finds that the May 1997 *Draft Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan* was available for public inspection at the GBUAPCD office in Bishop, California at least 30 days in advance of the public hearing to adopt the Plan.

- **Finding 97:** The GBUAPCD Governing Board finds that the Administrator of the U.S. Environmental Protection Agency (through the Regional Administrator) was given notice of the public hearing and a copy of the May 1997 *Draft Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan* at least 30 days in advance of the hearing.

- **Finding 98:** The GBUAPCD Governing Board finds that the Kern County Air Pollution Control District was given notice of the public hearing and a copy of the May 1997 *Draft Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan* at least 30 days in advance of the hearing.

- **Finding 99:** The GBUAPCD Governing Board finds that the City of Los Angeles was given notice of the public hearing and a copy of the May 1997 *Draft Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan* at least 30 days in advance of the hearing.

- **Finding 100:** The GBUAPCD Governing Board makes each and every of the above findings on the basis of substantial evidence in the record. The GBUAPCD is the custodian of the materials which constitute the record of proceedings upon which the decision to approve the Proposed Project is based. These materials are located at the District's offices at 157 Short Street, Bishop, California 93514.

RESOLUTION 97-06, EXHIBIT B

OWENS VALLEY PM_{10} PLANNING AREA
DEMONSTRATION OF ATTAINMENT STATE IMPLEMENTATION PLAN

MITIGATION MONITORING AND REPORTING PROGRAM

RELATED DOCUMENTATION:

MARCH 25, 1997 DRAFT ENVIRONMENTAL IMPACT REPORT
JUNE 18, 1997 FINAL ENVIRONMENTAL IMPACT REPORT
(STATE CLEARINGHOUSE NUMBER 96122077)

PROJECT FILES MAY BE REVIEWED AT:

GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT
157 SHORT STREET, BISHOP, CALIFORNIA 93514

JULY 2, 1997

RESOLUTION 97-06, EXHIBIT B
MITIGATION MONITORING AND REPORTING PROGRAM

Section 21081.6 of the Public Resources Code requires all state and local agencies to establish monitoring or reporting programs whenever approval of a project relies upon a mitigated negative declaration or an environmental impact report (EIR). The monitoring or reporting program must ensure implementation of the measures being imposed to mitigate or avoid the significant adverse environmental impacts identified in the mitigated negative declaration or EIR. [Tracking CEQA Mitigation Measures Under AB 1380, Third Edition, March 1996]

The following Mitigation Monitoring and Reporting Program (MMRP) has been prepared to meet the California Environmental Quality Act (CEQA) requirements for preparing a MMRP for the *Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan* [SIP], *Environmental Impact Report*. The MMRP will be administered by the Great Basin Unified Air Pollution District (GBUAPCD). The GBUAPCD will be responsible for monitoring activities throughout the construction and operational phases of the project.

All major reporting and monitoring activities will be outlined in a master schedule. Enforcement responsibilities for each mitigation measure would vary depending upon the agency(ies) designated in the MMRP as the Responsible Agency. Methods for enforcement of mitigation measures, resolution of conflicts, and notification of violations will vary and be determined by the designated Responsible Agency. Enforcement measures may include written notification to the LADWP of violation or non-compliance, fines levied for exceedance of specified environmental standards, and/or suspension of activities that may affect endangered species, significant cultural resources or human health and safety.

LADWP will be responsible for preparing an Environmental Compliance Report to document environmental actions taken to comply with the mitigation-monitoring requirements of the MMRP. The Environmental Compliance Report will be the principal means for documenting monitoring activities, but other documentation, such as memoranda and field logs would also be generated and compiled by the monitoring entity. Copies of the Environmental Compliance Report shall be submitted to the GBUAPCD, State Lands Commission (SLC), and Inyo County on a quarterly basis during site construction, and annually during normal SIP operations. The Environmental Compliance Report will document both compliance and non-compliance. A consistent form shall be developed on which to record and document all observations. The form should contain all information needed for periodic (i.e., weekly, monthly, quarterly, and/or annual) summaries of compliance status. The Environmental Compliance Report is intended as an individual, auditable record of a specific observation. Separate reports would be filed for construction activities and continuing project operations, as necessary. All documents or other materials which constitute the record of the MMRP shall be filed with the GBUAPCD.

The MMRP is arranged in a tabular format listing each of the mitigation measures identified in the EIR which was adopted. The MMRP is organized to provide the following information:

Mitigation Measure: The EIR mitigation measures, identified by the number code used in the Draft EIR, which have a monitoring or reporting requirement.

Implementation Procedure: Additional information on how the mitigation measure would be implemented, as needed.

Monitoring and Reporting Actions: An outline of the appropriate monitoring and/or reporting actions required to verify implementation of the mitigation measure.

Standard of Compliance: Criteria for determining compliance with the mitigation measure.

Responsible Agency: The agency(ies) which would be involved with the review and approval of actions required to implement the mitigation measure, reporting tasks, and/or implementing enforcement actions, as necessary.

Monitoring Schedule: A schedule for conducting each mitigation measure monitoring and reporting requirement.

"Mitigation Monitor": The City of Los Angeles or an independent third-party consultant retained by the City.

Mitigation measures and, therefore, mitigation monitoring are only required for those resource areas for which significant environmental impacts have been identified. For the Proposed Project this includes: air quality, vegetation resources, wildlife resources, cultural resources and transportation. For all other resources areas (geology and soils, hydrology and water resources, visual resources, noise, land use, econcmic and social impacts and public health/risk of upset), the Proposed Project will not cause any associated significant environmental impacts and, therefore, as a result of the approval of the Proposed Project, these resource areas do not have any mitigation monitoring requirements.

MITIGATION MEASURE	IMPLEMENTATION PROCEDURE	MONITORING AND REPORTING ACTIONS	STANDARD OF COMPLIANCE	RESPONSIBLE AGENCY(IES)	MONITORING SCHEDULE
<u>METEOROLOGY & AIR QUALITY:</u>					
Mitigation Measures (MM) 5-3.1 and 5-3.2: Fugitive dust emissions from lake bed construction activities and gravel mining activities will be controlled through the application of Best Available Control Measures (BACM) for fugitive dust emissions. Any gravel plant will be required to comply with the New Source Performance Standard for non-metallic mineral processing plants. Construction activities will comply with GBUAPCD Rules 400 and 402. This may include, but would not be limited to, use of chemical soil stabilizers, surface coverings, water trucks and water sprays.	Add requirement for fugitive dust control to all construction contracts let for work associated with control measure implementation. Apply BACM for fugitive dust emissions during construction. Any gravel plant will be required to comply with the New Source Performance Standard for non-metallic mineral processing plants.	1) Provide copy of all construction contracts. 2) Provide a report of fugitive dust mitigation measures applied during construction phase. 3) Inspect construction activities.	Comply with District Rules 400 and 402.	1) Mitigation Monitor and GBUAPCD. 2) Mitigation Monitor. 3) GBUAPCD.	1) Prior to commencement of construction activities. 2) File quarterly compliance report. 3) Throughout construction activities.
<u>VEGETATION RESOURCES:</u>					
MM 5-4.1: A total of 121 acres of Transmontane Alkaline Meadow (TAM) shall be established and maintained to replace vegetation lost as a result of control measure implementation and operation. The TAM will be vegetated to achieve species diversity and percent cover comparable to the TAM lost as a result of direct or indirect impacts. 89 acres will be established in the Managed Vegetation control area and 32 acres will be established in the shallow flood control area.	LADWP and GBUAPCD will coordinate with the Army Corps of Engineers (ACOE) and Calif. Dept. of Fish and Game (CDFG) to determine the appropriate methods and locations for providing compensatory TAM replacement. LADWP will then implement the agreed upon method for TAM replacement.	Verify submittal of plans for wetland compensation to ACOE and CDFG for review and approval. Verify implementation and effectiveness of implementation.	The replacement TAM will be vegetated to achieve species diversity and percent cover comparable to the TAM lost as a result of direct or indirect impacts.	Mitigation Monitor, ACOE and CDFG. Verifications submitted to GBUAPCD.	Prior to completion of construction of Managed Vegetation control area.

MITIGATION MEASURE	IMPLEMENTATION PROCEDURE	MONITORING AND REPORTING ACTIONS	STANDARD OF COMPLIANCE	RESPONSIBLE AGENCY(IES)	MONITORING SCHEDULE
MM 5-4.2: Areas subject to shallow flood and managed vegetation control measures will be surveyed annually after implementation to identify locations where exotic pest plants have encroached into the project area. Where exotic pest plants such as salt cedar, puncture weed, Russian olive and noxious grasses such as *Cenchrus* are identified as a result of annual monitoring, an exotic pest plant control program will be developed and implemented to eradicate exotic pest plant and noxious weeds.	Exotic pest plant control program will be accomplished through an appropriate combination of biological, mechanical, and chemical control methods. The exotic pest plant control program will focus on early removal of plants and will be coordinated with other control programs undertaken in Inyo County to ensure most effective utilization of resources.	1) Verify program establishment. 2) Provide reports on program activities and effectiveness.	To be established during program development.	1) Mitigation Monitor, CDFG and Inyo County. 2) Mitigation Monitor. Verifications and reports submitted to GBUAPCD.	1) Prior to initiation of any water releases for water-based control measures.
MM 5-4.3: Prior to final siting of projected infrastructure, such as a buried water transmission line in shadscale scrub and transmontane alkaline meadow, and roads, power lines, and the gravel conveyor within shadscale scrub, a focused pre-construction survey will be conducted during the optimal flowering period for Owens Valley checkerbloom, Inyo County mariposa lily, Booth's evening primrose, Kern County evening primrose, Ripley's cymopterus, Mono buckwheat, sand linanthus, and Nevada oryctes. Final alignments will be reconfigured as necessary to avoid populations of sensitive plant species if they are detected as a result of directed surveys.	After final design is complete, but prior to contract awards, focused pre-construction surveys will be conducted during the optimal flowering period for the subject species. Final infrastructure alignments shall be adjusted, if necessary to avoid subject species, if encountered.	Provide a report of all surveys. If necessary, revise plans to prevent impacts.	Avoid subject plant species to the extent possible.	Mitigation Monitor. Reports and plans submitted to GBUAPCD.	Prior to construction.

MITIGATION MEASURE	IMPLEMENTATION PROCEDURE	MONITORING AND REPORTING ACTIONS	STANDARD OF COMPLIANCE	RESPONSIBLE AGENCY(IES)	MONITORING SCHEDULE
WILDLIFE RESOURCES:					
MM 5-5.2: A total of 121 acres of Transmontane Alkaline Meadow (TAM) shall be established and maintained to replace the alkali skipper and the Owens Valley tiger beetle habitat lost as a result of control measure implementation and operation. The TAM will be vegetated to achieve species diversity and percent cover comparable to the TAM lost as a result of direct or indirect impacts. 89 acres will be established in the Managed Vegetation control area and 32 acres will be established in the shallow flood control area.	LADWP and GBUAPCD will coordinate with the Army Corps of Engineers (ACOE) and Calif. Dept. of Fish and Game (CDFG) to determine the appropriate methods and locations for providing compensatory TAM replacement. LADWP will then implement the agreed upon method for TAM replacement.	Verify submittal of plans for wetland compensation to ACOE and CDFG for review and approval. Verify and report on implementation and effectiveness of implementation.	The replacement TAM will be vegetated to achieve species diversity and percent cover comparable to the TAM lost as a result of direct or indirect impacts.	Mitigation Monitor, ACOE and CDFG. Verifications, plans and reports submitted to GBUAPCD.	Prior to completion of construction of Managed Vegetation control area.
MM 5-5.3:. Potential impacts on nesting northern harriers in TAM shall be avoided and reduced to below the level of significance by scheduling construction of the buried water transmission pipeline outside of the breeding season of northern harrier (mid-March to mid-September), in accordance with Table 4.2. If the breeding season cannot be avoided, surveys shall be conducted within and adjacent to the 2 acres of TAM prior to construction. If northern harriers are observed nesting within the area that would be impacted in the construction of the buried water transmission pipeline, construction will be sited so as to avoid nesting individuals of this species.	Schedule construction in two acres of TAM to occur outside the period from March 15 to September 15. If this period cannot be avoided, surveys shall be conducted within and adjacent to the 2 acres of TAM prior to construction. If northern harriers are observed nesting within the area that would be impacted, construction will be rescheduled or re-sited so as to avoid nesting individuals.	Provide construction schedules. If necessary, provide a survey report. If necessary, provide revised construction schedule or revised plans.	Avoid construction in 2 acres of TAM at the southern end of the Owens River delta during the period from March 15 to September 15, unless preconstruction surveys are performed and nesting individuals are avoided.	Mitigation Monitor and CDFG. Schedules, reports and plans submitted to GBUAPCD.	Prior to construction in 2 acres of TAM at the southern end of the Owens River delta.

MITIGATION MEASURE	IMPLEMENTATION PROCEDURE	MONITORING AND REPORTING ACTIONS	STANDARD OF COMPLIANCE	RESPONSIBLE AGENCY(IES)	MONITORING SCHEDULE
MM 5-5.4: Potential impacts on breeding Le Conte's thrasher and loggerhead shrike would be avoided and reduced below the level of significance by scheduling construction of all improvements in Shadscale Scrub in the vicinity of suitable nesting habitat outside the breeding season (mid-January to late July), in accordance with Table 4.2. If the breeding season could not be avoided, surveys in the areas in which construction would take place would be conducted and areas containing breeding individuals would be avoided.	Schedule construction in Shadscale Scrub to occur outside the period from January 15 to July 31. If this period cannot be avoided, surveys shall be conducted in areas proposed for construction prior to the start of construction. If Le Conte's thrashers or loggerhead shrikes are observed nesting within the area that would be impacted, construction will be rescheduled or re-sited so as to avoid nesting individuals.	Provide construction schedules. If necessary, provide a survey report. If necessary, provide revised construction schedule or revised plans.	Avoid construction in Shadscale Scrub during the period from January 15 to July 31, unless preconstruction surveys are performed and nesting individuals are avoided.	Mitigation Monitor and CDFG. Schedules, reports and plans submitted to GBUAPCD.	Prior to construction in Shadscale Scrub habitat.
MM 5-5.5(a): A pre-construction directed survey for breeding western snowy plovers at Owens Lake will be undertaken during the breeding season in the year proceeding implementation of PM_{10} control measures. The pre-construction survey will include all known or expected nesting areas at Owens Lake. The purpose of the survey will be to census: number and location of adults, number and location of juveniles, numbers and location of chicks, and locations of nests or expected nests.	Conduct pre-construction surveys as per protocol.	Provide a survey report.	Directed surveys to be conducted in accordance with the protocol established for the GBUAPCD 1996 survey.	Mitigation Monitor, CDFG and GBUAPCD. Survey report submitted to GBUAPCD.	Breeding season survey (March 15 to August 31) prior to the start of any lake bed construction.

MITIGATION MEASURE	IMPLEMENTATION PROCEDURE	MONITORING AND REPORTING ACTIONS	STANDARD OF COMPLIANCE	RESPONSIBLE AGENCY(IES)	MONITORING SCHEDULE
MM 5-5.5(b): A pre-construction survey to delineate the distribution of suitable foraging habitat for western snowy plovers in and adjacent to areas where PM_{10} Control Measures will be implemented will be undertaken in the year immediately proceeding project implementation. Suitable foraging habitat will include all areas supporting ephydrids. Density of March 10, 1997 ephydrids can be used as a measure of the quality of habitat. The results of directed surveys will be used as the basis for performance criteria in evaluating the quality of foraging habitat created as a result of project implementation.	Conduct pre-construction surveys as per protocol.	Provide a survey report.	Pre-construction surveys to be conducted in accordance with the protocol established for the GBUAPCD 1996 survey.	Mitigation Monitor, CDFG and GBUAPCD. Survey report submitted to GBUAPCD.	Breeding season survey (March 15 to August 31) prior to the start of any lake bed construction.
MM 5-5.5(c): Ground-disturbing activities associated with the implementation of PM_{10} control measures will not be undertaken in known or expected western snowy plover nesting areas identified as a result of the pre-construction surveys for breeding snowy plover during the breeding season, between march 15 and August 31.	Construction schedule development shall take into account the results of pre-construction surveys in order to avoid sensitive areas during the breeding season.	Provide a report and copies of all construction schedules.	Avoid construction in identified sensitive areas during breeding season.	Mitigation Monitor, CDFG and GBUAPCD. Submit report and copies of all construction schedules to GBUAPCD.	Prior to commencement of construction activities.

MITIGATION MEASURE	IMPLEMENTATION PROCEDURE	MONITORING AND REPORTING ACTIONS	STANDARD OF COMPLIANCE	RESPONSIBLE AGENCY(IES)	MONITORING SCHEDULE
MM 5-5.5(d): Construction avoidance measures to protect nesting and foraging habitat for western snowy plovers will be exercised when ground-disturbing activities associated with construction of shallow flooding, managed vegetation, gravel and associated development must be undertaken between March 15 and August 31.	A qualified wildlife biologist shall survey work areas that approach known or expected nesting areas identified during the pre-construction survey. A 500 ft radius buffer areas will be established to protect all known or expected nesting sites and associated foraging areas. The biologist will flag these areas with to ensure that they are avoided during construction.	Provide a survey report and plan of all buffer areas. Inspect for flagging. Inspect for compliance with buffer-zone avoidance.	Surveys to be conducted in accordance with the protocol established for the GBUAPCD 1996 survey.	Mitigation Monitor, CDFG and GBUAPCD. Survey report and plan submitted to GBUAPCD.	Prior to start of construction activities during breeding season (March 15 to August 31).
MM 5-5.5(e): (1) Post-construction surveys for western snowy plovers shall be undertaken in following implementation of water-based control measures. (2) The results of the post-construction surveys will be analyzed in relation to pre-construction surveys and results for control sites established as part of the overall monitoring program for the project. (3) Where the monitoring program indicates that western snowy plover population numbers are declining as a result of implementation and maintenance of the PM_{10} Control Measures, habitat restoration shall be undertaken to compensate for reduced numbers of potential nesting sites that occur as a result of the control measures that displace nesting sites.	(1) Post-construction surveys for western snowy plovers shall be undertaken in the first, second, third, fifth, tenth, fifteenth, twentieth, and twenty-fifth years following implementation of water-based control measures. (2) Establish control sites. (3) Sufficient breeding habitat restoration shall be undertaken to maintain population levels at sites on the east side of Owens Lake consistent with the average population numbers established as a result of the 1996 and 1997 directed surveys.	(1) Provide survey reports. (2) Provide plan for control sites. (3) If necessary, provide plan for habitat restoration.	Maintenance of population levels at sites on the east side of Owens lake consistent with average population numbers established as a result of the 1996 and 1997 directed surveys.	Mitigation Monitor, CDFG and GBUAPCD. Submit reports and plans to CDFG and GBUAPCD.	First, second, third, fifth, tenth, fifteenth, twentieth and twenty-fifth years following implementation of water-based control measures.

MITIGATION MEASURE	IMPLEMENTATION PROCEDURE	MONITORING AND REPORTING ACTIONS	STANDARD OF COMPLIANCE	RESPONSIBLE AGENCY(IES)	MONITORING SCHEDULE
<u>CULTURAL RESOURCES:</u>					
MM 5-6.1(a): Prior to any ground disturbance in the area identified as GB JSA-1, additional research and test excavation will be undertaken to determine whether this prehistoric resource is significant. If it is determined to be significant, it will be subjected to a data recovery program consisting of archaeological excavation to retrieve the important data from the site.	If ground disturbance is required in vicinity of GB JSA-1, attempt to revise project design to avoid. If avoidance is not possible, a qualified archaeologist will conduct research and test excavations. If site is significant, data recovery will take place.	Submit construction plans to check for site impact. If necessary, provide report on ability to modify plans to avoid. If necessary, submit report on site significance. If necessary, submit data recovery plan.	National Historic Preservation Act and State Historic Preservation Office Guidelines.	Mitigation Monitor, ACOE, BLM and Calif. State Lands Commission.	Prior to ground disturbance in vicinity of GB JSA-1.
MM 5-6.1(b): Prior to any ground disturbance in areas identified as sensitive for prehistoric resources, archaeological surveys will be conducted to locate and record prehistoric resources. If the surveys result in identification of resources that cannot be avoided, additional research or test excavations, where appropriate, will be undertaken to determine whether the resource(s) are significant. Significant resources that cannot be avoided will be subjected to data recovery program consisting of archaeological excavation to retrieve the important site data.	A qualified archaeologist shall conduct pre-construction surveys. Identify potentially significant cultural resources. Determine significance. If significant, avoid if possible. If avoidance is not possible recover important site data.	Submit construction plans to allow planning of site surveys. Submit survey report. If necessary, provide report on ability to modify plans to avoid. If necessary, submit data recovery plan. If necessary, submit recovery result report.	National Historic Preservation Act and State Historic Preservation Office Guidelines.	Mitigation Monitor, ACOE, BLM and Calif. State Lands Commission.	Prior to ground disturbance in areas identified as sensitive for prehistoric resources.

MITIGATION MEASURE	IMPLEMENTATION PROCEDURE	MONITORING AND REPORTING ACTIONS	STANDARD OF COMPLIANCE	RESPONSIBLE AGENCY(IES)	MONITORING SCHEDULE
TRANSPORTATION:					
MM 5-10.5: Warning lights and signs shall be installed by CalTrans at any side road entrances or overweight vehicle crossings constructed on SR 136 or SR 190 that would be used by delivery trucks hauling gravel from sites above the highways.	Lights and signs should be installed along the highways on either side of the crossings to warn motorists that there may be large, slow-moving trucks ahead. If CalTrans requires installation of traffic signals at the crossings, the warning signs and lights could be used in conjunction with the signals.	Provide gravel hauling plan. Provide sign/light/signal plan. Provide copies of CalTrans permits. Provide as-built plans.	CalTrans specifications.	Mitigation Monitor and CalTrans.	Prior to commencement of gravel hauling activities.
MM 5-10.8: All public roadways damaged by gravel hauling shall be repaired as required to maintain safe operating conditions throughout the gravel hauling period, as well as at the end of this period.	Public roadways utilized to haul gravel shall be inspected daily during gravel hauling operations. Repairs shall be made as soon as road damage occurs. Safe operating conditions shall be maintained at all times. Upon completion of gravel hauling operations, roadways shall be repaired to pre-project conditions.	Provide road repair plan prior to start of gravel hauling operations. Secure repair permits. Provide quarterly reports of daily inspections and repairs made.	CalTrans and Inyo County specifications.	Mitigation Monitor, CalTrans and Inyo County.	Daily during gravel hauling. At the conclusion of gravel hauling.

OWENS VALLEY PM_{10} PLANNING AREA
DEMONSTRATION OF ATTAINMENT
STATE IMPLEMENTATION PLAN

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***This appendix is available upon request in a separately bound document.**

EXECUTIVE SUMMARY

PURPOSE OF THE SIP

The Owens Valley PM_{10} Demonstration of Attainment State Implementation Plan (SIP) has been prepared by the Great Basin Unified Air Pollution Control District to meet federal requirements in the Clean Air Act Amendments of 1990 (CAAA). The SIP includes an analysis of the particulate matter air pollution problem in the Owens Valley and provides a control strategy to bring the area into attainment with the National Ambient Air Quality Standard (NAAQS) for particulate matter.

FEDERAL CLEAN AIR ACT AND THE SIP

On July 1, 1987, the US Environmental Protection Agency (USEPA) revised the NAAQS, replacing total suspended particulates (TSP) as the indicator for particulate matter with a new indicator called PM_{10} (i.e., particulate matter less than or equal to 10 microns in diameter). The intent of the new, health-based standard for particulate matter was to prevent concentrations of suspended particles in the air that are injurious to human health. PM_{10} can penetrate deep into the respiratory tract, and lead to a variety of respiratory problems and illnesses. On August 7, 1987, the USEPA designated the southern Owens Valley as one of the areas in the nation that violated the new PM_{10} NAAQS. Figure 1 shows the boundaries of the nonattainment area, which is known as the Owens Valley Planning Area. Subsequent air quality monitoring by the District has shown that the bed of Owens Lake -- most of which is owned by the State of California and managed by the California State Lands Commission (SLC) -- is the major source of PM_{10} emissions contributing to air quality violations in the Owens Valley Planning Area. In January 1993, the southern Owens Valley was reclassified as a "serious nonattainment" area for PM_{10}.

The USEPA required the State of California to prepare a SIP for the Owens Valley Planning Area that demonstrates how PM_{10} emissions will be decreased to prevent exceedances of the NAAQS. The District is the agency delegated by the State to fulfill this requirement. In accordance with Section 189(b) of the CAAA, an Attainment SIP for serious nonattainment areas must be submitted to the USEPA by February 8, 1997 that demonstrates conformance with the federal air quality standards through the implementation of a program of control measures. By statute, attainment of the NAAQS for PM_{10} must be accomplished by December 31, 2001.

This document was prepared to satisfy the requirements for a SIP that demonstrates attainment with the PM_{10} NAAQS. The SIP includes a PM_{10} control strategy to reduce wind blown PM_{10} emissions from 35 square miles of exposed playa at Owens Lake. The control strategy includes using gravel coverings, managed vegetation, and shallow flooding to accomplish PM_{10} emission reductions at Owens Lake. It is anticipated that the control strategy can be implemented in four and a half years and bring the area into attainment by December 31, 2001 as required by the

CAAA. After the District Board adopts the SIP, it will be sent to the California Air Resources Board for review and approval. Once approval is granted by the State, it will then be officially submitted to the USEPA in compliance with federal requirements.

HEALTH IMPACTS OF PM_{10} FROM OWENS LAKE

Particulate pollution is generally associated with dust, smoke and haze and is measured as PM_{10}, which stands for particulate matter less than 10 microns in diameter. These particles are extremely small, less than a tenth the diameter of a human hair. Because of their small size they can easily penetrate into the lungs. Breathing PM_{10} can cause a variety of health problems. It can increase the number and severity of asthma and bronchitis attacks. It can cause breathing difficulties in people with heart or lung disease, and it can increase the risk for, or complicate existing respiratory infections. The National Ambient Air Quality Standard is intended to protect people who are especially sensitive to elevated levels of PM_{10}, which includes; children, the elderly and people with existing heart and lung problems. The PM_{10} NAAQS for a 24-hour average is set at 150 $\mu g/m^3$. At much higher concentrations of PM_{10}, even healthy individuals can be adversely affected by the dust. The USEPA has set an episode level of 600 $\mu g/m^3$ as the level that can pose a significant risk of harm to the health of the general public, including otherwise healthy individuals (40 CFR 51.151).

The NAAQS for PM_{10} is frequently violated in the planning area because of wind blown dust from Owens Lake. Wind speeds greater than about 17 mph (7.6 m/s) have the potential to cause wind erosion from the barren lake bed. Ambient PM_{10} readings are the highest measured in the country. One PM_{10} reading from Keeler on April 13, 1995 reached 3,929 $\mu g/m^3$, more than 25 times higher than the PM_{10} NAAQS. From 1987 through 1995 the PM_{10} NAAQS was violated about 19 times per year in Keeler, 5 times per year in Olancha and 2 times per year in Lone Pine.

Studies of dust transport from Owens Lake show that the standard can be exceeded more than 50 miles away and expose many more people to violations of the PM_{10} standard than just the residents near Owens Lake. Figure 2 shows the extent of possible PM_{10} violations from Owens Lake dust storms. About 40,000 permanent residents between Ridgecrest and Bishop are annually affected by the dust from Owens Lake at concentrations that can be above the federal PM_{10} standard. In addition, many visitors spend time in the dust impacted area to enjoy the many recreational opportunities the Eastern Sierra and high desert have to offer. Lone Pine annually hosts the Lone Pine film festival which draws thousands of visitors from outside the area. The National Park Service is concerned about the health hazard posed to an estimated 250,000 to 350,000 visitors that are expected to annually visit the Manzanar National Historic Site, 15 miles north of Owens Lake. The Park Service is concerned because a high percentage of the visitors to Manzanar will be older visitors who are more prone to airborne respiratory threats, and that they will spend 3 to 4 hours outdoors in a potentially harmful environment.

SOURCES OF PM_{10} EMISSIONS

Air pollution emissions in the nonattainment area are dominated by PM_{10} emissions from wind erosion from the exposed Owens Lake playa. Other wind erosion sources in the nonattainment area are: off-lake sources of lake bed dust, small mining facilities and some areas near Lone Pine and Independence that have been disturbed by human activity. There are few industrial sources in the Owens Valley and the only other source of criteria pollutant emissions are wood stoves, fireplaces, unpaved and paved road dust, and vehicle tailpipe emissions. In the future, the USDA Forest Service will also be emitting PM_{10} from prescribed burning activities in and around the nonattainment area. The prescribed burning activity, however, is not expected to be done on windy days when the Owens Lake dust storms occur. Predicted windy days are avoided when doing prescribed burns for fire safety reasons.

Wind erosion at Owens Lake comprises more than 99% of the 24-hour and annual emission inventories. Wind erosion emissions can be separated into on-lake and off-lake source areas. The on-lake source areas are the wind erosion areas on the historic playa of Owens Lake. Figure 3 shows the identified source areas that have been used for the attainment demonstration SIP. Off-lake sources of wind blown dust are caused by dust that was initially entrained from the exposed playa and then deposited in areas off the lake bed. These dust deposition areas, which are located adjacent to the lake bed from Keeler to Olancha, become secondary sources of dust that can be entrained under windy conditions.

The locations of on-lake source areas were determined by field mapping of eroded areas after storms. The boundaries of the eroded areas were mapped using a global positioning system (GPS). These data were transferred to the Geographic Information System to map the boundaries and determine the area size. Off-lake source area locations are based on observations of dust storms in 1994 and 1995, and by use of aerial photos of deposition areas.

A number of methods have been used to estimate PM_{10} emissions from Owens Lake dust storms including sun photometry and portable wind tunnel measurements. A range of annual emissions from around 130,000 to over 400,000 tons of PM_{10} per year were estimated using these methods.

PM_{10} CONTROL MEASURES

Control measures are defined as those methods of PM_{10} abatement that could be placed onto portions of the Owens Lake playa and when in place are effective in reducing the PM_{10} emissions from the surface of the playa. For approximately the last 12 years the District and other researchers have studied the lake environment and the mechanisms that cause Owens Lake's severe dust storms. For the last six years the District has pursued a comprehensive research and testing program to develop PM_{10} control measures that are effective in the unique Owens Lake playa environment. Control measures that were tested on the lake but have been rejected as effective dust control measures for the SIP included the use of sprinklers, chemical dust suppressants, surface compaction, sand fences, and brush fences. These measures were discussed in the Owens Valley PM_{10} Planning Area Demonstration of Attainment SIP Projects Alternatives Analysis document. For the attainment demonstration, three PM_{10} control measures will be used; shallow flooding, managed vegetation and gravel.

Shallow Flooding for PM_{10} Control: The surfaces of naturally wet areas on the lake bed (i.e., those areas typically associated with seeps and springs) are resistant to wind erosion that causes dust. Shallow flooding mimics the physical and chemical processes that occur at and around natural springs and wetlands. In these areas, water discharges across the flat lake bed surface by raising the level of the shallow groundwater table to the surface. The areal extent of wetting is dependent upon the amount of water discharged to the surface, evaporation rate and lake bed topography. The size of the wetted area is less dependent on soil type because, once the water table is raised to the playa surface, surface evaporation is soil-type independent. Shallow flooding provides dust control over large areas with minimal infrastructure and it requires minimal ongoing operation, maintenance and lake bed access.

This control measure consists of releasing water along the upper edge of the PM_{10} emissive area elevation contour lines and allowing it to spread and flow down-gradient toward the center of the lake. To attain the required PM_{10} control efficiency, at least 75 percent of each square mile of the control area must be wetted (i.e., standing water or surface saturated soil) between September 15 and June 15 each year. This coverage can be determined by aerial photography. To maximize project water use efficiency, flows to the control area will be regulated at the outlets so that only sufficient water is released to keep the soil wet. Although the quantity of excess water will be minimized through system operation, any water that does reach the lower end of the control area will be collected and recirculated through the system. At the lower end of the flood area, or at intermediate locations along lower elevation contours, excess water will be collected along collection berms keyed into lake bed sediments and pumped back up to the outlets to be reused.

Due to the generally flat, uniform nature of the lake bed, the outlet water would spread over wide areas to create a random pattern of shallow pools. These pools would be generally less than a few inches deep. Pooled areas will produce no PM_{10}, and will act as sand traps to prevent crust abrasion and dust generation. Damp and saturated soils also resist wind erosion. Locally high areas or "islands" of non-wetted soil tend to self-level; the soil blows off the higher islands and is captured in the pools. Thus, over time the high areas would become lower and the low areas would become higher. This leveling process can be expected to occur over a period of a few years. In some limited cases, it may be necessary to mechanically level high areas. This would occur primarily where previous earthwork performed on the lake bed prevents natural uniform spreading of PM_{10} control waters.

Shallow Flooding has been shown to be effective for controlling wind blown dust in sand dominated soils on the lake bed. Between 1993 and 1996 a 600-acre test was conducted on the sand sheet between Swansea and Keeler (Figure 4). Effectiveness was evaluated in four ways; a) from aerial photographs assuming that flooded areas provided 100% control, b) from portable wind tunnel measurements of test and control areas, c) from fetch transect (2-dimensional) analysis of sand motion measurements; and d) from areal (3-dimensional) analysis of sand motion measurements. The average control effectiveness was 99% after the surface water covered 75% of the test area. Wind tunnel tests showed an area-wide PM_{10} emission rate of $4.1x10^{-6}$ g/m^2-s, for the shallow flood site when 75% of the surface area was covered with water. This emission rate, which is used for the attainment demonstration modeling, applies to periods when the hourly average wind speed is greater than 25 miles per hour at 10 meters.

Where shallow flood water is distributed across the playa, opportunistic plant species are expected to establish themselves where conditions are favorable. Limited stands of cattails (*Typha* sp.), sedges (*Carex* sp.), saltgrass (*Distichlis spicata*), and other species associated with saturated alkaline meadows of the region have colonized the immediate vicinity of the water outlets on the flood irrigation project. Based on testing performed by the District at the North Flood Irrigation Project test area, naturally established vegetation can be expected to immediately occur on about 0.5 percent of the area that is controlled with shallow flooding. This percentage may increase over time.

The expansive shallow flooded areas and the naturally established vegetation provide ephemeral resting and foraging habitat for wildlife use. Insect and shorebird utilization of wet areas created by District testing on the lake bed was common during control measure testing. Based on these previous experiences, it is anticipated that shallow flooding will create large areas of plant and wildlife habitat in areas where very little previously existed.

Water flows between September 15 and June 15 will be maintained to provide the required 75 percent of the area in standing water or saturated soil. During cool weather when evaporation rates are low, it may be possible to shut off flows completely for short periods as long as saturated soil conditions are maintained. To maximize water use efficiency, water flows should be minimized during the summer months when PM_{10} standard violations are infrequent and evaporation rates are high. It is a mandatory element of this project that minimal water flows be maintained between June 15 and July 31 to sustain established vegetation and wildlife. Between July 31 and September 15 the flows may be shut off completely. Based on the District's large-scale tests of shallow flooding, operating the shallowing flooding control measure in this manner is predicted to use approximately four acre-feet per year (ac-ft/yr) of water per acre controlled. Careful management of shallow flood areas may allow for even less water to be used.

Maintenance activities associated with shallow flooding would consist of minor grading and berming on the control areas to ensure uniform water coverage and prevent water channeling. Staffing requirements for operation and maintenance of the shallow flooding areas are estimated at approximately one FTEE per 3,200 acres of flooded area.

Managed Vegetation for PM_{10} Control: Where water appears on the playa surface with quantity and quality sufficient to leach the salty playa surface and sustain plant growth, vegetation has naturally become established. The saltgrass meadows around the playa margins and the scattered spring mounds found on the playa are examples of such areas. Vegetated surfaces are resistant to soil movement and thus provide protection from PM_{10} emissions. The managed vegetation strategy creates a mosaic of irrigated fields provided with subsurface drainage to create soil conditions suitable for plant growth using a minimum of applied water. Because this measure relies on earthen infrastructure for water distribution, it is best suited for use in clay soils that can be used for the construction of ditches, berms, channels and reservoirs that allow for level border irrigation strategies that leach and drain readily through the fractured structure of the soil. The proposed methods of soil reclamation are similar to those used elsewhere in this country and world-wide for desalinization of salt-affected soils, allowing such soils to be useful for plant growth.

This control measure consists of a creating a farm-like environment containing small (approximately 4 to 20 acre) confined fields constructed on contour that are irrigated with shallow pulses of water (Figure 5). The amount of water required to leach the soils to within a level suitable for salt-tolerant species depends on specifics of soil type and of surface treatment. Studies at the test plot indicate that between 3½ and 6 feet of water will be necessary to permanently reclaim a two-foot deep soil profile to a level suitable for planting with saltgrass. This amount of water can be delivered to the fields in 4 to 6 irrigation events, which can take place during a period of about 3 to 4 months. As the salt levels in the leached plots decline, plants can be introduced to the fields and irrigated using the same methods. Therefore, if leaching began during the winter months, saltgrass could be planted during the spring of the same year.

To attain the required PM_{10} control efficiency, a plant cover of 50 percent live or dead cover will be sufficient on the 75 percent of the total managed vegetation control area that will be vegetated. Data from test plots on the lake indicate that such cover can be achieved during the third growing season. Total cover will include both live and dead plant material, as both function to prevent PM_{10} emissions. Field studies on Owens Lake test plots confirm that the target saltgrass cover of 50 percent can be sustained with 2.5 ac-ft/yr of irrigation water for each acre planted with saltgrass. This results in an overall water requirement of two acre-feet of water per year per total acre of managed vegetation control area. The remaining 25 percent of the total control area will consist of such control measure infrastructure as roads, reservoirs, canals and drains. Percent cover can be measured by the point frame method.

Saltgrass (*Distichlis spicata)* will be the only plant species considered by this SIP to be introduced to the fields. It is tolerant of relatively high soil salinity, spreads rapidly via rhizomes, and provides good protective cover year-round even when dead or dormant. Saltgrass stands can subsist with minimal amounts of applied water during the summer, and dust control effectiveness remains undiminished, provided that adequate irrigation has stimulated plant growth and has provided stored water in the plants' rooting zone during the spring months.

Recent field and wind tunnel research using Owens playa sands and actual saltgrass vegetation has been conducted. These studies indicate that even sparse populations of saltgrass function very effectively in reducing sand migration and PM_{10} within the stand. The field studies concluded that for the coarse sands of the north sand sheet on Owens Lake, 95% reduction in sand movement can be achieved with a saltgrass cover of between 16 to 23%, depending on wind speed and direction. Wind tunnel studies showed that a vegetation cover of 12 to 23% will significantly reduce the amount of entrained sand and PM_{10}.

Wind tunnel studies were conducted on untreated, leached, vegetated, and "simulated" vegetated sites on the Owens Lake clay soils. Although the vegetation increased the aerodynamic roughness of the surface, there was no statistically significant difference between PM_{10} emissions from the vegetated and from the control (leached but unvegetated) sites. Both of these sites, however, showed PM_{10} reductions of two orders of magnitude compared to the natural playa surfaces. This indicates that treatment of the clay surfaces at Owens Lake by watering and leaching surface salts can by itself significantly reduce wind erosion without vegetation. However, saltgrass vegetation cover will provide additional surface protection after the initial protection provided by watering decreases.

In a companion project, Owens Lake clay soils with saltgrass were subjected to various windspeeds in a wind tunnel at the University of California at Davis. Preliminary results indicate that 54% vegetation cover reduces the emission rate of PM_{10} at a wind speed of 45 mph by 99.2% as compared to emissions from the natural playa at Owens Lake.

Control efficiencies were calculated for Owens Lake clay soils in both the field and the laboratory wind tunnels. The field studies showed 99.5% control efficiency with 11% saltgrass cover, and the laboratory study demonstrated 99.2% control efficiency at 54% cover as compared to uncontrolled emissions at Owens Lake.

The plan for managed vegetation is to achieve cover values of at least 50%, a value that would include dead or dormant stems that would provide erosion protection without presenting a transpirative surface. This level of cover could be retained with minimal water use during the summer, and would function during winter months as well without irrigation.

Based on field studies done at Owens Lake and elsewhere, the District concludes that more than 99% reduction of soil erosion and PM_{10} will be achieved at Owens Lake with a salt grass cover of 50%. For modeling and emissions inventory purposes the controlled PM_{10} emissions from the vegetation managed area is estimated at 1% of the uncontrolled emission rate.

Although saltgrass is the only plant species that will be deliberately introduced to the managed vegetation area, other plants species are expected to establish themselves opportunistically. Plant species observed on saltgrass test plots include seablight (*Sesuvium verrucosum*), parry saltbush (*Atriplex parryi*), and rabbitfoot grass (*Polypogon monospeliensis*). The species typical of transmontane alkaline meadows elsewhere in the region, such as inkweed (*Nitrophila occidentalis*), Nevada sedge (*Scirpus nevadensis*), and yerba mansa (*Anemopsis californica*) would also be expected to appear, adding diversity and wildlife habitat value to the fields. On saltgrass test plots established by the District on the playa, evidence of use by rabbits, rodents, insects, spiders, and even coyotes was found. The mosquito and salt cedar control programs discussed above would also take place on the managed vegetation control measure.

Every effort will be made to limit the potential for introduction of exotic pest plant species into source emission areas that will be controlled through the use of managed vegetation. Test plots established on the playa have not been invaded by exotic pest plants. Fortunately, the existing saline soil conditions inherent to the lake bed are inhospitable to most plants including exotic pest plants such as tamarisk, puncture weed and Russian thistle and noxious grasses such as *Cenchrus*. Exotic pest plants and noxious grasses will be removed from the source emission area (if present) prior to planting with saltgrass. Another potential source for the introduction of exotic pest plants would be from the saltgrass stands harvested for rhizomes to vegetate the panels. Exotic pest plants will be removed from the saltgrass stands (if present) prior to

harvesting. Removal will be accomplished through an appropriate combination of biological, mechanical and chemical control methods. Berms and other elements of infrastructure will be constructed from lake bed soils, which are not likely to be subject to invasion from these pest plants due to the high levels of salinity.

Managed vegetation is predicted to utilize approximately two ac-ft/yr of water per acre controlled, or 2.5 acre feet per irrigated acre. Non-irrigated acres (roads, berms, water storage, etc. account for approximately 25% of the controlled area. The distribution of the water over the entire vegetated area will be irregular, because at any given time some fields will be irrigated for maximum growth while others will be receive minimal amounts of water allowing for minimal stand maintenance. Water use will be higher during the initial stages of development of this measure, as it will take 3½-6 feet of water to leach the top two feet of soil to a salinity level tolerable to saltgrass, depending on surface treatment. Since the later stages of leaching can be accomplished after planting, total water use for the first year of implementation will be seven ac-ft/ac. After the first year, water use will be reduced to at or below 2.5 ac-ft/ac/yr.

Operation and maintenance activities for managed vegetation would consist of implementing an irrigation schedule for the fields, and necessary repair to water transmission and delivery structures and to the berms and ditches associated with the fields. Staffing requirements for operation and maintenance of the managed vegetation area are estimated at approximately one FTEE per 1,500 acres of vegetated area.

Gravel Cover for PM_{10} Control: A four-inch layer of coarse gravel laid on the surface of the Owens Lake playa will prevent PM_{10} emissions by: (a) preventing the formation of efflorescent evaporite salt crusts, because the large spaces between the gravel particles interfere with the capillary forces that transport the saline water to the surface where it evaporates and deposits salts; and (b) raising the threshold wind velocity required to lift the large gravel particles (i.e., larger than ⅜- inch diameter) so that transport of the particles is not possible by wind speeds typical of the Owens Lake area. Gravel blankets can work effectively on essentially any type of soil surface. Gravel test plots on Owens Lake have been in place for approximately 10 years and continue to completely protect the emissive surfaces beneath (Figure 6). Gravel placed onto the lake bed surface will be durable enough to resist wind and water deterioration and leaching and will be approximately the same color as the existing lake bed.

Under certain limited conditions of sandy soils combined with high ground water levels, it may be possible for some of the gravel blanket to settle into lake bed soils and thereby lose effectiveness in controlling PM_{10} emissions. To prevent the loss of any protective gravel material into lake bed soils, a permeable geotextile fabric may be placed between the soil and the gravel where necessary. This will prevent the loss of any gravel.

Gravel areas must be protected from water- and wind-borne soil and dust. The gravel blanket will be the last control measure to be installed. Therefore, wind-borne depositions will be eliminated. Gravel areas will also be protected from flood deposits with flood control berms, drainage channels and desiltation/retention basins. These measures will ensure that the gravel blanket will remain an effective PM_{10} control measure for many years.

To attain the required PM_{10} control efficiency, 100 percent of all areas designated for gravel must be covered with a layer of gravel at least four inches thick. All gravel material placed shall be screened to a size greater than ⅜-inch in diameter. The gravel material shall be at least as durable as the rock from the three sources analyzed in this document. The material shall have no larger concentration of metals than found in the materials analyzed in this document. The color of the material used shall be such that it does not significantly change the color of the lake bed.

A gravel cover forms a non-erodible surface when the size of the gravel is large enough that the wind cannot move the surface. If the gravel surface does not move, it protects finer particles from being emitted from the surface. Gravel and rock coverings have been used successfully to prevent wind erosion from mine tailings in Arizona. The potential PM_{10} emissions from a gravel surface can be estimated using the USEPA emission calculation method for industrial wind erosion for wind speeds above the threshold for the surface. PM_{10} will not be emitted if the wind speed is below the threshold speed.

Based on a particle size mode of ¼ inch, the proposed gravel cover will have a threshold wind speed of 90 miles per hour measured at 10 meters. This wind speed is rarely exceeded in the Owens Lake area. A more typical gust for Owens Lake may be around 50 miles per hour.

The proposed 4-inch thick gravel cover is intended to prevent capillary movement of salt and silt particles to the surface. Fine sands and silts that fill in void spaces in the gravel will allow the capillary rise of salts and reduce the effectiveness of a gravel blanket to control PM_{10} at Owens Lake. In addition, finer particles will lower the particle size mode and lower the threshold wind speed for the surface. Gravel blanket tests were performed at two sites on Owens Lake starting in June 1986. These tests showed that four-inch thick gravel blankets composed of ¼ inch and larger rocks prevented capillary rise of salts to the surface. Observations of ungraveled test plots in the same area, one with no surface covering and another with local soil, showed that salts would otherwise rise to the surface.

Because fine particles should not be allowed to cover or significantly invade the gravel, the gravel blankets would be the last measure implemented after all other erodible areas are controlled.

The PM_{10} emissions are expected to be zero for the gravel cover since the threshold wind speed to entrain gravel, and thus PM_{10}, is above the highest expected wind speeds expected for the area. This will result in 100% reduction of PM_{10} from areas that are covered by a gravel blanket.

Once the gravel cover has been applied to the playa, limited maintenance would be required to preserve the gravel blanket. The gravel would be visually monitored weekly to ensure that the gravel blanket was not filled with sand or dust, or had not been inundated or washed-out from flooding. If any of these conditions were observed over a substantial area, additional gravel would be transported to the playa via truck (unless the conveyor system was still in place and operational) and applied to the playa surface via truck and/or low ground-pressure bulldozer or grader. Operation and maintenance staffing requirements are estimated to be one FTEE per five square miles of gravel and an ongoing maintenance amount of gravel of 3,200 cubic yards per square mile per year.

PROPOSED CONTROL STRATEGY

The selection of the proposed control strategy was made after careful consideration of eight alternatives that were reviewed by the public, regulatory agencies and the City of Los Angeles. The range of alternatives that were considered not only accomplished the District's primary goal of bringing the area into attainment with the PM_{10} NAAQS, but also were consistent with the State of California's obligation of land and resource stewardship and of public trust values with respect to the Owens Lake bed which was exposed when the water of the Owens Valley was diverted into the Los Angles Aqueduct.

The selected PM_{10} control strategy combines into an overall plan to control dust from Owens Lake the three control measures: shallow flooding, managed vegetation and gravel covering (Figure 7). The project requires the use of an estimated 51,000 acre-feet (ac-ft) of water per year.

This amount of water may decrease over time as improved water use techniques are developed and as the lake bed becomes vegetated.

The SIP and the proposed implementation order do not prescribe the source(s) of water from which the City of Los Angeles must supply the water-based control measures. An available water source for the control measures is the Los Angeles Aqueduct. The control measures would use approximately that amount of water that analysis indicates could be supplied from the Los Angeles Aqueduct without causing significant impacts or water shortages to the City of Los Angeles, or significant indirect impacts to any other area. Fifty-one thousand acre-feet per year represents approximately 13% of the water that the Los Angeles Department of Water and Power (LADWP) exports to the City of Los Angeles. Over the last 20 years the LA Aqueduct flow to the City has averaged 395,000 ac-ft per year.

An air quality modeling analysis was performed to show that the proposed control strategy would reduce the PM_{10} emissions to a level that will bring the areas around Owens Lake into compliance with the 24-hour PM_{10} NAAQS of 150 $\mu g/m^3$. Air quality modeling utilized the US EPA approved guideline model, Industrial Source Complex - Short-term version 3. After the proposed control strategy is implemented, ambient PM_{10} design concentrations are expected to be highest in the area near the southeast shoreline, with a PM_{10} design concentration of 66.6 $\mu g/m^3$ (Figure 8). The design concentration refers to the third highest value in two years, which must be less than 150 $\mu g/m^3$ to show compliance with the standard. The NAAQS allows for one day per year on average to exceed 150 $\mu g/m^3$.

The level of emissions control required by this plan is the level appropriate to assure the timely and continual compliance of the PM_{10} NAAQS in the Owens Valley Planning Area. Even if the control requirements were reduced so that the PM_{10} concentration for the design day was 150 $\mu g/m^3$, the change would not make a material difference in the amount of control required, or its cost. Since ambient concentrations are proportional to emissions, Owens Lake playa emissions after implementation could increase by a factor of three to bring the 67 $\mu g/m^3$ to 150 $\mu g/m^3$. Because of the large percentage of control of playa emissions that is necessary in order to attain the PM_{10} NAAQS, a three-fold increase in allowable emissions (from 0.6% to 1.8%) would only decrease the plan's control effectiveness of 99.4% to 98.2%, an insignificant difference in both the intensity of the control measures, and in their cost.

IMPLEMENTATION SCHEDULE AND PHASING

The proposed project is to be implemented in phases over a four and a half year period. The order of implementation will generally be from north to south with the gravel areas being the last to be installed. Table 1 shows proposed phasing of each of the control measures on the playa. Area letters in Table 1 refer to the control areas indicated in Figure 7.

Table 1 Control Area Sizes for Annual Implementation.

Area - Control Measure		Area Controlled at the End of Each Year (acres) 1997	1998	1999	2000	2001
A	Shallow Flooding	---	1,210	1,210	0	1,210
B	Shallow Flooding	---	---	6,960	2,784	6,960
C	Gravel	---	---	---	---	3,365
D	Managed Vegetation	---	---	---	2,900	8,700
E	Gravel	---	---	---	---	1,940
F	Shallow Flooding	---	---	---	225	225
		0	1,210	8,170	5,909	22,400

Total = 22,400 acres

PM_{10} EMISSION REDUCTION TREND

An estimate of the PM_{10} emission reduction trend over the four and a half year implementation period can be estimated using the information shown in Table 1 and an approximation for the amount of PM_{10} per acre of playa controlled. Using the model estimated peak day PM_{10} emissions, an estimate of 0.48 tons of PM_{10} per acre of lake bed controlled is estimated for 22,400 acres that are intended for controls. Figure 9 shows the estimated peak-day emission trend line for the SIP control strategy. More than 99% reduction of peak-day PM_{10} emissions is expected over five years with the implementation of the control strategy. A similar trend line would also be estimated for the reduction of annual emissions.

COST AND EMPLOYMENT

The range of comparative preliminary costs for the construction of the proposed project is $91-$250 million. The range of comparative preliminary costs for annual operation and maintenance is $26 - $30 million. These estimates assume that the water supplied from the Aqueduct is replaced by the City with purchases from the Metropolitan Water District at a cost of $450 per acre foot. Using the construction and annual cost estimates, the range of 25-year annualized cost is $38 - $50 million, for a cost per ton of PM_{10} of $130 - $175. The South Coast 1997 Air Quality Management Plan sets the PM_{10} BACM cost-feasibility limit at $5,300 per ton of PM_{10}. Actual control costs required by the South Coast plan range from $170/ton for agricultural sources to $630/ton for unpaved roads. It is estimated that the proposed project will create between 84 and 91 jobs during construction and 14 long-term jobs for operation and maintenance of the control measures.

CONCLUSION

The proposed control strategy using a combination of shallow flooding, managed vegetation and gravel covering as shown in Figure 7 can be implemented in four and a half years to meet the federal attainment deadline of December 31, 2001. Investigations performed on the lake bed show that these control measures are feasible and that they will significantly reduce PM_{10} emissions. Air quality modeling has shown that this strategy can reduce PM_{10} impacts at sites around the historic lake shore to below the federal 24-hr PM_{10} standard.

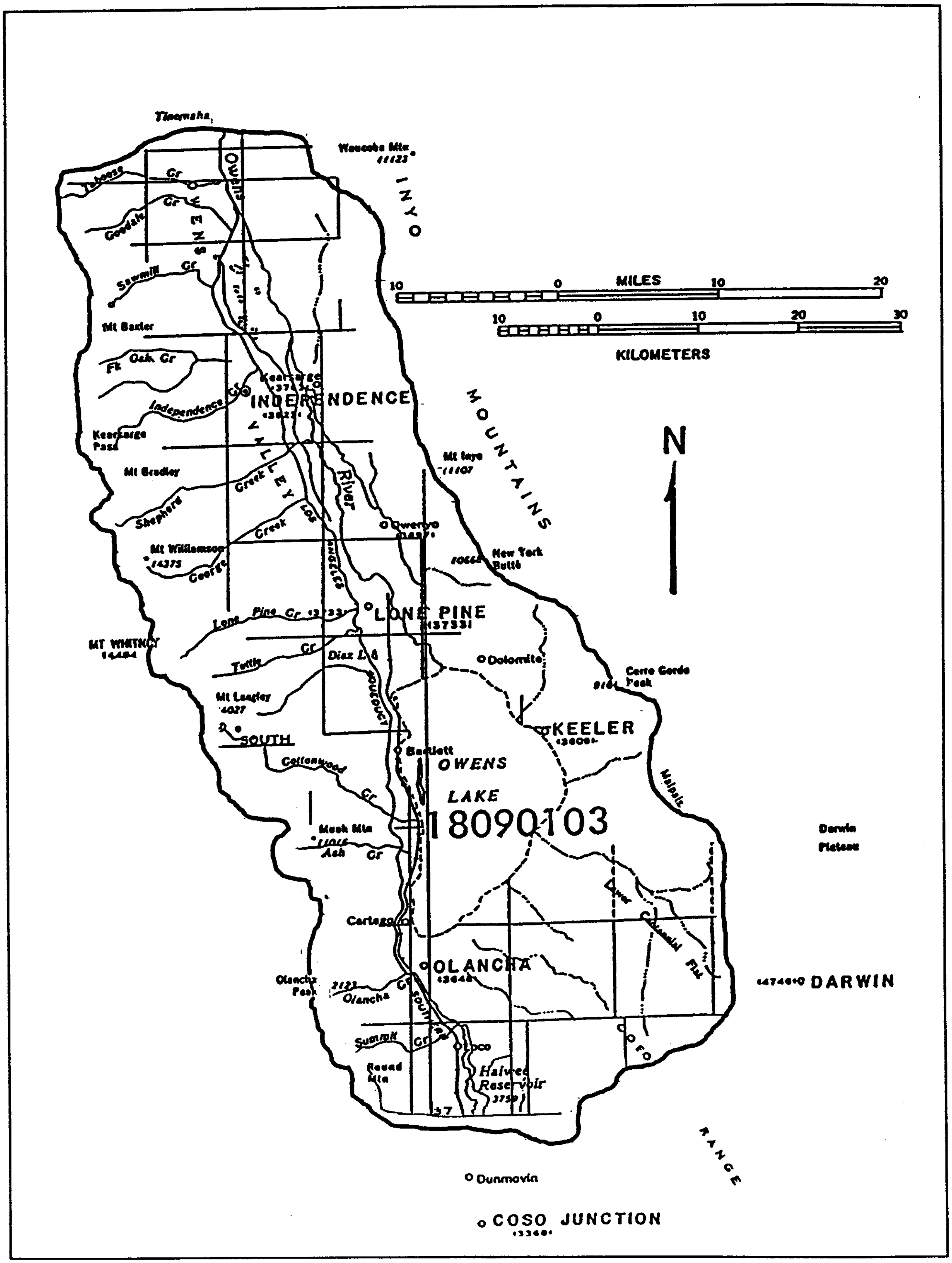

Figure 1: Boundaries of the federal PM_{10} non-attainment area.

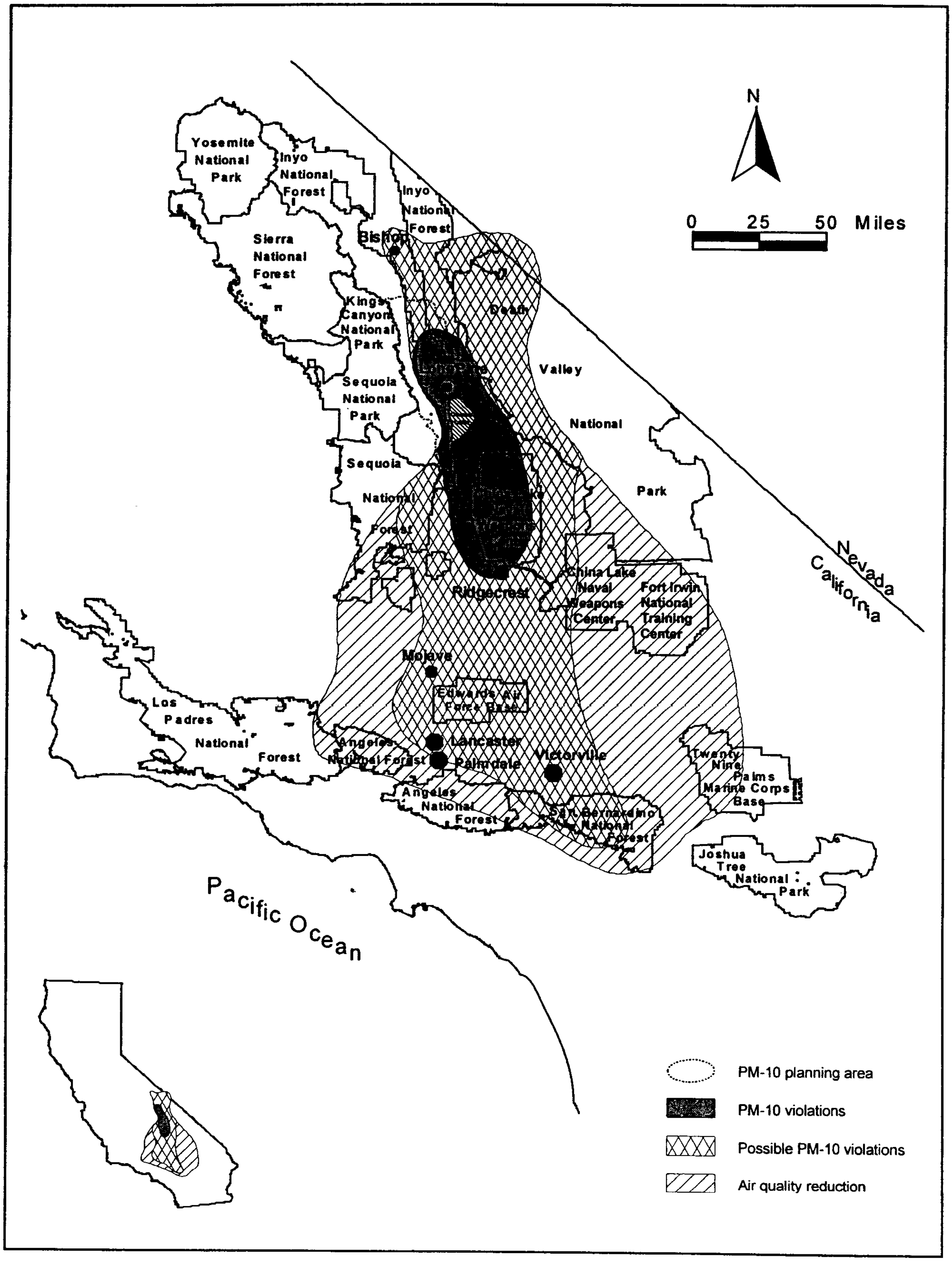

Figure 2: Projected area affected by dust from Owens Lake.

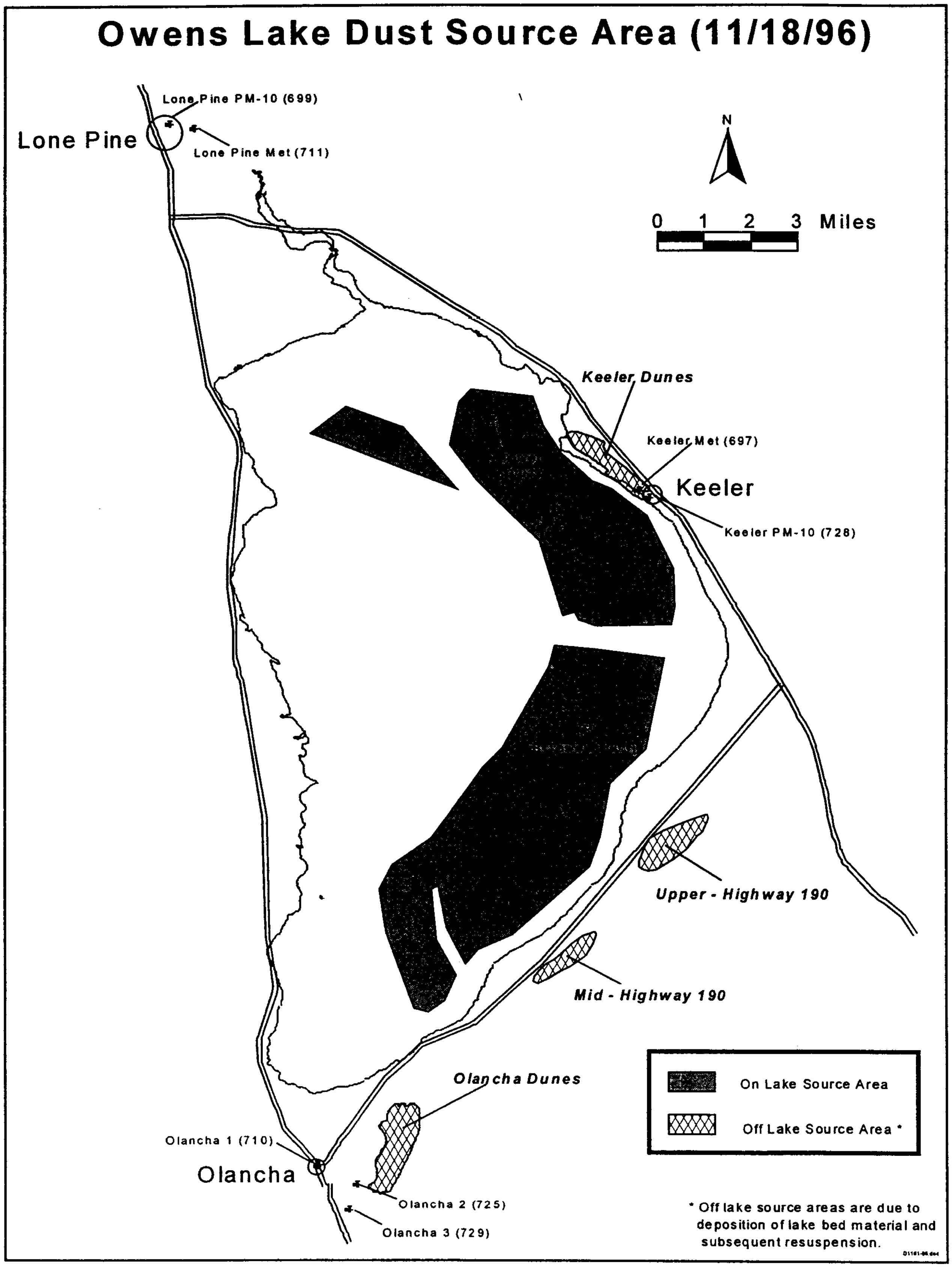

Figure 3: Owens Lake dust source areas for PM_{10} wind erosion.

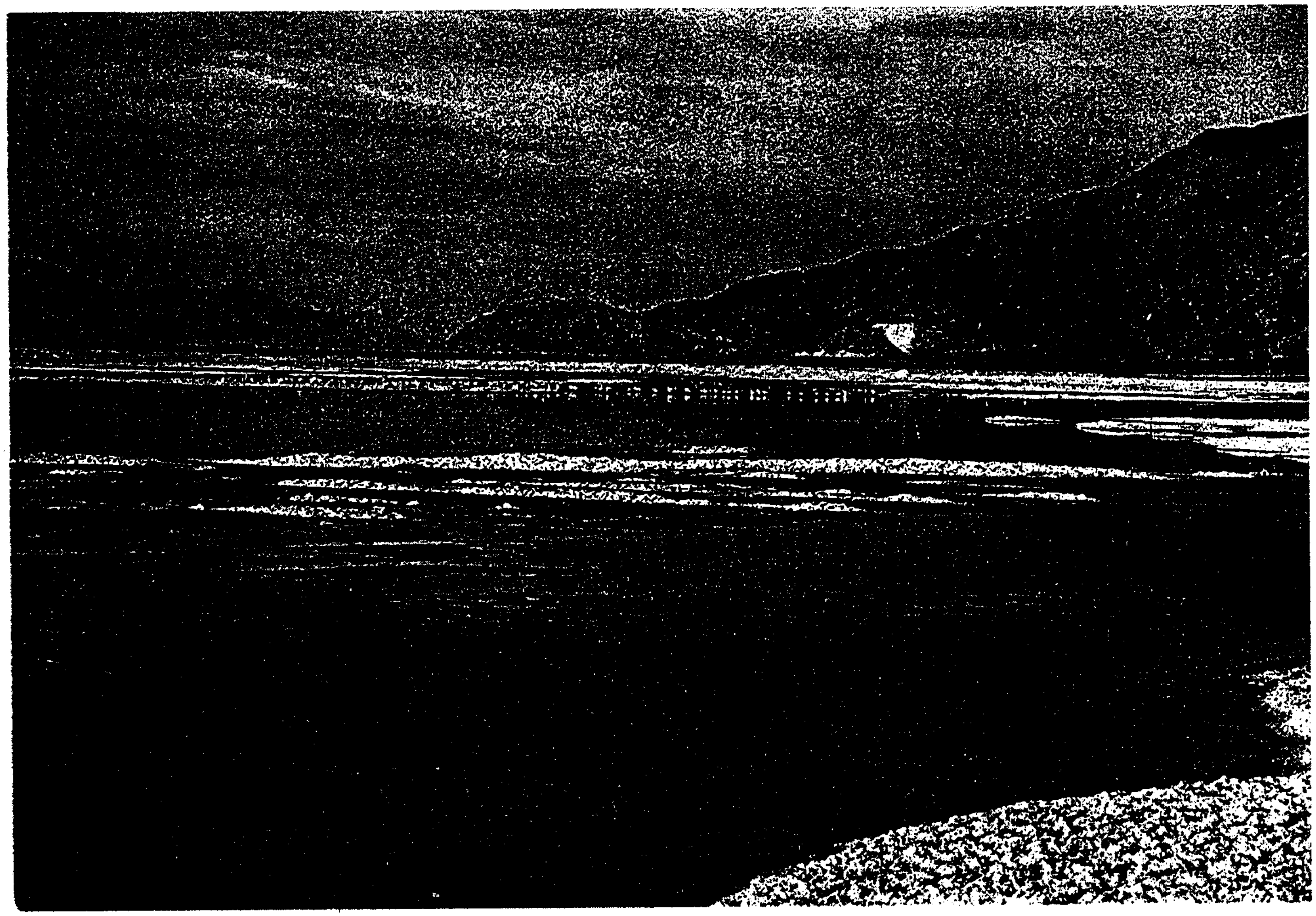

Figure 4: Shallow flooding - test site photograph.

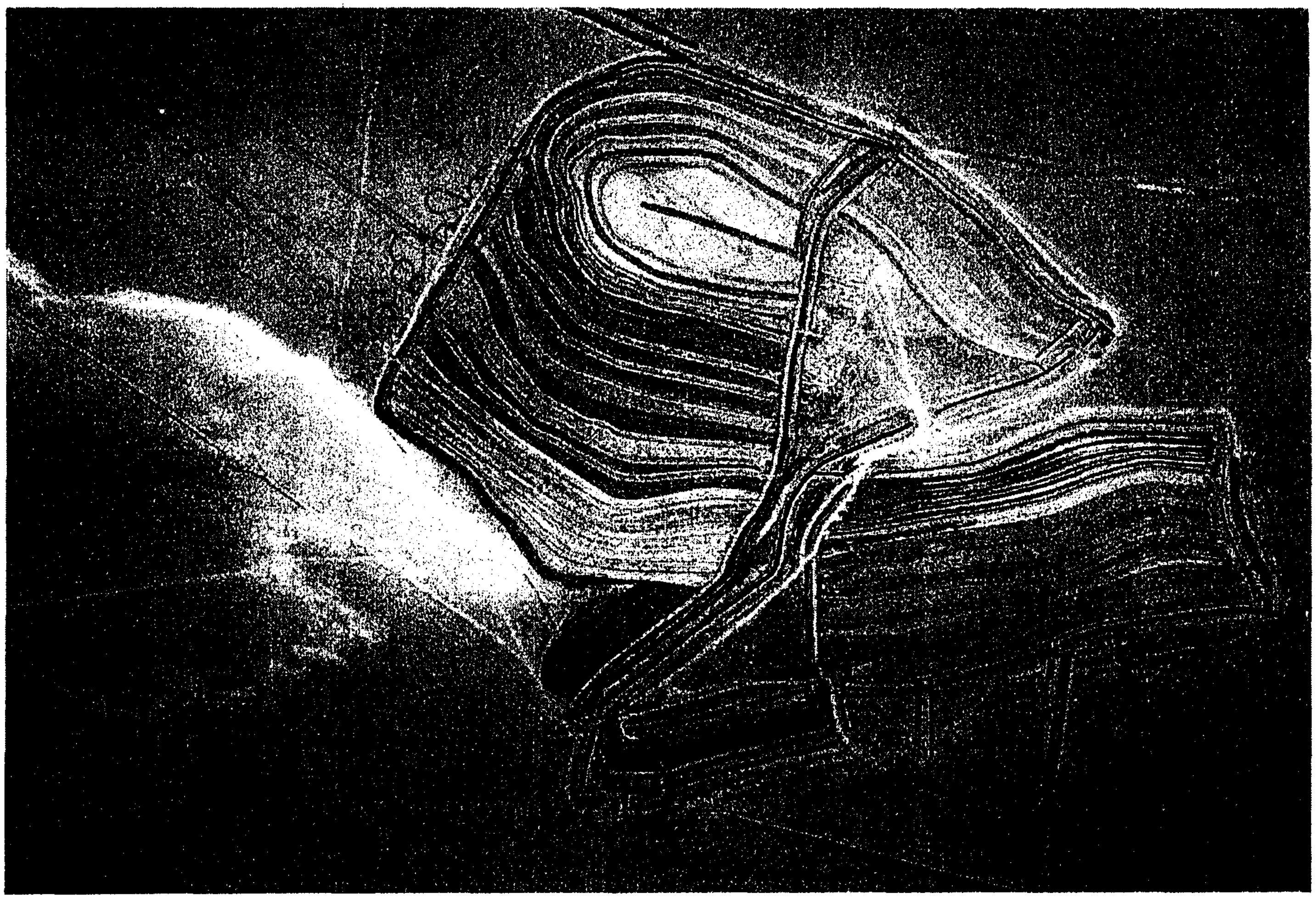

Figure 5: Managed vegetation - test site aerial photograph.

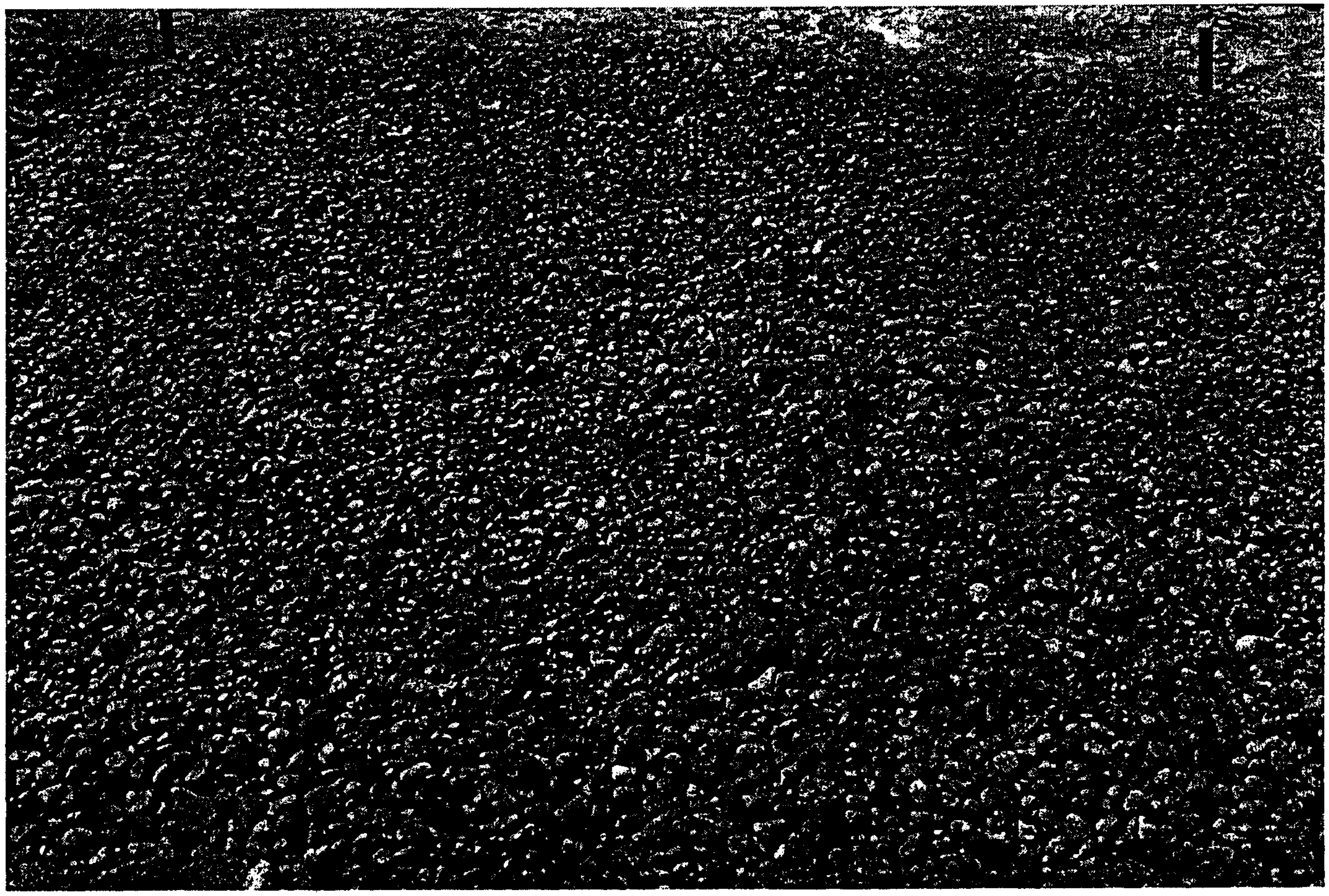

Figure 6: Gravel - test site photograph.

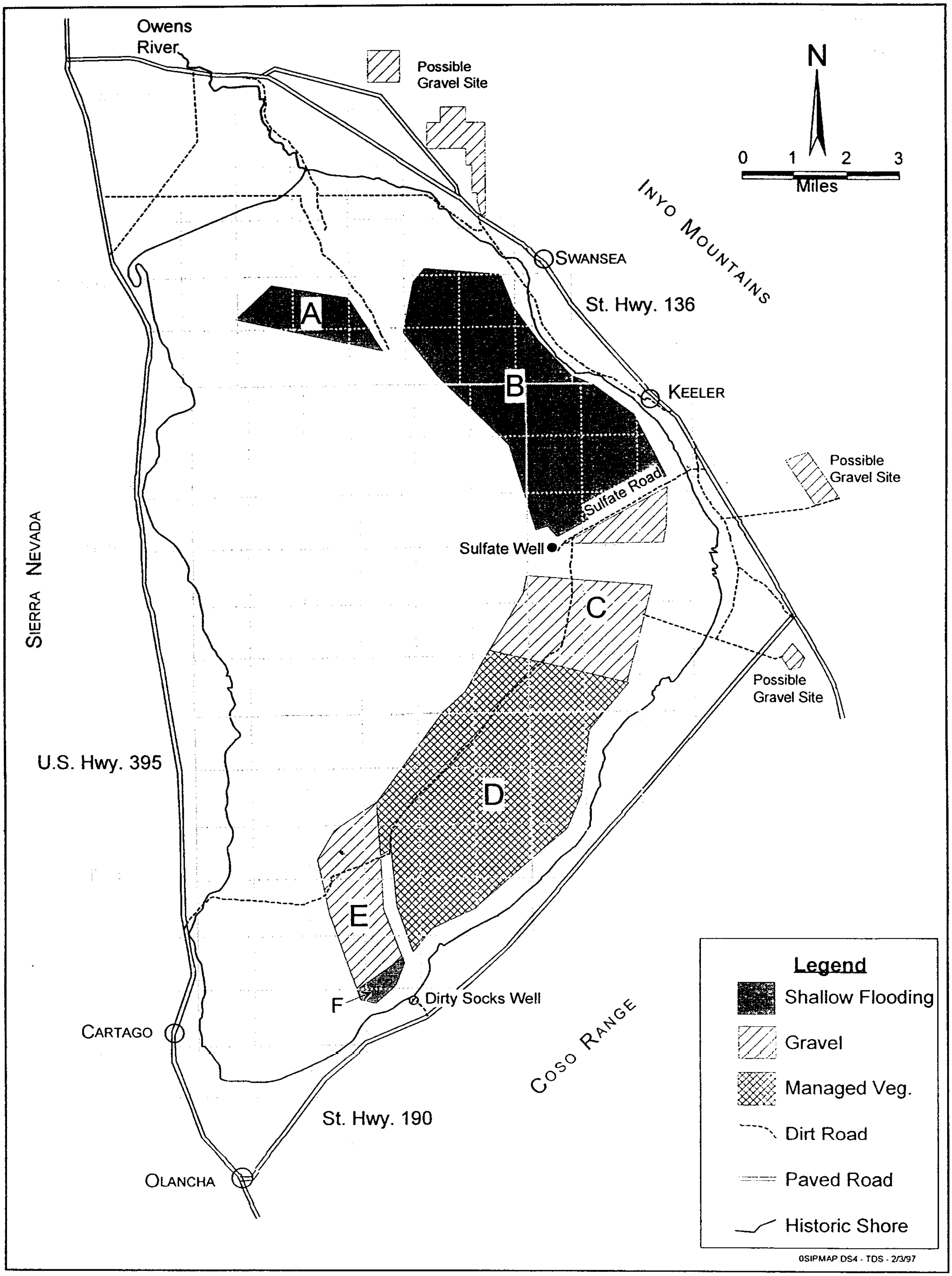

Figure 7: Proposed control strategy

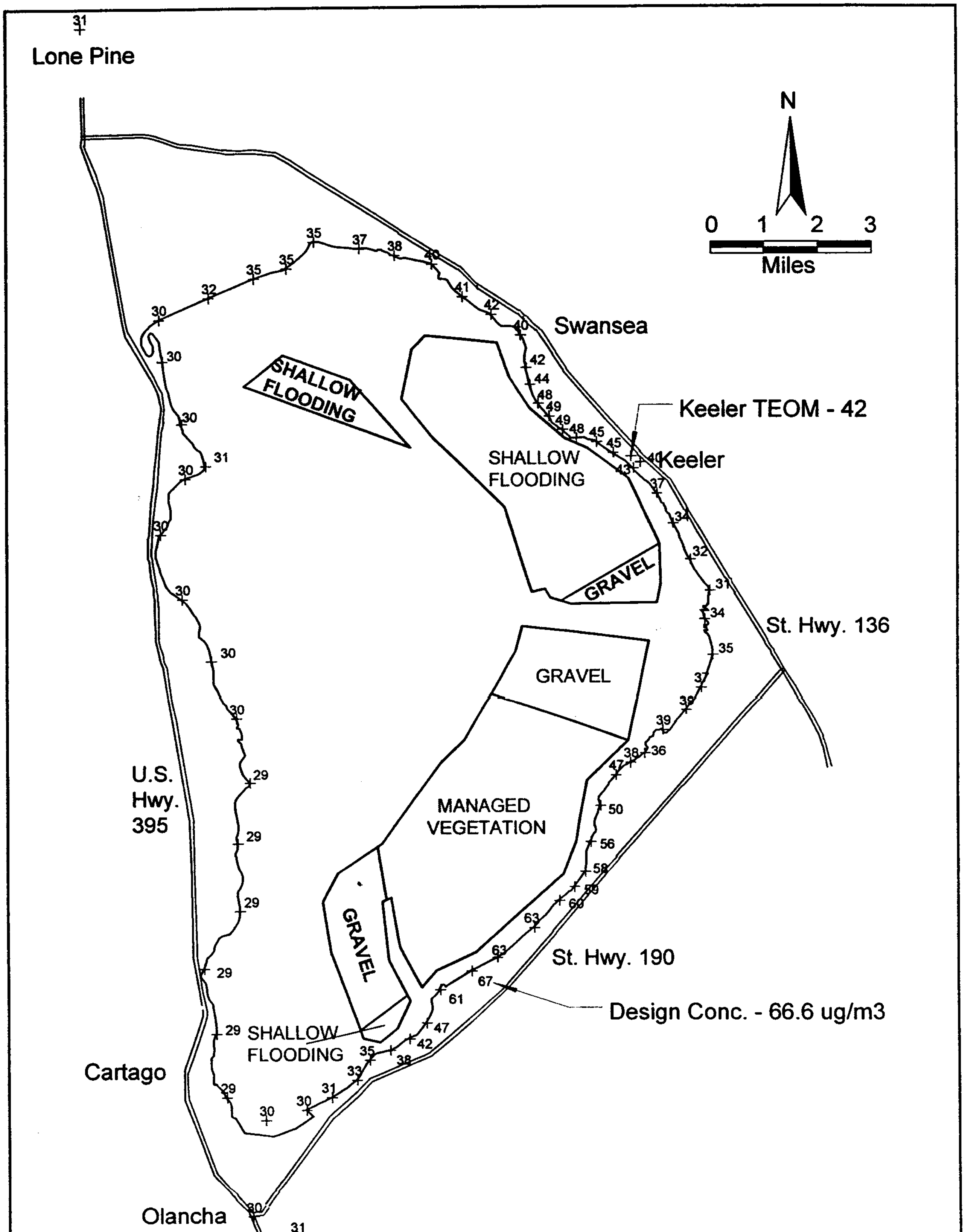

Figure 8: Air quality model: Third highest 24-hr PM_{10} concentrations for 1994-95 using proposed SIP controls.

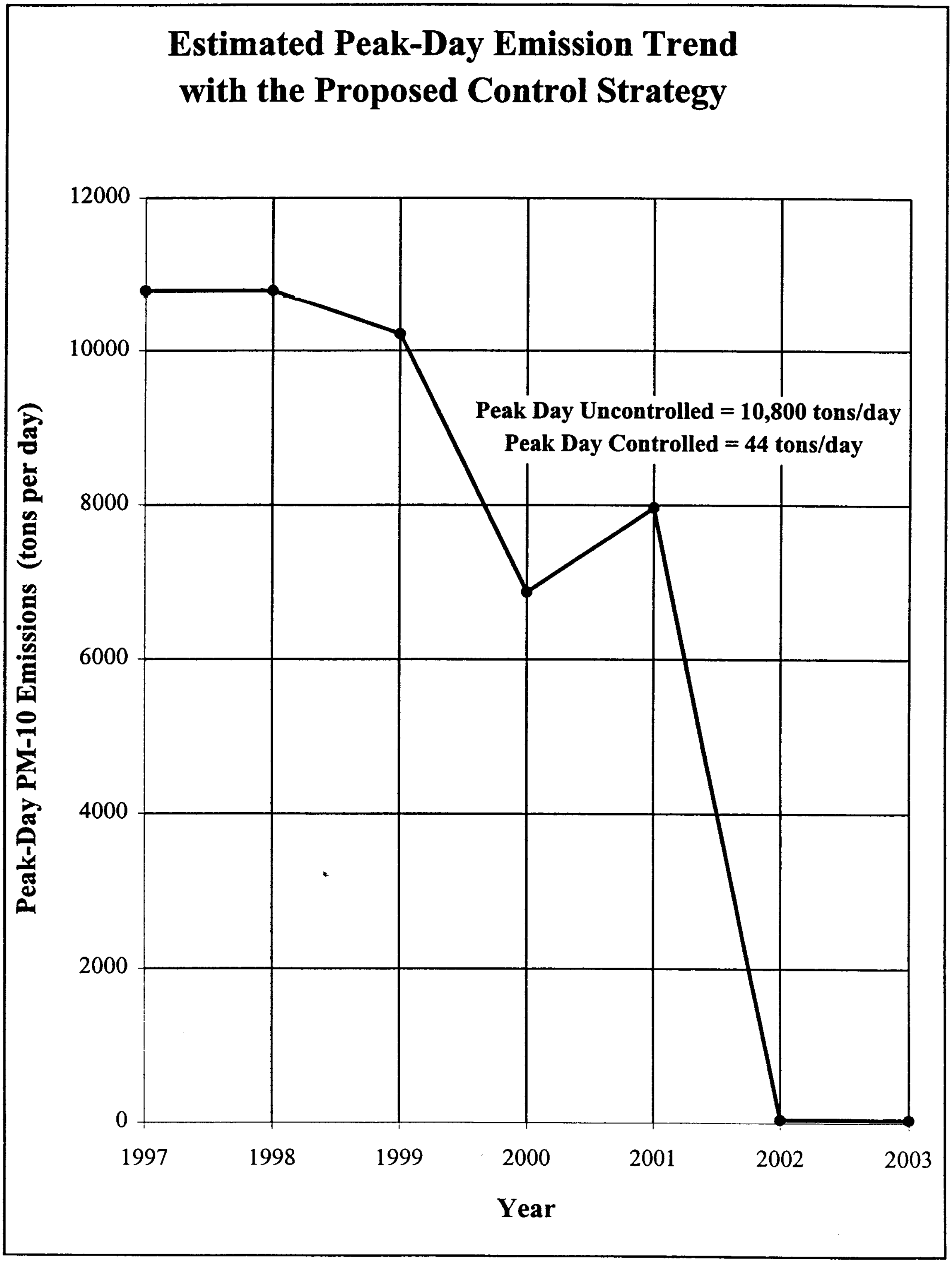

Figure 9: Estimated peak-day PM_{10} emision trend with the proposed control strategy.

CHAPTER 1

INTRODUCTION

1 INTRODUCTION

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1-3 ELEMENTS OF THE SIP 1-2

1 INTRODUCTION

This State Implementation Plan (SIP) has been prepared by the Great Basin Unified Air Pollution Control District to meet federal requirements in the Clean Air Act Amendments of 1990 (CAAA). The SIP includes an analysis of the particulate matter air pollution problem in the Owens Valley and provides a control strategy to bring the area into attainment with the National Ambient Air Quality Standard (NAAQS) for particulate matter.

1-1 FEDERAL CLEAN AIR ACT AND THE SIP

On July 1, 1987, the US Environmental Protection Agency (USEPA) revised the NAAQS, replacing total suspended particulates (TSP) as the indicator for particulate matter with a new indicator called PM_{10} (i.e., particulate matter less than or equal to 10 microns in diameter). The intent of the new, health-based standard for particulate matter was to prevent concentrations of suspended particles in the air that are injurious to human health. PM_{10} can penetrate deep into the respiratory tract, and lead to a variety of respiratory problems and illnesses. On August 7, 1987, the USEPA designated the southern Owens Valley (known as the Owens Valley Planning Area) as one of the areas in the nation that violated the new PM_{10} NAAQS. Subsequent air quality monitoring by the District has shown that the bed of Owens Lake -- most of which is owned by the State of California and managed by the California State Lands Commission (SLC) -- is the major source of PM_{10} emissions contributing to air quality violations in the Owens Valley Planning Area. In January 1993, the southern Owens Valley was reclassified as "serious non-attainment" for PM_{10}.

The USEPA required the State of California to prepare a SIP for the Owens Valley Planning Area that demonstrates how PM_{10} emissions will be decreased to prevent exceedances of the NAAQS. The District is the agency delegated by the State to fulfill this requirement. In accordance with Section 189(b) of the CAAA, an Attainment SIP must be submitted to the USEPA by February 8, 1997 that demonstrates conformance with the federal air quality standards through the implementation of a program of control measures. By statute, attainment of the NAAQS for PM_{10} must be accomplished by December 31, 2001.

1-2 DEMONSTRATION OF ATTAINMENT SIP

This document was prepared to satisfy the requirements for a SIP that demonstrates attainment with the PM_{10} NAAQS. The SIP includes a PM_{10} control strategy to reduce wind blown PM_{10} emissions from 35 square miles of exposed playa at Owens Lake. The control strategy includes using gravel coverings, managed vegetation, and shallow flooding to accomplish PM_{10} emission reductions at Owens Lake. It is anticipated that the control strategy can be implemented in four and a half years and bring the area into attainment by December 31, 2001 as required by the CAAA. If the District Board adopts the SIP, it will be sent to the California Air Resources Board for review and approval. If approval is granted by the State, it will then be officially submitted to the USEPA in compliance with federal requirements.

1-3 ELEMENTS OF THE SIP

The SIP includes an analysis of the air quality impacts caused by the wind blown PM_{10} from Owens Lake, estimates of the quantity of PM_{10} emitted, a discussion of control measures, and an air quality modeling analysis that demonstrates that it is possible to attain the PM_{10} standard with the proposed control measures. The following is a brief description of the contents of the SIP:

- Chapter 2 describes the Owens Valley planning area and provides a history of Owens Lake and the air pollution problem.
- Chapter 3 includes summarized information on the PM_{10} air pollution measurements taken in the Owens Lake area, sensitive air sheds in the area, and an assessment of how air quality compares to the federal standards.
- Chapter 4 contains the annual and peak 24-hour PM_{10} emission summary from wind erosion and other sources in the Owens Lake area.
- Chapter 5 describes the three control measures that are proposed for the SIP; shallow flooding, managed vegetation, and gravel covering.
- Chapter 6 covers the air quality modeling method that was used to show that the proposed control strategy would bring the Owens Valley into attainment with the PM_{10} NAAQS.
- Chapter 7 describes how the control measures will be placed on the lake bed and how they will be phased in to accomplish the overall level of control that is needed upon completion.
- Chapter 8 describes the form of the Board Order that will be issued to the City of Los Angeles to implement the SIP control strategy.
- References are listed at the end of each chapter, and are summarized in a composite list in Chapter 9.
- Terms, acronyms and measurement units are defined in a glossary in Chapter 10.
- Appendices to the SIP include daily PM_{10} data summaries, air quality dispersion modeling results, and an example of an industrial source permit issued by the District.

CHAPTER 2

OWENS VALLEY PLANNING AREA

2 OWENS VALLEY PLANNING AREA

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2 OWENS VALLEY PLANNING AREA

2-1 PROJECT LOCATION AND LAND OWNERSHIP

2-1.1 Location

Owens Lake is located in Inyo County in eastern-central California. It is situated at the south end of the long, narrow Owens Valley with the Sierra Nevada to the west, the Inyo Mountains to the east, and the Coso Range to the south (Figure 2.1). The predominantly dry, alkaline Owens Lake bed is approximately eight miles south of the community of Lone Pine on Highway 395, 65 miles north of the city of Ridgecrest, and 35 miles west of Death Valley. The communities of Olancha and Keeler are located on the southwestern and eastern shores of the lake bed, respectively. The lake bed extends about seventeen miles north and south and ten miles east and west and covers an area of approximately 110 square miles (70,000 acres).

Owens Lake and its surrounding dry playa are depicted on the following seven USGS 7.5 minute series topographic quadrangle maps: Lone Pine, Dolomite, Bartlett, Owens Lake, Keeler, Olancha and Vermillion Canyon. These maps are available for review in the District's Bishop office. Site specific topographic mapping has been compiled and is shown in Figure 2.2.

The proposed project for the State Implementation Plan will be implemented on about 35 square miles (22,400 acres) of the former lake bed, predominantly in the eastern portion (Figure 2.3). The shaded areas in Figure 2.3 represent PM_{10} source areas that require emission control measures as well as pipeline routes. There is one relatively small emission area, about two miles by ¾ mile in size, located immediately west of the Owens River delta, and one long emission area, approximately 2½ miles wide by fourteen miles long, located parallel to the historic eastern shoreline.

Figure 2.3 shows the existing riparian and wetland resources delineated at Owens Lake. These areas were mapped using ground surveys and satellite photos. Riparian vegetation extends onto the largely barren dry lake bed in the area of the Owens River delta. In addition, a narrow band of vegetation consisting of spring mounds and alkaline meadows is present along the edge of the historic shoreline, above the areas that are the primary sources of PM_{10} emissions.

2-1.2 Land Ownership

Approximately 68,000 acres, or 95%, of the Owens Lake bed is owned by the State of California and managed by the State Lands Commission (SLC). Most of this lake bed state-owned land is leased for a variety of purposes. The Owens Lake Soda Ash Company leases 16,120 acres of lake bed for the purposes of extracting trona ore. In addition, there are a few agricultural leases near historic shoreline areas. Most of the remaining lake bed areas are leased from the State by the District for the purposes of developing PM_{10} control measures. The remaining 5% of the lake bed, or approximately

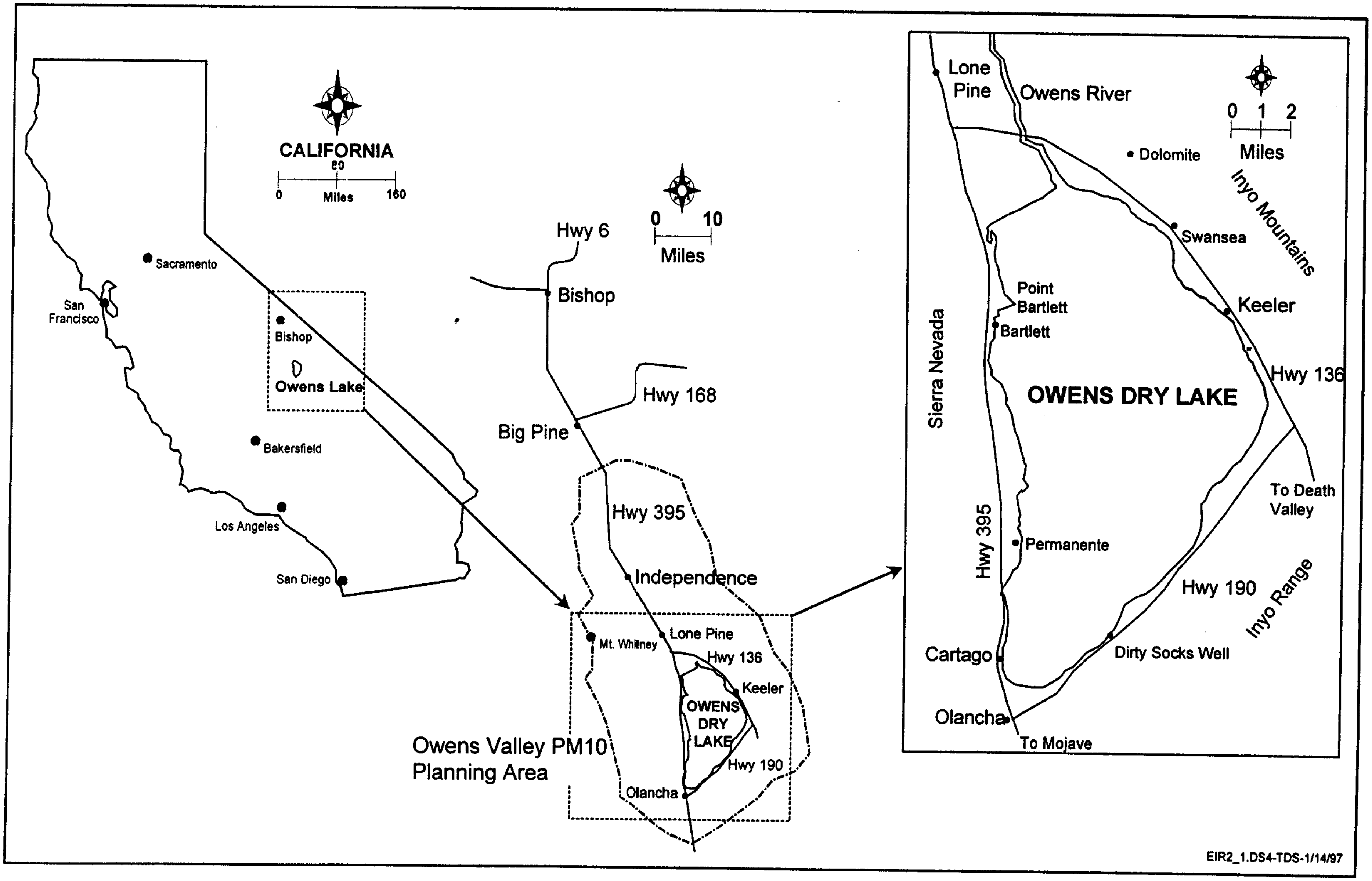

Figure 2.1: Vicinity Map.

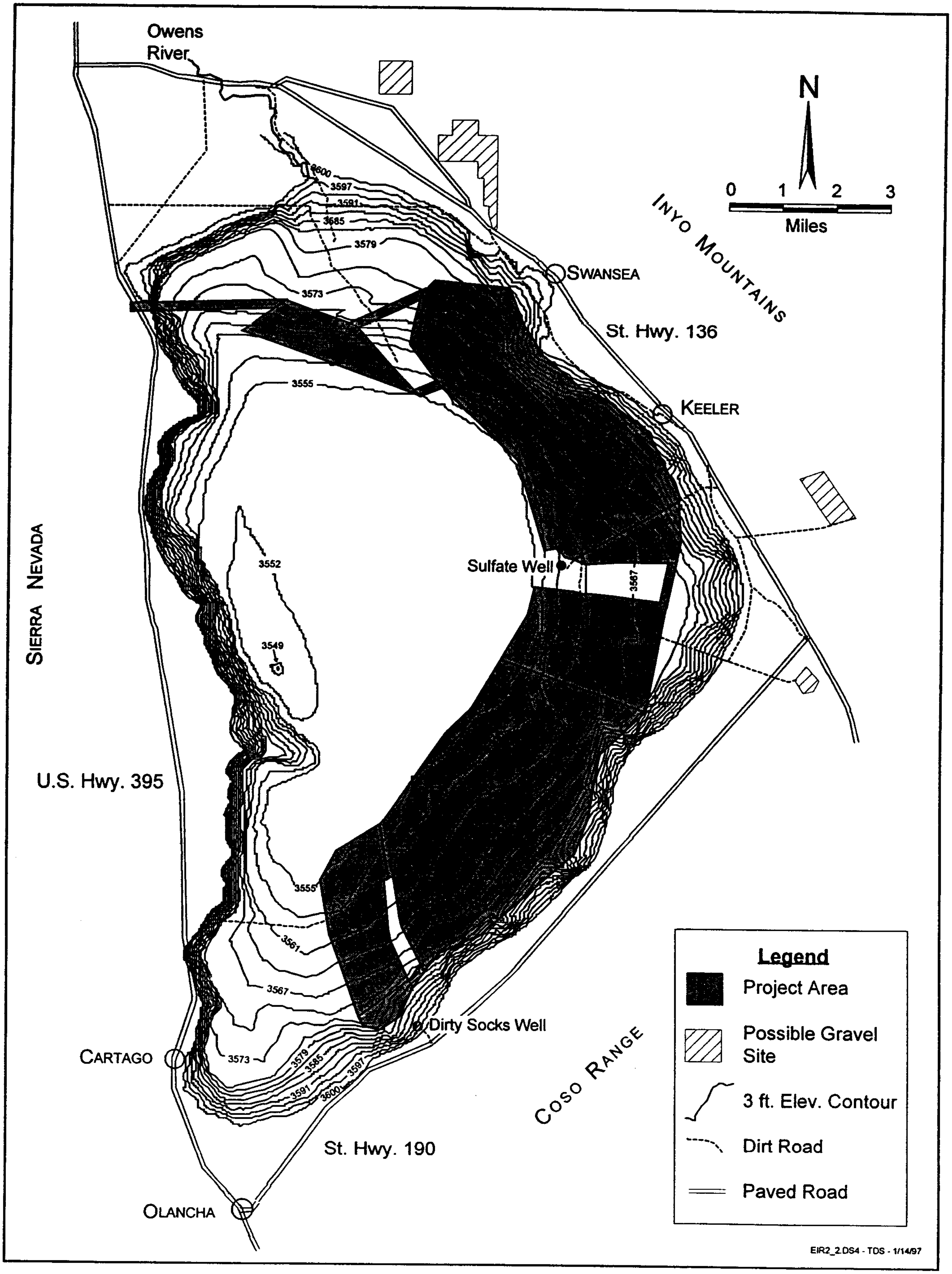

Figure 2.2: Topographic site map.

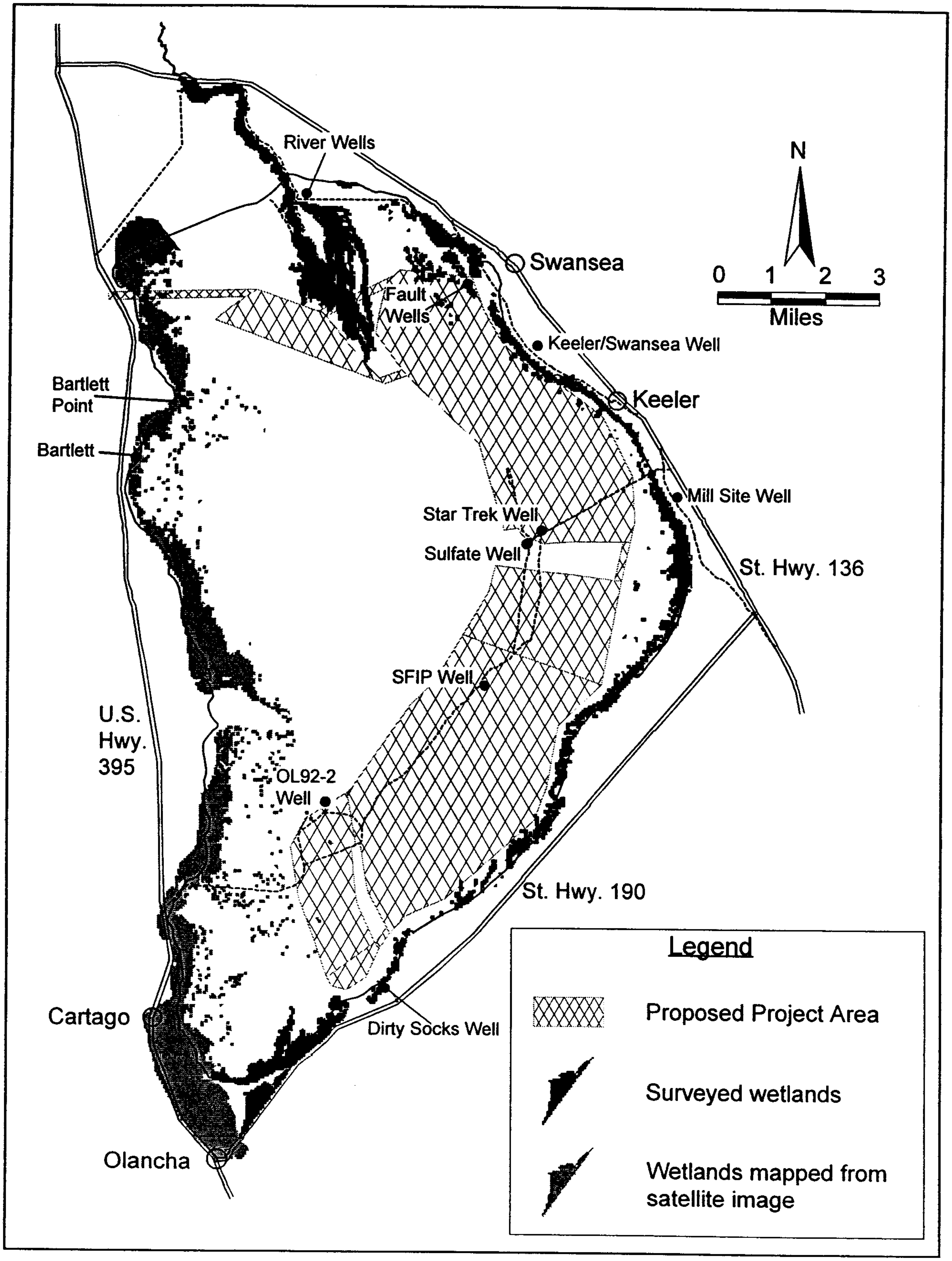

Figure 2.3: Project area map.

2,800 acres, is owned by the City of Los Angeles. The City's lands are in the Owens River delta and on the lake bed west of Keeler. Areas above the historic shoreline are owned by the U.S. Bureau of Land Management (BLM), the State, the City of Los Angeles and private owners. All control measures and supporting infrastructure are expected to be owned by the City of Los Angeles on property owned by the City or on leases or easements from other underlying owners.

2-2 PROJECT HISTORY

2-2.1 Environmental Setting and Effects of Diversions on Owens Lake

2-2.1.1 Geologic History. Owens Lake is part of a chain of lakes formed during the late Pleistocene epoch, about 1.8 million years ago. The lakes spanned from Mono Lake (previously a much larger lake known as Lake Russell) in the north to Manley Lake, the southeasternmost of the chain, in what is now known as Death Valley. During much of this time, water from the Owens Valley basin flowed out of Owens Lake through Rose Valley and into China Lake. The high stand of the lake that produced the shorelines at an elevation of 3,880 feet above mean sea level (all elevations will be given in feet above mean sea level) is estimated to have occurred 15,000-16,000 years ago. Since that time, the surface extent of the water of Owens Lake has been diminishing—although two deep cores on the lake bed have failed to identify any previous episodes of complete desiccation (Saint-Amand, *et al.*, 1986, Smith and Bischoff, 1993). Uplift processes in the Coso Range, combined with a post-glacial drying trend, eliminated overland outflow from the basin about 3,000 years ago. As a result, the lake basin became closed, losing water only through surface evaporation and transpiration. This internal drainage, combined with the arid environment, created the highly saline condition of remaining surface waters and playa soils at the bottom of the Owens Lake basin. Even during historic periods in the 1800's when it was used as a navigable waterway, Owens Lake was an alkali lake.

2-2.1.2 Historic Lake Levels. Although, historic lake levels were as high as 3,597 feet in 1878 (Lee, 1915), surface water diversions over the last 130 years have reduced the lake to less than one-third of its original size and about 5 percent of its original volume (Mihevc, 1992). From the 1860's to the early 1900's, withdrawals from the Owens River for agricultural purposes substantially reduced surface water inflow to the lake. Extensive irrigation projects compounded by drought caused the lake level to drop as low as 3,565 feet in 1906. However, as the drought ended, by 1912 the level had risen to 3,579 feet (Lee, 1915). In 1913, the Los Angeles Department of Water and Power (LADWP) completed a fresh water aqueduct system and began diverting waters of the Owens River south to the City of Los Angeles. Demand for exported water increased as Los Angeles grew, and diversions for irrigation continued in the Owens Valley (mainly on City-owned property). These factors resulted in Owens Lake becoming virtually dry by 1930; its level having dropped to an elevation of 3,554 feet (Saint-Amand, *et al.*, 1986 and LADWP, 1966).

A former or stranded shoreline was left behind at an approximate elevation of 3,600 feet. The former shoreline bounds the lake bed playa in aerial photographs and on most maps. Today, a small permanent brine pool is present in the lowest portion of the basin, surrounded by dry playa soils and crusts. The ordinary high water mark of this remnant brine pool has been defined by the U.S. Army Corps of Engineers to be that portion of the lake basin below 3,553.55 feet. Evaporite deposits and brines cover much of the playa area; the concentration of dissolved solids (salts) can be as high as 91 percent by weight (Holder, 1997).

2-2.1.3 Flora and Fauna. Although limited in distribution at Owens Dry Lake, the Owens Valley has been described as having a very rich variety of plants with over 2000 species represented in the region (DeDecker, 1984). Riparian, alkaline meadow, and alkali seep plant communities which circumscribe Owens Dry Lake provide important habitat for resident and migratory wildlife species. Many of the diverse wildlife resources that are characteristic of the Sierra Nevada, Inyo, and Coso mountain ranges surrounding Owens Dry Lake will occasionally be found on the Valley floor, particularly during winter. Heindel and Heindel (1995) report as many as 320 bird species for the Owens Valley floor including permanent residents, summer residents, winter residents, and migrants. Ephemerally flooded areas in the vicinity of Owens Dry Lake provide excellent resting and foraging habitat for winter migrants and prime opportunities for birdwatching. Several sensitive wildlife resources are known from Owens Dry Lake.

2-2.1.4 Cultural History. The Owens Valley has attracted the interest of archeologists since at least the 1930's. The Riddells (Riddell, H. 1951; and Riddell and Riddell 1956) conducted the major work in the region in the 1940s and 1950s, recording several sites on the perimeter of Owens Lake including important sites at Cottonwood Creek and Rose Spring. Two California State Historic Landmarks and two California Points of Historic Interest are located in the vicinity of Owens Lake. Ethnographic data indicate that the east shore of Owens Lake was used by Native American groups. Historic resources related to mining and transportation have been identified along the stranded shoreline.

2-2.2 Legal History

2-2.2.1 Natural Soda Products Co. vs. City of Los Angeles. By the late 1920's, the majority of the lake bed was dry and remained so until 1937. Valuable mineral deposits of trona ore were exposed and became available for extraction. In 1937, 1938, and 1939, the LADWP released large quantities of water onto the lake bed, causing extensive damage to the mineral deposits and chemical processing plants. In 1937, Natural Soda Products Company, a lessee of mineral rights from the State of California, sued the City of Los Angeles for damages to its chemical plant and business caused by the flooding of Owens Lake. The court decided the case in 1943 and a judgment for damages was awarded. Natural Soda Products Co. vs. City of Los Angeles 23 Cal.2d 193 [143 P.2d 12] established that "the city, by its long continued diversion of the waters of the Owens River, incurred an obligation to continue that diversion . . . at least so long as it continued to maintain its aqueduct." In 1939, the State, as owner of the lake bed, brought an action in People vs. the City of Los Angeles 34 Cal.2d 695 [214 P.2d 1] to define whether the City's obligation could be enforced by injunction, and if so, to determine the extent of the injunction. The trial court, citing the principles set forth in the Natural Soda Products case, later granted an injunction and prohibited the City from: (a) diverting any waters from the Mono Basin watershed into or onto Owens Lake, and (b) diverting any waters of the Owens River and its tributaries into or onto Owens Lake "which are not in excess of an amount equal to the reasonable capacity of [LADWP's] aqueduct system and all of its component facilities reasonably operated." The City of Los Angeles appealed the trial court's injunction.

In 1950, the appeal of People vs. the City of Los Angeles was finally resolved. The appellate court modified and affirmed the lower court's decision regarding the injunction. The two significant modifications were as follows. First, since waters of the Mono Basin watershed and Owens Valley waters become mixed, the first part of the injunction was technically unenforceable. It was, therefore, amended to prohibit increasing the natural flow of the Owens River, by diverting into it waters of the Mono Basin, if such a diversion would necessitate the release of water into or onto Owens Lake. Second, the LADWP was found to be under no obligation to spread surplus water onto land owned in the Owens Valley in excess of amounts that could reasonably be used on such land or stored underground for future beneficial use. Importantly, it also reaffirmed that portion of the injunction regarding "diverting any waters out of [LADWP's] aqueduct system onto Owens Lake, or in any way releasing any waters to be deposited into or onto Owens Lake at any time, unless the flow of water of the Owens Valley watershed is in excess of an amount equal to the reasonable capacity of [LADWP's] aqueduct system and all of its component facilities reasonably operated."

Although the SIP control measures are not expected to interfere with mining interests, the shallow flooding and managed vegetation control measures involve releasing water onto Owens Lake, which is an action that may conflict with the injunction. To address this concern, the State Lands Commission informed the District that if the measures ordered by the Board are acceptable to the Commission, they would work with interested parties to find a method to allay any concerns about compliance, or they may request a modification to the injunction to allow control measures to be implemented (Valentine, 1997).

2-2.2.2 Senate Bill 270. In 1982, the LADWP applied for a permit with the District to construct and operate a geothermal electric generating plant in the Coso Known Geothermal Resource Area. The permit was denied based on the assertion that LADWP was in violation of air pollution rules and regulations elsewhere in the region. Specifically, District Rule 200 considered the water-gathering operations of LADWP to be a "facility" responsible for the particulate emissions from Owens Lake and concluded that an air quality permit was required.

After failure of efforts to petition the action, a negotiated settlement emerged in Senate Bill 270 (SB 270) sponsored by Senator Dills in 1983. SB 270 (California Health and Safety Code §42316) exempted water-gathering operations from state air quality permit regulations. It provided that the City of Los Angeles must fund control measure development and must implement reasonable measures ordered by the District to attain compliance with the state and federal ambient air quality standards at Owens Lake. By law, the District mandated control measures may not affect the City's right to produce, divert store, or convey water. Chapter 8 of this document includes additional information on the applicability of CH&SC §42316 as it applies to the Board order to implement control measures.

2-2.3 Regulatory History

2-2.3.1 PM_{10} Nonattainment Designation. In 1987, the US Environmental Protection Agency (USEPA) revised the National Ambient Air Quality Standards, replacing total suspended particulates (TSP) as the indicator for particulate matter with a new indicator called PM_{10}. PM_{10} is defined as particulate matter that has an average aerodynamic diameter less than or equal to 10 microns. The standards for PM_{10} were set at 150 micrograms per cubic meter ($\mu g/m^3$) for 24 hours and 50 $\mu g/m^3$ for an annual average. At the same time, USEPA set forth regulations for implementing the revised NAAQS, and announced the policy for development of SIPs and supporting control strategies. Also in 1987, USEPA identified the southern Owens Valley (known as the Owens Valley Planning Area) as one of the areas in the nation that violated the PM_{10} NAAQS. Subsequent air quality monitoring by the District showed that the lakebed of Owens Lake is the major source of PM_{10} emissions contributing to air quality violations in the Owens Valley Planning Area. Extremely high PM_{10} concentrations (as much as 25 times the standard) have been verified downwind of Owens Lake. Inter-basin transport of PM_{10} into the southern Owens Valley is inconsequential.

Consequently, the USEPA has required the State of California to prepare a SIP for the Owens Valley Planning Area that demonstrates how PM_{10} emissions will be decreased to comply with the NAAQS. The District is the agency delegated by the State to fulfill this requirement. An initial SIP was prepared by the District in 1988, approved by the California Air Resources Board (CARB), and forwarded to the USEPA. No action was taken to approve or disapprove.

2-2.3.2 1990 Clean Air Act Amendments. In November 1990, the federal Clean Air Act Amendments (CAAA) were signed into law, setting into motion new statutory requirements for attaining the PM_{10} NAAQS. All areas in the United States that were previously classified as federal non-attainment areas for PM_{10}, including the southern Owens Valley, were designated as "moderate" PM_{10} non-attainment areas. In response to a request through the CAAA, in November 1991, the District prepared an addendum to the 1988 SIP that updated the air quality information and the work performed since 1988.

Section 188(b) of the CAAA specified that any area that cannot attain the NAAQS by December 1994 would subsequently be reclassified as a "serious" non-attainment area. In January 1993, USEPA completed its initial reclassification process, and included the southern Owens Valley among five nationwide areas reclassified as "serious" effective February 8, 1993. Section 189(b) of the CAAA further specified that a SIP revision is due within eighteen months of the reclassification (August 8, 1994). Said revision must assure that implementation of "best available control measures" (BACM), including "best available control technology" (BACT), will be effective within four years of the reclassification date. A Best Available Control Measures SIP was prepared in June 1994 and approved by CARB.

By February 8, 1997, a PM_{10} Attainment SIP must be submitted to the USEPA that (a) includes preferred and contingency PM_{10} control strategies, (b) provides air quality modeling that demonstrates attainment of the federal air quality standards from the implementation of these controls, and (c) provides quantitative milestones for "reasonable further progress" reporting to the USEPA. The Clean Air Act Amendments further require that the PM_{10} NAAQS be attained by December 31, 2001.

2-2.3.3 Natural Events Policy. In May 1996 the USEPA issued a new policy with regard to areas that would be in compliance with the PM_{10} NAAQS but for impacts caused by natural events (USEPA, 1996a). The new policy allows the Administrator to exclude PM_{10} monitoring data affected by natural events, such as wildfires, volcanic and seismic activities, and unusually high wind events, in designating or re-designating an area as attainment or non-attainment, including the moderate and serious designations for PM_{10} non-attainment.

The policy allows Natural Event Action Plans (NEAP) to be developed in lieu of SIP revisions. A NEAP would include a public health advisory program to alert the public when PM_{10} levels are affected by natural events and a schedule to implement Best Available Control Measures (BACM) if anthropogenic sources of wind blown dust are the cause of the violation. For a high wind event from an anthropogenic source to qualify as a "natural event" it must be shown that BACM for wind erosion was in place at the time of the event and that unusually high winds overwhelmed the BACM strategy.

The natural events policy would apply to the Owens Valley PM_{10} nonattainment area only after the control strategy and measures contained in this plan have been implemented. Although it is not anticipated to occur, unusually high winds may overwhelm the SIP control measures proposed in this plan after they are in place, and cause a violation of the PM_{10} NAAQS at one of the Owens Lake monitoring sites. Through a review of the historic wind speed data at the PM_{10} monitoring sites, hourly average wind speeds greater than 40 miles per hour at a 10 meter anemometer height are expected to occur on a frequency less than once per year. This 40 mph, hourly average wind speed at the PM_{10} monitoring sites has been taken into consideration for the design of the SIP control measures. It is anticipated that the SIP control measure will be capable of maintaining their expected level of control up to an hourly average of 40 miles per hour.

For purposes of flagging data for consideration as a natural event under the USEPA's Natural Events Policy, the District will consider an hourly average wind speed greater than 40 miles per hour, measured at one of the Owens Lake PM_{10} monitoring sites, as an unusually high wind. Any PM_{10} NAAQS violation that occur as a result of those unusually high winds will be flagged and submitted to the California Air Resources Board and the USEPA for their concurrence as a natural event, provided that Owens Lake PM_{10} control measures are in place and being properly operated and maintained during the event. The District's Natural Events Policy is expected to be adopted concurrently with the District's adoption of this SIP.

If a PM_{10} violation occurs as a result of other natural events, such as a forest fire or volcanic eruption, a NEAP will be developed and implemented to deal with air pollution impacts from future related natural events.

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CHAPTER 3

AIR QUALITY SETTING

3 AIR QUALITY SETTING

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3 AIR QUALITY SETTING

3-1 CLIMATE AND METEOROLOGY

The Owens Lake project area is located in the southern end of the Owens Valley in Inyo County. Owens Lake is bounded by the Inyo Mountains to the east and the Sierra Nevada to the west which rise over 10,000 feet (3,000 m) above the lake bed surface. Because it is in the rain shadow of the Sierra Nevada, annual rainfall is very low in the project area. Owens Lake averages around 4 inches (10 cm) of rainfall per year with the greatest amount falling from November through April. Temperatures range from around 18° F (-8 ° C) to 70° F (21° C) during the winter, and 45° F (6.6° C) to 103° F (39° C) during the summer. Winds in the area can exceed hourly average speeds of 40 mph (18 m/s) as measured at a 33 foot (10 m) height. These winds are generally associated with the counter-clockwise rotating storm systems that pass through the area. Strong southern winds usually occur as the storm front approaches the Owens Valley and strong northerly winds result from the passing of the storm. These general wind directions are sometimes complicated by local eddy effects that can cause 180 degree differences in the wind direction from the west to east side of the valley.

3-2 AIR QUALITY AND AREA DESIGNATIONS

Air quality is regulated through federal, State and local requirements and standards in the project area. Under the Federal Clean Air Act, the U.S. Environmental Protection Agency (USEPA) has set ambient air quality standards to protect public health and welfare. Air quality standards have been set for the following criteria pollutants; particulate matter less than 10 microns (PM_{10}), ozone, carbon monoxide, oxides of nitrogen (NO_x), sulfur dioxide, and lead. In addition, California has set air quality standards for these pollutants which are usually more stringent, and has added to this list standards for vinyl chloride, hydrogen sulfide, sulfates and visibility reducing particles. Table 3.1 shows the current State and federal ambient air quality standards.

The Southern Owens Valley has been designated by the State and the USEPA as non-attainment for the State and federal 24-hour average PM_{10} standards. The boundaries of the federal PM_{10} nonattainment area are shown in Figure 3.1. The area is designated as "attainment" or "unclassified" for all other ambient air quality standards. Wind blown dust from the dry lake bed of Owens Lake is the dominant cause of National Ambient Air Quality Standard (NAAQS) violations for PM_{10} in the non-attainment area.

Table 3.1 California and National Ambient Air Quality Standards.

Pollutant	Averaging Time	California Standards[a] Concentration[c]	National Standards[b] Primary[c,d]	National Standards[b] Secondary[c,e]
Ozone	1 hour	0.09 ppm (180 µg/m³)	0.12 ppm (235 µg/m³)	Same as primary standard
Carbon Monoxide	8 hour	9.0 ppm (10 µg/m³)	9.0 ppm (10 µg/m³)	Same as primary standard.
	1 hour	20 ppm (23 µg/m³)	35 ppm (40 µg/m³)	Same as primary standard
Nitrogen Dioxide	Annual Average	-	0.053 ppm (100 µg/m³)	Same as primary standard
	1 hour	0.25 ppm (470 µg/m³)	~	Same as primary standard
Sulfur Dioxide	Annual Average	-	0.03 ppm (80 µg/m³)	~
	24 Hour	0.05 ppm[f] (131 µg/m³)	0.14 ppm (365 µg/m³)	~
	3 Hour	-	~	0.5 ppm (1300 µg/m³)
	1 Hour	0.25 ppm (655 µg/m³)	~	~
Suspended Particulate Matter (PM_{10})	Annual Geometric Mean	30 µg/m³	~	~
	24 Hour	50 µg/m³	150 µg/m³	Same as primary standard
	Annual Arithmetic Mean	-	50 µg/m³	Same as primary standard
Sulfates	24 Hour	25 µg/m³	~	~
Lead	30 Day Average	1.5 µg/m³	~	~
	Calendar Quarter	-	1.5 µg/m³	Same as primary standard
Hydrogen Sulfide	1 Hour	0.03 ppm (42 µg/m³)	~	~
Vinyl Chloride (chloroethene)	24 Hour	0.010 ppm (26 µg/m³)	~	~
Visibility Reducing Particles	1 Observation	In sufficient amount to reduce the prevailing visibility to less than 10 miles when the relative humidity is less than 70%[g]	~	~

[a]California standards for ozone, carbon monoxide, sulfur dioxide (1 hour), nitrogen dioxide and particulate matter (PM_{10}), are values that are not to be exceeded. The sulfates, lead, hydrogen sulfide, vinyl chloride, and visibility reducing particles standards are not to be equaled or exceeded.

[b]National standards, other than ozone and those based on annual averages or annual arithmetic means, are not to be exceeded more than once a year. The ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the standard is equal to or less than one.

[c]concentration expressed first in units in which it was promulgated. Equivalent units given in parenthesis are based upon a reference temperature of 25°C and a reference pressure of 760 mm of mercury. All measurements of air quality area to be corrected to a reference temperature of 25°C and a reference pressure of 760 mm of mercury (1,013.2 millibar); ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

[d]National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health. Each state must attain the primary standards no later than three years after that state's implementation plan is approved by the Environmental Protection Agency.

[e]National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. Each state must attain the secondary standards within a "reasonable time" after the implementation plan is approved by the EPA.

[f]At locations where the state standards for ozone and/or suspended particulate matter are violated. National standards apply elsewhere.

[g]Prevailing visibility is defined as the greatest visibility which is attained or surpassed around at least half of the horizon circle, but not necessarily in continuous sectors.

Source: ARB Fact Sheet 38 (revised 7/88)

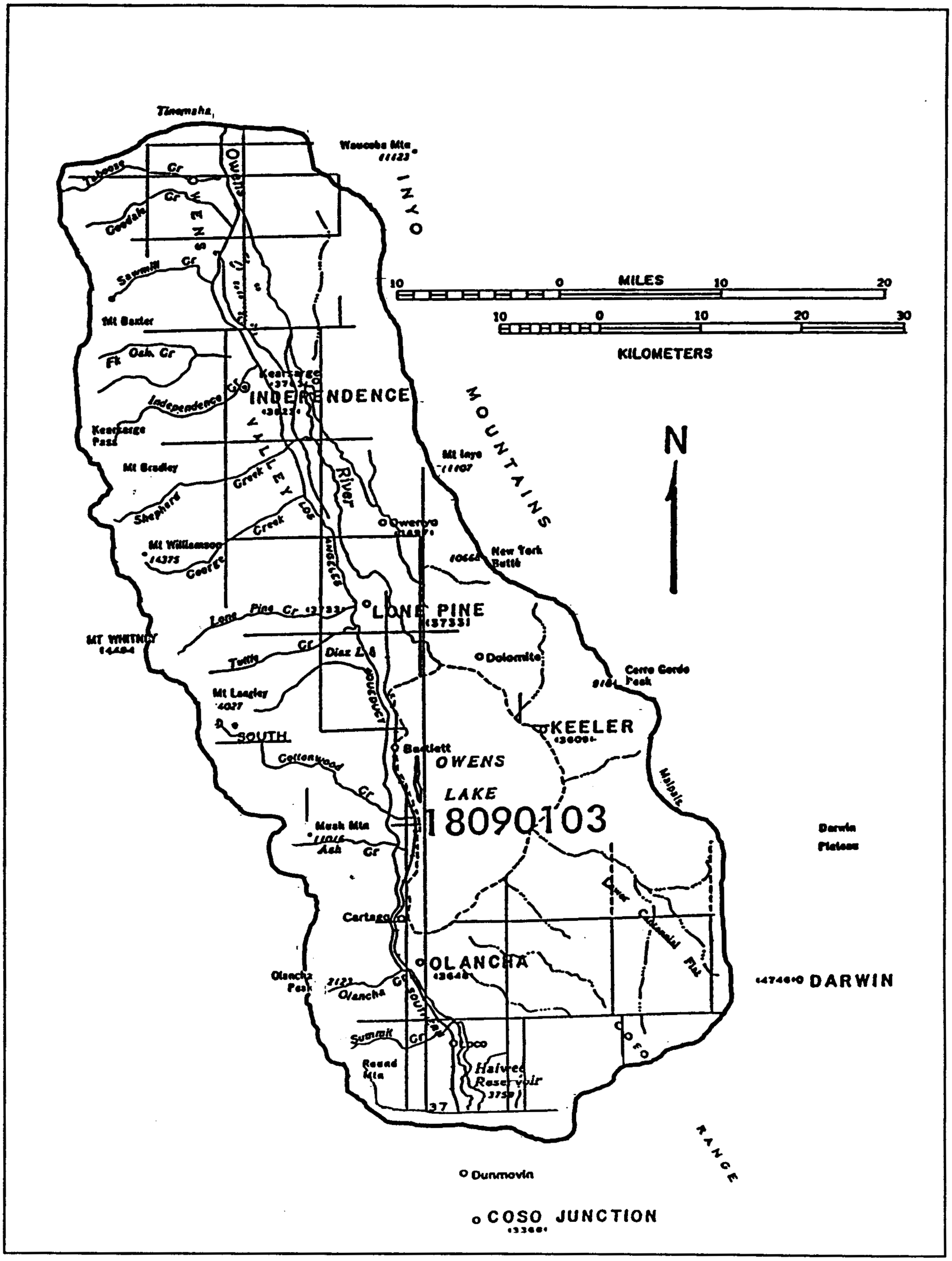

Figure 3.1: Boundaries of the federal PM_{10} non-attainment area.

The USEPA designated the Owens Valley as a "serious" non-attainment area due to the frequent violations of the NAAQS for PM_{10} and the inability of the area to attain the standard by December 31, 1995. For serious PM_{10} non-attainment areas, the federal Clean Air Act Amendments of 1990 (CAAA) require the submittal of a State Implementation Plan (SIP) by February 8, 1997 that will bring the area into attainment with the NAAQS by December 31, 2001, if practicable. This SIP, which includes the plan for the dust control project, is intended to satisfy those CAAA requirements.

3-3 PM_{10} Air Quality

3-3.1 Health Impacts of PM_{10}

Particulate pollution is generally associated with dust, smoke and haze and is measured as PM_{10}, which stands for particulate matter less than 10 microns in diameter. These particles are extremely small, less than a tenth the diameter of a human hair. Because of their small size they can easily penetrate into the lungs. Breathing PM_{10} can cause a variety of health problems. It can increase the number and severity of asthma and bronchitis attacks. It can cause breathing difficulties in people with heart or lung disease, and it can increase the risk for, or complicate existing respiratory infections. Children, the elderly and people with existing heart and lung problems are especially sensitive to elevated levels of PM_{10}. At extremely high concentrations of PM_{10}, even otherwise healthy individuals can be adversely affected by the dust. The USEPA has set an episode level of 600 $\mu g/m^3$ (averaged over 24-hours) as the level that can pose a significant risk of harm to the health of the general public (40 CFR 51.151).

3-3.2 Owens Lake Health Advisory Program

The National Ambient Air Quality Standard for PM_{10} is frequently violated in the planning area because of wind blown dust from Owens Lake. Wind speeds greater than about 17 mph (7.6 m/s) have the potential to cause wind erosion from the barren lake bed. Ambient PM_{10} readings are the highest measured in the country. One PM_{10} reading from Keeler on April 13, 1995 reached 3,929 $\mu g/m^3$, more than 25 times higher than the PM_{10} NAAQS of 150 $\mu g/m^3$ for a 24-hour average. From 1987 through 1995 the PM_{10} NAAQS was violated about 19 times per year in Keeler, 5 times per year in Olancha and 2 times per year in Lone Pine.

In 1995, the District instituted a program to advise the public when unhealthful levels of particulate pollution occur in the Owens Lake area. Under this program, the District issues air pollution health advisories when dust storms from Owens Lake cause PM_{10} concentrations to exceed selected trigger levels. Health advisory notices are FAXed to schools in the affected downwind communities and to the local radio stations.

A stage 1 air pollution health advisory is issued when hourly PM_{10} levels exceed 400 $\mu g/m^3$. The stage 1 health advisory recommends that children, the elderly and people with heart or lung problems refrain from strenuous outdoor activities in the impacted area. A stage 2 air pollution advisory is issued when hourly PM_{10} levels exceed 800 $\mu g/m^3$, and recommends that everyone refrain from strenuous outdoor activities in the impacted area.

The Owens Lake air pollution health advisory program is not intended to replace the need to control the dust problem at Owens Lake, but it is intended to help reduce adverse health effects until dust control measures are in place. This health advisory program will remain in effect until dust control measures are implemented at Owens Lake and the PM_{10} levels do not violate the NAAQS.

3-3.3 Monitoring Sites and Data Collection

3-3.3.1 Permanent PM_{10} Monitoring Network. Ambient PM_{10} measurements to determine compliance with the federal PM_{10} standard have been taken at Keeler, Olancha, and Lone Pine for about 10 years. Meteorological data are also collected at each of these permanent monitoring sites to provide wind speed, wind direction, and temperature data. Precipitation data are also collected at the Keeler site. Figure 3.2 shows the location of these three sites. Other permanent sites that are equipped with PM_{10} samplers are Coso Junction and Navy I, which also monitor violations from Owens Lake dust that is transported to the south.

3-3.3.2 Dust Transport Study. Historically the permanent stations have normally operated on a one in six day schedule to sample PM_{10}, and do not sample on the five of six off-schedule days. This was changed for a period from March 1993 to June 1995 to collect data to assess the PM_{10} impacts down wind from Owens Lake toward Ridgecrest. A special purpose monitoring network was set up as shown in Figure 3.2, adding Pearsonville, Inyokern and Ridgecrest. During the special purpose monitoring period samplers were operated remotely to start sampling at approximately the same time on the day Owens Lake dust events were forecasted to impact the southern sites. The results of this study showed that the Owens Lake dust plume caused exceedances of the PM_{10} NAAQS as far south as Ridgecrest, 50 miles away. Appendix A includes the monitoring data from this episode monitoring program. Based on observations of dust plumes prior to conducting this study (Cahill, *et al.*, 1994 and GBUAPCD, 1988) and the results of this study, the District believes that Figure 3.3 is a reasonable estimate of the extent of PM_{10} transport from Owens Lake.

About 40,000 permanent residents between Ridgecrest and Bishop are annually affected by the dust from Owens Lake. In addition, many visitors spend time in the dust impacted

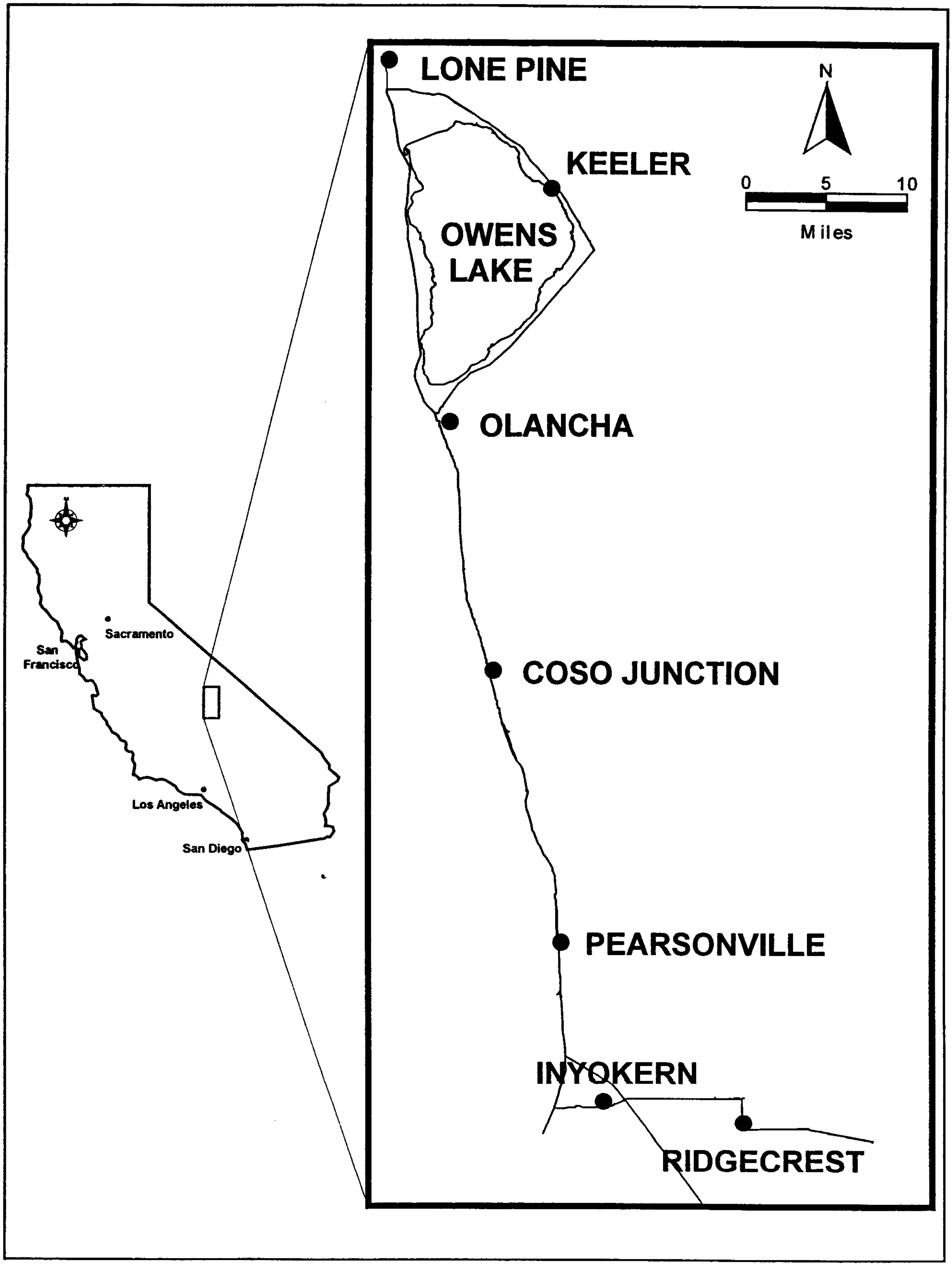

Figure 3.2: Location of PM_{10} monitor sites near Owens Lake.

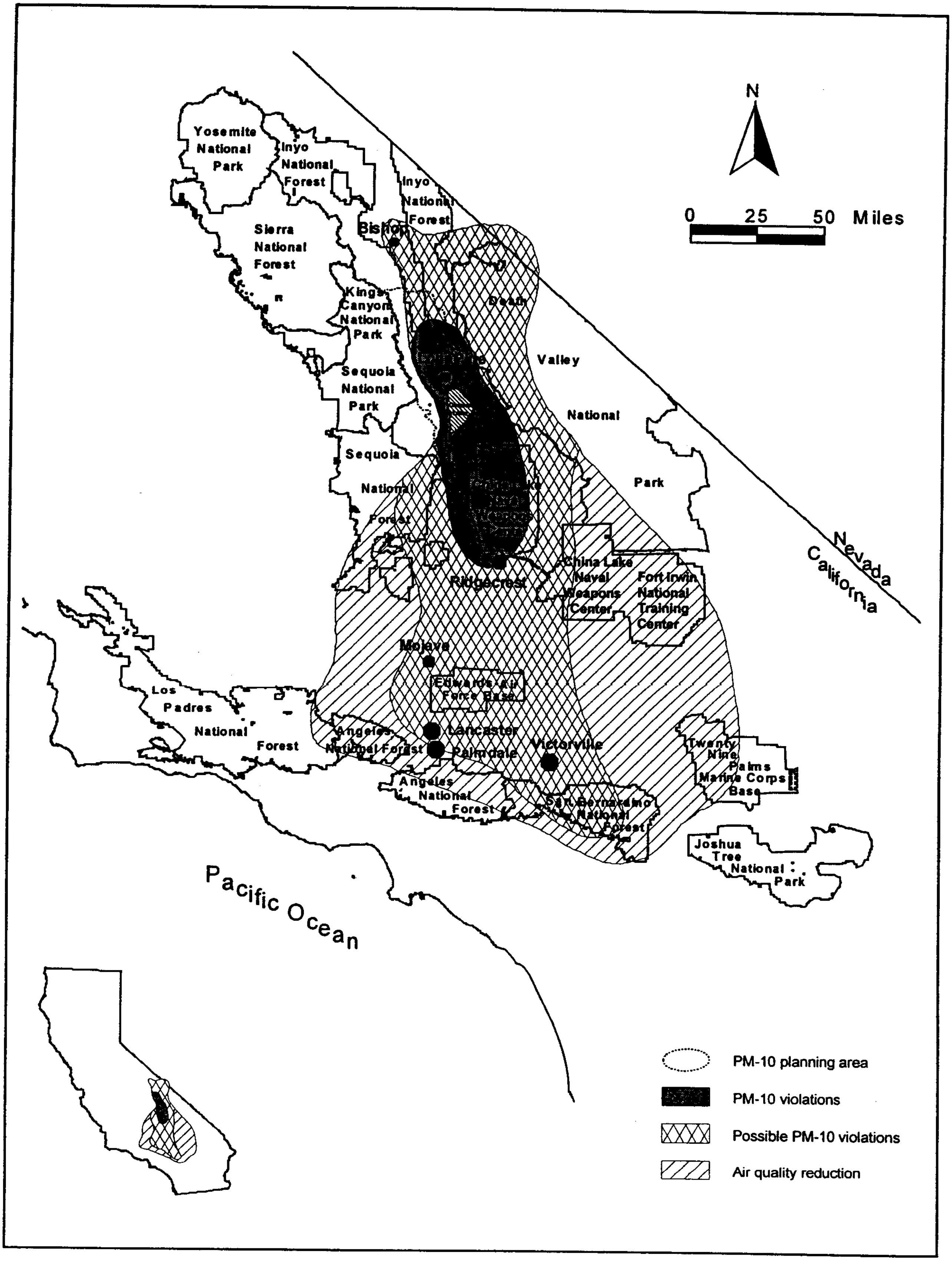

Figure 3.3: Projected area affected by dust from Owens Lake.

area, to enjoy the many recreational opportunities the Eastern Sierra and high desert have to offer. Lone Pine annually hosts the Lone Pine film festival which draws thousands of visitors from outside the area. The National Park Service is concerned about the health hazard posed to an estimated 250,000 to 350,000 visitors that are expected to annually visit the Manzanar National Historic Site, 15 miles north of Owens Lake. The Park Service is concerned because a high percentage of the visitors to Manzanar will be older visitors who are more prone to airborne respiratory threats, and that they will spend 3 to 4 hours outdoors in a potentially harmful environment (Hopkins, 1997).

3-3.3.3 Daily PM_{10} Monitors. In 1994, the District installed TEOM (Tapered Element Oscillating Microbalance) continuous PM_{10} monitors at Keeler, Olancha and Lone Pine to sample hourly PM_{10} concentrations and to generate daily PM_{10} data. This information was used for air quality planning purposes and to provide hourly concentrations for the health advisory program.

3-3.4 PM_{10} Data Summary

3-3.4.1 Number of 24-hour Violations and Peak Concentrations. An estimate for the expected number of violations of the PM_{10} standard can be derived from the one in six day sampling, using size selective inlet samplers (SSI), that was done at the three monitoring sites around Owens Lake. Because the one in six day schedule provides a random sample of daily PM_{10} data, a frequency analysis of the data from 1987 through 1995 can be used to estimate the number of exceedances per year that occurred during that period. To be in attainment with the NAAQS, the 24-hour PM_{10} standard of 150 $\mu g/m^3$ cannot be exceeded more than 1.0 time per year on average. Figures 3.4, 3.5 and 3.6 show that Keeler would be expected to exceed 150 $\mu g/m^3$ about 19 times per year, Olancha 5 times per year and Lone Pine 2 times per year. These graphs were generated by arranging the data at each site in order from the highest to lowest concentration and then dividing the rank number for each data point by the number of samples to determine the fraction of samples with concentrations equal to or greater than a given concentration. For instance, 693 $\mu g/m^3$ is the 4th highest SSI measurement for Keeler between 1987 and 1995. Dividing 4 by the number of SSI samples taken, in this case 490, yields a fraction of 0.008. This fraction is then multiplied by 365 to determine the expected number of days per year that a given concentration would be exceeded. In this example, 3 days per year on average would be expected to exceed 693 $\mu g/m^3$, and is plotted on the graph. Doing the same calculation for each SSI sample provides the points to generate the frequency distribution curves which are displayed on a semi-log curve. This procedure follows the exponential tail distribution method in the USEPA's PM_{10} SIP Development Guidelines (USEPA, 1987). The peak concentrations measured at each site using all of the PM_{10} data for this same period are summarized in Table 3.2. The peak concentrations in Table 3.2 are measured using the TEOM PM_{10} monitor, while the expected number of

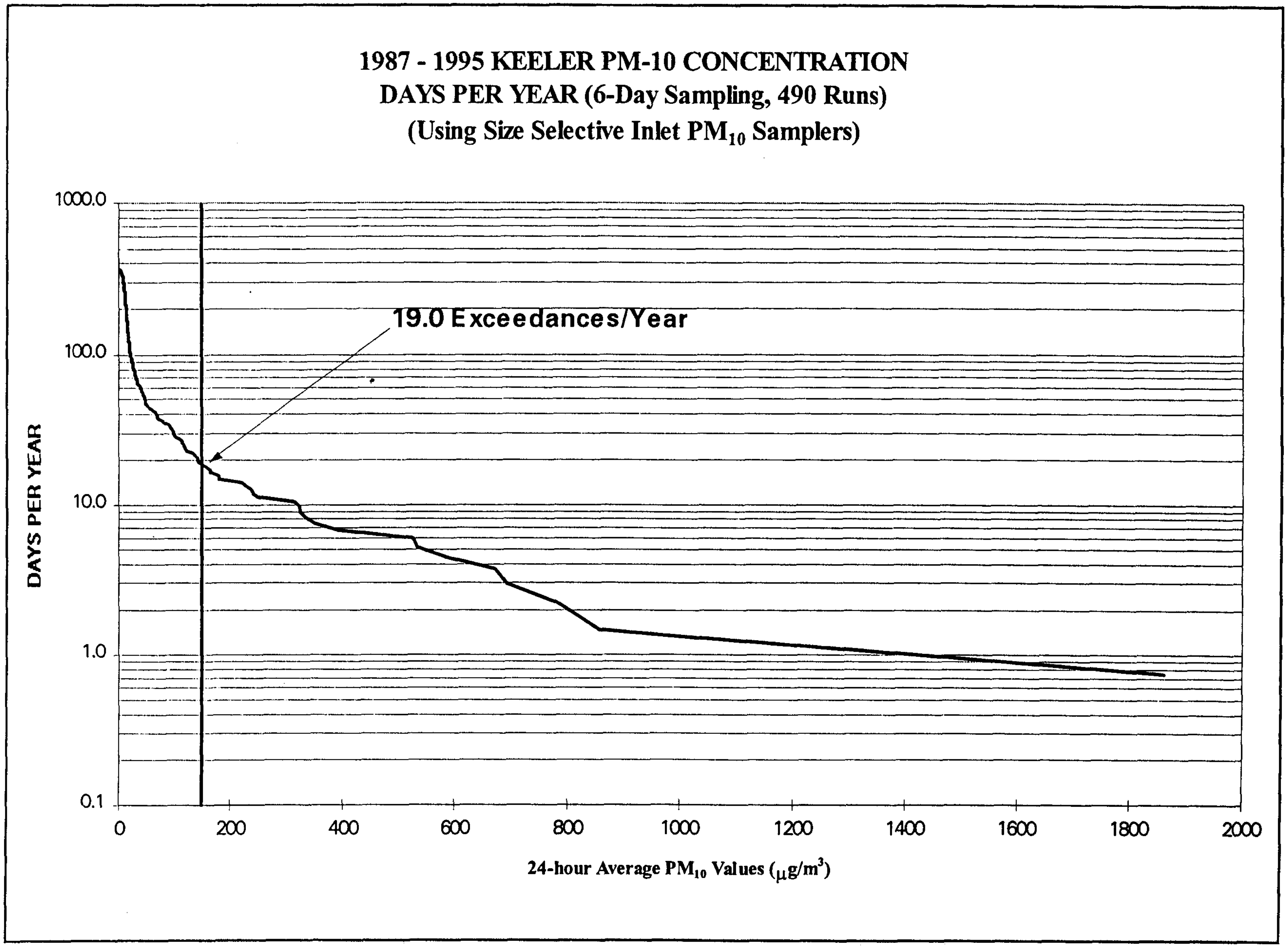

Figure 3.4: Keeler PM_{10} frequency distribution shows that the PM_{10} levels exceed the 150 $\mu g/m^3$ 24-hour NAAQS about 19 days per year.

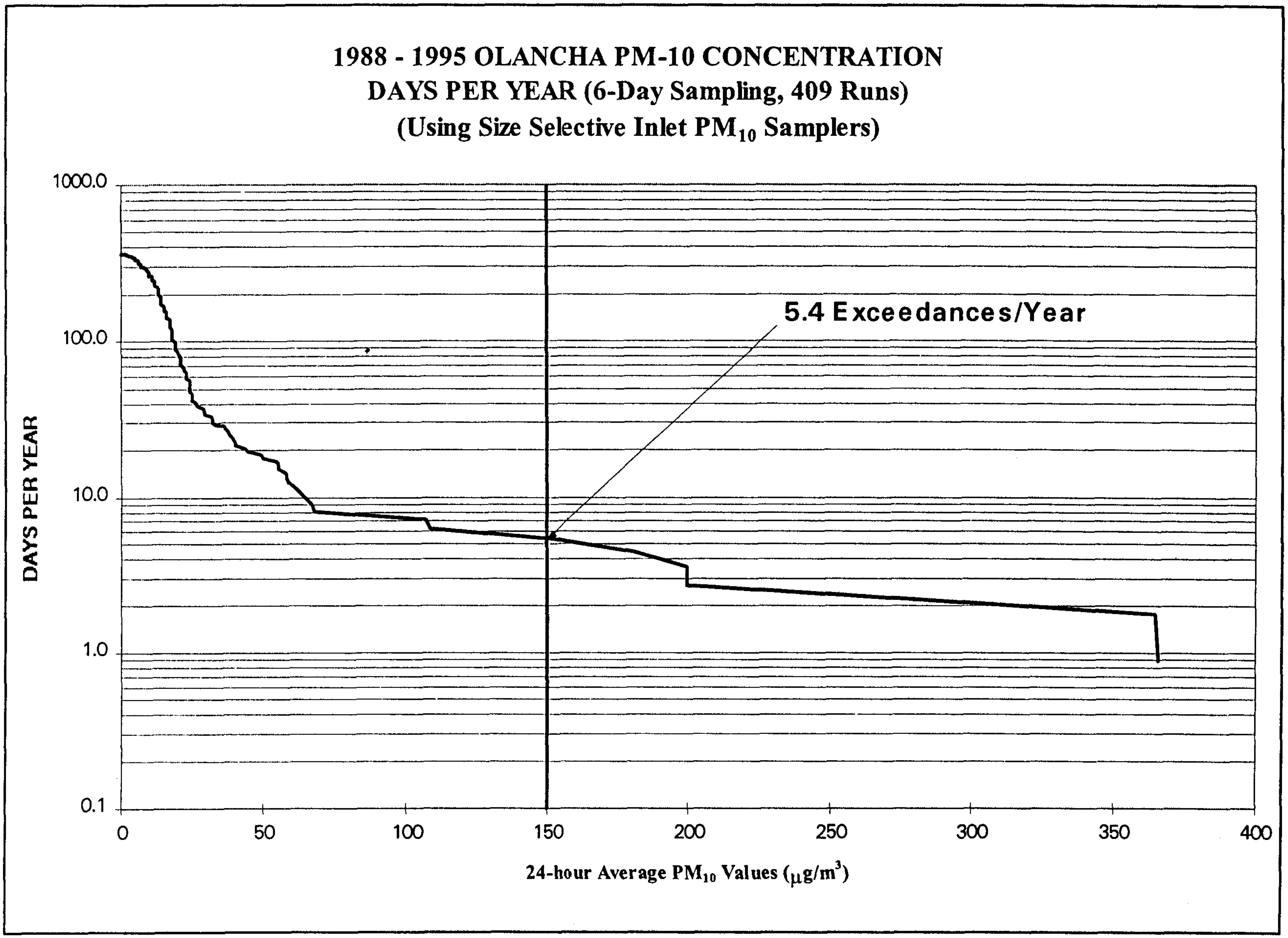

Figure 3.5: Olancha PM_{10} frequency distribution shows that the PM_{10} levels exceed the 150 $\mu g/m^3$ 24-hour NAAQS about 5 days per year.

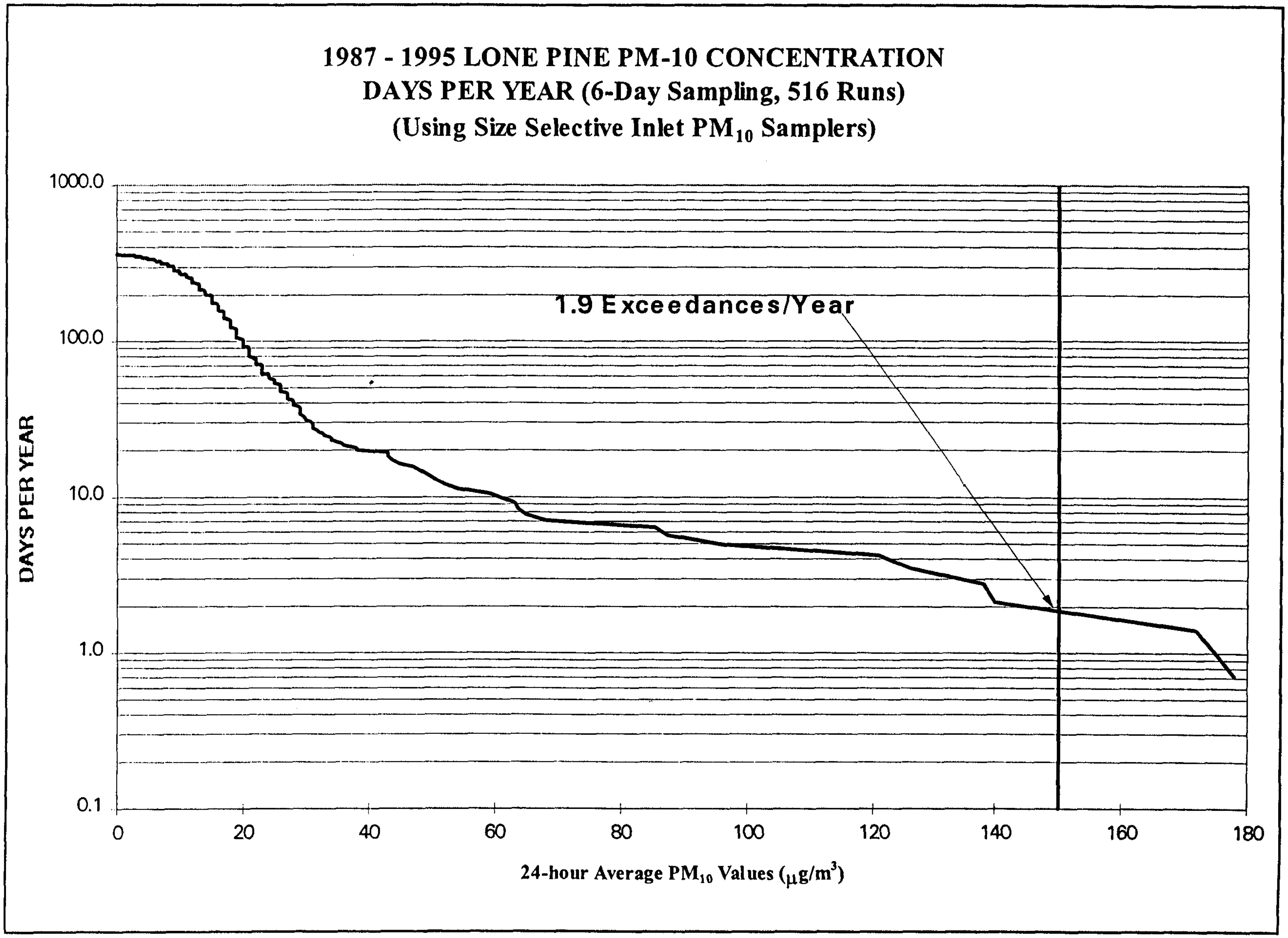

Figure 3.6: Lone Pine PM_{10} frequency distribution shows that PM_{10} values exceed the 150 $\mu g/m^3$ 24-hour NAAQS about 2 days per year.

Table 3.2. Number of PM_{10} violations per year and peak concentrations in the Owens Valley planning area, 1987 through 1995.

Monitoring Site	Peak PM_{10} Concentration (Date of peak)[1]		Expected Number of Exceedances Per Year [2]
Keeler	3,929 μg/m³	(4/13/95)	19
Lone Pine	499 μg/m³	(3/18/94)	2
Olancha	2,252 μg/m³	(4/9/95)	5

[1] From TEOM PM_{10} monitor data.
[2] From every sixth day SSI PM_{10} monitor data (1987-95).

exceedances are estimated using size selective inlet PM_{10} sampling data. A complete PM_{10} data summary for Keeler, Olancha and Lone Pine is included in Appendix A. A separate summary of the sampling days from 1987 through 1995 that exceeded 150 μg/m³ is also included in Appendix A.

For the days when the 24-hour PM_{10} standard is violated, the peak hourly wind speed at the Owens Lake monitoring sites have been measured up to 46 mph. Violations have also been recorded when the hourly wind speed peaked at a more modest 20 mph, See Appendix A. The daily average wind speed when the 24-hour PM_{10} standard is violated ranges from 5 to 33 mph.

3-3.4.2 Annual Average PM_{10} Concentrations. The Owens Valley Planning Area currently attains the annual PM_{10} NAAQS at all sites. The annual average PM_{10} concentration for the Owens Valley Planning Area is determined from the one in six day data from Keeler. Although a 9 year record is available, the annual average is based on air quality for the last three years. Using the last three years of data from 1993 through 1995, and using the federal method for determining the annual average, the value for Keeler is 43.3 μg/m³ (40 CFR 50, Appendix K). This is below the PM_{10} NAAQS which is set at 50 μg/m³. It is expected that implementation of the control strategy will reduce this value. A summary of the quarterly and annual average values used to determine the annual average is included in Appendix A.

Table 3.3 Cancer risk at Keeler due to Owens Lake dust storms.

Toxic Metal	Risk Level $(\mu g/m^3)^{-1}$	Metal Concentration (parts per million)	Additional Cancer Risk
Cadmium	4.2×10^{-3}	29	6 per million
Arsenic	3.3×10^{-3}	107	18 per million
		Lifetime Cancer Risk =	24 per million

Risk levels from the California Air Toxics Program (CAPCOA, 1993)
Dust samples are taken from Keeler PM_{10} filters, with concentrations measured by x-ray fluorescence (Chester LabNet, 1996).
70-year cancer risk at PM_{10} = 50 $\mu g/m^3$ (Keeler annual average from 1987-1995)

3-4 CANCER RISK DUE TO OWENS LAKE DUST STORMS

Owens Lake dust contains cadmium, arsenic and other toxic metals that are at levels above the natural concentrations in soils in the Owens Valley. These metals pose a significant risk for additional cancer cases in the highest dust impacted areas. Table 3.3 shows that the cancer risk at Keeler associated with cadmium and arsenic in the Owens Lake dust is over 20 in a million. This is based on an annual concentration average of 50 $\mu g/m^3$ from the dust storms for a 70 year period. The value of 50 $\mu g/m^3$ is taken from the nine year average of PM_{10} concentrations at Keeler.

Under the District's adopted air toxics policy, a toxic risk greater than 1 in a million additional cancer cases is considered to be significant. This policy requires that sources that pose a risk greater than 1 in a million implement controls to reduce the risk, and it prohibits the issuance of a permit to sources that exceed a risk of 10 in a million. (GBUAPCD, 1987)

3-5 VISIBILITY AND SENSITIVE AIRSHEDS

Visibility in the Owens Valley generally ranges from 37 to 93 miles, with the best visibility occurring during the winter. Visibility is most limited from May through September and during days when Owens Lake dust storms occur. Owens Lake dust storms can reduce visibility to zero near Owens Lake and obscure visibility 150 miles away. The main cause of visibility degradation in the Owens Valley is fine particles in the atmosphere. In addition to dust from Owens Lake, visibility degradation results from transport of air pollutants from the San Joaquin Valley and South Coast air basins, and forest fires. Most of the visibility degradation can be attributed to inter-basin transport of air pollutants. On days when Owens Lake dust storms do not occur, emissions of fine particulate matter from gasoline and diesel fueled vehicles and equipment within the Owens Valley are local man-made contributors to visibility degradation, however, these local sources have an insignificant impact on the area's visibility. Nitrogen dioxide, a light absorbing gas formed during fuel combustion, contributes less than 5% to the overall visibility degradation. Other man-made sources of visibility degrading emissions represent less than 5% of the overall reduction in visibility (Trijonis *et al.*,1988).

There are 11 sensitive airsheds in the region, including wilderness areas, national parks, national forests, a national historic site, and the R-2508 military airspace. Figure 3.7 shows the locations of these sensitive airsheds. Four of these airsheds are designated as Class I PSD areas, which are afforded more stringent protection from visibility degradation and for impacts from air pollutants: John Muir and Domeland Wilderness Areas, Kings Canyon and Sequoia National Parks. These sensitive areas and their classifications are shown in Table 3.4.

The R-2508 military air space, which includes the China Lake Naval Air Weapons Station (NAWS), is a sensitive site for visibility impacts from Owens Lake dust events. Good visibility is needed for some military operations, such as an air-to-air test (an air-launched target whose target is also in the air), which relies on high-speed cameras to record time, space and position information. Owens Lake events can reduce the visibility to less than 1 to 2 miles at China Lake. The Department of the Navy has stated that cancellation of a test costs the Range and/or its customer approximately $10,000 to $50,000. Owens Lake dust events can lead to cancellations of several tests per day and can last for one to two days, or occasionally longer (Stevenson, 1996).

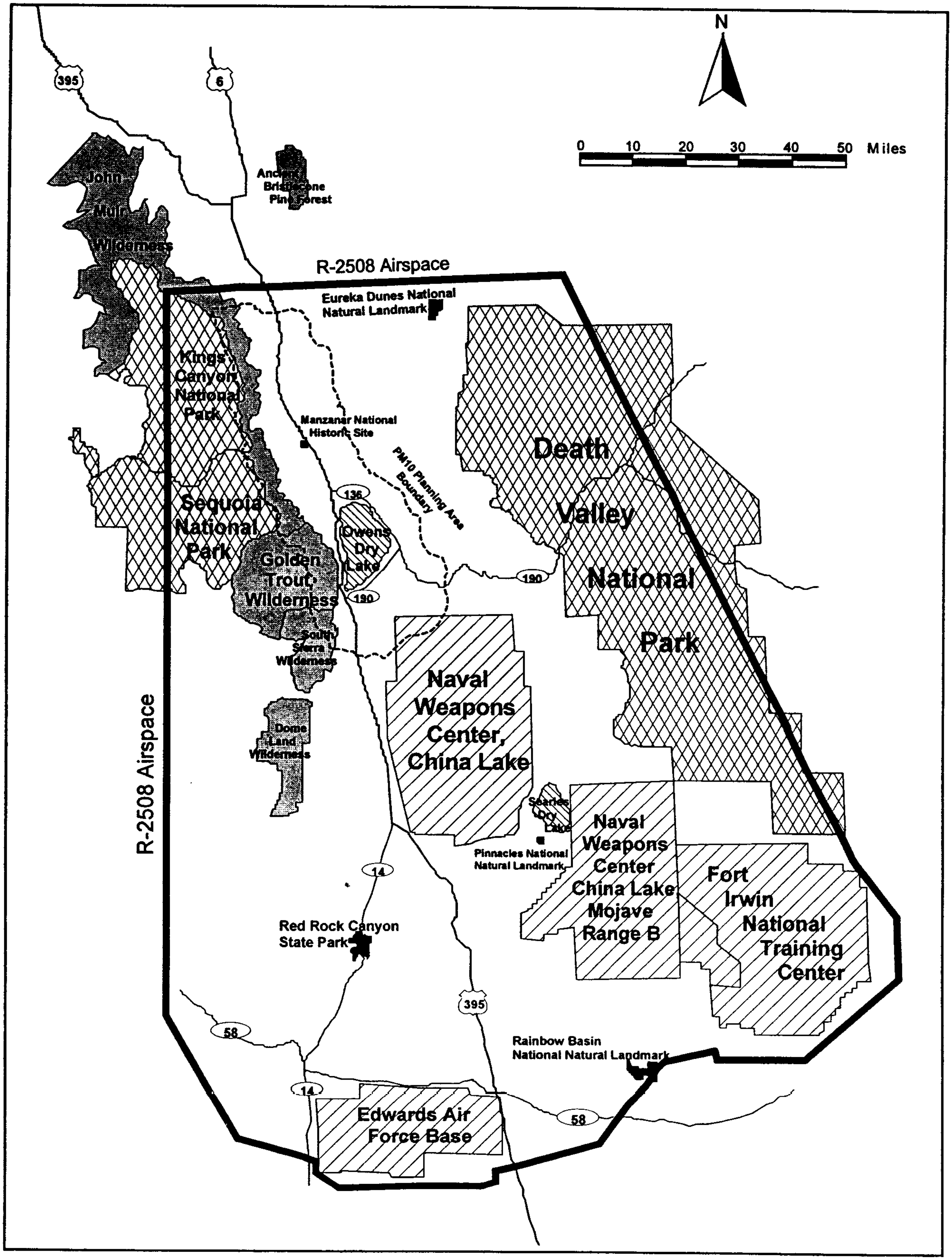

Figure 3.7: Location of sensitive airsheds near Owens Lake.

Table 3.4: Sensitive airsheds and their PSD classifications.

Sensitive Airshed	PSD Airshed Classification
* Wilderness Areas in National Forests:	
Domeland	Class I
Golden Trout	Class II
John Muir	Class I
South Sierra	Class II
National Parks:	
Death Valley	Class II
Kings Canyon	Class I
Sequoia	Class I
* National Historic Site:	
Manzanar	Class II
National Forests:	
Inyo	Class I & II
Sequoia	Class I & II
* Military Base:	
China Lake NAWS	Class II

Source: MHA Environmental Consulting, Inc., 1994

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CHAPTER 4

PM_{10} EMISSION INVENTORY

4 PM_{10} EMISSION INVENTORY

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4 PM_{10} EMISSION INVENTORY

4-1 INTRODUCTION

Criteria pollutant emissions in the Owens Valley PM_{10} nonattainment area are dominated by PM_{10} emissions from wind erosion on the exposed Owens Lake playa. Other wind erosion sources in the nonattainment area include; off-lake sources of lake bed dust, small mining facilities and some areas near Lone Pine and Independence that have been disturbed by human activity. There is a lack of large industrial sources in the Owens Valley and the only other sources of criteria pollutant emissions are wood stoves, fireplaces, unpaved and paved road dust, and vehicle tailpipe emissions. In the future, the USDA Forest Service will also be emitting PM_{10} from prescribed burning activities in and around the nonattainment area. The prescribed burning activity, however, is not expected to be done on windy days when the Owens Lake dust storms occur. Predicted high wind days are avoided when doing prescribed burns for fire safety reasons.

The emissions inventory includes the sources within the expected control area for the plan. This covers the southern half of the designated nonattainment area, which includes the community of Lone Pine on the control area's northern boundary. Areas outside of this control area are significantly impacted by Owens Lake dust, but there are no sources outside of this control area that have been found to cause, or could reasonably be expected to cause, a violation of the NAAQS for PM_{10}.

The future emissions inventory is not expected to grow significantly from the current inventory. Changes to future population and traffic related emissions are expected to be insignificant in comparison to the wind blown PM_{10} from Owens Lake. The future inventory will be kept constant for planning purposes.

The annual and 24-hour PM_{10} emissions for the Owens Valley PM_{10} Planning Area are summarized in Table 4.1 for the 1995 base year and discussed in this chapter for each source category. For planning purposes to attain the 24-hour National Ambient Air Quality Standard for PM_{10} the 24-hour peak inventory is used. The annual emission estimates are provided for comparative information.

4-2 NON-OWENS LAKE PM_{10} EMISSIONS

4-2.1 Entrained Paved Road Dust and Tail Pipe Emissions for Mobile Sources

Entrained paved road dust PM_{10} emissions are based on revised estimates from the California Air Resources Board for the 1995 emissions inventory, which estimates annual PM_{10} emissions of 268 tons of PM_{10} per year (0.7 tons per day) in Inyo County. The emission factors used are:

Table 4.1 Annual and 24-Hour PM_{10} Emissions in the Owens Valley PM_{10} Planning Area for the 1995 Emissions Inventory Base Year.

	PM_{10} Peak 24-Hour (Tons/Day)	PM_{10} Annual (Tons/Year)
Area and Mobile Sources		
Owens Lake Primary Wind Erosion	8,346	279,900
Owens Lake Secondary Wind Erosion	516	11,200
Vehicle Tailpipe	0.08	29
Unpaved Road Dust	0.15	53
Paved Road Dust	0.19	69
Residential Wood Burning	0.24	36
Prescribed Burning	42	2,532
Agricultural Operations	0.00	1
Industrial Facilities		
Big Pine Distributors	0.06	21
Pacific Lightweight Prod.	0.09	32
Federal White Aggregate	0.08	28
Owens Lake Soda Ash*	0.51	179
(*Proposed project)		
Total Emissions	8,905.40	294,080

Freeways - 0.57 pounds of PM_{10} per thousand vehicle miles traveled (VMT); major roads and collectors - 0.83 lbs PM_{10}/1000 VMT; and local roads - 3.4 lbs. PM_{10}/1000 VMT. The overall composite emission factor for the county is 1.16 lbs. PM_{10}/1000 VMT, which is based on the county traffic mix of 0% freeway, 74% major roads, 13% collectors, and 13% local roads (CARB, 1997). PM_{10} emissions from vehicle exhaust was estimated at 0.3 tons per day (T/d) in Inyo County for 1994 (CARB, 1996).

Assuming for estimation purposes that vehicle traffic in the control area is primarily on Highway US 395, a simple proportion of the mileage in the control area to the length of US 395 in Inyo County yields a good estimate of the PM_{10} 24-hour and annual emissions from mobile sources.

Entrained Road Dust:
(30 miles/115 miles) x 0.7 T/d = 0.19 tons of PM_{10} per day
0.19 T/d x 365 days = 69 tons of PM_{10} per year

Vehicle Exhaust:
(30 miles/115 miles) x 0.3 T/d = 0.08 Tons of PM_{10} per day
0.08 T/d x 365 days = 29 tons of PM_{10} per year

4-2.2 Entrained Unpaved Road Dust

An estimate of entrained PM_{10} emissions from traffic on unpaved roads in the control area is based on emission factors found in the USEPA's Compilation of Air Pollution Emission Factors, AP-42 (USEPA, 1985).

$$PM_{10} = 2.1\ (s/12)\ (S/30)\ (W/3)^{0.7} (w/4)^{0.5}\ [(365-p)/365]$$

Where:	PM_{10}	=	PM_{10} emissions in pound per vehicle mile traveled
	s	=	silt content of road surface material (5 percent)
	S	=	mean vehicle speed (20 miles per hour)
	W	=	mean vehicle weight (3 tons)
	w	=	mean number of wheels (4 wheels)
	p	=	number of days per year with precipitation greater than 0.01 inches (assume zero for daily and worst-case annual emissions)

The Owens Valley values for each variable in the emission estimate are shown in parenthesis. The 5% silt content value is based on samples taken in the Owens Lake area from the Cerro Gordo Road and Keeler, which showed the silt content ranged from 1 to 6% (Murphy, 1997). Assuming 50 vehicles per day with an average trip length of 10 miles, yields 0.15 tons of PM_{10} per day, or 53 tons of PM_{10} per year.

4-2.3 Residential Wood Combustion

The AP-42 emission factor for wood stoves is 15 grams of PM_{10} per kilogram of wood burned. An estimate of residential wood combustion emissions from the control area can be made by using the wood usage estimate of 2 cords of pine per year (density = 800 kg/cord) for Bishop, which is 60 miles north of the control area. The heating season is about 150 days per year. The population estimate for the control area is 2,745. A high end estimate for the number of wood stoves is one for every two people (1,372.5 stoves). This yields an estimate of 0.24 tons of PM_{10} per day and 36.3 tons of PM_{10} per year for residential wood combustion in the control area.

4-2.4 Prescribed Burning Emissions and Regulations

The US Forest Service provided air pollution emission estimates for historic pre-settlement smoke emissions in the Owens Valley PM_{10} nonattainment area (McKee, 1996). The US Forest Service plans to increase prescribed burning activities in the national forest to a level that is comparable to historic natural forest fire cycles in the Eastern Sierra. Based on the Forest

Service's fuel models and the historic fire return rate to forest land in the Owens Valley PM_{10} nonattainment area, an annual average estimate of 2,532 tons per year of PM_{10} is determined. As the burn season for prescribed burning is expected to last about 60 days per year, daily average emissions will be about 42.2 tons per day.

The inclusion of these emission estimates for prescribed burning is for SIP conformity purposes to ensure that prescribed burning activities in the nonattainment area have been considered in the Owens Valley PM_{10} SIP attainment demonstration. General conformity requirements contained in District Regulation XIII, require that federal actions and federally funded projects conform to SIP rules and that they do not interfere with efforts to attain federal air quality standards. Prescribed burning activities are not expected to be done on windy days when the Owens Lake dust storms occur. Predicted high wind days are avoided when performing prescription burns for fire safety reasons. In addition, prescribed burning is regulated through District Rules 410 and 411 for wildland and forest management burning. These rules require that a burn plan be submitted to the Air Pollution Control Officer prior to conducting the burn, and that burning will not cause or contribute to violations of the air quality standards. If prescribed burning is done in a manner which complies with District rules, burning activities are not expected to interfere with attainment of the PM_{10} NAAQS in the Owens Valley.

4-2.5 Industrial Facilities

Emissions from industrial facilities are based on permitted emissions under each facility's daily permit limit for throughput or operating hours. Annual emissions are extrapolated from peak daily emissions over a 351 day work year. Total PM_{10} emissions from industrial facilities are 0.74 tons of PM_{10} per day and 260 tons per year. This includes potential emissions from the Owens Lake Soda Ash Company, which is a proposed project and is included for future planning purposes. Table 4.1 lists the individual industrial facilities that are located in the control area. There are no other significant sources of PM_{10} foreseen for the planning area.

4-2.6 Agricultural Operations

There are very few agricultural operations near Owens Lake. In the control area, south of Lone Pine and North of Haiwee reservoir, there are about 200 acres of pasture land and 20 acres of alfalfa. The estimated emissions for agricultural operations is less than 1 ton of PM_{10} per year using estimates provided by the California Air Resources Board. (CARB, 1997 and Keisler, 1997).

4-3 WIND EROSION

4-3.1 Wind Erosion Source Areas

Wind erosion at Owens Lake is the dominant source of PM_{10} in the control area, comprising more than 99% of the 24-hour and annual emission inventories. Wind erosion emissions can be separated into on-lake and off-lake source areas. The on-lake source areas are the wind erosion areas on the historic playa of Owens Lake. Figure 4.1 shows the identified source areas that have been used for the attainment demonstration. Off-lake sources of wind blown dust are caused by dust that was initially entrained from the exposed playa and then deposited in areas off the lake bed (Holder, 1997a). These dust deposition areas, which are located adjacent to the lake bed from Keeler to Olancha, become secondary sources of dust that can be entrained under windy conditions. After the on-lake source areas are controlled, PM_{10} from the off-lake source areas will be minimal (Niemeyer, 1996).

The locations of on-lake source areas were determined by field mapping of eroded areas after storms. The boundaries of the eroded areas were mapped using a global positioning system (GPS). These data were transferred to the Geographic Information System (GIS) to map the boundaries and determine the area size (Cox, 1996). Off-lake source area locations are based on observations of dust storms by Niemeyer and Niemeyer and by use of aerial photos of deposition areas. This information was mapped in the GIS. From fall 1994 through summer 1995, Niemeyer and Niemeyer observed the location and size of many of the dust storms at Owens Lake. These source areas were mapped and sun photometry was used for some storms to quantify the PM_{10} emissions lofted from Owens Lake (Niemeyer and Niemeyer, 1995). The results of this study are discussed in Section 4-3.3.

A number of methods have been used to estimate PM_{10} emissions from Owens Lake dust storms including sun photometry and portable wind tunnel measurements. A range of annual emissions from around 130,000 to over 400,000 tons of PM_{10} per year were estimated using these methods. The BACM SIP (GBUAPCD, 1994) discussed these estimation methods, except for sun photometry which was not completed until 1995. Recent studies have refined the estimation methods using the portable wind tunnel and sun photometry, which provided a direct method of PM_{10} measurement during storms (Ono, 1997 and Niemeyer, 1995).

4-3.2 Portable Wind Tunnel Method for PM_{10} Emissions

4-3.2.1 1993 through 1995 Seasonal PM_{10} Emission Algorithm. Wind tunnel tests were performed on many areas of the lake bed to determine the PM_{10} emission factors for air quality modeling purposes. The tests showed that the PM_{10} emission rates from late fall through winter were generally lower than during the spring season, when the PM_{10} emissions were about 2 to 3 times higher.

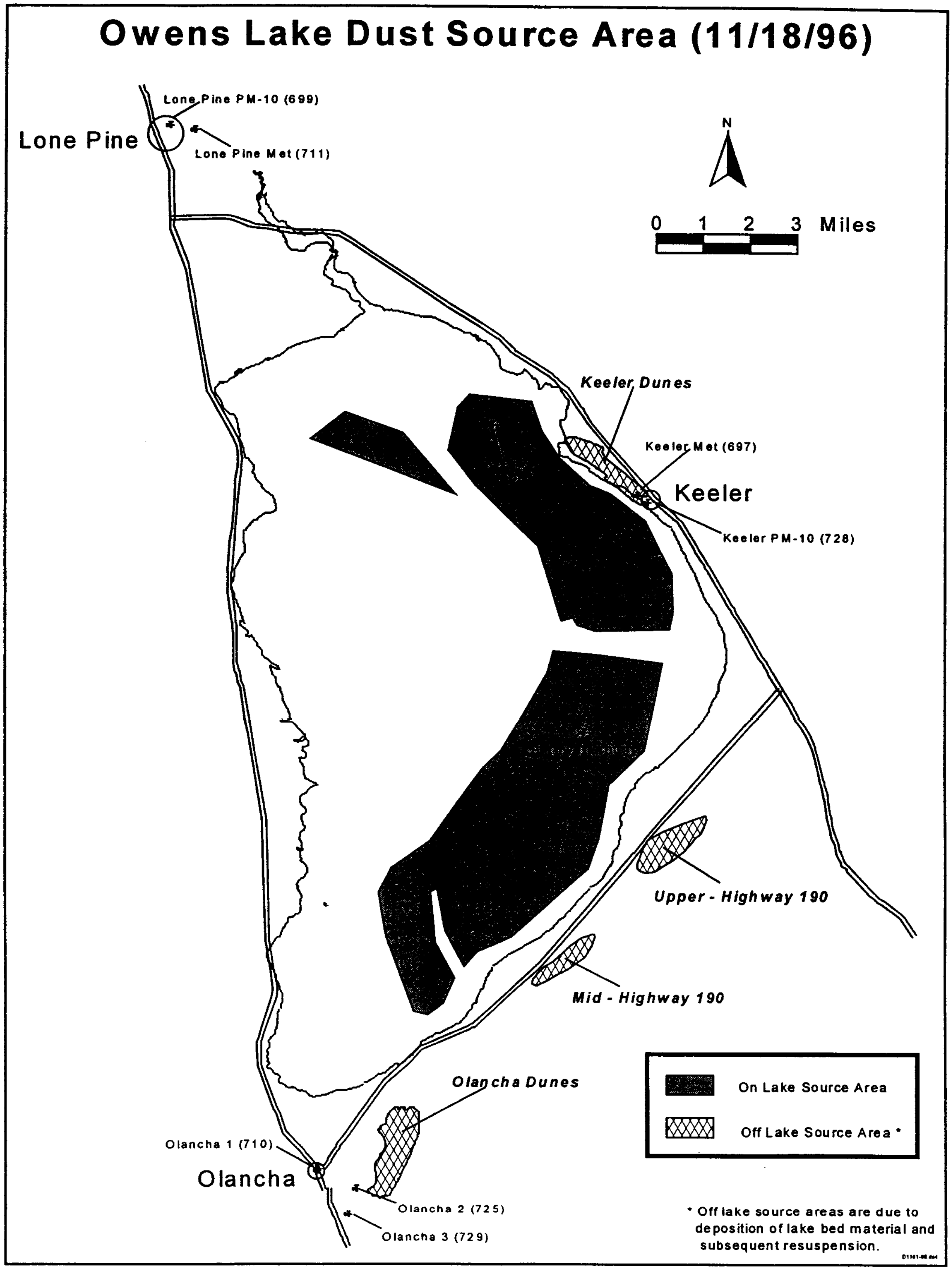

Figure 4.1: Owens Lake dust source areas for PM_{10} wind erosion.

Although there are obvious surface differences across the playa, the wind tunnel-generated PM_{10} emission data showed that the highest PM_{10} emission rates in each area were similar for a given season. Northern test sites in sand dominated areas showed the same range of PM_{10} emission potential as sites in the southern clay and sand areas during the same season. These seasonal differences in the PM_{10} data were used to generated PM_{10} emission algorithms for fall and spring that could be applied for all the wind erosion areas on the playa. Figure 4.2 shows a comparison of the seasonal emission algorithms. Figures 4.3 and 4.4 show the data points used to generate the PM_{10} emissions and wind speed relationship.

The fall and winter data include data from October through February and the spring data include data collected from March through June. The wind tunnel data at Owens Lake were collected from 1993 through 1995 from the erodible portions of the playa. Equations 4-1 and 4-2 are the emission algorithms that are used with the air quality model to predict worst-case ambient PM_{10} impacts (equations are shown for wind speed in units of meters per second or miles per hour);

Fall/Winter (Non-Spring) - July through January

$$PM_{10}\ (g/m^2/s) = 1.34 \times 10^{-5} \exp[0.25*u(m/s)] \qquad \text{Equation 4-1}$$

$$PM_{10}\ (g/m^2/s) = 1.34 \times 10^{-5} \exp[0.11*u(mph)]$$

Spring - February through June

$$PM_{10}\ (g/m^2/s) = 1.9 \times 10^{-4} \exp[0.13*u(m/s)] \qquad \text{Equation 4-2}$$

$$PM_{10}\ (g/m^2/s) = 1.9 \times 10^{-4} \exp(0.057*u(mph)]$$

where u is the hourly average wind speed in meters per second at a 10 meter anemometer height for wind speeds greater than 7.6 meters per second (17 miles per hour). Below this wind speed it is assumed that PM_{10} emission rates are zero or insignificant as compared to emissions at higher wind speeds. Although the threshold wind speed is not constant and may be higher during many dust storms, this threshold wind speed provides a lower threshold for modeling worst case conditions.

The seasonal change from winter and fall conditions to spring erosion conditions generally occurs around February or March when cold wet weather brings salts to the surface, with the subsequent drying creating a very erodible surface. The end of the spring season generally occurs in May or June when warmer temperatures cause the surface to start forming a wind resistant crust. Some areas of the playa, however, will remain erodible throughout the summer and into the fall and winter. In the fall and early winter the surface crust starts to deteriorate on large parts of the playa, creating more erosive surface conditions.

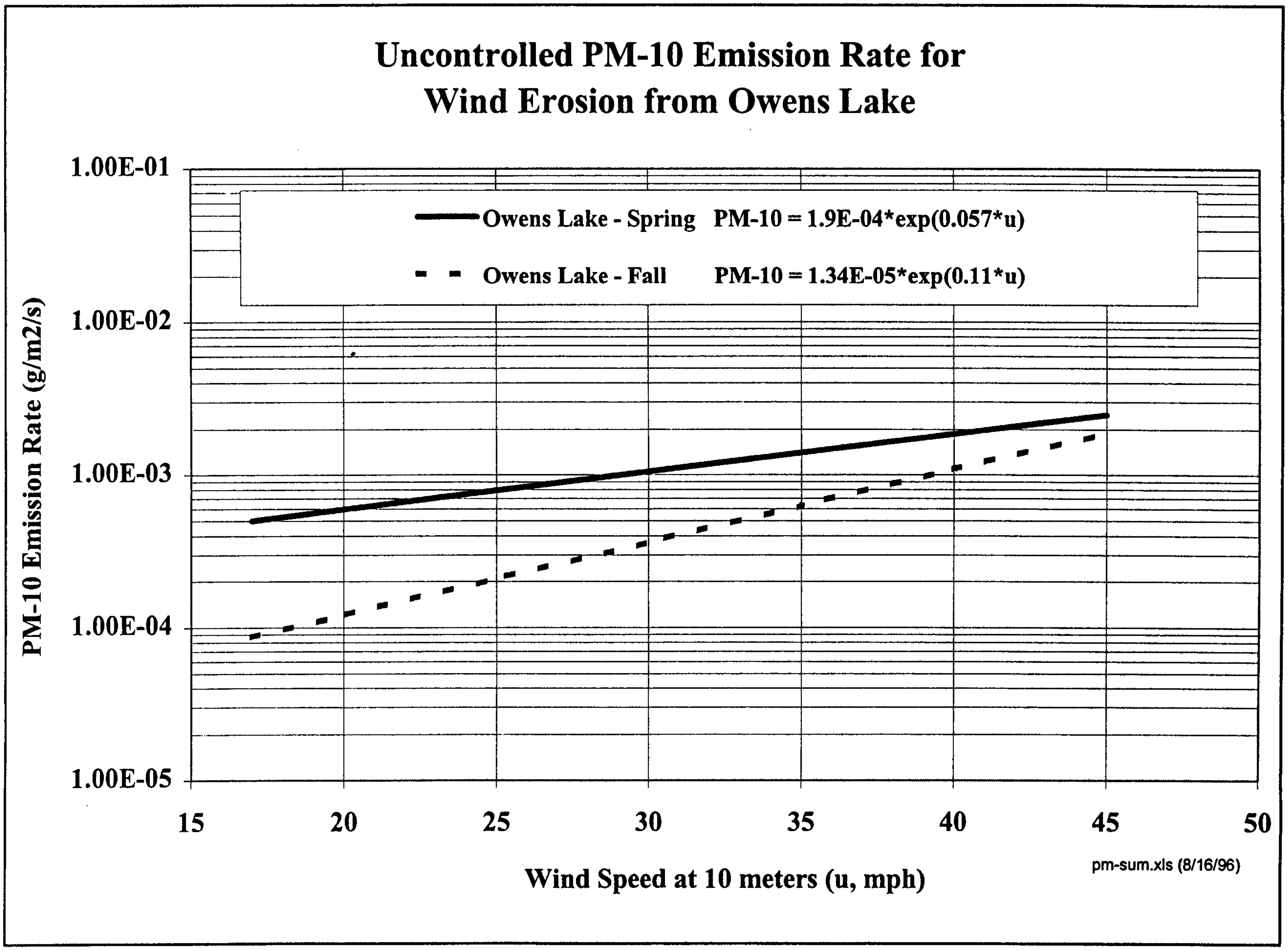

Figure 4.2: A comparison of wind tunnel generated seasonal PM_{10} wind erosion emissions as a function of wind speed for Owens Lake.

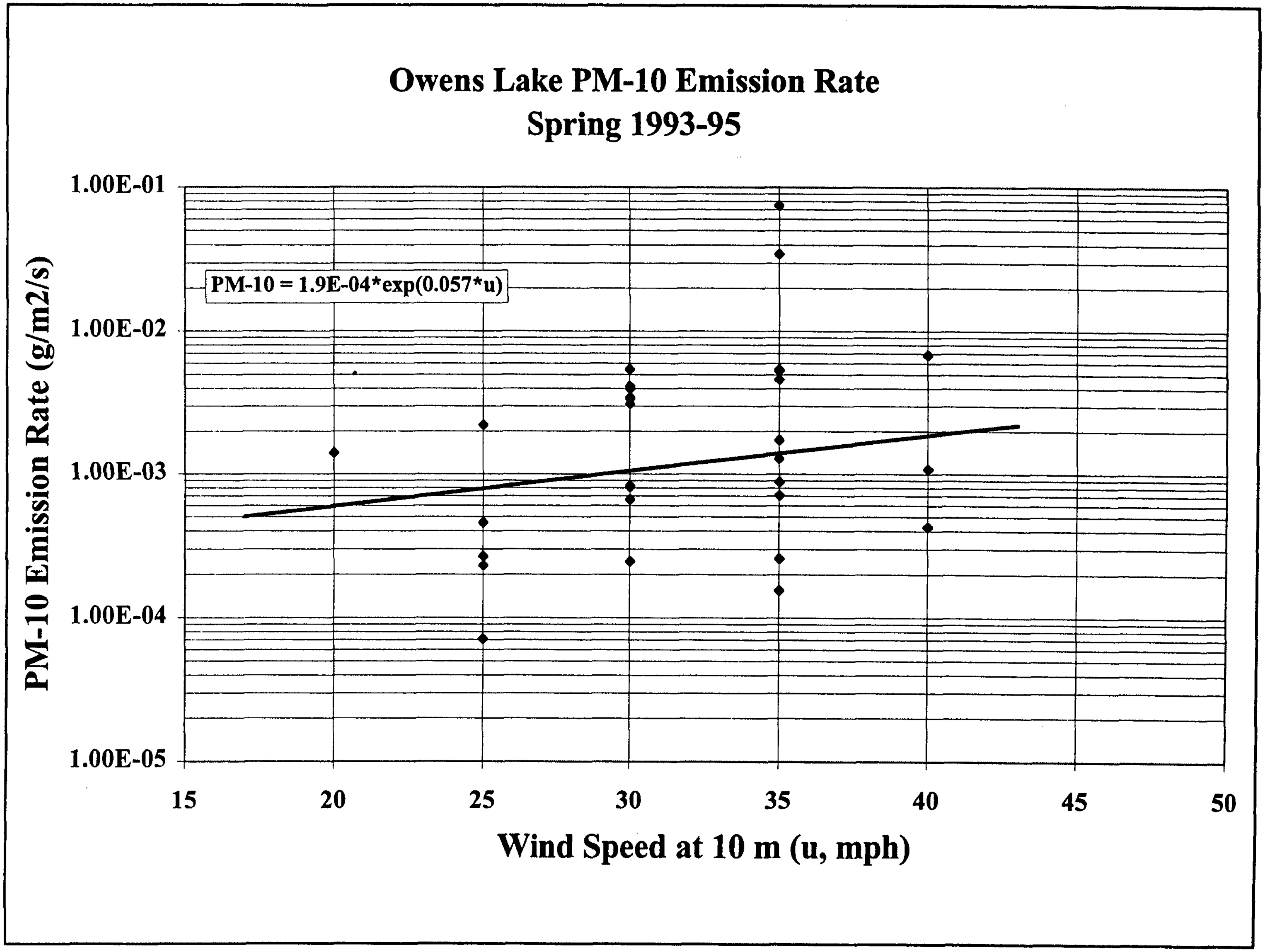

Figure 4.3: Spring PM_{10} wind erosion emission data generated from the portable wind tunnel at Owens Lake.

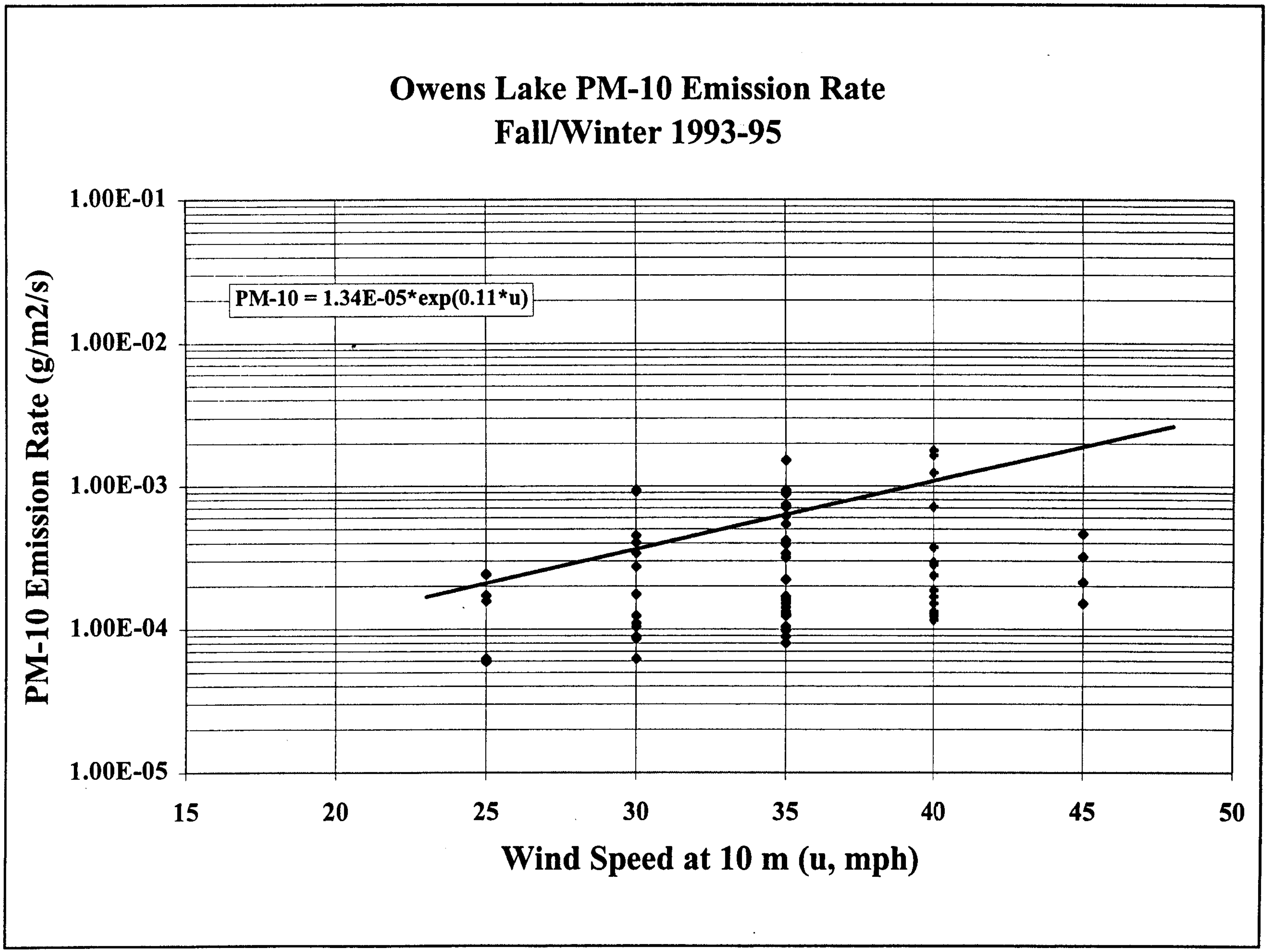

Figure 4.4: Fall/winter PM_{10} wind erosion emission data generated from the portable wind tunnel at Owens Lake.

4-3.2.2 Model Validation Emission Algorithms. The ISC3 dispersion model was validated against PM_{10} monitoring data on dust storm days in 1994 and 1995 (MFG, 1996b and MFG, 1997a). The emission algorithms for these model validation runs were derived from wind tunnel data collected at Owens Lake around the time of the storms. Data for the model validation runs were collected from two fall dust storms in 1994 and four spring dust storm days in 1995. Equations 4-3 and 4-4 were generated using all the data points from the wind tunnel runs during those periods. The fall 1994 algorithm closely matches the 1993 through 1995 algorithm in equation 4-1, while the Spring 1995 validation algorithm generates PM_{10} emissions that are two to three times lower than the Spring 1993 through 1995 algorithm in equation 4-2.

Fall 1994 Model Validation Algorithm

$$PM_{10}\,(g/m^2/s) = 1.2 \times 10^{-5} \exp[0.27*u(m/s)] \qquad \text{Equation 4-3}$$

$$PM_{10}\,(g/m^2/s) = 1.2 \times 10^{-5} \exp[0.12*u(mph)]$$

Spring 1995 Model Validation Algorithm

$$PM_{10}\,(g/m^2/s) = 4.0 \times 10^{-6} \exp[0.36*u\,(m/s)] \qquad \text{Equation 4-4}$$

$$PM_{10}\,(g/m^2/s) = 4.0 \times 10^{-6} \exp[0.16*u(mph)]$$

Where u is the hourly average wind speed in meters per second at a 10 meter anemometer height for wind speeds above 7.6 meters per second (17 mph). For wind speed less than this threshold it is assumed that the PM_{10} emission rate is negligible.

4-3.2.3 Controlled Emissions for Uncontrolled Shallow Flooding. An emission factor was determined for areas adjacent to the water on the North Flood Irrigation Project. Almost all the valid runs performed in these areas had non-detectable PM_{10} emissions. A PM_{10} emission flux rate of 4.1E-06 $g/m^2/s$ was determined by averaging all the runs together including those runs with non-detectable amounts of PM_{10} emissions. As shown in Figure 4.5 there is no apparent wind speed relationship to the data. This emission rate is constant when wind speeds are greater than 25 miles per hour (11 m/s) at 10 meters and does not increase with wind speed.

4-3.2.4 24-hour and annual PM_{10} emissions using the wind tunnel data. The wind tunnel based emission algorithms for Owens Lake were used to estimate the emissions per unit area from the erodible areas on and off the lake bed. The emissions were estimated as a function of wind speed. Lake bed emissions were based on 'B' Tower wind speeds, while off-lake emissions from the Keeler Dunes, Olancha Dunes and areas near highway 190 were based on wind speeds at Keeler or Olancha which are lower than the 'B' Tower wind speeds due to rougher terrain. See the source area map in Figure 4.1. The off-lake areas between Keeler and Olancha use the Keeler wind speed data. Based on the number of observed dust events, these areas are less active than

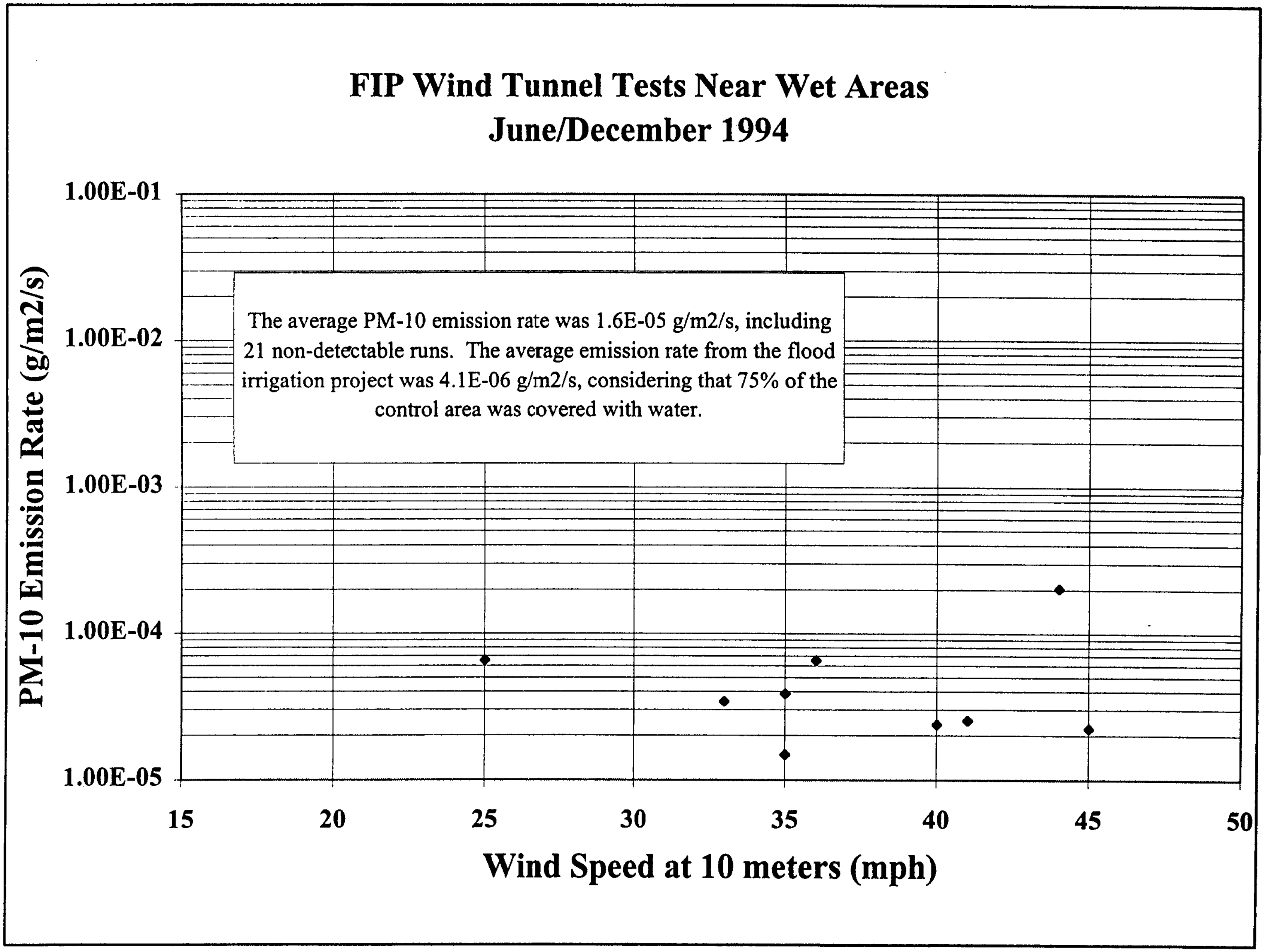

Figure 4.5: PM_{10} emissions from the North Flood Irrigation Project determined with the portable wind tunnel.

CHAPTER 6

AIR QUALITY MODELING

6 AIR QUALITY MODELING

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the Keeler Dunes and much less active than the Olancha Dunes (Niemeyer and Niemeyer, 1995). This may indicate that the off-lake winds for this area are more similar to Keeler than to Olancha. Table 4.2 summarizes the PM_{10} emission estimates for 1995 using equations 4-1 and 4-2 for wind tunnel data collected from 1993 through 1995. The annual PM_{10} emissions from on-lake and off-lake source areas was 291,100 tons in 1995, while the peak 24-hour emissions were estimated for April 9, 1995 at 8,862 tons of PM_{10}. Using the validation modeling equations 4-3 and 4-4 for 1995 yields lower values for 1995, of 4,456 tons for 24-hours and 129,900 tons for the annual emissions (Ono, 1997). These results are summarized in Table 4.3.

Because more than twice as many emission runs were used to characterize the 1993 to 1995 emissions equation (n = 102), and because they represent three years of sampling instead of one, equations 4-1 and 4-2, may provide a better estimate for the PM_{10} emission potential for any given year and are used for the Owens Lake primary and secondary wind erosion estimates in Table 4.1. The model validation equations, 4-3 and 4-4, used emission data from fall 1994 and spring 1995, so it is more appropriate for use in predicting the ambient impacts in the model validation analysis which was also done for 1994 and 1995.

4-3.3 Sun Photometry Method for PM_{10} Emissions

The sun photometry emission estimation method allows the observer to measure the total amount of PM_{10} in a vertical column of air using the sun as a source of light to measure light scattering. With a known size distribution for the dust particles, a measurement of the change in scattered light from the sun can be used to determine the amount of suspended PM_{10} in the vertical column. A number of measurements across the dust plume's path are used to estimate the total vertical flux of PM_{10} that is entrained from the source area where the dust was generated. The size of the dust generation areas were concurrently mapped for the vertical flux calculation. This methodology and the results of measurements are included in the report "Characterization of Source Areas, Size and Emission Rates for Lake Owens, CA, October 94- October 95, *Optical Depth, Columnar Mass, Concentration and Flux of* PM_{10}," (Niemeyer, 1995).

For this study, Niemeyer mapped the source area locations and boundaries by observing dust storms from Cerro Gordo, 10 to 15 miles from the lake bed. Plumes were seen when lake level winds were as low as 5 m/s (11 mph). Niemeyer's PM_{10} emission flux readings using the sun photometer measured a range of values from 2.7×10^{-3} to 7.62×10^{-2} g/m^2-s, with an average value of 2.64×10^{-2} g/m^2-s for nine storms.

Although Niemeyer did not make an estimate of the annual PM_{10} emissions from the sun photometry method, Sahu used her observations to estimate the average source area size of the dust plumes and estimated the duration of wind events (McCarley, 1996). Sahu estimated that 915 hours of wind events occurred that were above a 5 m/s threshold during the observation period, and that the average source area size for each event was 4,388,451 m^2. Using Niemeyer's average flux, this yields an annual PM_{10} estimate of 420,672 tons for the period from October

Table 4.2 PM_{10} emission estimates for the 1995 base year using the portable wind tunnel data from 1993 - 1995 for Equations 4-1 and 4-2.

		24-hr Emissions on 4/9/95		Annual Emissions	
Erosion Area	Size (m^2)	($g/m^2/day$)	(tons/day)	($g/m^2/yr$)	(tons/yr)
Lake Bed	90.68×10^6	83.5	8,346	2,800	279,900
Keeler Dunes	1.84×10^6	52.8	107	951	1,900
Upper Hwy 190	2.17×10^6	52.8	126	951	2,300
Mid-Hwy 190	1.25×10^6	52.8	73	951	1,300
Olancha Dunes	3.04×10^6	62.8	210	1,692	5,700
TOTALS	98.98×10^6		8,862		291,100

Table 4.3 PM_{10} emission estimates for 1995 using the portable wind tunnel data from Fall 1994 and Spring 1995 Equations 4-3 and 4-4.

		24-hr Emissions on 4/9/95		Annual Emissions	
Erosion Area	Size (m^2)	($g/m^2/day$)	(tons/day)	($g/m^2/yr$)	(tons/yr)
Lake Bed	90.68×10^6	43.2	4,318	1,262	126,150
Keeler Dunes	1.84×10^6	13.2	27	282	570
Upper Hwy 190	2.17×10^6	13.2	32	282	670
Mid-Hwy 190	1.25×10^6	13.2	18	282	390
Olancha Dunes	3.04×10^6	18.2	61	632	2,120
TOTALS	98.98×10^6		4,456		129,900

1994 to October 1995. For days with winds above the threshold, that lasted for 24 hours, such as those that occurred in spring 1995, the peak 24-hour PM_{10} emissions estimate is 11,034 tons.

4-3.4 Reconciliation of the Portable Wind Tunnel and Sun Photometry Methods of PM_{10} Estimates for Wind Erosion

Although the portable wind tunnel method yields a single emission rate that is applied to a large area, it is not correct to assume that dust plumes and emissions within the area are homogenous. Like the visual observations, some areas may have very visible dust plumes and should have high emission rates, while other areas appear to emit nothing. As shown by the graph of wind tunnel data for spring emission rates in Figure 4.3, at 35 miles per hour, the (geometric best fit curve) "average" is composed of runs that have emission rates that are an order of magnitude higher and lower than the average. It is likely that this entire range of emission rates is occurring simultaneously from different locations within a large source area. A large source area may have subareas that are emitting in the order of 10^{-2} g/m^2-s, another area at 10^{-3}, other areas at 10^{-4}, and some areas are not emitting at all. The emissions algorithm generated by the wind tunnel incorporates this heterogenous source mix into an average emission rate as a function of wind speed. Although this methodology yields a single emission rate for a large area, it also reflects the heterogeneity in dust plumes that are observed. This includes averaging in portions of the source area that may not be emitting, which reduces the area-wide average emission flux rate. (Ono, 1996)

In contrast to the portable wind tunnel method, the sun photometry method is based on observing and mapping individual dust plume source areas and measuring the PM_{10} emission flux from a smaller area. Although the source area size is smaller, the PM_{10} flux rates are generally larger than those estimated with the portable wind tunnel. These differences tend to balance when comparing overall emissions with the portable wind tunnel. The product of the two variables results in a 20 to 30% higher estimate of PM_{10} using the sun photometry method than with the wind tunnel method (Equations 4-1 and 4-2).

Table 4.4 summarizes the results for the different methods of estimating annual and 24-hour PM_{10} emissions from wind erosion at Owens Lake. Note that the 1995 base year emission inventory shown in Table 4.1 utilizes a mid-range value from the wind tunnel based method for 1993 to 1995 sampling runs.

Table 4.4 Summary of results for different methods of estimating annual and 24-hour PM_{10} emissions from wind erosion at Owens Lake.

	PM_{10} Emissions	
Method	Peak 24-hour Tons/Day	Annual Tons/year
Wind Tunnel (1993-95)	8,862 (4/9/95)	291,100
Wind Tunnel (Fall '94, Spring '95)	4,456 (4/9/95)	129,900
Sun Photometer	11,034 (4/9/95)	420,672

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CHAPTER 5

CONTROL MEASURES

5 CONTROL MEASURES

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5 CONTROL MEASURES

5-1 INTRODUCTION

Control measures are defined as those methods of PM_{10} abatement that could be placed onto portions of the Owens Lake playa and when in place are effective in reducing the PM_{10} emissions from the surface of the playa. For approximately the last 12 years the District and other researchers have been involved with the study of the lake environment and the mechanisms that cause Owens Lake's severe dust storms. For the last six years the District has pursued a comprehensive research and testing program to develop PM_{10} control measures that are effective in the unique Owens Lake playa environment. Control measures that were tested on the lake but have been rejected as effective dust control measures for the SIP included the use of sprinklers, chemical dust suppressants, surface compaction, sand fences, and brush fences. These measures were discussed in the Owens Valley PM_{10} Planning Area Demonstration of Attainment SIP Projects Alternatives Analysis document (GBUAPCD, 1996). For the attainment demonstration included in Chapters 6 and 7, three PM_{10} control measures will be used; shallow flooding, managed vegetation and gravel.

This section includes; a brief description of each control measure used in the attainment demonstration, a discussion of the PM_{10} emissions after the control measure is implemented, and the conditions that need to be met to achieve the necessary level of control. These descriptions contain both mandatory and conceptual elements and are provided to illustrate how the control strategy mandated by this SIP may be feasibly implemented. The mandatory elements of the control strategy are set forth in the proposed form of the Board Order in Section 8-2. Control strategy elements not mandated by this SIP are left to the discretion of the City of Los Angeles. Chapter 7 of this document will show where these controls will be used on the playa to achieve the National Ambient Air Quality Standard for PM_{10}.

5-2 SHALLOW FLOODING

5-2.1 Description of Shallow Flooding for PM_{10} Control

The surfaces of naturally wet areas on the lake bed (i.e., those areas typically associated with seeps and springs) are resistant to wind erosion that causes dust. Shallow flooding mimics the physical and chemical processes that occur at and around natural springs and wetlands (Figure 5.1). In these areas, water discharges across the flat lake bed surface by raising the level of the shallow groundwater table to the surface. The areal extent of wetting is dependent upon the amount of water discharged to the surface, evaporation rate and lake bed topography. The size of the wetted area is less dependent on soil type because, once the water table is raised to the playa surface, surface evaporation is soil-type independent. Shallow flooding provides dust control over large areas with minimal infrastructure and it requires minimal ongoing operation, maintenance and lake bed access.

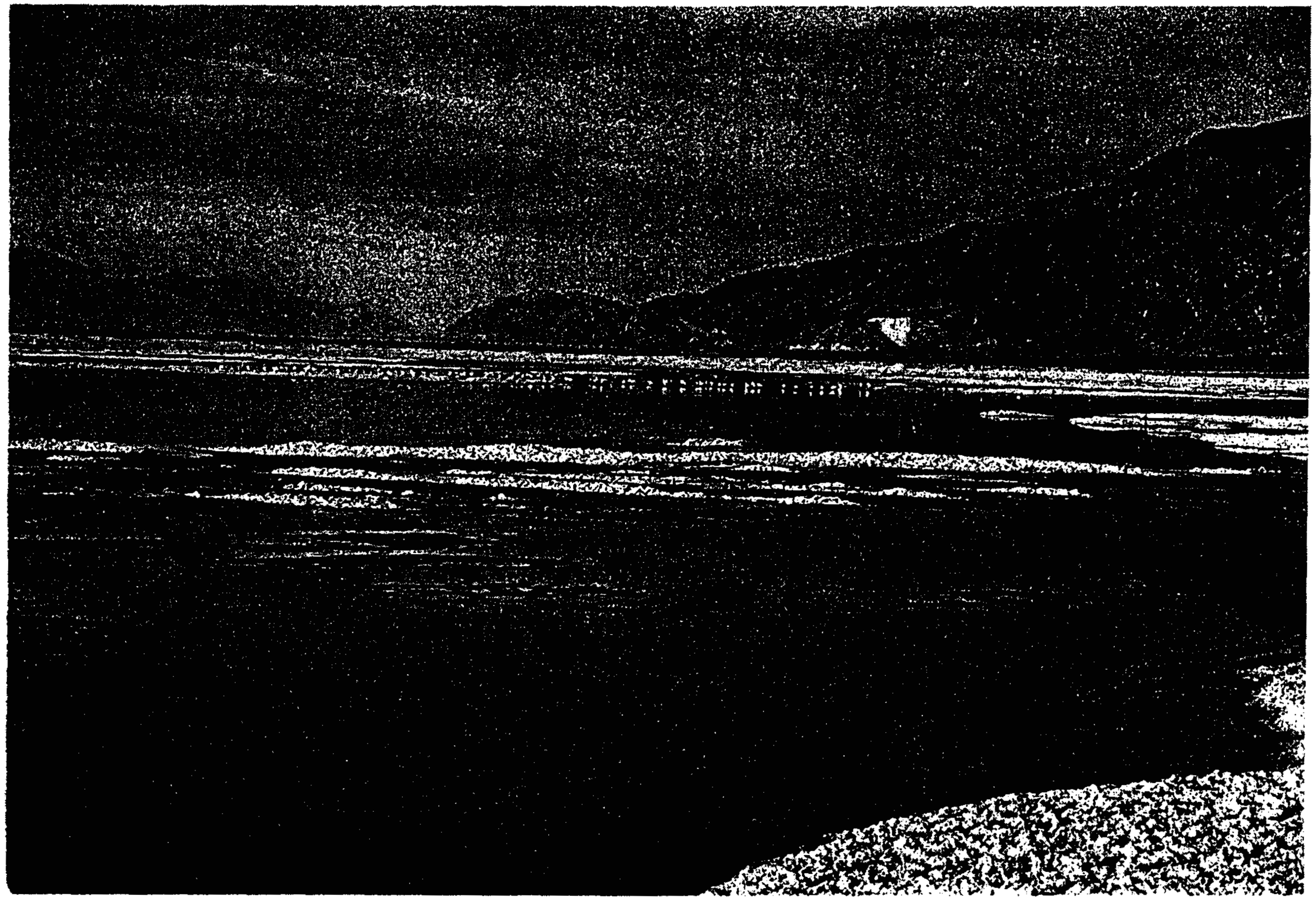

Figure 5.1: Shallow flooding - test site photograph.

This control measure consists of releasing water along the upper edge of the PM_{10} emissive area elevation contour lines and allowing it to spread and flow down-gradient toward the center of the lake. To attain the required PM_{10} control efficiency, at least 75 percent of each square mile of the control area must be wetted (i.e., standing water or surface saturated soil) between September 15 and June 15 each year. This coverage can be determined by aerial photography (Hardebeck, *et al.*, 1996). To maximize project water use efficiency, flows to the control area will be regulated at the outlets so that only sufficient water is released to keep the soil wet. Although the quantity of excess water will be minimized through system operation, any water that does reach the lower end of the control area will be collected and recirculated through the system. At the lower end of the flood area, or at intermediate locations along lower elevation contours, excess water will be collected along collection berms keyed into lake bed sediments and pumped back up to the outlets to be reused (Figure 5.2).

Due to the generally flat, uniform nature of the lake bed, the outlet water would spread over wide areas to create a random pattern of shallow pools. These pools would be generally less than a few inches deep. Pooled areas will produce no PM_{10}, and will act as sand traps to prevent crust abrasion and dust generation. Damp and saturated soils also resist wind erosion. Locally high areas or "islands" of non-wetted soil tend to self-level; the soil blows off the higher islands and is captured in the pools. Thus, over time the high areas would become lower and the low areas would become higher. This leveling process can be expected to occur over a period of a few years. In some limited cases, it may be necessary to mechanically level high areas. This would occur primarily where previous earthwork performed on the lake bed prevents natural uniform spreading of PM_{10} control waters.

Shallow flooding will require a water transmission, distribution and outlet infrastructure and the construction of electrical power lines, access roads and water control berms as discussed in the Draft EIR for the SIP..

Prior to testing shallow flooding on a large scale on Owens Lake, there was concern that the addition of water over large areas sufficient to raise the shallow groundwater table to the surface would create new areas of salt efflorescence. The results of the large-scale tests indicated that salt efflorescence caused by shallow flooding was insignificant, between 0 to1 percent of the test area (Hardebeck, *et al.*, 1996).

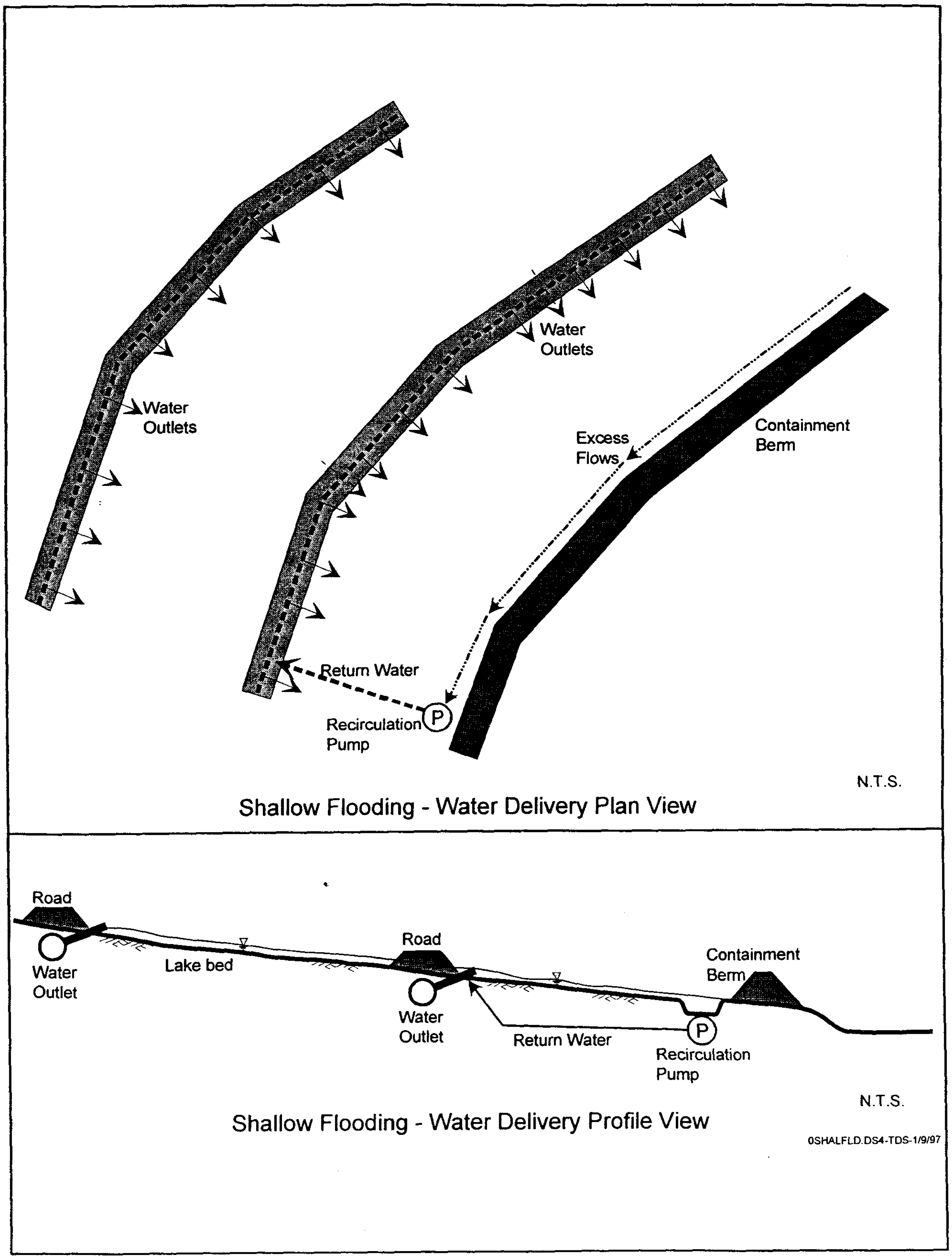

Figure 5.2: Shallow flooding - water delivery schematic.

5-2.2 PM_{10} Control Effectiveness for Shallow Flooding

Shallow flooding has been shown to be effective for controlling wind blown dust and PM_{10} on sand dominated soils on the lake bed. Between 1993 and 1996 a 600-acre test was conducted on the sand sheet between Swansea and Keeler. Effectiveness was evaluated in four ways; a) from aerial photographs assuming that flooded areas provided 100% control, b) from portable wind tunnel measurements of test and control areas, c) from fetch transect (2-dimensional) analysis of sand motion measurements; and d) from areal (3-dimensional) analysis of sand motion measurements. The average control effectiveness was 99% after the surface water covered 75% of the test area. Wind tunnel tests showed an area-wide PM_{10} emission rate of $4.1x10^{-6}$ g/m^2-s, for the shallow flood site when 75% of the surface area was covered with water. This emission rate, which is used for the attainment demonstration modeling, applies to periods when the hourly average wind speed is greater than 25 miles per hour at 10 meters. (Hardebeck, *et al.*, 1996, See Appendix D)

5-2.3 Shallow Flooding Habitat

Where shallow flood water is distributed across the playa, opportunistic plant species are expected to establish themselves where conditions are favorable. Limited stands of cattails (*Typha* sp.), sedges (*Carex* sp.), saltgrass (*Distichlis spicata*), and other species associated with saturated alkaline meadows of the region have colonized the immediate vicinity of the water outlets on the flood irrigation project. Based on testing performed by the District at the North Flood Irrigation Project test area, naturally established vegetation can be expected to immediately occur on about 0.5 percent of the area that is controlled with shallow flooding. This percentage may increase over time.

The expansive shallow flooded areas and the naturally established vegetation provide ephemeral resting and foraging habitat for wildlife use. Figure 5.1 is a photo of the District's North Flood Irrigation Project during a shallow flooding testing project. A large flock of shorebirds can be seen using the wetted area. Figure 5.3 is a photo of cattail vegetation that naturally established near the water outlets on the shallow flooding test site. Insect and shorebird utilization of wet areas created by District testing on the lake bed was common during control measure testing. Based on these previous experiences, it is anticipated that shallow flooding will create large areas of plant and wildlife habitat in areas where very little previously existed. Due to the initially hostile environment for plants on Owens Lake and the desire to vegetate as much of the lake bed as possible in order to provide for effective PM_{10} control, livestock grazing will be prohibited in areas where shallow flooding will be used as a PM_{10} control measure.

Figure 5.3: Shallow flooding - photograph of naturally establishd vegetation.

In addition to desirable plant species, such as those listed above, that may invade and help to control PM_{10} emissions, there is the possibility that undesirable non-native salt cedar (*Tamarix ramosissima*) may invade wet playa areas. A mandatory element of this project will be a program to remove any salt cedar that invades PM_{10} control areas. Salt cedar on the lake bed will be controlled independently or through annexation into Inyo County's control program. Annexation into the County's program would require a cooperative agreement with Inyo County.

Every effort will be made to limit the potential for introduction of exotic pest plant species into source emission areas that will be controlled through the use of shallow flooding. Fortunately, the existing saline soil conditions inherent to the lake bed are inhospitable to most plants including exotic pest plants such as tamarisk, puncture weed and Russian thistle and noxious grasses such as *Cenchrus*. Exotic pest plants and noxious grasses will be removed from the source emission area (if present) prior to the initiation of shallow flooding. Removal will be accomplished through an appropriate combination of biological, mechanical and chemical control methods.

A key consideration in the design of the Shallow Flooding PM_{10} Control Measure for Owens Lake has been the need to maintain existing breeding population of shorebirds, and the western snowy plover in particular. Owens Lake is an important stopover on the Pacific flyway. Thousands of shorebirds stop at Owens Lake in the spring. The majority of these shorebirds continue northward to breeding areas at Mono Lake, northern California, the Pacific Northwest and Canada. Implementation of the Shallow Flooding PM_{10} Control Measure would be expected to provide suitable nesting and foraging habitat until June 15. A portion of the shorebirds that would have normally continued their migration to northern breeding areas are expected to remain at Owens Lake and utilize nesting and foraging habitat created as a result of the Shallow Flooding PM_{10} Control Measure.

Cessation of the Shallow Flooding PM_{10} Control Measure on June 15, prior to successful fledging of shorebirds is predicted to have a significant adverse impact on these shorebird populations. In order to minimize the potential disruption of breeding activities, the water distribution system (Figure 5.4) has been designed with laterals spaced at one mile intervals. Water delivery may be reduced on June 15 but, if reduced, must be continued at a reduced rate from June 16 until July 31 when most shorebirds have successfully fledged. This design ensures that wetted areas, which provide important resting and foraging habitat, are available within a maximum of one-half mile of dry areas on the playa most likely to be support nesting shorebirds. It is anticipated that the reduced water delivery rate during the summer would use approximately 10 to 20 percent of the water used by the shallow flooding control measure during the September to June period (approximately 1,500-2,000 gpm during full-flow periods and 150-400 gpm during habitat maintenance flows).

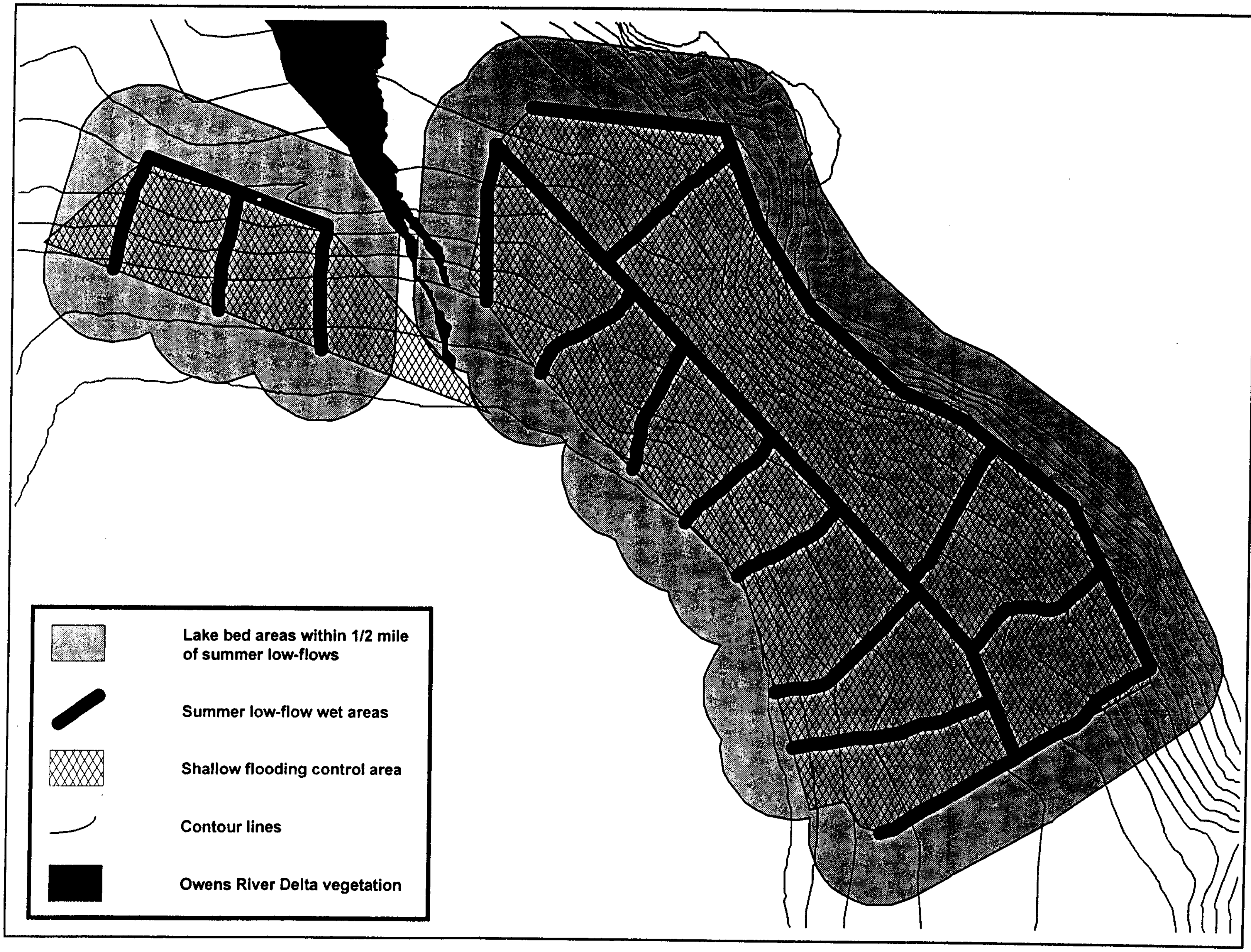

Figure 5.4: Conceptual location of June 15 to July 31 habitat maintenance flows.

Field investigations were performed by mosquito entomologists from the University of California, Davis at District shallow flooding test sites and at natural pond, spring and seep areas around Owens Lake to determine the potential for water-based control measures to create mosquito-breeding habitat (Eldridge, 1995). These investigations concluded that mosquito habitat had limited potential to occur on the lake bed, but could occur when water depths range from 2-20 inches and when water had essentially no movement.

To prevent the creation of potential mosquito-breeding habitat, a mandatory element of this project will be detailed design of the site infrastructure which incorporate specific measures to minimize water depths ranging from 2 to 20 inches and to prevent still-water areas from forming. An additional mandatory element of this project will be a program to abate mosquito breeding and swarming. Abatement activities may include application of pesticide or biological controls. These measures are successfully used throughout the Owens Valley. As an alternative to a separate mosquito abatement program, the City of Los Angeles may petition the County of Inyo to annex all water-based control measure areas into the Inyo County Mosquito Abatement Program. Appropriate assessments will be levied to ensure that abatement activities can take place, if necessary.

In recognition of the location of the source emission control areas in an area that is a stopover location for shorebirds and waterfowl, the mosquito abatement program shall be designed to minimize the potential impacts on the breeding success of western snowy plovers and other birds that use the playa. The program will be designed in accordance with the following parameters:

- Preference will be based on biological control measures;
- Mosquitofish will not be introduced into existing aquatic habitats or areas that are connected to existing aquatic habitats;
- Bat house/roosting structures (designed to preclude raptor perching) will be used as a component of the mosquito abatement program;
- Pesticides that have been identified by the State or Federal Environmental Protection Agencies as being known or expected to cause thinning of eggshells in native avian populations will not be used as part of the mosquito abatement program;
- Representative fragments of failed eggs from native birds in mosquito abatement areas recovered during the course of normal mosquito abatement activities will be subject to analysis by a certified laboratory to assess the influence of mosquito abatement activities on egg failure; and
- Mosquito abatement activities will be conducted in accordance with State-of-the-Practice procedures established by the United States Department of Agriculture, Animal Damage Control.

5-2.4 Shallow Flooding Operation and Maintenance Activities

Water flows between September 15 and June 15 will be maintained to provide the required 75 percent of the area in standing water or saturated soil. During cool weather when evaporation rates are low, it may be possible to shut off flows completely for short periods as long as saturated soil conditions are maintained. To maximize water use efficiency, water flows should be minimized during the summer months when PM_{10} standard violations are infrequent and evaporation rates are high. It is a mandatory element of this project that minimal water flows be maintained between June 15 and July 31 to sustain established vegetation and wildlife. Between July 31 and September 15 the flows may be shut off completely. Based on the District's large-scale tests of shallow flooding, operating the shallowing flooding control measure in this manner is predicted to use approximately four acre-feet per year (ac-ft/yr) of water per acre controlled. Careful management of shallow flood areas may allow for even less water to be used.

Maintenance activities associated with shallow flooding would consist of minor grading and berming on the control areas to ensure uniform water coverage and prevent water channeling. Staffing requirements for operation and maintenance of the shallow flooding areas are estimated at approximately one FTEE per 3,200 acres of flooded area.

5-3 MANAGED VEGETATION

5-3.1 Description of Managed Vegetation for PM_{10} Control

Where water appears on the playa surface with quantity and quality sufficient to leach the salty playa surface and sustain plant growth, vegetation has naturally become established. The saltgrass meadows around the playa margins and the scattered spring mounds found on the playa are examples of such areas. Vegetated surfaces are resistant to soil movement and thus provide protection from PM_{10} emissions. The managed vegetation strategy creates a mosaic of irrigated fields provided with subsurface drainage to create soil conditions suitable for plant growth using a minimum of applied water. An aerial view of a 40-acre test plot using this strategy is shown in Figure 5.5. Because this measure relies on earthen infrastructure for water distribution, it is best suited for use in clay soils that can be used for the construction of ditches, berms, channels and reservoirs that allow for level border irrigation strategies that leach and drain readily through the fractured structure of the soil. The proposed methods of soil reclamation are similar to those used elsewhere in this country and world-wide for desalinization of salt-affected soils, allowing such soils to be useful for plant growth. Feasibility of implementation, and effectiveness for PM_{10} control, are detailed in "Vegetation as a Control Strategy: Updated Report" which is included as Appendix E to this document.

This control measure consists of a creating a farm-like environment containing small (approximately 4-20 acre) confined fields constructed on contour that are irrigated with shallow

Figure 5.5: Managed vegetation - test site aerial photograph.

pulses of water. The amount of water required to leach the soils to within a level suitable for salt-tolerant species depends on specifics of soil type and of surface treatment. Studies at the test plot indicate that between 3½ and 6 feet of water will be necessary to permanently reclaim a two-foot deep soil profile to a level suitable for planting with saltgrass (Ayars, 1997). This amount of water can be delivered to the fields in 4-6 irrigation events, which can take place during a period of about 3 to 4 months. As the salt levels in the leached plots decline, plants can be introduced to the fields and irrigated using the same methods. Therefore, if leaching began during the winter months, saltgrass could be planted during the spring of the same year.

To attain the required PM_{10} control efficiency, a plant cover of 50 percent live or dead cover will be sufficient on the 75 percent of the total managed vegetation control area that will be vegetated. Data from test plots on the lake indicate that such cover can be achieved during the third growing season. Total cover will include both live and dead plant material, as both function to prevent PM_{10} emissions. Field studies on Owens Lake test plots confirm that the target salt grass cover of 50 percent can be sustained with 2.5 acre-feet per year of irrigation water for each acre planted with saltgrass. This results in an overall water requirement of two acre-feet of water per year per total acre of managed vegetation control area. The remaining 25 percent of the total control area will consist of such control measure infrastructure as roads, reservoirs, canals and drains. Percent cover can be measured by the point frame method (Scheidlinger, 1997, see Appendix E).

Irrigation leaches the soils of the salts, which are removed from the area using subsurface open drains (Figure 5.6). On the clay dominated soils found in the area designated for managed vegetation, irrigation with fresh water can potentially cause a collapse of the soil structure, preventing water infiltration and salt leaching. However, in field studies on the Owens Lake bed, this has not been observed to occur. The drainage system is constructed, however, to allow for the mixing of fresh water and saline drain water to achieve an ideal irrigation salinity (calculated to be approximately 15 dS/m) (Ayars, 1997). If drain water is not reused for irrigation, the drain water will be discharged to downhill evaporation ponds where a saturated evaporite deposit will be formed and managed in wet condition in order to prevent PM_{10} emissions.

Leaching and irrigation water applied to the managed vegetation also serves to maintain a downward gradient of salts in the rooting column of the soil of the plots in order to prevent salt from the shallow water table from rising into the rooting zone by capillary action. The drain system in the managed vegetation area has the additional function of preventing the rise of the water table into the rooting zone on the fields, and the irrigation schedule will maintain the necessary downward gradient within the rooting zone.

Constructing the fields on contour means that the fields are essentially flat, and the water spreads evenly over them allowing for very efficient irrigation. The leaching fraction of the irrigation water will be recovered in the drains. During the initial years of the project, this drain water will contain sufficient salts to render it useless as irrigation water, and it will be discharged for use in

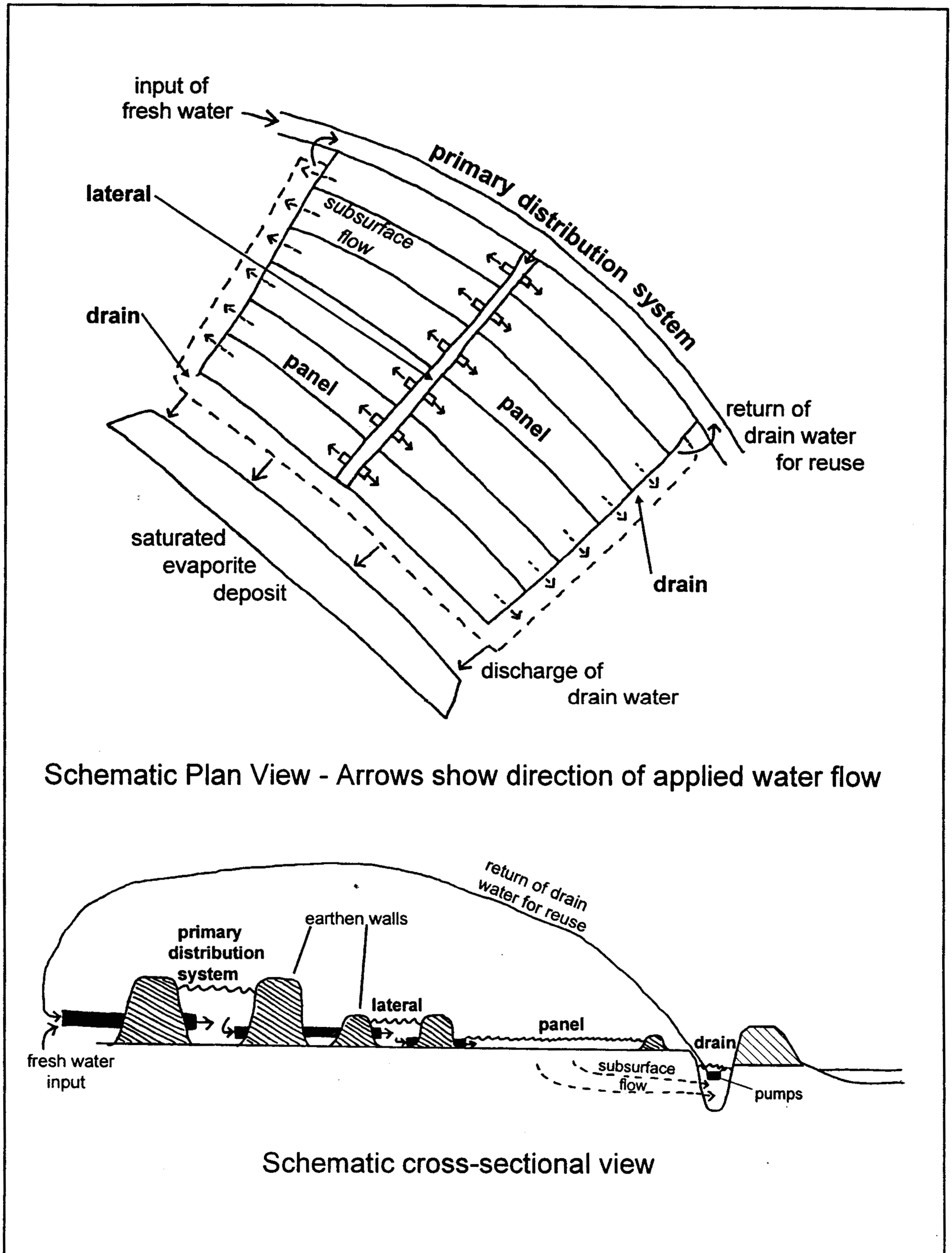

Figure 5.6: Managed vegetation - water delivery schematic.

shallow flooding or to the low sump locations. As the fields improve in quality, the drain water may be of a quality adequate for recirculation as irrigation water and can be returned to the fields.

Managed vegetation will require a water transmission, distribution, and drainage infrastructure presented in schematic form in Figure 5.6. It will also require the construction of access roads, recirculation pumps and water and flood control berms.

The sump area saturated evaporite deposits will be located adjacent to the existing evaporite deposit above the brine pool. The deposit areas will be constructed in clay soils. Intrusion into the existing deep groundwater system will be prevented by the high upward hydraulic gradient experienced in this area (approximately 40 feet above the surface in the nearby existing South FIP well). As with many areas of the lake bed, these upward groundwater gradients, in the absence of a drainage system, maintain high soil moisture levels and will help to maintain the deposits in a wet condition. Management of contoured field drainage waters will ensure that the deposits remain wet and non-emissive. As the soils in the contoured fie[illegible]ed of salt, their drain water will be able to be recirculated back into the irrigation system.

Saltgrass (*Distichlis spicata*) will be the only plant species considered [illegible] be introduced to the fields. It is tol[illegible] of relatively high soil salinity, spr[illegible] via rhizomes, and provides good protective c[illegible] year-round even when dead or dorm[illegible]s stands can subsist with minimal amounts of applied water during the summer, and [illegible] effectiveness remains undiminished, provide[illegible]t adequate irrigation has stimulated [illegible] and has provided stored water in the pl[illegible] rooting zone during the spring mon[illegible]

5-3.2 PM_{10} Control Effectiv[illegible] for Managed Vegetation

Recent field and wind tunnel research using Owens playa sands and actual saltgrass vegetation has been conducted by Lancaster and White (Lancaster, 1996, White, *et al.*, 1996). These studies indicate that even sparse populations of saltgrass function very effectively in reducing sand migration and PM_{10} within the stand. Lancaster concluded that for the c[illegible] of the north sand sheet on Owens Lake, 95% reduction in sand movement can be ach[illegible] a saltgrass cover of between 16 to 23%, depending on wind speed and direction. White showed that a vegetation cover of 12 to 23% will significantly reduce the amount of entrained sand and PM_{10}.

Wind tunnel studies were conducted in February 1997 on untreated, lea[illegible], vegetated, and "simulated" vegetated sites on the Owens Lake clay soils (Nickling *et al.* 1997). Although the vegetation increased the aerodynamic roughness of the surface, there w[illegible]ally significant difference between PM_{10} emissions from the vegetated and from the control (leached but unvegetated) sites. Both of these sites, however, showed PM_{10} redu[illegible] orders of magnitude compared to the natural playa surfaces. This indicates that tr[illegible] the clay surfaces at Owens Lake by watering and leaching surface salts can by itself significantly reduce wind erosion without vegetation. However, saltgrass vegetation cover will provide additional surface protection after the initial protection provided by watering decreases (Nickling *et al.* 1997).

In a companion project, Owens Lake clay soils with saltgrass were subjected to various windspeeds in a wind tunnel at the University of California Davis. Preliminary results (White, 1997) indicate that 54% vegetation cover reduces the emission rate of PM_{10} at wind speed of 45 mph by 99.2% as compared to emissions from the natural playa at Owens Lake.

Control efficiencies were calculated for Owens Lake clay soils in both the field and the laboratory wind tunnels. The field studies showed 99.5% control efficiency with 11% saltgrass cover, and the laboratory study demonstrated 99.2% control efficiency at 54% cover as compared to uncontrolled emissions at Owens Lake.

The plan for managed vegetation is to achieve cover values of at least 50%, a value that would include dead or dormant stems that would provide erosion protection without presenting a transpirative surface. This level of cover could be retained with minimal water use during the summer, and would function during winter months as well without irrigation. A high control effectiveness for low levels of plant cover in natural agricultural-type soils is supported by field research performed by Buckley and Grantz, *et al.* in places other than Owens Lake, which indicate that a plant cover of even 30% can achieve better than 99% reduction of soil erosion (Buckley, 1987; and Grantz, *et al.*, 1995).

Based on the Buckley and Grantz field studies, the field studies at Lake Texcoco, other work relating to PM_{10} emissions and vegetation, and studies done at Owens Lake, staff believes that more than 99% reduction of soil erosion and PM_{10} will be achieved at Owens Lake with a salt grass cover of 50%. Table 5.1 summarizes research results regarding vegetation cover and control effectiveness. For modeling and emissions inventory purposes the controlled PM_{10} emissions from the vegetation managed area is estimated at 1% of the uncontrolled emissions and emission rate.

5-3.3 Managed Vegetation Habitat

Although saltgrass is the only plant species that will be deliberately introduced to the managed vegetation area, other plants species are expected to establish themselves opportunistically. Plant species observed on saltgrass test plots include seablight (*Sesuvium verrucosum*), parry saltbush (*Atriplex parryi*), and rabbitfoot grass (*Polypogon monospeliensis*). Other species typical of transmontane alkaline meadows elsewhere in the region, such as inkweed (*Nitrophila occidentalis)*, Nevada sedge (*Scirpus nevadensis)*, and yerba mansa *(Anemopsis californica*) would also be expected to appear, adding diversity and wildlife habitat value to the fields. On

Table 5.1. Summary of studies relating the surface cover of vegetation to percent control of PM_{10} emissions.

SUMMARY OF VEGETATION COVER AND CONTROL EFFECTIVENESS STUDIES

Reference	Surface Cover Characteristics	Wind Speed[1]	% Control
van de Ven, *et al.*, 1989	4-5 inch high stubble, 30 stems/ sq. ft 19.28 mph threshold on bare surface.	NA	100%
Fryrear, 1994	50% canopy cover.	48 mph	96.3%
Musick & Gillette, 1990	25% vegetation lateral cover, 19.4 mph threshold on bare surface. (1)	NA	100%
Buckley, 1987	30% ground cover.	NA	99%
Grantz, *et al.*, 1995	31% cover on sandy soil.	NA	99.8%
Lancaster, 1996	16-23% salt grass cover at Owens Lake on sandy soil.	39 mph	95%
White, *et al.*, 1997	42% cover on loose Owens Lake sand in a wind tunnel.	44 mph	97.1%[2]
Nickling *et al.*, 1997	11-30% saltgrass cover at Owens Lake on clay soil.	≥ 45 mph	99.5%[3]
White, 1997	54% saltgrass cover in wind tunnel at UC Davis in clay soil	45 mph	99.4%[3]

Notes:

[1] Wind speeds are normalized to an equivalent 10 meter wind speed at Owens Lake. This conversion uses the surface boundary layer equation assuming 0.01 cm surface roughness and the free stream speed for a given height if 10 meter wind speeds are not available.

[2] Measured PM_{10} emission reduction in the wind tunnel.

[3] Use uncontrolled $PM_{10} = 2.6 \times 10^{-3}$ g/m^2/s (from EQ. 4-3 for 45 mph)

saltgrass test plots established by the District on the playa, evidence of use by rabbits, rodents, insects, spiders, and even coyotes was found. The mosquito and salt cedar control programs discussed in Section 5-2.3 would also take place on the managed vegetation control measure.

Every effort will be made to limit the potential for introduction of exotic pest plant species into source emission areas that will be controlled through the use of managed vegetation. Test plots established on the playa have not been invaded by exotic pest plants. Fortunately, the existing saline soil conditions inherent to the lake bed are inhospitable to most plants including exotic pest plants such as tamarisk, puncture weed and Russian thistle and noxious grasses such as *Cenchrus*. Exotic pest plants and noxious grasses will be removed from the source emission area (if present) prior to planting with saltgrass. Another potential source for the introduction of exotic pest plants would be from the saltgrass stands harvested for rhizomes to vegetate the panels. Exotic pest plants will be removed from the saltgrass stands (if present) prior to harvesting. Removal will be accomplished through an appropriate combination of biological, mechanical and chemical control methods. Berms and other elements of infrastructure will be constructed from lake bed soils, which are not likely to be subject to invasion from these pest plants due to the high levels of salinity.

5-3.4 Managed Vegetation Operation and Maintenance Activities.

Managed vegetation is predicted to utilize approximately two ac-ft/yr of water per acre controlled, or 2.5 acre feet per irrigated acre. Non-irrigated acres (roads, berms, water storage, etc. account for approximately 25% of the controlled area. The distribution of the water over the entire vegetated area will be irregular, because at any given time some fields will be irrigated for maximum growth while others will be receive minimal amounts of water allowing for minimal stand maintenance. Water use will be higher during the initial stages of development of this measure, as it will take 3½-6 feet of water to leach the top two feet of soil to a salinity level tolerable to saltgrass, depending on surface treatment (Ayars, 1997). Since the later stages of leaching can be accomplished after planting, total water use for the first year of implementation will be seven ac-ft/ac. After the first year, water use will be reduced to at or below 2.5 ac-ft/ac/yr.

Operation and maintenance activities for managed vegetation would consist of implementing an irrigation schedule for the fields, and necessary maintenance of water transmission and delivery structures and to the berms and ditches associated with the fields. Staffing requirements for operation and maintenance of the managed vegetation area are estimated at approximately one FTEE per 1,500 acres of vegetated area.

5-4 GRAVEL COVER

5-4.1 Description of Gravel Cover for PM_{10} Control

A four-inch layer of coarse gravel laid on the surface of the Owens Lake playa will prevent PM_{10} emissions by: (a) preventing the formation of efflorescent evaporite salt crusts, because the large spaces between the gravel particles interfere with the capillary forces that transport the saline water to the surface where it evaporates and deposits salts; and (b) raising the threshold wind velocity required to lift the large gravel particles (i.e., larger than ⅜- inch diameter) so that transport of the particles is not possible by wind speeds typical of the Owens Lake area. Gravel blankets can work effectively on essentially any type of soil surface. Figure 5.7 is a photograph of one of the District's gravel test plots on Owens Lake. These test plots have been in place for approximately 10 years and continue to completely protect the emissive surfaces beneath. Gravel placed onto the lake bed surface will be durable enough to resist wind and water deterioration and leaching and will be approximately the same color as the existing lake bed.

Under certain limited conditions of sand soils combined with high groundwater levels, it may be possible for some of the gravel blanket to settle into lake bed soils and thereby lose effectiveness in controlling PM_{10} emissions. To prevent the loss of any protective gravel material into lake bed soils, a permeable geotextile fabric may be placed between the soil and the gravel where necessary. This will prevent the loss of any gravel.

Gravel areas must be protected from water- and wind-borne soil and dust. The gravel blanket will be the last control measure to be installed. Therefore, wind-borne depositions will be eliminated. Gravel areas will also be protected from flood deposits with flood control berms, drainage channels and desiltation/retention basins. These measures will ensure that the gravel blanket will remain an effective PM_{10} control measure for many years.

To attain the required PM_{10} control efficiency, 100 percent of all areas designated for gravel must be covered with a layer of gravel four inches thick. All gravel material placed shall be screened to a size greater than ⅜-inch in diameter. The gravel material shall be at least as durable as the rock from the three sources analyzed in this document. The material shall have no larger concentration of metals than found in the materials analyzed in this document. The color of the material used shall be such that it does not significantly change the color of the lake bed.

5-4.2 PM_{10} Control Effectiveness for Gravel Cover

A gravel cover forms a non-erodible surface when the size of the gravel is large enough that the wind cannot move the surface. If the gravel surface does not move, it protects finer particles from being emitted from the surface. Gravel and rock coverings have been used successfully to prevent wind erosion from mine tailings in Arizona (Chow and Ono, 1992). The potential PM_{10}

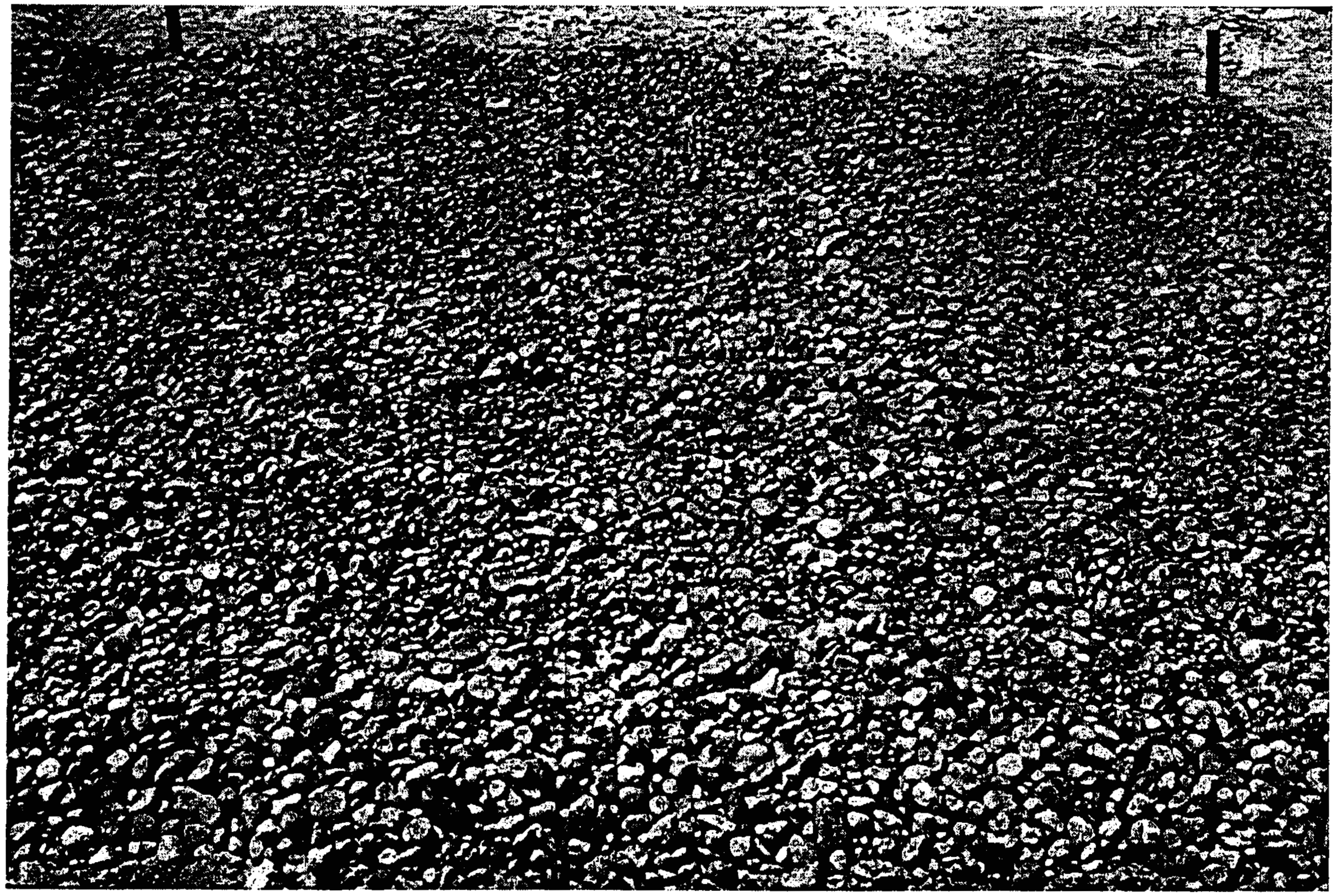

Figure 5.7: Gravel - test site photograph.

emissions from a gravel surface can be estimated using the USEPA emission calculation method for industrial wind erosion for wind speeds above the threshold for the surface (USEPA, 1985). PM_{10} will not be emitted if the wind speed is below the threshold speed.

Based on a particle size mode of ¼ inch, the proposed gravel cover will have a threshold wind speed of 90 miles per hour measured at 10 meters (USEPA, 1992, Ono and Kiesler, 1996, see Appendix F). This wind speed is rarely exceeded in the Owens Lake area. A more typical gust for Owens Lake may be around 50 miles per hour.

The proposed 4-inch thick gravel cover is intended to prevent capillary movement of salt and silt particles to the surface. Fine sands and silts that fill in void spaces in the gravel will allow the capillary rise of salts and reduce the effectiveness of a gravel blanket to control PM_{10} at Owens Lake. In addition, finer particles will lower the particle size mode and lower the threshold wind speed for the surface. Gravel blanket tests were performed at two sites on Owens Lake starting in June 1986. These tests showed that four-inch thick gravel blankets composed of ¼ inch and larger rocks prevented capillary rise of salts to the surface. Observations of ungraveled test plots in the same area, one with no surface covering and another with local soil, showed that salts would otherwise rise to the surface (Cox, 1996, see Appendix F).

Because fine particles should not be allowed to cover or significantly invade the gravel, the gravel blankets would be the last measure implemented after all other erodible areas are controlled.

The PM_{10} emissions are expected to be zero for the gravel cover since the threshold wind speed to entrain gravel, and thus PM_{10}, is above the highest expected wind speeds expected for the area. This will result in 100% reduction of PM_{10} from areas that are covered by a gravel blanket.

5-4.3 Gravel Cover Operation and Maintenance

Once the gravel cover has been applied to the playa, limited maintenance would be required to preserve the gravel blanket. The gravel would be visually monitored weekly to ensure that the gravel blanket was not filled with sand or dust, or had not been inundated or washed-out from flooding. If any of these conditions were observed over a substantial area, additional gravel would be transported to the playa via truck (unless the conveyor system was still in place and operational) and applied to the playa surface via truck and/or low ground-pressure bulldozer or grader. Operation and maintenance staffing requirements are estimated to be one FTEE per five square miles of gravel and an ongoing maintenance amount of gravel of 3,200 cubic yards per square mile per year.

5-5 REGULATORY EFFECTIVENESS

Rule effectiveness is a measure of the compliance by the regulated sources with the control measures required under the plan. Since virtually all the PM_{10} emissions in the Planning Area originate from the dry playa of Owens Lake, and since a single operator, the City of Los Angeles, is required to undertake the control measures required under this plan to control those emissions, the District projects a rule effectiveness of 100 percent for the plan's control measures.

The District will enforce the plan's requirements through continual oversight and inspection of the City's efforts to construct and commence operation of the control measures, and through periodic inspection and monitoring, both on a scheduled and random basis, once the control measures are fully implemented. The plan contains milestones for construction and operation of the control measures, and test methods for determining the compliance of the City's control strategy implementation with the performance standards required under this plan.

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6 AIR QUALITY MODELING

6-1 INTRODUCTION

Computer based air quality modeling techniques were used to predict concentrations resulting from windblown PM_{10} emissions from the Owens Lake playa. The Owens Lake airshed has been designated as a "serious" PM_{10} nonattainment area by the U.S. Environmental Protection Agency (USEPA). Episodes are accompanied by wind events and the most significant source of PM_{10} in the air basin is windblown dust from the Owens Lake playa. Air quality modeling techniques were applied to assess control scenarios developed by the Great Basin Unified Air Pollution Control District (GBUAPCD) to reduce PM_{10} concentrations and bring the airshed into attainment. A performance evaluation was also conducted to assess the uncertainty and reliability of these modeling methods based on a comparison of model predictions with ambient PM_{10} measurements.

This section provides a synopsis of the modeling analysis conducted by McCulley, Frick & Gilman, Inc. (MFG) on behalf of the GBUAPCD. The technical details of the study are described in the *Owens Lake Air Quality Modeling Study* (MFG, 1997a). The study followed the methods outlined in the *Owens Lake Modeling Protocol* (MFG, 1997b) and is based on the results and experience gained in previous modeling investigations (MFG, 1995; MFG, 1996a; MFG 1996b).

The objectives of the air quality modeling were as follows:

- conduct the dispersion modeling in accordance with the regulatory guidance for PM_{10} SIPs using USEPA recommended modeling tools and procedures.

- perform an evaluation of the proposed dispersion modeling techniques using two years of ambient data and focus the evaluation on the higher observed 24-hour PM_{10} concentrations. The performance evaluation was used to assess model uncertainty and aid in the selection of several aspects of the modeling procedures.

- assess and refine control strategies until the modeling approach demonstrates attainment of the PM_{10} National Ambient Air Quality Standards (NAAQS).

The 24-hour NAAQS for PM_{10} is 150 $\mu g/m^3$, not to be exceeded more than once per year at locations accessible to the public. The current modeling analysis is based on two years of meteorological data. Within a two year period, no more than two concentrations higher than the NAAQS are allowed at each receptor location. The NAAQS is attained when the expected third highest 24-hour concentration at each location accessible to the public is less than 150 $\mu g/m^3$.

The remainder of Section 6 summarizes the air quality modeling techniques, model input data, evaluation procedures, and the attainment demonstration. Section 6-2 presents an overview of the air quality modeling methods and emission factors selected for the study. Section 6-3 describes the model evaluation where model predictions are compared to ambient observations. This section contrasts the performance of different modeling assumptions. The modeling procedures are applied to assess a proposed control strategy and demonstrate attainment of the NAAQS in Section 6-4.

6-2 MODELING METHODS AND INPUT PARAMETERS

This section discusses the techniques and input data that were used in the air quality modeling assessment. The basic approach follows MFG's previous studies with refinements suggested by the results of the performance evaluation described in Section 6-3. Features of the modeling approach include:

- the Industrial Source Complex Short-Term model (ISCST3, Version 96113; USEPA, 1995);
- wind speed dependent emission factors for each season and control alternative based on interpretation of wind tunnel data collected by GBUAPCD;
- three modeling sub-regions with receptors placed on the historical shoreline (3600') and at the monitoring stations; and
- two years of meteorological data within the three modeling regions.

Figure 6.1 displays the location of the three modeling regions, monitoring stations, historical shoreline, and an outline of potential emitting source areas considered in the model. The source areas shown in Figure 6.1 include both the on-lake Owens Lake playa and off-lake areas. The off-lake source areas shown were created by historical deposition from the Owens Lake playa.

6-2.1 ISCST3 Air Quality Model

ISCST3 is the USEPA recommended dispersion model for regulatory assessment of fugitive dust sources (40 CFR Part 51, Appendix W; USEPA, 1986). The selection of ISCST3 was based on regulatory precedence and the objectives of the modeling analysis. Model performance during six historical episodes was assessed in a preliminary model evaluation study (MFG, 1996b). Further evaluations involving refined techniques and a larger ambient data set are discussed in Section 6-3.

The required input data for ISCST3 include model options, a receptor network, an emission inventory, a meteorological data set, and background concentration estimates. Rural dispersion curves were selected and other optional variables were set by exercising the regulatory default option. In the current study, MFG assumed particles were not significantly removed from the plume by dry deposition during transport to the receptors of interest.

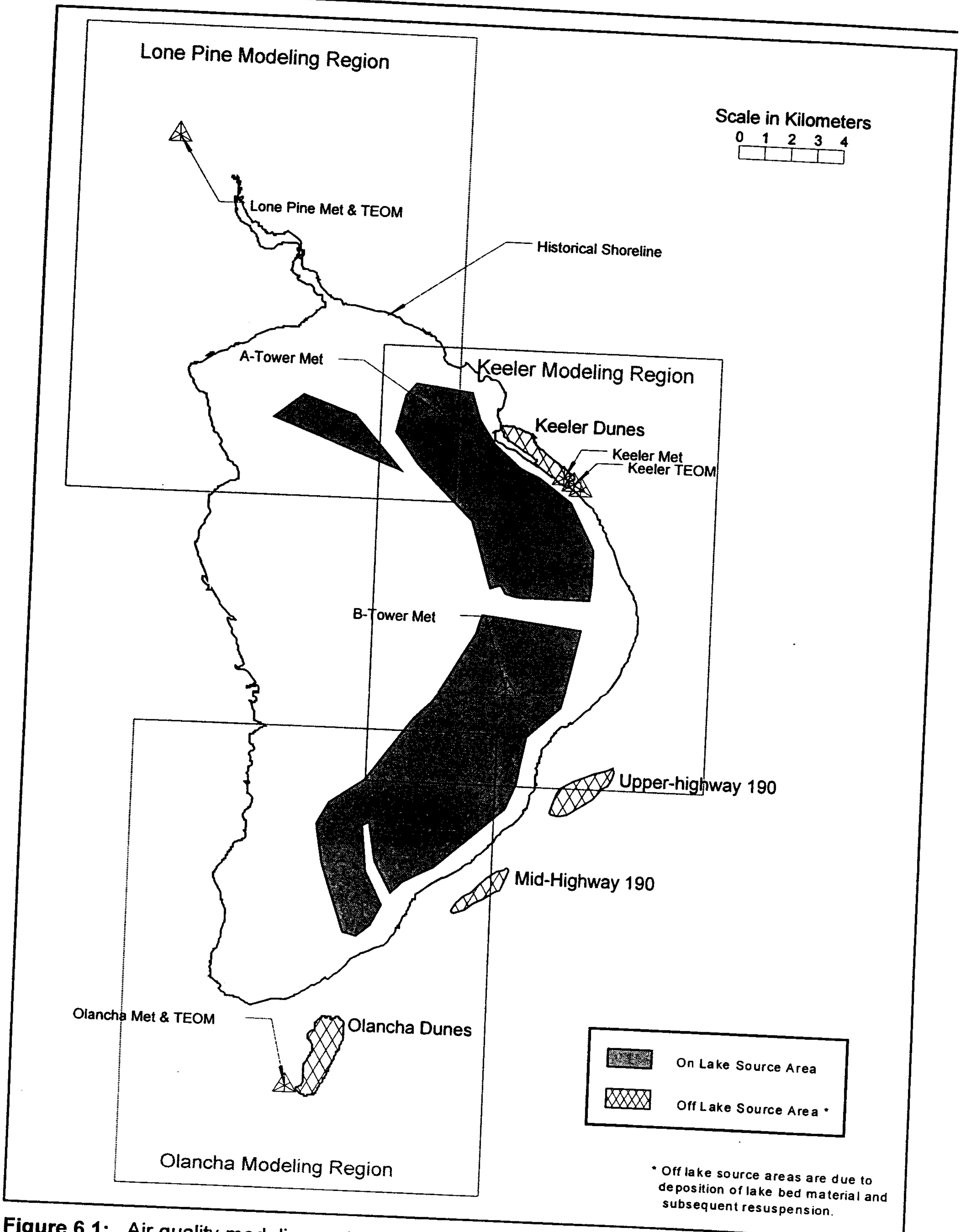

Figure 6.1: Air quality modeling regions, source areas, and monitoring stations.

6-2.2 Source Areas and Emission Factors

Air quality model simulations were based on hourly variable emissions predicted for both existing and controlled source areas. Emission rates varied with the size of the source area, wind speed, season, and level of control. The following is a brief description of the methods applied.

6-2.2.1 Existing Source Areas

The locations of both existing on-lake and off-lake source areas are shown in Figure 6.1. For the ISCST3 simulations, these irregular areas were divided into rectangles. The orientation and size of the rectangles varied depending on the outline of the source area and the proximity of potential receptors. Windblown emissions from on-lake source areas were based on wind velocity data from the B-Tower site (Figure 6.1). B-Tower is centrally located and more representative of winds over these playas than the A-Tower, Keeler, Lone Pine, or Olancha meteorological monitoring sites. Emission rates for the Olancha Dunes were calculated using wind data from the Olancha station. Other off-lake windblown emissions were based on the data collected at Keeler. Wind speeds and predicted emission fluxes were usually lower for the off-lake source areas due to a rougher local surface and more sheltered exposure.

Two different sets of uncontrolled emission factors were considered in the modeling simulations: algorithms from the previous performance evaluation (hereafter Method 1) and the more conservative curves used in *Results of Control Alternative Evaluation* (MFG, 1996a; Method 2). GBUAPCD developed these algorithms based on different interpretations of wind tunnel tests conducted on the playa. The Method 1 set of curves were selected to be representative of actual conditions during the episodes evaluated in the *Owens Lake Model Evaluation* (MFG, 1996b). Using data collected around six historical periods of interest, GBUAPCD suggested area source emissions could be calculated from:

Equation 6-1

$$PM_{10}\ (g/m^2/s) = 1.2 \times 10^{-5} \exp[0.27 * u(m/s)] \quad ;\textit{for Fall 1994}$$

$$PM_{10}\ (g/m^2/s) = 4.0 \times 10^{-6} \exp[0.36 * u\ (m/s)] \quad ;\textit{for Spring 1995}$$

where PM_{10} is the area source emission flux ($g/m^2/s$) and u is the hourly average wind velocity (m/s) at 10 m. A threshold wind speed of 7.6 m/s was used for Equation 6-1. Emissions for hours with wind velocities less than the threshold were assumed to be negligible. The Spring 1995 factors were assumed for the months of February to June. All other months were simulated with the curves developed for November and December 1994.

The wind tunnel data collected by GBUAPCD suggest the erosion potential of the Owens Lake playas can sometimes be higher than predicted by Equation 6-1. Based on wind tunnel data with the higher emission rates, the Method 2 emission factor relationships are given by:

Equation 6-2

$$PM_{10}\ (g/m^2/s) = 1.34 \times 10^{-5} \exp[0.25*u(m/s)] \quad \text{; for January, July to December}$$
$$PM_{10}\ (g/m^2/s) = 1.9 \times 10^{-4} \exp[0.13*u(m/s)] \quad \text{; for February to June}$$

A threshold wind speed of 7.6 m/s was also used for Equation 6-2. Emission fluxes predicted by Equation 6-2 are higher during spring episodes, especially for wind velocities near the wind suspension threshold.

Uncontrolled emission rates were calculated using both the above equations. Subsequent model predictions were compared to ambient PM_{10} observations and the better performing algorithm selected for the evaluation of control alternatives. The performance evaluation methods and results are discussed in Section 6-3.

6-2.2.2 Controlled Source Areas

The control strategy proposed to bring the Owens Lake NAA into attainment is depicted in Figure 6.2. Existing on-lake source areas are modified by shallow flooding, gravel, and managed vegetation to reduce or eliminate wind suspended PM_{10} emissions. Figure 6.2 does not include the off-lake sources. The control strategy assumes re-suspension of deposited material from these secondary sources will eventually be eliminated by control of the on-lake source areas (Niemeyer, 1996).

Emission fluxes for the controlled source areas were calculated by modifying the uncontrolled emission factor relationship with an assumed control efficiency. The following emission factors for each control measure were assumed:

Equation 6-3

$$PM_{10}' = 4.1 \times 10^{-6} \quad \text{; for shallow flooding and } u>11.2\ m/s$$
$$PM_{10}' = 0.01 \times PM_{10} \quad \text{; for managed vegetation}$$
$$PM_{10}' = 0.00 \quad \text{; for gravel}$$

where PM_{10}' is the controlled area source emission flux ($g/m^2/s$) and PM_{10} is the uncontrolled emission flux from Equation 6-1 or Equation 6-2. Emission factors for managed vegetation were 1% of the uncontrolled emission rate, while those for areas controlled by shallow flooding were a constant value for all winds above the threshold shown in Equation 6-3. Emissions for areas covered by gravel were assumed to be negligible.

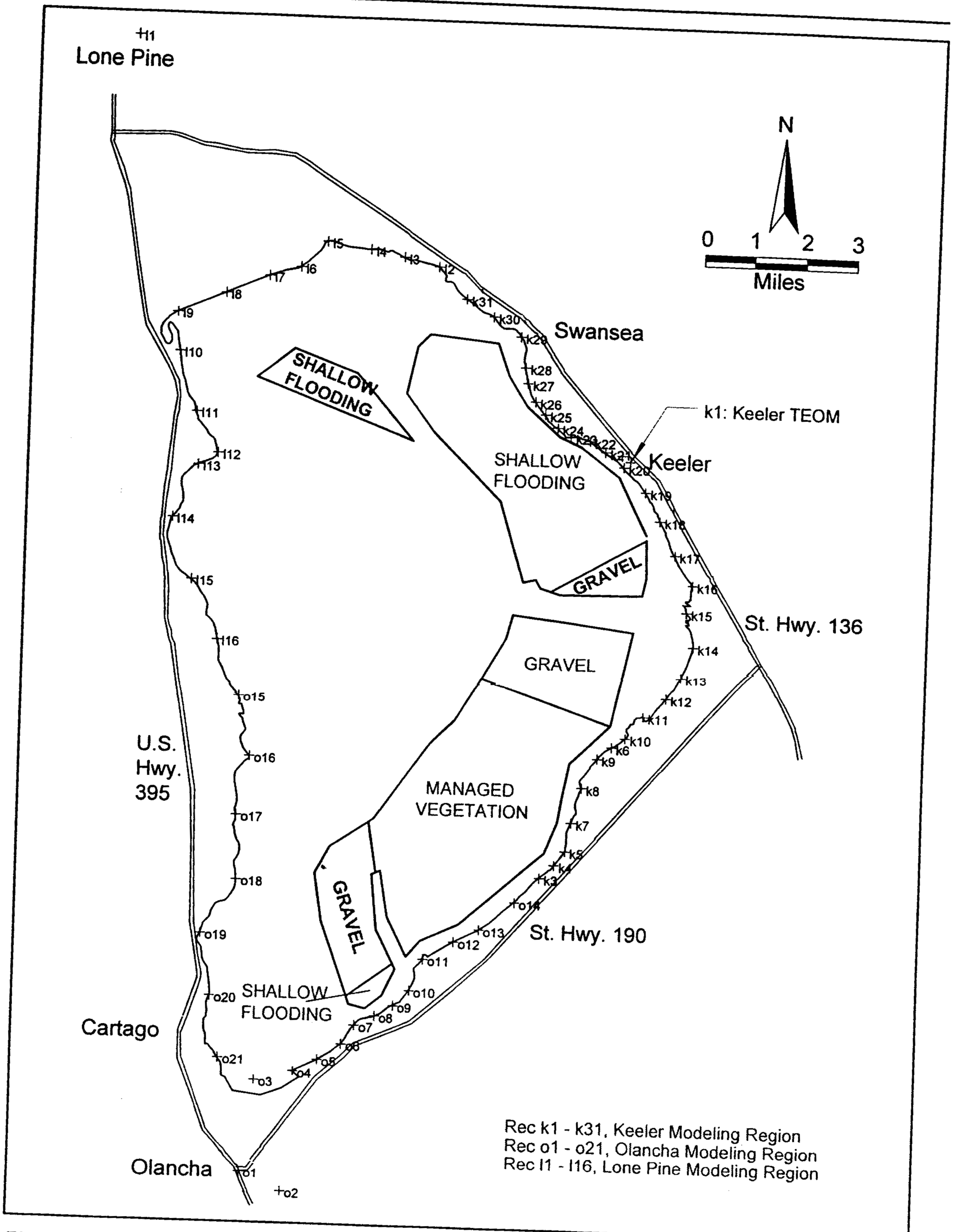

Figure 6.2: Air quality model: Receptor locations, and controlled source areas.

6-2.3 Meteorological Data

Meteorological monitoring sites within the Owens Lake airshed are shown in Figure 6.1. Two years of meteorological observations from these stations were used to construct air quality modeling input data sets. The period selected was 1994 through 1995. Although longer periods for some of the stations were available, the meteorological data collected during these two years were the most extensive and complete. The two year period also contained many high PM_{10} episodes of interest.

Previous studies found winds within the study area vary spatially in regimes not easily simulated with conventional air quality modeling techniques. The ISCST3 model assumes steady state and spatially homogeneous conditions exist for each simulation hour. For each hour, only one wind speed and direction observation are used by the model to simulate diffusion and transport from source area to receptor over the entire modeling grid. Depending on the actual plume trajectory, biases can be introduced into the modeling at receptors distant from the source areas.

In order to correct for some aspects of the two dimensional wind field within the ISCST3 simulations, the study area was divided into three regions (shown in Figure 6.1). Modeling each region separately allowed the application of different meteorological data sets. The three modeling areas were based on the characteristics of terrain and the proximity of the meteorological monitoring stations.

Within the modeling regions, it was unclear whether source or receptor based meteorological data would be the most representative of transport. Thus, several concepts were assessed by preparing three meteorological files within each region as follows:

- Vector average winds for transport and diffusion. These data sets were constructed using a combination of source and receptor based winds. Wind speeds were calculated from the average of the B-Tower data and the monitoring station wind velocity within the modeling region of interest. Wind direction was based on the unit vector average of the B-Tower and the regional monitoring station wind directions.

- Local winds for transport and diffusion. Wind data from Keeler, Lone Pine, and Olancha were used in the construction of the data sets for three respective modeling regions. This technique was used in each of the previous modeling studies (MFG, 1995, 1996a, and 1996b).

- B-Tower winds for transport and diffusion. Wind data from the B-Tower site were also used to construct data sets for the two years of interest and provide the basis for prediction within the three regions.

The three methods for preparing the meteorological data sets have advantages/disadvantages depending on source to receptor relationships and the location of the meteorological station. The performance evaluation described in Section 6-3 was used to guide the selection of the more appropriate data set for assessing the proposed control strategy.

In addition to the wind speed, wind direction, and temperature observations collected at the monitoring sites, ISCST3 requires hourly estimates of atmospheric stability class and the depth of the well-mixed layer. Stability class controls the rate a plume spreads, while the mixing depth can be used by the model to simulate the effects of an elevated temperature inversion. Stability class and mixing depth were calculated from available data using techniques suggested by the USEPA. Further details concerning the replacement of missing data, the calculation of stability class, and other aspects of the data set construction can be found in *Owens Lake Air Quality Modeling Study* (MFG, 1997a).

6-2.4 Background Concentration

The dispersion model simulations include only windblown emissions from the source areas shown in Figure 6.1. During wind events other local and regional sources of fugitive dust also contribute to the PM_{10} concentrations observed at the monitoring locations. A constant of 28 $\mu g/m^3$ was added to all predictions to account for background sources. GBUAPCD derived this value based on an analysis of the 31 periods during 1994 and 1995 when PM_{10} concentrations were above 150 $\mu g/m^3$. The constant background is the average of the upwind values from the Olancha-Lone Pine paired data.

6-3 MODEL PERFORMANCE EVALUATION

6-3.1 Purpose of Model Evaluation

The model performance evaluation compares model predictions to observations in order to assess the uncertainty and reliability of the modeling methods. The performance evaluation was also used to assess different modeling options with the goal of selecting techniques that best characterize the high PM_{10} episodes. The performance evaluation considered the Method 1 versus Method 2 emission factors and the three methods used for specifying the transport and diffusion winds.

6-3.2 Model Evaluation Methods

The modeling approach was designed to address the higher 24-hour PM_{10} concentrations observed at Owens Lake. Thus, the model evaluation focused on comparisons between the higher model predictions and observations. Emission factor relationships that predict the spatial and temporal behavior of the emitting playas for all possible conditions are not available and are unlikely to be developed in the near future. Due to uncertainty and variability in the wind tunnel data, the emission factor relationships are biased toward the higher values in an attempt to capture the more erosive events for regulatory modeling purposes. These emission factor relationships will over-predict average concentrations and model performance may be poor when paired in time and space.

The performance evaluation used PM_{10} observations from the three TEOM (Tapered-element Oscillating Microbalance) monitoring stations shown in Figure 6.1. Twenty-four hour averages were calculated using the hourly data collected at each location during 1994 through 1995. Although high-volume sampling data were also available, the TEOM data are more continuous and complete. All days with valid TEOM observations and at least one hour of B-Tower wind speed greater than the wind suspension threshold were used for the model comparisons.

Several different statistical performance measures were used during the comparison of the ISCST3 predictions with observations. The measures selected evaluated the ability of the modeling approach to explain the whole range of 24-hour PM_{10} concentrations, but decisions were based on the measures focused at the higher concentrations. The statistical measures were as follows:

- the biases between the mean and standard deviation of the observations and predictions at each location;
- the temporal correlation between predictions and observations at each monitoring location;
- the biases between the predicted versus observed maximum and design concentration at each monitoring site. The design concentration for the analysis was the third highest concentration in two years; and
- the bias of the "robust highest concentration" (RHC).

Calculation of the RHC in the analysis was based on the top 2% of the observed and predicted concentrations. The RHC is a measure designed to be more “robust” in a statistical sense than the maximum value and is recommended by the USEPA for performance evaluations in a regulatory setting (Cox, 1987). Further details regarding the calculation of the RHC and the other performance measures are described in the *Owens Lake Air Quality Modeling Study* (MFG, 1997a).

6-3.4 Model Evaluation Results

The ISCST3 model was applied to simulate 24-hour PM_{10} concentrations during 1994 to 1995. Model predictions within the three modeling regions were obtained using two different emission methods and three different meteorological data sets. Table 6.1 compares these predictions with observations using the performance measures discussed previously.

At the Keeler TEOM site, the higher observations were closely explained by the less conservative Method 1 emission factor relationship. The Method 2 emission factors over-predicted the higher concentrations by about a factor-of-two and performed less well in general. The distinction between the performance of the three meteorological data sets was less clear at this location with the Keeler wind data explaining more of the variance and the vector average data more closely matching the higher PM_{10} concentrations.

Model performance was slightly less favorable for the Lone Pine TEOM site. This site is more removed from the source areas and the selection of the meteorological data set had more influence on the performance statistics. In general the vector average meteorological data performed the best, with a higher correlation coefficient and peak predictions more closely matching observations. Predictions based on the Method 2 emission factors over-predicted the higher 24-hour TEOM data regardless of the meteorological data set employed.

Of the three TEOM sites, model performance was the least favorable at Olancha and the most dependent on the meteorological data set used in the simulations. The predictions based on the vector average winds tended to perform better but had more scatter (lower correlation coefficient) than predictions using the Olancha winds. Over-prediction at the receptor was sometimes coincident with periods when the wind speeds at Olancha were very much lighter than over the Owens Lake playa.

The model performance statistics for Olancha are heavily influenced by the maximum value observed at this location (April 9, 1995; 2,252 $\mu g/m^3$). The design concentration and RHC are much lower and more closely matched by the model predictions. The model predictions for the April 9, 1995 episode based on the vector average winds, was lower than the observed concentration at Olancha because the modeled dust plume missed the monitoring station. However, predicted concentrations near the plume centerline were close to those observed at the monitoring station.

Table 6.1: Model evaluation statistics
24-Hour PM_{10} concentrations 1994-1995

data set	num. samples	max (µg/m³)	mean (µg/m³)	std. dev. (µg/m³)	corr. coef.	RHC (µg/m³)	design conc (µg/m³)
Observed Keeler TEOM	352	3929	99	348		3678	2204
Method 2 Keeler Met	352	7485	624	890	0.655	6563	4858
Vector Met	352	7322	655	951	0.609	6745	4855
B-Tower Met	352	6706	691	1039	0.570	7166	5078
Method 1 Keeler Met	352	3649	251	397	0.737	3347	2700
Vector Met	352	3681	254	408	0.702	3681	2528
B-Tower Met	352	3737	263	439	0.649	3875	2774
Observed L Pine TEOM	416	499	28	43		430	307
Method 2 L Pine Met	416	2744	164	302	0.554	2533	1729
Vector Met	416	1707	119	216	0.568	1765	1301
B-Tower Met	416	884	61	100	0.315	1016	769
Method 1 L Pine Met	416	1600	80	124	0.540	1184	769
Vector Met	416	699	63	74	0.618	569	398
B-Tower Met	416	284	38	27	0.311	250	190
Observed Olancha TEOM	127	2252	48	206		1417	558
Method 2 Olancha Met	127	5431	468	982	0.506	5892	4692
Vector Met	127	1365	177	295	0.384	1387	1283
B-Tower Met	127	534	51	69	0.244	491	387
Method 1 Olancha Met	127	4704	220	549	0.486	4058	2692
Vector Met	127	420	82	90	0.344	487	413
B-Tower Met	127	248	39	35	0.074	276	220

Notes: Number of samples based on valid model prediction-observation pairs during 1994 to 1995. RHC refers to Robust Highest Concentration. Details concerning the data sets and calculation of the statistics can be found in *Owens Lake Air Quality Modeling Study* (MFG, 1997a)

Although model performance varied between the modeling regions depending on the dispersion modeling approach and statistical measure, the following general conclusions can be drawn from the evaluation:

- the Method 1 emission factors performed better than the more conservative Method 2 factors

- predictions based on vector average winds performed slightly better than those using only the local data. Transport and diffusion calculations based solely on the B-Tower winds performed the least favorably in all modeling regions

- the modeling was the most reliable near Keeler where source to receptor transport distances are the smallest

- although there was considerable scatter between model predictions and observations, the better modeling data sets were able to explain the higher PM_{10} observations

Based on the results of the performance evaluation, the attainment demonstration was based on the Method 1 emission factor relationships and vector average winds within each modeling region. This approach tended to under-predict the highest concentration at Olancha. However, this was because the predicted plume missed the monitoring station. In the attainment demonstration that follows plume trajectory estimates are not as critical, because more receptors are used and locations of the highest predictions are less important than the magnitudes of the predictions.

6-4 ATTAINMENT DEMONSTRATION

6-4.1 Modeling Procedures

The modeling procedures evaluated in Section 6-3 were applied to simulate controlled windblown emissions from the Owens Lake playas. The ISCST3 model was used to simulate two years of meteorological conditions from 1994 to 1995. Meteorological data sets were prepared for each region using vector average winds for transport and diffusion. Uncontrolled emissions were calculated according to the Method 1 (Equation 6-1) algorithm as a function of wind speed and season then modified by the effects of the proposed control measures. For the simulations, the source areas shown in Figure 6.2 were characterized by rectangles and assigned control efficiencies according to Equation 6-3.

Table 6.2 summarizes the annual and highest daily PM_{10} emissions from the input files used in the attainment demonstration. Uncontrolled emissions within the airshed were reduced by over

Table 6.2: PM_{10} Emission Estimate Summary

Source Configuration	Emitting Area (km^2)	1994 PM_{10} Emissions (ton/yr)	1995 PM_{10} Emissions (ton/yr)	Max Daily Emissions (ton/day)	Date of Max Daily Emissions
Uncontrolled	100	110,000	136,000	10,800	6/6/95
Controlled	70	597	714	43.9	6/6/95

Emission rates based on Method 1 algorithm, proposed control measures, B-Tower wind speed data, and area source configurations depicted in Figure 6.1 and Figure 6.2. Calculation of emitting area does not include gravel or other portions with zero emissions.

99% due to the proposed area source control measures. The highest daily emissions were predicted for June 6, 1995. Northwesterly winds over 20 m/s were observed at the B-Tower during this episode.

In order to assess the proposed control strategy, a ring of receptors was placed at the 3600' elevation around Owens Lake and at the monitoring locations as shown in Figure 6.2. This elevation was the historical level of Owens Lake and is also representative of areas of potential public access. At their closest point, these receptors are within about 100 m of the eroding playas. The resolution of receptor spacing along the historic shoreline was increased in regions close to the source areas. The 68 receptors were divided into three groups corresponding to the modeling regions and meteorological data sets. The division of the receptors is shown in Figure 6.2.

Daily predictions for receptors within each modeling region were added to a background value of 28 $\mu g/m^3$, then sorted to obtain the third highest prediction at each receptor location. Attainment of the NAAQS is demonstrated when the third highest prediction at the same location in two years is below 150 $\mu g/m^3$.

6-4.2 Modeling Results

The results of the attainment demonstration are summarized in Table 6.3, where the highest and design (highest of the third highest) concentrations are listed by modeling region. The third highest predictions at each receptor are shown in Figure 6.3. Appendix B contains a list of the top ten PM_{10} concentration predictions by modeling region, indicating the receptor locations and dates of these higher episodes.

The air quality modeling predicts the proposed control measures would greatly reduce potential concentrations within the Owens Lake nonattainment area and the 24-hour PM_{10} NAAQS would be attained at the historical shoreline. The highest 24-hour prediction of 81.7 $\mu g/m^3$ occurred during the episode with the highest daily emissions (June 6, 1995), impacting the Olancha modeling region receptors. These receptors were downwind of the source area controlled by managed vegetation practices. This general area was also impacted by the design episode, March 12, 1994. The design concentration was 66.6 $\mu g/m^3$, which is below the 24-hour PM_{10} NAAQS.

The level of emissions control required by this plan is the level appropriate to assure the timely and continual compliance of the PM_{10} NAAQS in the Owens Valley Planning Area. Even if the control requirements were reduced so that the PM_{10} concentration for the design day was 150 $\mu g/m^3$, the change would not make a material difference in the amount of control required, or its cost. Since ambient concentrations are proportional to emissions, Owens Lake playa emissions after implementation could increase by a factor of three to bring the 67 $\mu g/m^3$ to 150 $\mu g/m^3$. As explained below, because of the large percentage of control of playa emissions that is necessary in order to attain the PM_{10} NAAQS, a three-fold increase in allowable emissions (from 0.6% to 1.8%) would only decrease the plan's control effectiveness of 99.4% to 98.2%, an insignificant difference in both the intensity of the control measures, and in their cost.

Under the control strategy required by this plan, on the modeled design day (March 12, 1994), uncontrolled emissions are reduced from 4,676 tons to 26 tons after controls are fully implemented, for an overall PM_{10} reduction of 99.4%. Assuming that the design site concentration minus background (66.6 minus 28 $\mu g/m^3$) is directly proportional to the controlled emissions (26 tons), an emissions to impact ratio of 0.67 tons per $\mu g/m^3$ is used to project emissions needed to meet the standard at 150 $\mu g/m^3$ (minus background is 122 $\mu g/m^3$). This calculation projects that emissions of 82 tons of Owens Lake PM_{10} will result in predicted PM_{10} concentration of 150 $\mu g/m^3$ on the design day. Compared to the uncontrolled emissions of 4,676 tons on this day, 98.2% emission reductions is needed to achieve the predicted PM_{10} concentration of 150 $\mu g/m^3$ on the design day. Therefore, the percentage difference between the control effectiveness that would result in a predicted PM_{10} concentration of 150 $\mu g/m^3$ on the design day versus the control effectiveness predicted for the control strategy required by this plan is 1.2% (that is, 98.2% versus the predicted control effectiveness of 99.4%).

Table 6.3: Highest and Third Highest 24-hour Predictions

Modeling Region	Highest Episode			Third Highest Episode [a]		
	PM_{10} (µg/m³)	Date	Receptor [b]	PM_{10} (µg/m³)	Date	Receptor [b]
Keeler	77.1	6/6/95	K-7	60.1	3/12/94	K-3
Olancha	81.7	6/6/95	O-14	66.6	3/12/94	O-12
Lone Pine	44.6	3/3/95	L-2	40.0	3/21/95	L-2

(a) 24-hour period that resulted in the third highest prediction at the same receptor location in two years.

(b) Receptor locations are shown in Figure 6.2.

Predicted PM_{10} concentrations within the Keeler and Lone Pine modeling regions were lower than for Olancha. The source areas affecting these receptors were controlled by gravel or shallow flooding. The control efficiencies assumed for these measures were higher than for managed vegetation and resulting emission fluxes lower.

In summary, the modeling analysis demonstrates attainment of the 24-hour PM_{10} NAAQS at all receptors with design concentrations below the NAAQS.

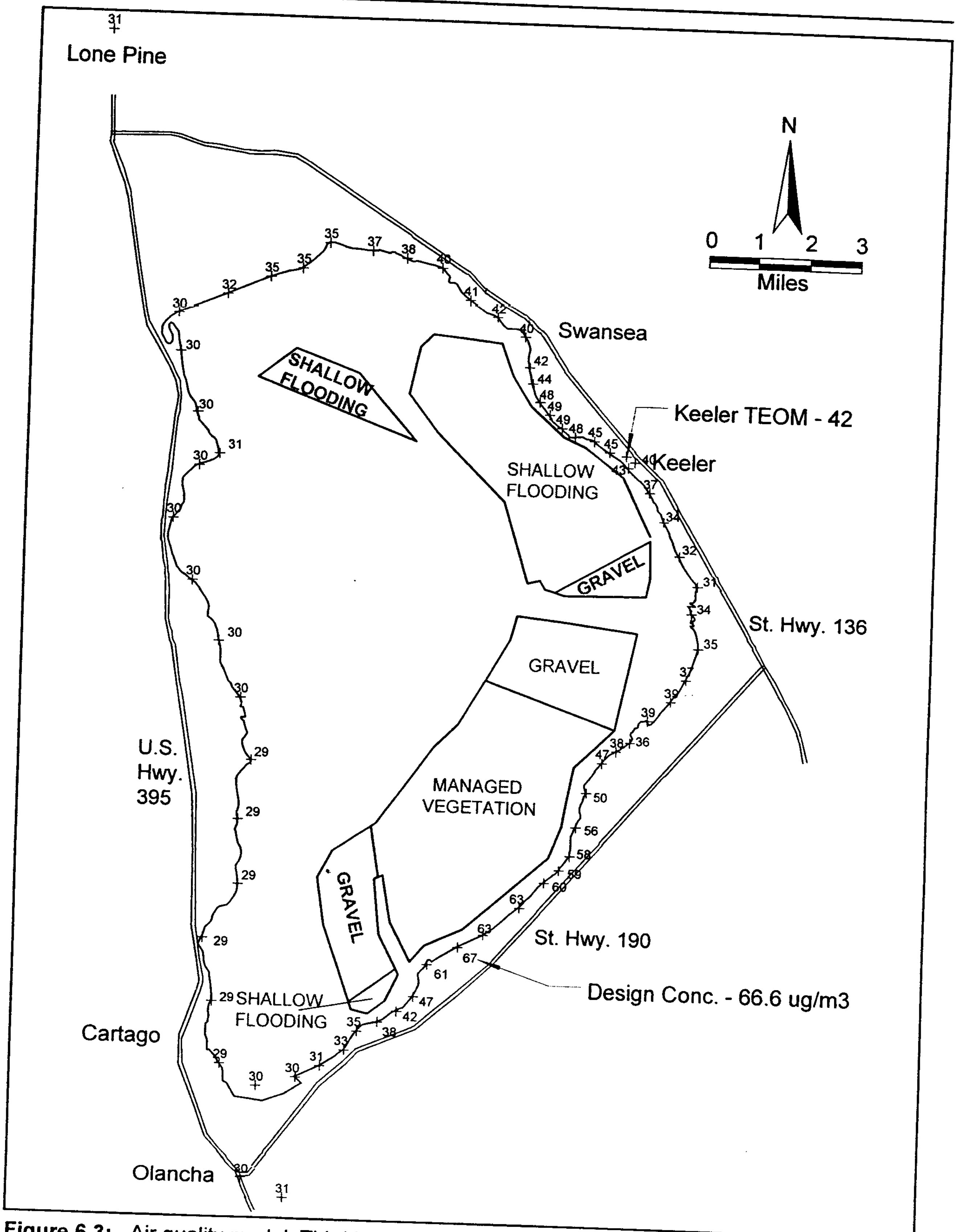

Figure 6.3: Air quality model: Third highest 24-hr PM_{10} concentrations for 1994-95 using proposed SIP controls.

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CHAPTER 7

CONTROL STRATEGY AND ATTAINMENT DEMONSTRATION

7 CONTROL STRATEGY AND ATTAINMENT DEMONSTRATION

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7 CONTROL STRATEGY AND ATTAINMENT DEMONSTRATION

7-1 INTRODUCTION

The selection of the proposed control strategy was made after careful consideration of eight alternatives that were reviewed by the public, regulatory agencies and the City of Los Angeles. The range of alternatives that were considered not only accomplished the District's primary goal of bringing the area into attainment with the PM_{10} NAAQS, but embodied a sense of land and resource stewardship and a desire to return to the area some of the public trust values that were lost when the water of the Owens Valley was diverted into the Los Angles Aqueduct. Six objectives were considered in the selection of a preferred control strategy (GBUAPCD, 1996):

1) Ensure that implementation of the Attainment SIP minimizes, or compensates for, long-term significant adverse changes to sensitive resources within the natural and human environment.

2) Ensure that implementation of the Attainment SIP has a high likelihood of success without substantial delays.

3) Ensure that the Attainment SIP substantially conforms with adopted plans, policies and existing legal requirements.

4) Ensure that implementation of the Attainment SIP minimizes the long-term consumption of natural resources.

5) Ensure that implementation of the Attainment SIP minimizes the cost per ton of particulate pollution controlled.

6) Ensure that implementation of the Attainment SIP is consistent with the State of California's obligation to preserve and enhance the public trust values associated with Owens Lake.

The selected PM_{10} control strategy that is discussed in this section combines the three control measures discussed in Chapter 5: shallow flooding, managed vegetation and gravel covering into an overall plan to control dust from Owens Lake. Through the use of air quality modeling (see Chapter 6), the District has determined that this control strategy has a high likelihood of bringing the Owens Valley into attainment with the National Ambient Air Quality Standard for PM_{10}.

7-2 PROPOSED CONTROL STRATEGY

The proposed control strategy uses three control measures, shallow flooding, managed vegetation and gravel to control PM_{10} emissions (Figure 7.1). The project requires, at most, the use of an

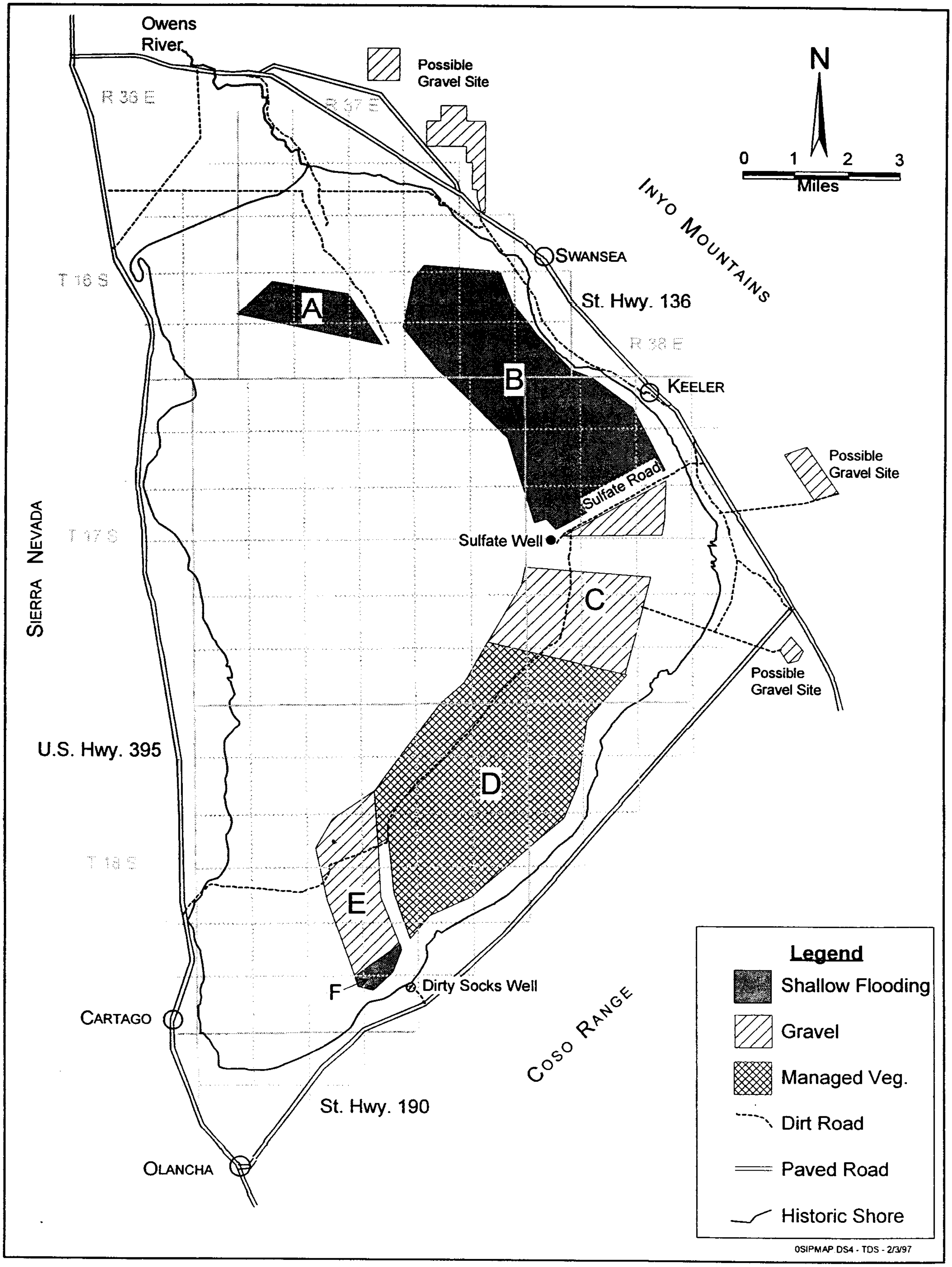

Figure 7.1: Proposed control strategy

estimated 51,000 acre-feet (ac-ft) of water per year. This amount of water may decrease over time as improved water use techniques are developed and as the lake bed becomes vegetated.

The SIP and the proposed implementation order do not prescribe the source(s) of water from which the City of Los Angeles must supply the water-based control measures. An available water source for the control measures is the Los Angeles Aqueduct. The control measures would use approximately that amount of water that analysis indicates could be supplied from the Los Angeles Aqueduct without causing significant impacts or water shortages to the City of Los Angeles, or significant indirect impacts to any other area. Fifty-one thousand acre-feet per year represents approximately 13% of the water that the Los Angeles Department of Water and Power (LADWP) exports to the City of Los Angeles. Over the last 20 years the LA Aqueduct flow to the City has averaged 395,000 ac-ft per year.

7-2.1 Shallow Flooding

An estimated maximum of 33,600 ac-ft/yr of water will be used for shallow flooding on approximately 8,395 acres of emissive lake bed (the annual amount of water required or "duty" = 4 ac-ft/ac/yr). Shallow flooding will be sited principally in sand-dominated areas west of the Owens River delta (Area A, Figure 7.1) between Keeler and Swansea (Area B) and a small area at the Dirty Socks dunes (Area F). Shallow flooding has been tested on sandy soils and has been determined to be very effective (Hardebeck, 1996). The design of the measure shall include provisions for recirculating drainage water, as this will allow for improved water use efficiencies and a decrease in the total amount of water required to control PM_{10} emissions.

The Owens Delta flooding area (Area A) will be approximately 1,210 acres in size and will be located on the west side of the Owens River delta. If the Los Angeles Aqueduct is used as the source of water for the project, the water would be delivered to this area along its north edge from an Aqueduct transmission main as it heads across the lake bed toward the east-side control areas. Water will flow south out of an outlet line approximately 7,000 feet long. The south and east boundaries of this area will have berms to prevent flows into the brine pool. A low-head pump will be located in the south east corner of the control area to allow excess water to be returned to the upper outlets.

The Keeler/Swansea flooding area (Area B) will be approximately 6,960 acres in size and will be located along the northeast historic shoreline between Swansea and Keeler. The area is about 5½ miles long and 2½ miles wide. Water would be delivered to this shallow flood area via two 30,000 foot long outlet lines. The use of two outlet lines will allow flows to be adjusted to this large area so that only enough water would be applied to keep the site wet and excess runoff would be minimized. A containment berm will be constructed along the lower (west) edge of Area B. This will prevent flow into the brine pool and will allow water that does flow to the lower edge to be collected and pumped back into the outlet system.

The southern portion of the Keeler/Swansea flood area (Area B) is located on the playa on what is known as the Keeler transition zone. This transition zone marks the boundary between the deep sands of the northeast sand sheet and the crusted clays along the southern portion of the playa. Although this soil transition zone contains some fractured clay-dominated soils close to the surface, in general, the transition zone is composed of surface sand deposits that are several inches up to two feet thick. Data from shallow piezometers in the transition zone indicate that the shallow groundwater is typically within 2 to 4 feet of the surface. Therefore, it is anticipated that the conditions for shallow flooding across this zone are not significantly different from those tested on massive sand sheets to the north. This conclusion is supported by the presence of three main spring areas (Black Sand Spring, Horse Pasture Spring and Keeler Spring) that discharge water to the surface near the historic shoreline and flow across the Keeler transition zone often extending for a considerable distance out onto the playa.

The Dirty Socks flood area (Area F) will be about 225 acres in size and is located north of the Dirty Socks Well. Water will be outlet onto this area through a 6,000 foot pipeline. A containment berm will surround this area and, as with Areas A and B, water recirculation facilities will be provided. This control area will surround the existing Dirty Socks dune that has formed since the lake dried. Surrounding this dune with wet soil will prevent south winds from blowing dune sands into the Dirty Socks gravel area located directly to the north.

7-2.2 Managed Vegetation

There are approximately 11,400 acres of clay-dominated soils that are appropriate for implementing managed vegetation. These soils begin in the approximate vicinity of the Sulfate Road, and extend southerly to just north of the Dirty Socks Well (Areas C and D, Figure 7.1). 8,700 acres of this area is proposed for managed vegetation (Area D). The remainder is slated for gravel coverage (Area C). Area D is estimated to use a maximum of 17,400 ac-ft/yr (duty = 2 ac-ft/ac/yr).

The clay soils in this area are appropriate for the construction of earthen delivery channels, berms, and open drains that comprise this measure's infrastructure. In addition, the texture and fractured structure of the clay soil makes it well suited for water distribution, leaching, and plant growth. High volumes of water will be delivered over short periods of time to flat confined fields that have been ripped or disced to a depth of at least 24 inches to facilitate infiltration and leaching. Water will travel rapidly over the clay surface to spread in a shallow, even fashion, and will not be immediately lost to deep percolation as would be the case in the coarse sandy soils elsewhere on the playa. Salty water resulting from the leaching action is rapidly transmitted through the soil profile by the network of existing fractures, allowing for effective drain water collection. Finally, the fine clay particles have a very high pore volume (approximately 50%) and therefore retain ample water for a long period of time that can be used by plants between irrigation events (Stradling, 1997 and Ayars, 1997).

As with the shallow flooding control measure, efforts to improve water use efficiencies will continue. Increased understanding of patterns of consumptive use of the plants being cultivated, and of the minimum cover required to stabilize the soil surface will allow for highly customized irrigation schedules and duties. As soil leaching progresses with time, drain water recovered from the fields may be suitable for recycling onto the fields for continued irrigation, resulting in lower overall water use. Effort will also be made to introduce appropriate drought-tolerant plants, which will allow the measure to be successfully operated with the minimum amount of water.

Because this area of the lake bed is subject to frequent, and often large, storm water flows from the Coso Range, the managed vegetation control area will be protected along its upper edge with a storm water diversion berm and flood waters will be directed into flood control channels that will travel across the site toward the brine pool. The lower edge of the area will also have a containment berm to prevent flows into the brine pool and to protect the site from high lake levels.

7-2.3 Gravel

Gravel will be used to control the remaining 5,305 acres of emissive area. The gravel will be used in two areas dominated by transition silty clay to silty sand soils in the central portion of the emissive area (Area C, Figure 7.1) and at the very south end of the dust area north of the Dirty Socks well (Area E, Figure 7.1).

If the entire 5,305 acres is covered with a 4-inch layer of greater than ⅜-inch gravel, approximately 2.8 million cubic yards of gravel will be required. If a gravel production/ transportation/spreading rate of 200 to 400 cubic yards per hour is assumed, it would take between one and two years to install 5,305 acres of gravel cover. Different installation rates will take proportionally different installation times.

The two gravel areas will be surrounded by berms and flood control channels to protect the gravel from flash floods, high brine pool levels, spring flows and adjacent water-based control measures. Gravel is proposed to be the final measure implemented. The 5,305 acres of gravel would be the maximum area to be covered with gravel under the scope of this SIP.

7-2.4 Control Strategy Implementation Summary

Table 7.1 summarizes the size, the annual water duty and the annual water volume for each of the control areas.

Table 7.1 Summary of Proposed Control Strategy

Control Area	Area (acres)	Duty (ft/yr)	Volume (ac-ft/yr)
A - Delta Flood	1,210	4	4,840
B - Keeler/Swansea Flood	6,960	4	27,840
C - East Gravel	3,365	0	0
D - Coso Vegetation	8,700	2	17,400
E - Dirty Socks Gravel	1,940	0	0
F - Dirty Socks Flood	225	4	900
Totals:	**22,400**		**50,980**

7-3 IMPLEMENTATION SCHEDULE AND PHASING

The Proposed project is to be implemented in phases over a four and a half year period. The order of implementation will generally be from north to south with the gravel areas being the last to be installed. Table 7.2 is a schedule that shows the proposed implementation schedule for the control measures. Table 7.2a is a summary of the project milestones.

7-3.1 Shallow Flooding

Phasing for the shallow flooding would take place over 3½ years. During the first year the infrastructure for Area A and the roads and electrical lines for Area B would be constructed. Shallow flooding of Area A can begin after the first 18 months (see Table 7.2a - Milestones). In the second year the infrastructure for Area B would be completed and the water transmission lines would be extended to the north end of the managed vegetation area (Area D). After two and a half years, water can begin to be applied to Area B. No shallow flood construction would take place in the third year. In the three and a half years Area F would be constructed and begin operation. In order to provide sufficient water for soil leaching and plant establishment for Area D, Phase 2 during 2001, water flows to Area A may be shut off and water flows to Area B may be reduced to 40% of normal from January 1, 2001 through December 25, 2001. The reduced flows to Area B should be delivered to the southern end of Area B, in order to protect the gravel being placed in Area C.

7-3.2 Managed Vegetation

Phasing for the managed vegetation control measure is expected to take place over a period of four years. During the first year no managed vegetation construction will take place, as the infrastructure necessary to deliver water to the site will be under construction to the north. During the second year, site roads will be constructed. During the third year, the initial phase of 2,900 acres will be constructed and begin operation. During the fourth year, the final 5,800 acres will be completed.

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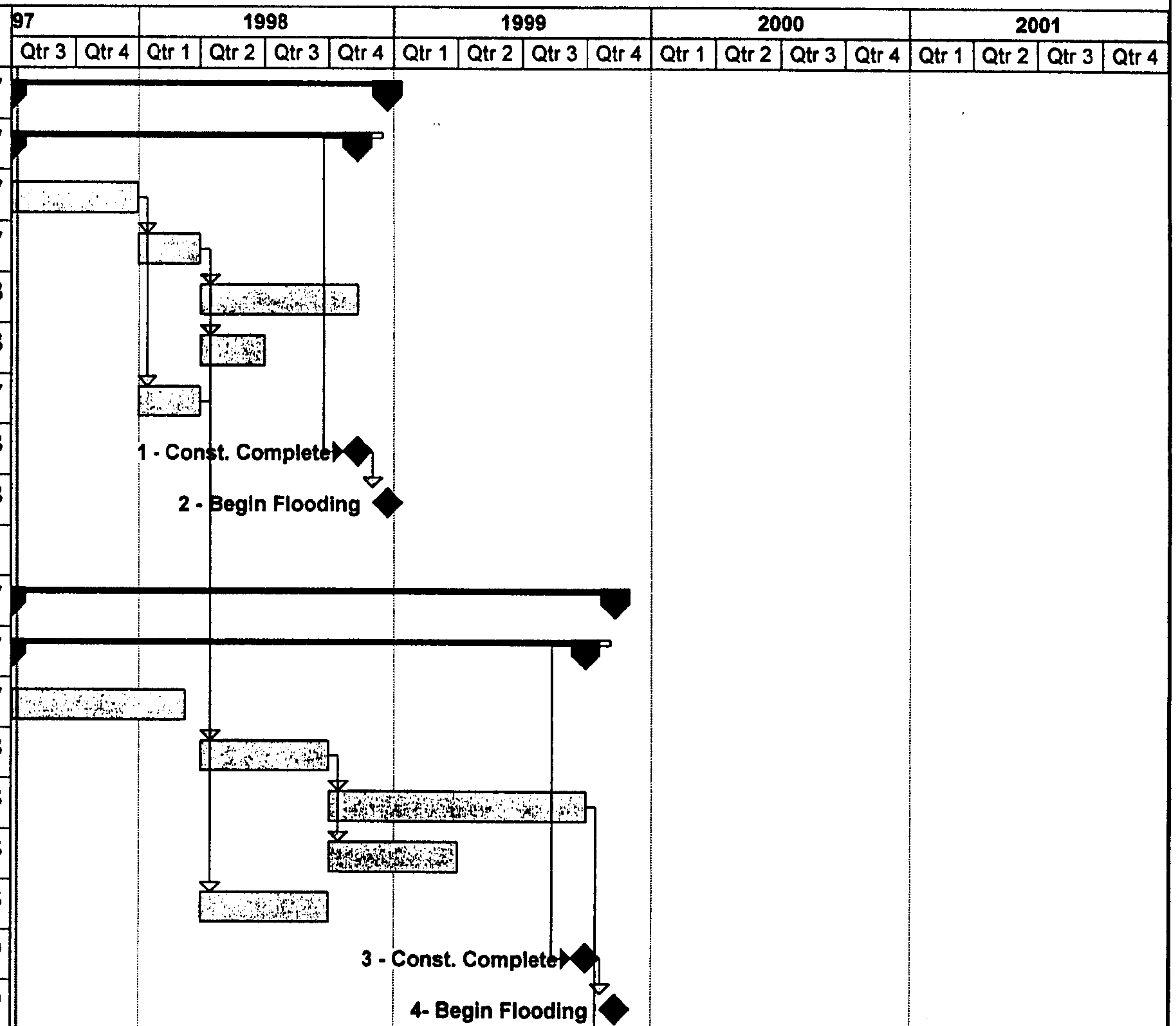
ID	Task Name	Duration	Start
1	Area A - Shallow Flooding	385d	7/2/97
2	Construction	355d	7/2/97
3	Permit, design, bid	26w	7/2/97
4	Roads	13w	12/31/97
5	Water lines	32w	4/1/98
6	Berms	13w	4/1/98
7	Electrical	13w	12/31/97
8	1 - Const. Complete	0d	11/10/98
9	2 - Begin Flooding	0d	12/22/98
10			
11	Area B - Shallow Flooding	615d	7/2/97
12	Construction	585d	7/2/97
13	Permit, design, bid	36w	7/2/97
14	Roads	26w	4/1/98
15	Water lines	52w	9/30/98
16	Berms	26w	9/30/98
17	Electrical	26w	4/1/98
18	3 - Const. Complete	0d	9/28/99
19	4- Begin Flooding	0d	11/9/99



Date: 7/9/97 | Task | Milestone | Summary

Table 7.2: Owens Valley SIP Control measure Implementation Schedule

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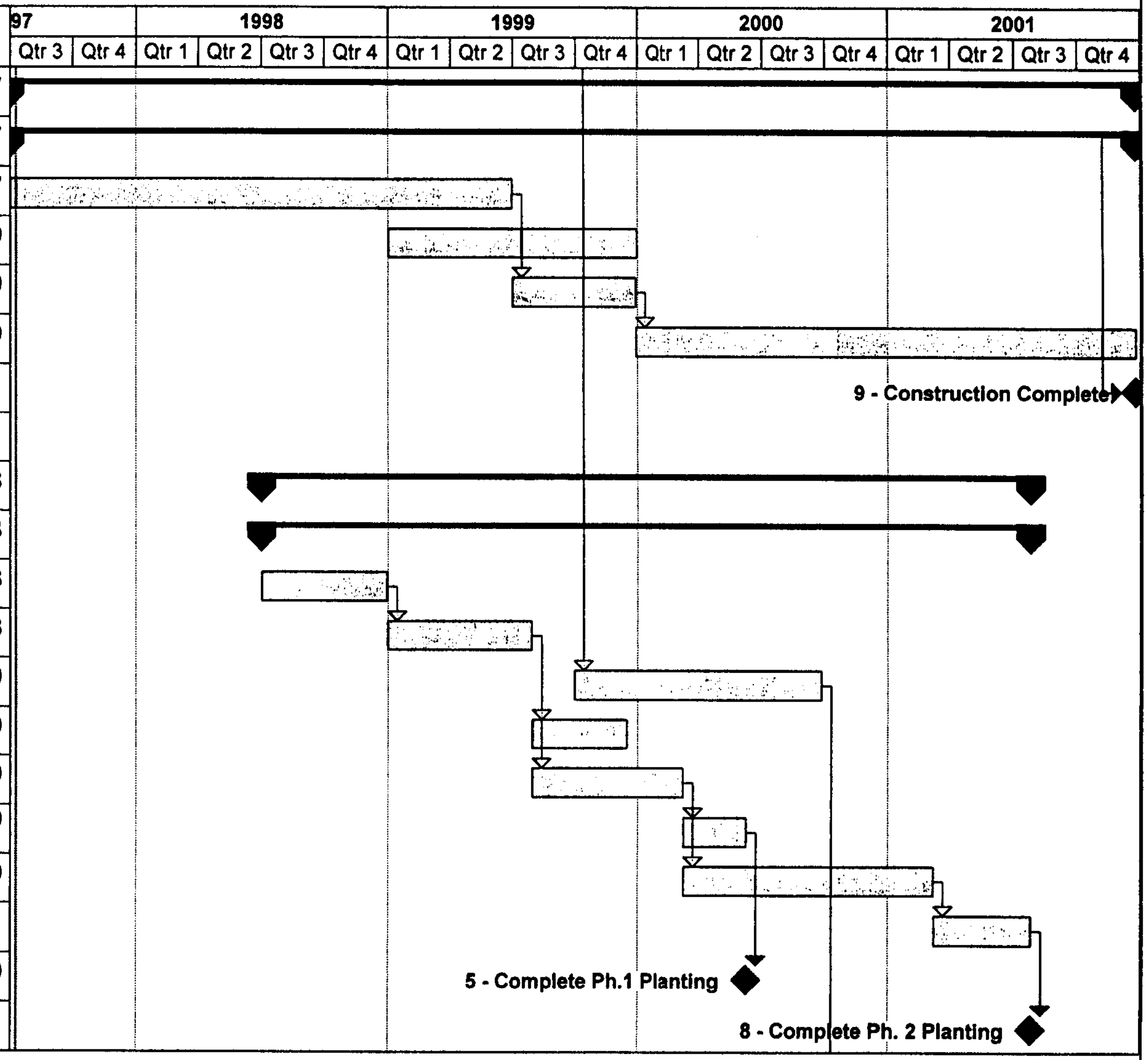
ID	Task Name	Duration	Start
20	Area C - Gravel	1170d	7/2/97
21	Construction	1170d	7/2/97
22	Permit, design, bid	104w	7/2/97
23	Roads, berms, channels	52w	1/1/99
24	Mine development	26w	6/30/99
25	Gravel placement	104w	12/29/99
26	9 - Construction Complete	0d	12/25/01
27			
28	Area D - Managed Veg	800d	7/2/98
29	Construction	800d	7/2/98
30	Permit, design, bid	26w	7/2/98
31	Roads	30w	12/31/98
32	Water lines	52w	9/29/99
33	Electrical	20w	7/29/99
34	Construct phase 1	32w	7/29/99
35	Plant phase 1	13w	3/9/00
36	Construct phase 2	52w	3/9/00
37	Plant phase 2	20w	3/8/01
38	5 - Complete Ph.1 Planting	0d	6/7/00
39	8 - Complete Ph. 2 Planting	0d	7/25/01



Date: 7/9/97 | Task | Milestone | Summary

Table 7.2: Owens Valley SIP Control measure Implementation Schedule

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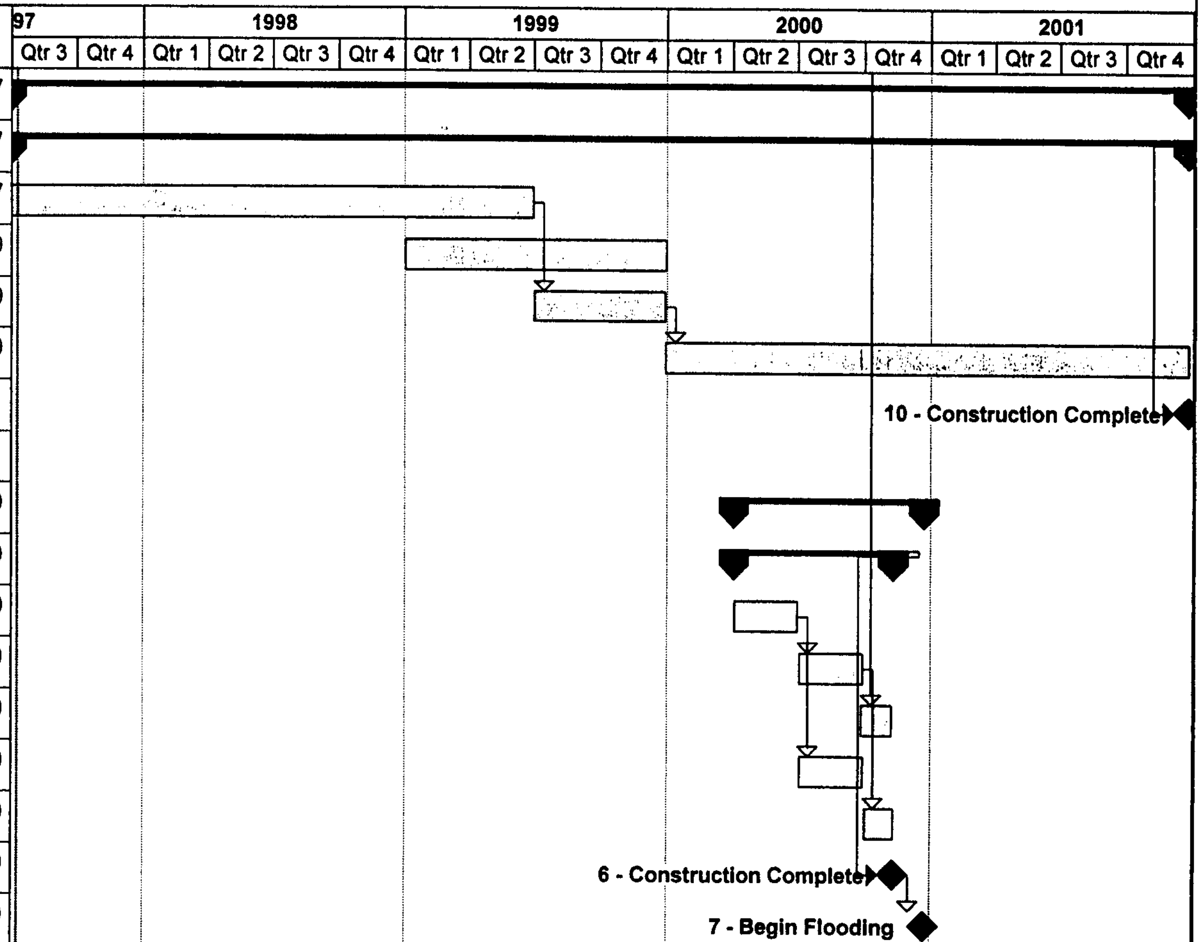
ID	Task Name	Duration	Start
40	Area E - Gravel	1170d	7/2/97
41	Construction	1170d	7/2/97
42	Permit, design, bid	104w	7/2/97
43	Roads, berms, channels	52w	1/1/99
44	Mine development	26w	6/30/99
45	Gravel placement	104w	12/29/99
46	10 - Construction Complete	0d	12/25/01
47			
48	Area F - Shallow Flooding	190d	4/3/00
49	Construction	160d	4/3/00
50	Permit, design, bid	13w	4/3/00
51	Roads	13w	7/3/00
52	Water lines	6w	9/27/00
53	Berms	13w	7/3/00
54	Electrical	6w	10/2/00
55	6 - Construction Complete	0d	11/10/00
56	7 - Begin Flooding	0d	12/22/00



Date: 7/9/97 | Task | Milestone | Summary

Table 7.2: Owens Valley SIP Control measure Implementation Schedule

Table 7.2a Project Milestones

MILESTONE	DATE
1 - Complete Construction Area A	November 10, 1998
2 - Begin Flooding of Area A[1]	December 22, 1998
3 - Complete Construction Area B	September 28, 1999
4 - Begin Flooding of Area B[2]	November 9, 1999
5 - Complete Area D Phase 1 Planting	June 7, 2000
6 - Complete Construction of Area F	November 10, 2000
7 - Begin Flooding Area F	December 22, 2000
8 - Complete Area D Phase 2 Planting [1,2]	July 25, 2001
9 - Complete Construction Area C	December 25, 2001
10 - Complete Construction Area E	December 25, 2001

Notes:
1. In order to provide sufficient water for soil leaching and plant establishment for Area D, Phase 2, water flows to Area A may be shut off from January 1, 2001 through December 25, 2001.
2. In order to provide sufficient water for soil leaching and plant establishment for Area D, Phase 2, water flows to Area B may be reduced to 40% of normal from January 1, 2001 through December 25, 2001. The reduced flows shall be delivered to the southerly portion of Area B at a level adequate to achieve the performance standard for shallow flooding (75% coverage with standing water or saturated surface soil) on that southerly portion.

7-3.3 Gravel

For purposes of determining an implementation schedule, it was necessary to predict the probable source of the natural resources to be applied to the lake bed. For the reasons set forth in the EIR, the District has forecasted, but does not require, that gravel for the project will come from the Keeler Fan site. Permitting and construction is expected to take four and a half years. Permitting and design would take place during the first two years. Construction of on-site infrastructure would begin in the second year. The mine would be developed and gravel placement would begin in the third year. Gravel placement is expected to take two years to complete.

Table 7.3 Control Area Sizes for Annual Implementation.

Area - Control Measure	Area Controlled at the End of Each Year (acres) 1997	1998	1999	2000	2001
A Shallow Flooding	---	1,210	1,210	0	1,210
B Shallow Flooding	---	---	6,960	2,784	6,960
C Gravel	---	---	---	---	3,365
D Managed Vegetation	---	---	---	2,900	8,700
E Gravel	---	---	---	---	1,940
F Shallow Flooding	---	---	---	225	225
	0	1,210	8,170	5,909	22,400

Total = 22,400 acres

7-4 PM_{10} EMISSION REDUCTION TREND

An estimate of the PM_{10} emission reduction trend over the four and a half year implementation period can be estimated using the information discussed in Section 7-3 and an approximation for the amount of PM_{10} per acre of playa controlled. Table 7.3 summarizes the size of the areas that will be controlled each year under the control strategy. Using the model estimated peak day PM_{10} emission total of 10,800 tons per day and PM_{10} emissions of 44 tons per day after controls are in place (Table 6.2), an estimate of 0.48 tons of PM_{10} per acre of lake bed controlled is estimated for 22,400 acres that are intended for controls. Figure 7.2 shows the estimated peak-day emission trend line for the SIP control strategy. A similar trend line would also be estimated for the reduction of annual emissions.

7-5 COST AND EMPLOYMENT

The range of comparative preliminary costs for the construction of the Proposed Project is $91 - $250 million. The range of comparative preliminary costs for annual operation and maintenance is $26 - $30 million. The range of these costs are based on the analyses performed by the District (Appendix G), and adjusted costs from the Parsons Engineering Science report which is included with the District's evaluation of their costs in the comments to the SIP. Adjustments to the Parsons costs were necessary due to incorrect project design assumptions. These estimates assume that the water supplied from the Los Angeles Aqueduct is replaced by the City with purchases from the Metropolitan Water District at a cost of $450 per acre-foot. Using the

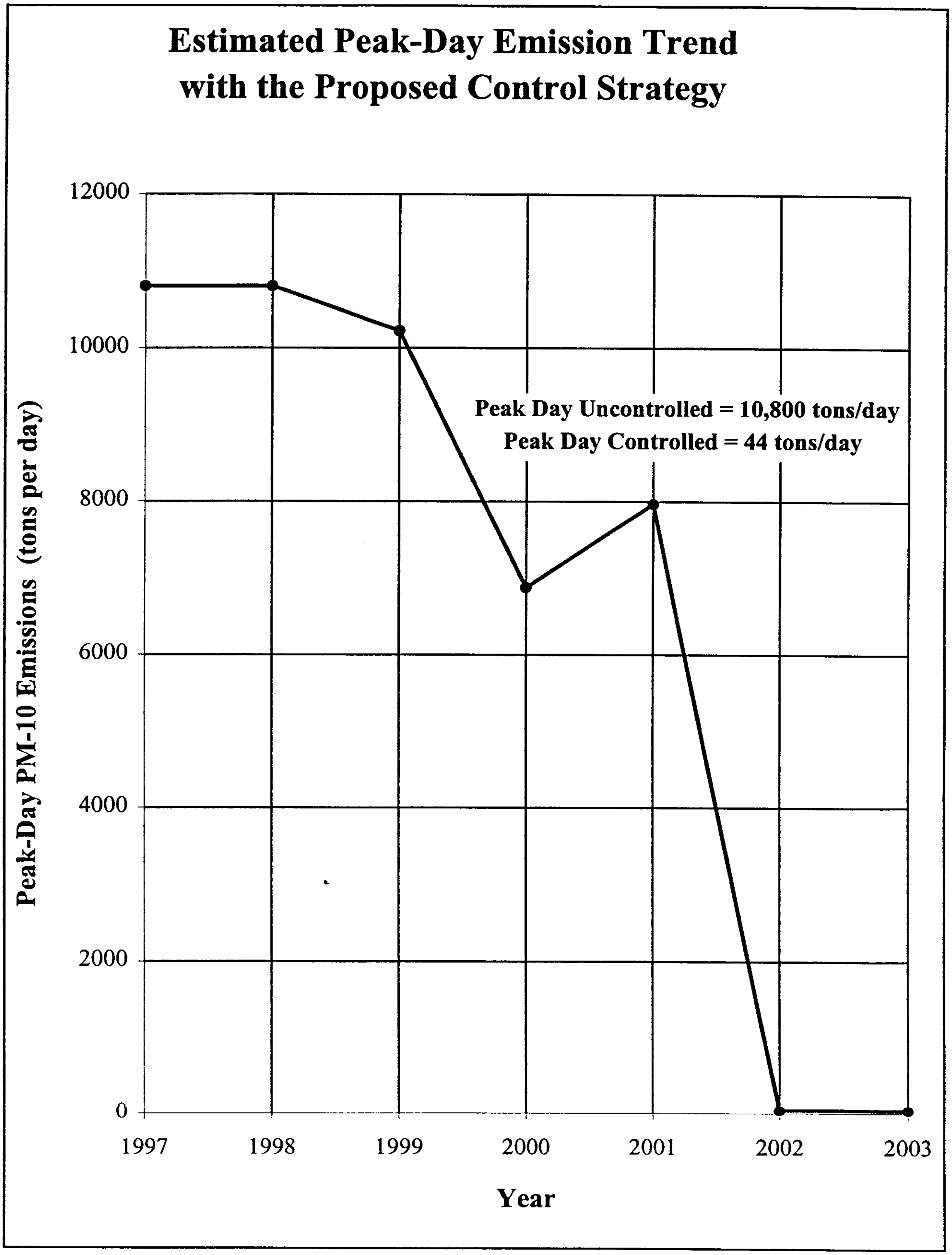


Figure 7.2: Estimated peak-day PM_{10} emision trend with the proposed control strategy.

construction and annual cost estimates, the range of 25-year annualized cost is \$38 - \$50 million, for a cost per ton of PM_{10} controlled of \$130 - \$175. The South Coast 1987 Air Quality Management Plan set the PM_{10} BACM cost-feasibility limit at \$5,300/ton. Actual control costs required by the South Coast Plan range from \$170/ton for agricultural sources to \$630/ton for unpaved roads. It is estimated that the Proposed Project will create between 84 and 91 jobs during construction and 14 long-term jobs for operation and maintenance of the control measures (Great Basin, 1997 and Parsons, 1997).

7-6 MODELED ATTAINMENT DEMONSTRATION

As discussed in Section 6-5, an air quality modeling analysis was performed to show that the proposed control strategy would reduce the PM_{10} emissions to a level that will bring the areas around Owens Lake into compliance with the PM_{10} NAAQS. Air quality modeling utilized the USEPA approved guideline model, Industrial Source Complex - Short-term version 3. After the proposed control strategy is implemented, ambient PM_{10} levels are expected to be below the 24-hour PM_{10} NAAQS of 150 $\mu g/m^3$. The highest impact area is expected to occur in the area near the southeast shoreline (see Figure 6.3).

7-7 MONITORING AND IMPLEMENTATION

Adoption of the control strategy set forth in this SIP will require the District to maintain programs to monitor and enforce the proper and timely execution of mandatory implementation and air quality attainment provisions of this SIP. Specifically, the District shall continue to monitor air quality in the Planning Area, in order to determine whether reasonable further progress is being made, as shown by emission reduction milestones, and whether the control strategy achieves progress toward attainment of the 24-hour PM_{10} NAAQS by the attainment deadline. Second, the District shall monitor and enforce the implementation of the control strategy by the City of Los Angeles, to ensure both that the control measures are properly and timely installed, and that their installation and operation conform to the design and performance requirements of this SIP. Third, as required by the mitigation and monitoring program that will be adopted by the District at the time it certifies the Final Environmental Impact Report, the District shall enforce the mitigation measures, as well as elements of the project description, that are intended to avoid or lessen adverse environmental impacts of implementing the control strategy. Some of those mitigation measures and project elements require long-term monitoring of certain environmental effects of implementing the control strategy, and taking appropriate responsive action when the monitoring discloses an adverse environmental effect.

7-8 COMMITMENTS TO REDUCE IMPLEMENTATION COST

During the course of implementing the control strategy, experience and ongoing studies are likely to provide knowledge that will help to significantly reduce the cost of implementing the proposed control strategy. Experience will be gained while constructing and operating the control measures on the playa that may help to reduce costs associated with the control measures. This could result in better operating methods that reduce water usage for the shallow flooding and managed vegetation control measures.

In order to optimize the use of limited water resources and to reduce the cost to implement the control strategy, the District will commit through this SIP to conduct studies in the following areas:

Shallow Flooding
- Optimize water use and PM_{10} control.
- Reduce construction and operations costs.

Gravel
- Optimize gravel use and PM_{10} control.
- Reduce construction and operation costs.

Vegetation Management
- Increase water use efficiency.
- Improve efficiency of vegetation establishment.
- Reduce construction and operation costs.

Water Resources
- Investigate impacts from groundwater pumping by refining the hydrologic model for the Owens Lake Basin.
- Evaluate water resources that could become available if the Lower Owens River project is approved.

Replacement Control Measures
- Assess cost and effectiveness of agricultural tilling on Owens Lake as a viable and less costly measure to replace portions of the gravel or managed vegetation control areas.
- Assess the cost and effectiveness of other PM_{10} controls that have a likelihood of success on the Owens Lake playa.

Many of these investigations will be done in conjunction with the initial implementation of the control measures, such as the methods to optimize water use and PM_{10} control. It is likely that the information gained from these studies can be easily integrated into the implementation program, provided that any changes are within the scope of the EIR supporting this SIP. Other investigations are separate studies that would be conducted concurrent to the implementation program for use in the future, such as the hydrologic modeling. Implementation of projects such as pumping groundwater or the use of the Lower Owens River water, that are not analyzed in the SIP EIR, will require separate or supplemental EIR's to assess the impacts due to those projects.

7-9 EXISTING RULES AND REGULATIONS TO CONTROL PM_{10}

The focus of the discussion in the SIP control strategy is on controls for Owens Lake, which is regulated under California Health & Safety Code §42316. This is discussed in more detail in Chapter 8. Other sources that contribute PM_{10}, such as industrial sources, forest management burning (see section 4-2.4 regarding prescribed burning), and fugitive dust are covered under existing District Rules. These rules are listed in Table 7.4 for sources other than Owens Lake. Methods to control fugitive dust and to comply with these rules are included in permits to operate for industrial sources. An example of a permit to operate for an industrial facility is included in Appendix C.

It should be noted that contractors that are involved in the implementation of the SIP control strategy, such as road building, gravel mining and hauling are subject to these District rules and regulations regarding fugitive dust control. The gravel mining and hauling activities will be required to apply for an Authority to Construct and obtain a Permit to Operate from the District. This permit will include Conditions of Approval such as those included in the example permit in Appendix C.

7-10 CONTINGENCY CONTROL MEASURES

Although the District concludes that attainment of the federal PM_{10} NAAQS will be accomplished through the implementation of the SIP control strategy, the federal Clean Air Act Amendments of 1990 require a description of contingency measures (CAAA Section 172(c)(9)). The contingency measures are control measures that can be implemented in case the SIP control strategy fails to bring the area into attainment. The following contingency control measures are incorporated into this SIP and shall be implemented, as necessary, to bring the Owens Valley Planning Area into attainment with the NAAQS:

Contingency Measure 1 - Increase the application intensity of implemented controls. This may include increasing vegetation cover, increasing gravel thickness, and/or increasing surface water coverage.

Contingency Measure 2 - Replace control measures that are not appropriately sited. Gravel may replace shallow flooding or managed vegetation in areas that initially proposed for those controls, but are later found to be inappropriate due to soil type, salt infiltration or other site specific problems.

Table 7.4 Existing Rules and Regulations to Control Sources of PM_{10}.

District Rule	Description
209-A	Requires new sources with PM_{10} emissions greater than 250 pounds per day of total suspended particulates, or facility modifications of greater than 15 tons per year of PM_{10} to apply Best Available Control Technology to control PM emissions.
400	Limits visible emissions from any source, except those exempted under Rule 405, to less than Ringelmann 1 or 20% opacity.
401	Requires that reasonable precautions be taken to prevent visible particulate emissions from crossing the property boundary.
402	Prohibits sources of air pollution from causing a nuisance to the public or endangering public health and safety.
408	Limits agricultural burning operations to designated burn days and requires a burn permit.
409	Limits range improvement burning to designated burn days and requires that a burn plan be approved by the Air Pollution Control Officer.
410	Limits forest management burning to designated burn days and requires that a burn plan be approved by the Air Pollution Control.
411	Limits wildland management burning to designated burn days and requires that a burn plan be approved by the Air Pollution Control Officer.

Contingency Measure 3 - Expand control measures to areas not included in the project area. If areas outside of the initial project area are found to cause PM_{10} violations after the SIP control strategy is implemented, appropriate control measures will be implemented in these source areas to bring the area into attainment with the NAAQS.

Implementation of contingency measures may require the District and/or the City of Los Angeles to take discretionary or quasi-discretionary actions which require compliance with the California Environmental Quality Act (CEQA). If contingency measures are applied to relatively small areas within the project area boundaries, the change may not be considered a significant change from the SIP control strategy and may be within the scope of the CEQA document for the SIP control strategy. If significant changes, such as expanding controls outside the project area are needed, proper CEQA documentation will be completed prior to implementation of the contingency measure.

7-11 REASONABLE FURTHER PROGRESS

Under CAAA Section 189(c), the demonstration of attainment SIP is required to include quantitative milestones which are to be achieved every three years until the area is redesignated attainment and which demonstrate reasonable further progress toward attainment by the attainment date. Table 7.2a includes the milestones that will be tracked to achieve the emission reduction trend as shown in Figure 7.2 to demonstrate reasonable further progress toward attaining the NAAQS. A Reasonable Further Progress Report will be submitted to the State and USEPA once every three years, beginning three years from the date of adoption of the 1997 SIP.

7-12 AUTHORITY AND RESOURCES

Under California Health & Safety Code §42316, the District is authorized to require the City of Los Angeles to undertake reasonable control measures to mitigate the air quality impacts of its activities in the production, diversion, storage or conveyance of water. The control measures may only be required on the basis of substantial evidence that the water production, diversion, storage or conveyance of water by the City causes or contributes to violations of state or federal ambient air quality standards. In addition, the control measures shall not affect the right of the City to produce, divert, store or convey water.

The District has found that the control measures required under this plan are reasonable and that, on the basis of substantial evidence, the City's water production, diversion, storage or conveyance causes or contributes to violations of state or federal ambient air quality standards in the Owens Valley Planning Area. Also, the District has concluded that the required control measures do not affect the right of the City to produce, divert, store or convey water. On this basis, the District has authority, directly under state law, to issue orders directing the City of Los

Angeles to implement the control strategy described in this plan. Those orders are enforceable by the District under state law. Health & Safety Code §42402 provides that the District may impose civil penalties of up to $10,000 per day against a person who violates any order issued pursuant to Health & Safety Code §42316. In addition, under Health & Safety Code §41513, the District is empowered to bring a judicial action in the name of the People of the State of California to enjoin any violation of its orders. Finally, Health & Safety Code §42400 makes it a criminal offense to violate a lawful order of the District.

The District has the financial resources to enforce compliance with the plan. California Health & Safety Code §42316 authorizes the District annually to assess and collect reasonable fees against the City of Los Angeles. The amount of the fees is set by the District, based on an estimate of the actual costs of the District of its activities associated with the development of air pollution control measures and related air quality analysis, pertaining to the air quality impacts of the City's production, diversion, storage or conveyance of water. Enforcement of the requirements of this plan is a cost which the District may properly include in the estimate it develops as a basis to impose its annual fees under Health & Safety Code §42316. Such enforcement costs include salaries and expenses of appropriate personnel, and attorneys fees incurred in enforcing provisions the plan, and defending the District in challenges to the plan and its adoption. As with the control measures, the District's orders to pay fees are enforceable under state law. The District may impose civil penalties of up to $10,000 per day and seek injunctive relief if any of its fee assessments are not timely and fully paid. Moreover, although state law permits the City to appeal an order imposing fees to the State Air Resources Board, the appeal does not stay the City's obligation to pay the fees on time.

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CHAPTER 8

ENABLING LEGISLATION TO IMPLEMENT CONTROL STRATEGY

8 ENABLING LEGISLATION TO IMPLEMENT CONTROL STRATEGY

8-1 IMPLEMENTATION OF THE CONTROL STRATEGY 8-1

8-2 THE BOARD ORDER 8-3

FIGURES

Figure 8.1 Text of CH&SC §42316 which allows the District to assess fees for studies and order mitigation measures to implement the SIP control strategy. 8-2

8 ENABLING LEGISLATION TO IMPLEMENT CONTROL STRATEGY

8-1 IMPLEMENTATION OF THE CONTROL STRATEGY

Under California Health & Safety Code §42316 (see Figure 8.1 & Section 2-2.2.2), the District is ordering the City of Los Angeles (City) to implement the SIP control measures on the schedule included in Chapter 7. The schedule will require that implementation of the control measures take place over a four and a half year period with completion by December 31, 2001. The Board order to implement the control strategy is included in this chapter for the Board to approve as part of this SIP.

The order requires the City to implement shallow flooding, gravel and managed vegetation control measures in the areas shown in Figure 7.1. Implementation under the Board's order also ensures compliance with the California Environmental Quality Act. This includes: required environmental mitigation measures, environmental monitoring, and supplemental environmental documents. Separate environmental documents to the SIP EIR will be needed for gravel mining, and possibly for other aspects of implementation if changes are made to the proposed control strategy.

In addition to the Board's implementation order, the City will be assessed for actual costs associated with the District's activities to monitor air quality and control measure implementation at Owens Lake. This will be issued as an annual assessment under CH&SC §42316.

Text of California Health & Safety Code §42316

42316. (a) The Great Basin Air Pollution Control District may require the City of Los Angeles to undertake reasonable measures, including studies, to mitigate the air quality impacts of its activities in the production, diversion, storage, or conveyance of water and may require the city to pay, on an annual basis, reasonable fees, based on an estimate of the actual costs to the district of its activities associated with the development of the mitigation measures and related air quality analysis with respect to those activities of the city. The mitigation measures shall not affect the right of the city to produce, divert, store, or convey water and, except for studies and monitoring activities, the mitigation measures may only be required or amended on the basis of substantial evidence establishing that water production, diversion, storage, or conveyance by the city causes or contributes to violations of state or federal ambient air quality standards.

(b) The city may appeal any measures or fees imposed by the district to the state board within 30 days of the adoption of the measures or fees. The state board, on at least 30 days' notice, shall conduct an independent hearing on the validity of the measures or reasonableness of the fees which are the subject of the appeal. The decision of the state board shall be in writing and shall be served on both the district and the city. Pending a decision by the state board, the city shall not be required to comply with any measures which have been appealed. Either the district of the city may bring a judicial action to challenge a decision by the state board under this section. The action shall be brought pursuant to Section 1094.5 of the Code of Civil Procedures and shall be filed within 30 days of service of the decision of the state board.

(c) A violation of any measure imposed by the district pursuant to this section is a violation of an order of the district within the meaning of Sections 41513 and 42402.

(d) The district shall have no authority with respect to the water production, diversion, storage, and conveyance activities of the city except as provided in this section. Nothing in this section exempts a geothermal electric generating plant from permit or other district requirements.

(Added by Stats. 1983, Ch. 608, Sec. 1. Effective September 1, 1983.)

Figure 8.1 Text of CH&SC §42316 which allows the District to assess fees for studies and order mitigation measures to implement the SIP control strategy.

8-2 THE BOARD ORDER

The following order of the Great Basin Unified Air Pollution Control District is incorporated into this State Implementation Plan and constitutes an integral part thereof.

BOARD ORDER # 070297-04
IMPLEMENTATION OF DUST CONTROL ON OWENS LAKE

The Governing Board of the Great Basin Unified Air Pollution Control District (Board) orders the City of Los Angeles (City) to implement the following PM_{10} control measures in accordance with the Owens Valley PM_{10} State Implementation Plan (SIP) schedule. These measures shall be implemented in the areas described by the attached 2-sheet exhibit titled "Coordinate Description of Owens Lake PM_{10} Control Areas" as follows:

Shallow Flooding
The shallow flooding control measure will apply water to the surface of the areas of the lake bed designated for control by shallow flooding (shown as Areas A, B, and F in SIP Figure 7.1), in amounts and by means sufficient to achieve the following performance standard commencing on September 15 of each year, and ending on June 15 of the next year: 75% percent of each square mile of each of Areas A, B and F shall continuously consist of standing water or surface saturated soil. Coverage shall be confirmed by aerial photography or other methods satisfactory to the District.

Between June 16 and July 31 of each calendar year, the City will supply, within the boundaries of the Areas A, B, and F, water in amounts and locations adequate to maintain sources of food and water suitable for sustaining nesting and fledgling shorebirds, including western snowy plovers, nesting within the boundaries of those control areas or within ½ mile of their boundaries. If the control measure as implemented creates vegetation of the type and density used as wildlife habitat, the City shall supply water in amounts sufficient to maintain that vegetation in a state suitable for wildlife habitat during the period between June 15 and July 31 of each calendar year.

The City shall construct a berm keyed into the lake bed sediments along the lower boundary of each of Areas A, B and F to minimize the transmission of excess water from the control areas toward the Owens Lake brine pool. The design and implementation of this berm will incorporate snowy plover crossings located at each 500 feet along the length of the berm, adequate in design to freely allow traverse of the berm by both snowy plover adults and chicks. Surface waters that reach the lower boundary of those control areas will be collected and recirculated for reapplication to the control areas. The control measure areas will have lateral boundary edge berms as necessary to contain waters in the control areas and to isolate the control measure areas from each other and from areas not controlled.

The City shall remove any exotic pest plants, including salt cedar (Tamarix ramosissima), that invade any of Areas A, B, and F. As necessary to protect human health, the City shall avoid or abate mosquito breeding and swarming in those control areas by effective means which minimize adverse effects upon adjacent wildlife.

Managed Vegetation

In Area D (as shown in SIP Figure 7.1), the City shall achieve coverage of at least 50% on each acre in substantially evenly distributed live or dead vegetation, as measured by the point-frame method. The vegetation shall consist only of locally-adapted native species or species approved by both the District and the State Lands Commission.

The following portions of Area D are exempted from the requirement of 50% vegetative coverage: (1) portions of Area D consistently inundated with water, such as reservoirs and canals, (2) roadways necessary to access, operate and maintain the control measure which are otherwise controlled to render them substantially non-emissive, (3) portions of Area D used as floodwater diversion channels or desiltation/retention basins, (4) portions of Area D set aside as Transmontane Alkaline Meadow (TAM) habitat restoration zone which meet the requirements set forth below.

In Area D, a minimum of 121 acres of the control area (less any offsets) must be established as a habitat restoration zone for TAM, vegetated to achieve species diversity and achieving vegetative cover comparable to TAM. Any TAM established and maintained by the City in control areas using shallow flooding, shall be an acre-for-acre offset to this habitat restoration provision.

The City shall remove any exotic pest plants, including salt cedar (Tamarix ramosissima), that invade the control area. To the extent necessary to protect human health, the City shall avoid or abate mosquito breeding and swarming in those control areas by means which minimize adverse effects upon adjacent wildlife.

To protect the control measure from natural flooding, the City shall incorporate drains and channels in the control measure area adequate to divert the flood waters away from the vegetated areas and to outlet the flood waters into the Owens Lake brine pool (or reservoir(s), if any). The drains and channels shall be designed to incorporate features (such as desiltation/ retention basins) adequate to capture the alluvial material carried by the flood waters and to avoid greater than normal deposition of this material into the Owens Lake brine pool.

The City shall construct a berm keyed into the lake bed sediments along the lower boundary of Area D to minimize the transmission of excess water from the control area toward the Owens Lake brine pool. The design and implementation of this berm will incorporate snowy plover crossings located at each 500 feet along the length of the berm, adequate in design to freely allow traverse of the berm by both snowy plover adults and chicks. Surface waters that reach the lower boundary of the control area will be collected and recirculated for reapplication to the control area or other discharge. The control measure areas will have lateral boundary edge berms as necessary to contain waters in the control areas and to isolate the control measure areas from each other and from areas not controlled.

Gravel

Areas C and E as shown in SIP Figure 7.1 shall be covered with a layer of gravel at least four inches thick. All gravel material placed must be screened to a size greater than ⅜-inch in diameter. Where necessary to support the gravel blanket, it shall be placed over a permanent permeable geotextile fabric. The gravel shall have resistence to leaching and erosion. It shall be no more toxic than the gravel analyzed by the District from the Keeler fan site. It shall also be comparable in coloration to the lake bed soils.

To protect the control measure from natural flooding, the City shall incorporate drains and channels in the control measure areas adequate to divert the flood waters away from the graveled areas and to outlet the flood waters into the Owens Lake brine pool. The drains and channels shall be designed to incorporate features (such as desiltation/retention basins) adequate to capture the alluvial material carried by the flood waters and to avoid greater than normal deposition of this material into the Owens Lake brine pool. The gravel placement design and implementation shall adequately protect the graveled areas from the deposition of wind- and water-borne soil. The City will apply best available control measures (BACM) and New Source Performance Standard (NSPS) emission limits to its gravel mining and transportation activities occurring in the District's geographic boundaries as required by the District in the City's District-issued Permit to Construct and Permit to Operate.

The implementation of the control measures shall be conducted so as to attain each project milestone set forth in the attached table on or before by the date ascribed to such milestone in the table.

Furthermore, the Board orders the City of Los Angeles to satisfy the following requirements related to the implementation of the shallow flooding, managed vegetation, and gravel control measures:

The City will apply best available control measures (BACM) to control air emissions from its construction/implementation activities occurring in the District's geographic boundaries as required by the District in the City's District-issued Permit to Construct and Permit to Operate. In addition, the City shall comply with any applicable requirements of the Mitigation Monitoring and Reporting Program adopted by the District concurrently with its certification of the Final Environmental Impact Report for this project. In the construction and implementation of control measures, the City shall avoid disturbing during the breeding season for each of the following bird species: (1) the nesting habitat (namely, shadscale scrub) of the Le Conte's thresher and loggerhead shrike during the breeding season for those birds, (2) the nesting habitat (namely, transmontane alkaline meadow) of the northern harrier, and (3) the nesting habitat (namely, the Owens Lake playa) of the western snowy plover. As an alternative, the City may elect, during the breeding season for those birds, to take adequate steps to identify and avoid disturbing breeding individuals of those species. The City's construction and implementation activities will comply with Mitigation Measures set forth in the Final EIR relating to protection of cultural resources, Mitigation Measures relating to protection of sensitive plant species and Mitigation Measures relating to the reduction of traffic hazards, all as set forth in the Final EIR and Mitigation Monitoring and Reporting Program.

Attachments: Table of Project Milestones for Board Order, and Coordinate Description of Owens Lake PM_{10} Control Areas (2 sheets).

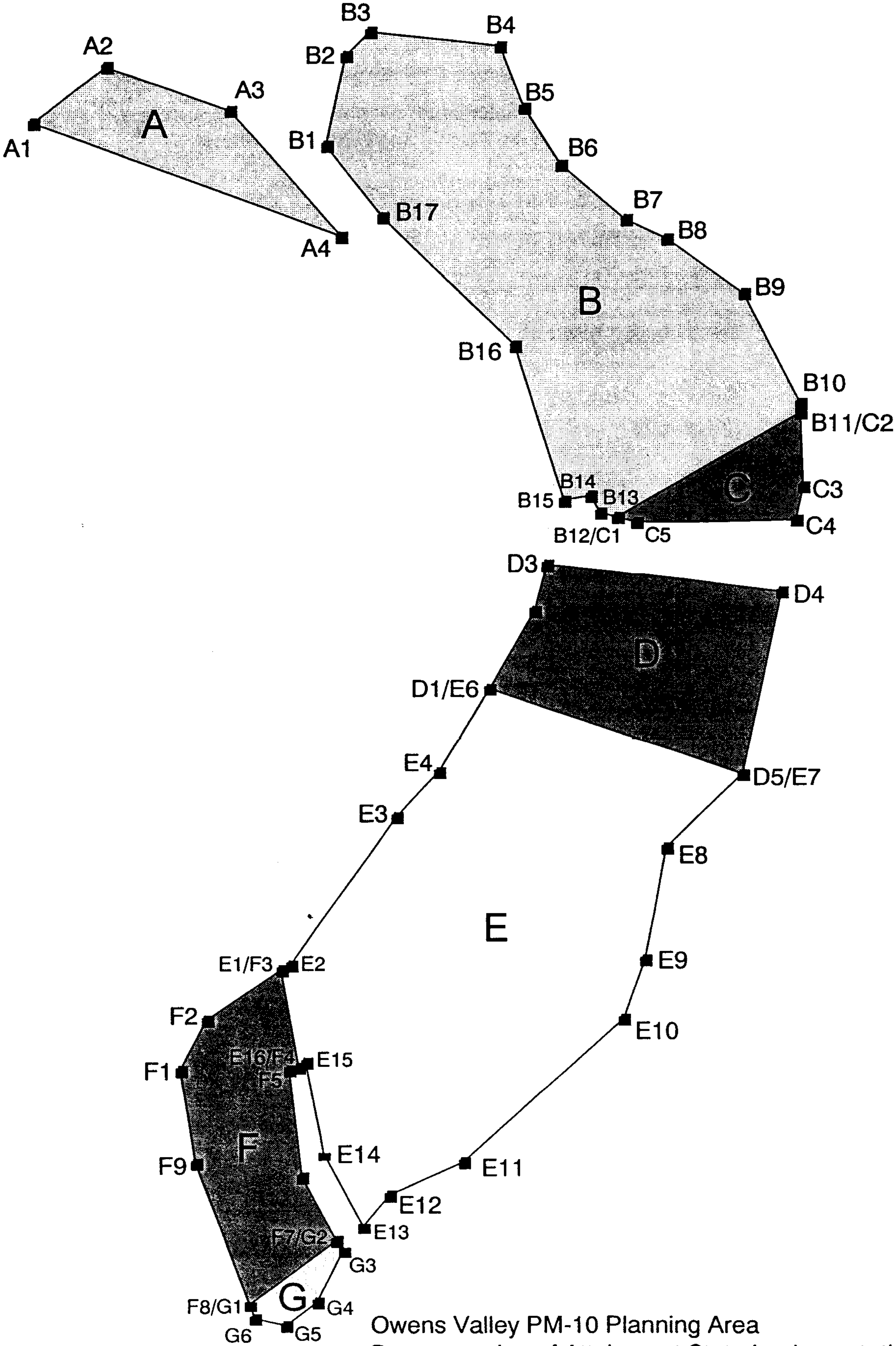
Owens Valley PM-10 Planning Area

Demonstration of Attainment State Implementation Plan

Coordinate Description of Owens Lake PM-10 Control Measure Areas

Point #	Longitude	Latitude		Point #	Longitude	Latitude
A1	-118.00360	36.51007		E1	-117.96090	36.38246
A2	-117.99035	36.51845		E2	-117.95921	36.38336
A3	-117.96797	36.51159		E3	-117.93932	36.40523
A4	-117.94773	36.49253		E4	-117.93111	36.41171
				E6	-117.92178	36.42456
				E7	-117.87594	36.41089
B1	-117.95038	36.50601		E8	-117.89002	36.40005
B2	-117.94675	36.51949		E9	-117.89406	36.38327
B3	-117.94223	36.52319		E10	-117.89845	36.37439
B4	-117.91819	36.52090		E11	-117.92836	36.35348
B5	-117.91402	36.51154		E12	-117.94175	36.34858
B6	-117.90746	36.50302		E13	-117.94667	36.34402
B7	-117.89590	36.49453		E14	-117.95377	36.35522
B8	-117.88818	36.49166		E15	-117.95654	36.36858
B9	-117.87443	36.48330		E16	-117.95811	36.36804
B10	-117.86451	36.46672				
B11	-117.86447	36.46527				
B12	-117.89795	36.45004		F1	-117.97958	36.36767
B13	-117.90140	36.45093		F2	-117.97437	36.37530
B14	-117.90319	36.45333		F3	-117.96090	36.38246
B15	-117.90764	36.45255		F4	-117.95811	36.36804
B16	-117.91618	36.47577		F5	-117.95955	36.36754
B17	-117.94021	36.49519		F6	-117.95763	36.35165
				F7	-117.95156	36.34197
				F8	-117.96768	36.33241
C1	-117.89795	36.45004		F9	-117.97701	36.35391
C2	-117.86447	36.46527				
C3	-117.86420	36.45444				
C4	-117.86560	36.44925		G1	-117.96768	36.33241
C5	-117.89455	36.44916		G2	-117.95156	36.34197
				G3	-117.95056	36.34038
				G4	-117.95509	36.33281
D1	-117.92178	36.42456		G5	-117.96116	36.32909
D2	-117.91321	36.43637		G6	-117.96671	36.33017
D3	-117.91088	36.44312				
D4	-117.86846	36.43863				
D5	-117.87594	36.41089				

Note: All coordinates are in decimal degrees, WGS 84 spheroid coordinate system



Owens Valley PM-10 Planning Area
Demonstration of Attainment State Implementation Plan
Coordinate Description of Owens lake PM-10 Control Are

Table of Project Milestones for Board Order

Milestone	Date
1 - Complete Construction Area A	November 10, 1998
2 - Begin Flooding of Area A[1]	December 22, 1998
3 - Complete Construction Area B	September 28, 1999
4 - Begin Flooding of Area B[2]	November 9, 1999
5 - Complete Area D Phase 1 Planting	June 7, 2000
6 - Complete Construction of Area F	November 10, 2000
7 - Begin Flooding Area F	December 22, 2000
8 - Complete Area D Phase 2 Planting [1,2]	July 25, 2001
9 - Complete Construction Area C	December 25, 2001
10 - Complete Construction Area E	December 25, 2001

Notes:

1. In order to provide sufficient water for soil leaching and plant establishment for Area D, Phase 2, water flows to Area A may be shut off from January 1, 2001 through December 25, 2001.

2. In order to provide sufficient water for soil leaching and plant establishment for Area D, Phase 2, water flows to Area B may be reduced to 40% of normal from January 1, 2001 through December 25, 2001. The reduced flows shall be delivered to the southerly portion of Area B at a level adequate to achieve the performance standard for shallow flooding (75% coverage with standing water or saturated surface soil) on that southerly portion.

CHAPTER 9

SUMMARY OF REFERENCES

9 SUMMARY OF REFERENCES

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CHAPTER 10

GLOSSARY AND LIST OF ACRONYMS

10 GLOSSARY AND LIST OF ACRONYMS

10-1 GLOSSARY

airshed	A geographical area which, because of topography, meteorology, and climate, shares the same air.
Board	The Great Basin Unified Air Pollution Control District Board
control measures	Those methods of PM_{10} abatement that could be placed into portions of the Owens Lake playa and, when in place, are effective in reducing the PM_{10} emissions from the surface over which they are implemented.
District	The Great Basin Unified Air Pollution Control District (a.k.a. GBUAPCD).
efflorescence	Efflorescence occurs when subsurface moisture is drawn upward through capillary action, carrying dissolved salts with it. As moisture evaporates, the salts are left at the surface in fine powdery deposits which can be lifted by turbulent winds. Powdery efflorescent salt surfaces have a very high PM_{10} content.
non-attainment area	An area which has not met state and USEPA air quality requirements.
Owens Lake playa	The surface area of the Owens Lake lakebed which is not covered by the Owens Lake brine pool; the actual size of the playa may change from year to year, and includes those portions of the lakebed which may be temporarily covered with water which is not high salinity.
Proposed Project	The sum of those activities which are proposed to be adopted by the Great Basin Unified Air Pollution Control District in the PM_{10} State Implementation Plan for the Owens Valley Planning Area and implemented to reduce fugitive PM_{10} emissions from the Owens Lake playa to meet the National Ambient Air Quality Standards for particulate matter smaller than 10 microns (PM_{10}); this would include all actions, whether undertaken on or off the playa.
SIP EIR	The Environmental Impact Report that was written to accompany and support the State Implementation Plan as required by the California Environmental Quality Act.

10-2 LIST OF ACRONYMS

ADT	Average daily traffic
AMSL	Above mean sea level
A&WMA	Air & Waste Management Association
BACM	Best Available Control Measures
BACT	Best Available Control Technology
BLM	U.S. Department of Interior, Bureau of Land Management
CAAA	Federal Clean Air Act Amendments of 1990
CalTrans	California Department of Transportation
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CASAC	Clean Air Scientific Advisory Committee
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CH&SC	California Health and Safety Code
DRI	Desert Research Institute
EIR	Environmental Impact Report
FTEE	Full-time equivalent employee
GBUAPCD	Great Basin Unified Air Pollution Control District (a.k.a. District)
GIS	Geographic Information System
GPS	Global Positioning System
ISCST3	Industrial Source Complex Short Term, a.k.a ISC3
LADWP	Los Angeles Department of Water and Power
MFG	McCulley, Frick and Gilman
NAAQS	National ambient air quality standards
NOAA	National Oceanographic and Atmospheric Administration
NEAP	Natural Event Action Plans
NEPA	National Environmental Policy Act
NSPS	New Source Performance Standard

OLSAC	Owens Lake Soda Ash Company
PM_{10}	Particulate Matter less than 10 microns nominal aerodynamic diameter
R.	Range
SIP	State Implementation Plan
SLC	California State Lands Commission
SSI	Size Selective Inlet
T.	Township
TEOM	Tapered Element Oscillating Microbalance, continuously measures ambient PM_{10}
TSP	Total suspended particulates
UCD	University of California at Davis
USEPA	U.S. Environmental Protection Agency
USDA	U.S. Department of Agriculture

10-3 MEASUREMENT UNITS

ac	acre, 640 acres = 1 square mile
ac-ft	acre-feet, volume of water, 1 ac-ft will cover a 1 acre area 1 foot deep with water.
^{o}C	degrees Celsius
^{o}F	degrees Fahrenheit
ft	feet, 1 foot = 0.3048 meters
g	grams, 1,000 grams = 1 kilogram
kg	kilogram, 1 kilogram = 2.2046 pounds
m	meters, 1 meter = 3.28 feet
m/s	meters per second, 1 meter per second = 2.237 miles per hour
mph	miles per hour, 1 mile per hour = 0.447 meters per second
ppm	parts per million
s	second
ton	US short ton, 1 ton = 2,000 pounds weight = 907.2 kilograms
yr	year
‘	feet
“	inches
µg	microgram, 1 microgram = 10^{-6} grams
µm	micron, 1 micron = 10^{-6} meters

APPENDIX A

PM-10 Monitoring Data

- All sites 1987 through 1995
- Off-lake March 1993 through June 1995
- Days that Exceeded 150 $\mu g/m^3$
- Summary of Quarterly and Annual averages

PM-10 Monitoring Data

All Sites 1987 through 1995

Summary of GBUAPCD PM-10 Monitoring 1987-1995

(all values are $\mu g/m^3$)

DATE	Keeler SSI	Keeler TEOM	Olancha SSI	Olancha TEOM	Lone Pine SSI	Lone Pine TEOM	Coso Junction SSI	Coso Navy SSI	Pearson-ville SSI	Inyo-kern SSI	Ridge-crest SSI
1/3/87	121		35		45		16				
1/9/87	6		15		16		27				
1/15/87	100		115		25		196				
1/19/87							19				
1/21/87	13		57		28		25				
1/27/87	672		37		178						
2/2/87	251		21		140		27				
2/8/87	13		25		19		19				
2/9/87					19						
2/14/87	9		4		8		12				
2/18/87	22										
2/20/87	54		145		7						
2/21/87							11				
2/26/87	39		33		8		36				
3/4/87	71		19		38		33				
3/10/87	230		13		17		8				
3/16/87	55		68				32				
3/22/87	166		110		13		65				
3/28/87	31		24		13		15				
4/3/87	33		29		18		32				
4/9/87	11		28		14		56				
4/15/87	23		45		25		47				
4/21/87	18		124		20		48				
4/27/87	25		29		19		23				
5/3/87	10		21		15		19				
5/9/87	7		14		9		13				
5/15/87	24		33		13		15				
5/21/87	8		14		11		28				
5/27/87	10		20		9		21				
6/2/87	13		27		17		41				
6/8/87	15		30				124				
6/12/87					21						
6/14/87	54		42		35		29				
6/20/87	17		18		21		30				
6/26/87	76		33		29		115				
7/2/87			15		24						
7/8/87	20		27		27		47				
7/14/87	22		26		20		36				
7/20/87	25		13		48		13				
7/26/87	24		14		26		27				
8/1/87	17		16		17						
8/7/87	22		25		27						
8/10/87							59				
8/13/87	18		25		25		43				
8/19/87	19		23		23		37				
8/25/87	13		23		20		40				
8/31/87			16				37				
9/3/87	42										
9/6/87	17		26		38		33				
9/12/87			31		47		36				
9/18/87	21		28		23		42				
9/24/87	12		15		16		20				
9/30/87	12		23		16		36				

Summary of GBUAPCD PM-10 Monitoring 1987-1995

(all values are $\mu g/m^3$)

DATE	Keeler SSI	Keeler TEOM	Olancha SSI	Olancha TEOM	Lone Pine SSI	Lone Pine TEOM	Coso Junction SSI	Coso Navy SSI	Pearson-ville SSI	Inyo-kern SSI	Ridge-crest SSI
10/6/87	16		31		17		42				
10/12/87	53		15		28		73				
10/18/87	12		19		18		18				
10/24/87	7		10		8		12				
10/30/87	6		10		5		16				
11/5/87	5		5				14				
11/11/87	12		13		14		14				
11/14/87					12						
11/17/87	16		23		9		25				
11/23/87	10		10		14		8				
11/29/87	11		19		19		14				
12/5/87	3		5		6		6				
12/11/87	8		9		13		11				
12/17/87	8		9		6						
12/19/87							2				
12/23/87	111		14		5		30				
12/29/87	5		6		12		8				
1/4/88	9		5		13		13				
1/10/88	9		12		17		9				
1/16/88	394		25		172		15	2			
1/22/88	11		11		23		37	7			
1/28/88	8		13		13		31				
2/3/88	10		12		19						
2/9/88	14		18				31	32			
2/15/88	10		21		29		47	6			
2/21/88	14		18		17		34	22			
2/27/88	12		13		8		20	14			
3/4/88	7		10		8		11	20			
3/9/88	115		67		29						
3/14/88							15				
3/15/88	69		18		43						
3/16/88							23	11			
3/22/88			13		12		18	41			
3/28/88	49		50		23		92	63			
4/3/88	21		23		36		24	44			
4/9/88	17		24		22		17				
4/12/88								6			
4/15/88	3		3		6		4				
4/21/88	8		7		7		9	12			
4/27/88	18		16		18		27	32			
5/3/88	15		14		22		22				
5/4/88								11			
5/5/88	56		13		50						
5/9/88							22				
5/15/88	17		16		26		25				
5/21/88	13		18		18		20	53			
5/27/88	20		23		21		32	48			
6/2/88	12		17		19		43	23			
6/8/88	12		9		9		14	17			
6/13/88	12										
6/14/88			23		19		31	118			
6/20/88	30		15				17	36			
6/23/88					4						

Summary of GBUAPCD PM-10 Monitoring 1987-1995

(all values are $\mu g/m^3$)

					Lone	Lone	Coso	Coso	Pearson	Inyo	Ridge
	Keeler	Keeler	Olancha	Olancha	Pine	Pine	Junction	Navy	-ville	-kern	-crest
DATE	SSI	TEOM	SSI	TEOM	SSI	TEOM	SSI	SSI	SSI	SSI	SSI
6/26/88	20		18		7		16	62			
7/2/88	16		20		11		14	30			
7/8/88	21		22		20		23	37			
7/14/88	21		25		21		28	42			
7/20/88	20		29		19		29	76			
7/26/88	20		19		12		16	55			
8/1/88	70		23		20		25	47			
8/7/88	20		17		10		20	29			
8/13/88	20		15		12		28	50			
8/19/88	20		21		19		33	58			
8/25/88	12		12		8		9	113			
8/31/88	14		17		15		20				
9/2/88								50			
9/6/88	24		29		31						
9/7/88								71			
9/8/88											
9/12/88	52				29			119			
9/13/88							24				
9/18/88	38		40		43		49	78			
9/24/88	18		22		20		31	86			
9/30/88	4		14		12		13	24			
10/6/88	14		24		18		26	27			
10/12/88	15		40		15		28	34			
10/18/88	12		18		9		16	22			
10/24/88	19		29		21		20	41			
10/30/88	18		29		18		20	31			
11/5/88	13		18		14		18	42			
11/11/88	12		14		19		12	30			
11/17/88	123		55		19		17	117			
11/23/88	324		44		64		12	26			
11/29/88	11		10		5		5	25			
12/5/88	11		29		36		17	23			
12/11/88	8		13		19		8	47			
12/17/88	8		8		11						
12/20/88							8	11			
12/23/88	7		5		10		5	8			
12/29/88							7	14			
12/30/88	11		13		12						
1/4/89	9		12		16		25	12			
1/10/89	98		22		65		37	31			
1/16/89			13		15		4	23			
1/22/89			13		22		11	17			
1/28/89	12		107		14		30	33			
1/29/89								23			
2/1/89											
2/3/89	1861				126		101	227			
2/9/89	5				4		16	16			
2/15/89					14		13	10			
2/21/89	8				12		16	13			
2/24/89	32				16						
2/27/89							37	12			
3/5/89	12				17		13	20			
3/9/89	11				78						

Summary of GBUAPCD PM-10 Monitoring 1987-1995

(all values are $\mu g/m^3$)

DATE	Keeler SSI	Keeler TEOM	Olancha SSI	Olancha TEOM	Lone Pine SSI	Lone Pine TEOM	Coso Junction SSI	Coso Navy SSI	Pearson-ville SSI	Inyo-kern SSI	Ridge-crest SSI
3/11/89							10	22			
3/17/89	12				14		13	10			
3/20/89							11				
3/23/89	44				29		16	13			
3/29/89	13		26		12		17	9			
4/4/89	9		20		8		41	29			
4/10/89	15		26		12		50	17			
4/16/89	15		17		20		22	20			
4/22/89	326		25		87		37	45			
4/28/89	10		14		8		18	15			
5/4/89	15		17		14		65	46			
5/10/89	44		20		85		17	44			
5/16/89	11		11		8		11	15			
5/22/89	165		19		34		16	16			
5/28/89	587		13		96		15	18			
6/3/89	97		19		10		38	43			
6/9/89	29		21		16		34	42			
6/15/89	24		36		18		47	44			
6/21/89	104		109		24		69	36			
6/27/89	84		21		27		23	45			
7/3/89	12		13		30		43	45			
7/9/89	43		32		13		52	37			
7/15/89	22		19		18		36	28			
7/21/89	20		25		21		31	29			
7/27/89	15		17		15		26	26			
8/2/89	15		17		18		26	27			
8/8/89	20		32		18		27	66			
8/14/89	10		38		9		19	17			
8/20/89	115		27		16		30	30			
8/26/89	16		19		13		31	31			
9/1/89	19		25		18		41	29			
9/7/89	21		38		18		22	21			
9/13/89	12		18		6		19	16			
9/19/89	59		13		3		22	10			
9/25/89	11		12		9		26	15			
10/1/89	16		12		5		11	17			
10/7/89	14		24		12		14	15			
10/13/89	13		20		12		25	15			
10/19/89	15		18		9		37	14			
10/25/89	23		63		7		9	11			
10/31/89			32		17		15	17			
11/6/89	10		16		17		18	11			
11/12/89	7		21		16		15	11			
11/18/89	6		19		10		2	7			
11/24/89	18		22		26		18	22			
11/30/89	11		16		16		6	4			
12/6/89	103		58		20		27	25			
12/12/89	9		36		26		17	8			
12/18/89							15	14			
12/19/89	13		24		31						
12/24/89	11		16		22		5	6			
12/30/89	120		27		12		25	43			
1/5/90	4		11		19		6	3			

Summary of GBUAPCD PM-10 Monitoring 1987-1995

(all values are $\mu g/m^3$)

					Lone	Lone	Coso	Coso	Pearson	Inyo	Ridge
	Keeler	Keeler	Olancha	Olancha	Pine	Pine	Junction	Navy	-ville	-kern	-crest
DATE	SSI	TEOM	SSI	TEOM	SSI	TEOM	SSI	SSI	SSI	SSI	SSI
1/11/90	11		16		27		16	10			
1/17/90	4		2		10		1	1			
1/23/90	8		11		22		4	5			
1/29/90	7		10		19		14	7			
2/4/90	43		14		21		28	10			
2/10/90	4		9		4		2	5			
2/16/90	533		6		52		11	3			
2/22/90	4		7		10		7	4			
2/28/90	14		14		17		13	15			
3/6/90	49		12		15			55			
3/12/90	2		4		9		10	2			
3/18/90	11		0		9		8	4			
3/24/90	9		15		11		10	11			
3/30/90	8		9		18		15	12			
4/1/90								12			
4/5/90	13		20		29		15	15			
4/11/90	12		21		15		15	14			
4/17/90	7		11		6		9	10			
4/23/90	85		200				866	94			
4/26/90					9						
4/28/90	95										
4/29/90			44		28		9	23			
5/5/90	8		15		9		11	10			
5/11/90	14		16		13		18	23			
5/17/90	43		200		26		26	33			
5/23/90	181		65		27		22				
5/29/90	27		11		6		14	8			
6/4/90	13		17		13		15				
6/10/90	10		18		21		13	14			
6/16/90	11		14		15		11	12			
6/22/90	22		24		34		33	32			
6/28/90	15		24		15		21	20			
7/4/90	14		16		15		18	17			
7/10/90	15		19		20		29				
7/16/90	14		19		19		24	23			
7/22/90	12		15		15		14	18			
7/28/90	12		18		12		20	24			
8/3/90	23		25		25		35				
8/9/90	16		15		13		12	29			
8/15/90			58		68		69				
8/21/90	10		18		15		12	14			
8/27/90	11		8		11		14	12			
9/2/90	12		13		13		12	22			
9/8/90	15		18		17		18	19			
9/14/90	16		17		7		10	16			
9/20/90	4		7		5		6	9			
9/26/90	7		10		7		12				
10/2/90	13		14		12		16				
10/3/90								8			
10/8/90	3		13		6		4	5			
10/11/90					26						
10/14/90	11		15		13		16	16			
10/20/90	4		8		6		5	5			

Summary of GBUAPCD PM-10 Monitoring 1987-1995

(all values are $\mu g/m^3$)

DATE	Keeler SSI	Keeler TEOM	Olancha SSI	Olancha TEOM	Lone Pine SSI	Lone Pine TEOM	Coso Junction SSI	Coso Navy SSI	Pearson-ville SSI	Inyo-kern SSI	Ridge-crest SSI
10/26/90	9		12		7		10	19			
11/1/90	7		10		13		7	11			
11/7/90	138		21		0		45	85			
11/13/90	8		11		2		14				
11/15/90								18			
11/19/90	20		16		18		23				
11/25/90	858		40		59		14				
11/28/90								14			
12/1/90	11		14		22		6	5			
12/7/90	14		17		23		7	8			
12/13/90	15		16		14		16	16			
12/19/90	693		59		18		9	12			
12/25/90	6				14		6	14			
12/28/90			13								
12/31/90	13		15		27		9				
1/6/91	9		10		15		4	4			
1/12/91	12		12		23		8	7			
1/18/91	26		7		18		9	13			
1/24/91			13		20		10	10			
1/30/91	40		32		51		45	37			
2/5/91	10		12		17		13	10			
2/11/91	18		17		23		17	13			
2/17/91	13		23		26		19	26			
2/23/91	35		14		13		14	13			
3/1/91	10				0		2	3			
3/7/91	14		5		8		5	9			
3/13/91	144		181		29		8	6			
3/15/91			12								
3/19/91	4		5		9		6	9			
3/25/91	134		6		5		5	5			
3/31/91	46		9		10		12	12			
4/6/91	181		25		17		15	15			
4/12/91	21		15		9		18	42			
4/18/91	10		10		10		13	20			
4/24/91	29		11				14	28			
4/30/91	49						30	42			
5/1/91					82						
5/6/91	12				30		17	26			
5/7/91			11								
5/12/91	10				11		12	16			
5/14/91			23								
5/18/91	68		17		14		14	19			
5/24/91	19		16		15		18	22			
5/30/91			49				64	150			
5/31/91	335				19						
6/5/91	32		24		30		31	33			
6/11/91	15		18		21		22	36			
6/17/91	18		12		12		15	29			
6/23/91	26		13		18		14	17			
6/29/91	9		10		9		12	15			
7/5/91			19		21		17	22			
7/11/91					20		30	24			
7/17/91			7		18		19	24			

Summary of GBUAPCD PM-10 Monitoring 1987-1995

(all values are $\mu g/m^3$)

DATE	Keeler SSI	Keeler TEOM	Olancha SSI	Olancha TEOM	Lone Pine SSI	Lone Pine TEOM	Coso Junction SSI	Coso Navy SSI	Pearson -ville SSI	Inyo -kern SSI	Ridge -crest SSI
7/23/91			13		15		26	28			
7/29/91			20		16		18	24			
7/31/91			18								
8/4/91	14		11		14		42	25			
8/10/91	12		14		15		33	39			
8/16/91	14		13		15		26	26			
8/22/91	16		15		19		31	25			
8/28/91	13		13		15		27	20			
9/3/91			18		15			19			
9/9/91			14		21			13			
9/15/91	13		13		17			11			
9/21/91	28		24		25			12			
9/27/91	17		12		17			19			
10/1/91							10				
10/3/91			17		16		20				
10/9/91	10		16		14		14				
10/15/91	9		12		15		15				
10/21/91	10		10		13		12				
10/27/91	143		7		12		22				
11/2/91	10				13		7	16			
11/5/91			13								
11/8/91	14		12		16		16	18			
11/14/91	48		9		15		16	32			
11/20/91	9		10		17		13	10			
11/26/91	13		16		22		9	9			
12/2/91	12				12		16	22			
12/5/91			14								
12/8/91	46		6		7		9	7			
12/14/91	10		14		22		6	13			
12/20/91	142		61		9		93	112			
12/26/91	11		11		23		13	9			
1/1/92	7		10		11						
1/4/92								4			
1/7/92	8		7		9		5	4			
1/13/92	14		10		19		7	9			
1/19/92	7		9		9		10	4			
1/25/92	11		10				8	13			
1/31/92	14		9		14		13	6			
2/6/92	6				9						
2/12/92	5				5						
2/18/92	6				12						
2/24/92	10				6						
3/1/92	15				21						
3/7/92	6				4						
3/13/92			18				20				
3/14/92								23			
3/19/92	20		13		21		20	12			
3/25/92	6		6		9		8				
3/31/92	7		6		3						
4/6/92	15		14		14						
4/12/92	62		13		32						
4/18/92	151		366		31						
4/24/92	17		19		21						

Summary of GBUAPCD PM-10 Monitoring 1987-1995

(all values are $\mu g/m^3$)

					Lone	Lone	Coso	Coso	Pearson	Inyo	Ridge
	Keeler	Keeler	Olancha	Olancha	Pine	Pine	Junction	Navy	-ville	-kern	-crest
DATE	SSI	TEOM	SSI	TEOM	SSI	TEOM	SSI	SSI	SSI	SSI	SSI
4/30/92	350		19		63						
5/6/92	5		10		6						
5/12/92	19		20		17						
5/18/92	18		18		22						
5/24/92	13		17		13						
5/30/92	22		20		20						
6/5/92	25		21		22						
6/11/92	26		21		28						
6/17/92	13		12		11						
6/23/92	13		14		24						
6/29/92	526		13		61						
7/5/92	18		11		10						
7/11/92	19		17		19						
7/17/92			10		16						
7/23/92	16		17		16						
7/29/92	15		19		17						
8/4/92	20		19				38	43			
8/10/92	12		14		15		32	46			
8/16/92	11		14		9		10	60			
8/22/92	39		19		23			50			
8/28/92	19		33		18		26	26			
9/3/92	242		22		23		29	36			
9/9/92	14		17		14		23	26			
9/15/92	15		14		13		24	24			
9/21/92	13		15		12		22	29			
9/27/92	14		16		15		21	21			
10/3/92	10		10		8		12	14			
10/9/92	19		21		21		25	25			
10/15/92	35		24		20		38				
10/21/92	13		12		13		22	20			
10/27/92							8				
10/28/92	5		5		8						
11/2/92	16		6		6		6	5			
11/8/92	16		12		15		14	11			
11/14/92	11		12		15		7	7			
11/20/92	100		39		21		38	37			
11/26/92	7		10		17		6				
12/2/92	48				31		22	16			
12/3/92			13								
12/8/92	7		6		13			6			
12/13/92			365				50				
12/14/92	18										
12/20/92	7		5		16		4	6			
12/26/92	11		4		25		5	10			
1/1/93	781		4		13		6				
1/7/93	6		2		5		1				
1/13/93	2		1		3		2				
1/19/93	9		5		7		2				
1/25/93	8		6		11		3				
1/31/93	7		6		3		3	6			
2/6/93	11		8		18		10	11			
2/12/93	6		5		14		8	6			
2/18/93	8		5		6		6	3			

Summary of GBUAPCD PM-10 Monitoring 1987-1995

(all values are $\mu g/m^3$)

DATE	Keeler SSI	Keeler TEOM	Olancha SSI	Olancha TEOM	Lone Pine SSI	Lone Pine TEOM	Coso Junction SSI	Coso Navy SSI	Pearson-ville SSI	Inyo-kern SSI	Ridge-crest SSI
2/24/93	11		4		2		4	8			
3/2/93	5		7		10		5	9			
3/8/93	9				8		11	9			
3/11/93			37				11				
3/12/93		8									
3/13/93		12									
3/14/93	10	13			10		8	10		18	
3/15/93		18									
3/16/93		46									
3/17/93		513									
3/18/93		8									
3/19/93		61									
3/20/93	5	9			9		23	16			
3/21/93		9									
3/22/93		35									
3/23/93		276									
3/24/93		257									
3/25/93		24									
3/26/93	3	5	1		7		1	1	7	3	4
3/27/93		7									
3/28/93		5									
3/29/93		6									
3/30/93		7									
3/31/93		13									
4/1/93	19	19	14				17	10			
4/2/93		10									
4/3/93		10									
4/4/93		225									
4/5/93		49									
4/6/93		15									
4/7/93	14	15	13		16			18			
4/8/93		40									
4/9/93		23									
4/10/93		22									
4/11/93		22									
4/12/93		121									
4/13/93	10	11			10			13			
4/14/93		13									
4/15/93		18									
4/16/93		19									
4/17/93		578									
4/18/93		21									
4/19/93	12	11			9		25	11			
4/20/93		36	14								
4/21/93		479									
4/22/93		172									
4/23/93		155									
4/24/93		5									
4/25/93	13	11	10		9		12	16			
4/26/93		11									
4/27/93		19									
4/28/93		19									
4/29/93		18									

Summary of GBUAPCD PM-10 Monitoring 1987-1995

(all values are $\mu g/m^3$)

DATE	Keeler SSI	Keeler TEOM	Olancha SSI	Olancha TEOM	Lone Pine SSI	Lone Pine TEOM	Coso Junction SSI	Coso Navy SSI	Pearson -ville SSI	Inyo -kern SSI	Ridge -crest SSI
4/30/93		35									
5/1/93	46	57	153		31		94	35			
5/2/93		32									
5/3/93		412									
5/4/93		231					165		75	48	
5/5/93		18									
5/6/93		23									
5/7/93	17	17	18		16		23	20			
5/8/93		30							30	27	27
5/9/93		25									
5/10/93		32									
5/11/93		43									
5/12/93		64									
5/13/93	48	65	15		28			20			
5/14/93		19									
5/15/93		68									
5/16/93		24									
5/17/93		14									
5/18/93		24									
5/19/93	18	23	17		17		34	23			
5/20/93		20									
5/21/93		22									
5/22/93		18									
5/23/93		25									
5/24/93		43									
5/25/93	16	20	17		33		26	37			
5/26/93		24									
5/27/93		22									
5/28/93		17									
5/29/93		18									
5/30/93		24									
5/31/93	80	127	18		18		21	31			
6/1/93		15									
6/2/93		72									
6/3/93		13									
6/4/93		285									
6/5/93		27									
6/6/93	8	9	8		5		9				
6/7/93		7									
6/8/93		10									
6/9/93		10									
6/10/93		55									
6/11/93		14									
6/12/93	41	45	10		43		51	29	44	24	17
6/13/93		25									
6/14/93		24									
6/15/93		20									
6/16/93		92									
6/17/93		34									
6/18/93	9	12			12		16	14			
6/19/93		14									
6/20/93		28									
6/21/93		36									

OFF-LAKE PM-10 MONITORING DATA

RUN TIMES	DATE	Keeler	Olancha	LonePine	CosoJunction	CosoNavy	Pearson	Inyokern	Ridgecrest
		SSI	SSI	SSI	SSI	SSI	SSI	SSI	SSI
Make-up Mid-mid.	7/19/95	11							
Midnight-Midnight	7/20/95			14	20	27	15	15	
Midnight-Midnight	7/26/95			9	14	30			
Midnight-Midnight	7/27/95	8							
Midnight-Midnight	7/31/95					31			
Midnight-Midnight	8/1/95			20					
Midnight-Midnight	8/7/95			12	22	13	12	12	16
Midnight-Midnight	8/13/95			12	15	13			
Midnight-Midnight	8/19/95			14		12			
Midnight-Midnight	8/22/95				13				
Midnight-Midnight	8/25/95	16	13	13	16	13			
Midnight-Midnight	8/31/95	12	11	14		10			
Midnight-Midnight	9/6/95	10	9		17	12	14	12	
Midnight-Midnight	9/12/95		11	15	14	10			
Make-up, Mid-mid.	9/13/95	13							
Midnight-Midnight	9/18/95		6	14	10	12			
Midnight-Midnight	9/24/95		14	16	16	17			
Midnight-Midnight	9/30/95		7		7	7			
10:00-10:00	10/4/95	19							
Midnight-Midnight	10/6/95		14	16	24	12			
Midnight-Midnight	10/10/95							11	
Midnight-Midnight	10/12/95		17	23	20	16	30	18	
Midnight-Midnight	10/18/95		14	18	17	14			
Midnight-Midnight	10/19/95	14							
22:00-22:00	10/21/95	99							
Midnight-Midnight	10/24/95		10	13	12	6			
Midnight-Midnight	10/30/95	14	13	15	15	11			
Midnight-Midnight	11/5/95	17	13	17	16	13			
Midnight-Midnight	11/11/95	11	8	13	10	8			
Midnight-Midnight	11/17/95	12	13	18	10	5			
Midnight-Midnight	11/23/95	13	24	19	10	10			
All 8:00-8:00	11/26/95						77	30	24
Midnight-Midnight	11/29/95	6	6	16	5	4			

OFF-LAKE PM-10 MONITORING DATA

RUN TIMES	DATE	Keeler	Olancha	LonePine	CosoJunction	CosoNavy	Pearson	Inyokern	Ridgecrest
		SSI	SSI	SSI	SSI	SSI	SSI	SSI	SSI
Midnight-Midnight	12/5/95	11	12	19	15	8			
17:00-17:00	12/8/95	14							
Midnight-Midnight	12/11/95		12	24	16	6			
Keel=8:53-8:53	12/12/95	106							
Keel-3:00-3:00	12/15/95	10							
All 11:00-11:00	12/16/95		13	2	7		7	3	7
Midnight-Midnight	12/17/95					3			
Midnight-Midnight	12/23/95	9	7		3	1			
Midnight-Midnight	12/29/95	7	3		4	3			

PM-10 Monitoring Data

Days that Exceeded 150 μg/m^3

PM_{10} MONITORING DATA

(PM_{10} and wind speed summary for days that exceeded 150 $\mu g/m^3$ at any monitoring site)

DATE	Keeler SSI ($\mu g/m^3$)	Keeler TEOM ($\mu g/m^3$)	Keeler Wind (mph)	Olancha SSI ($\mu g/m^3$)	Olancha TEOM ($\mu g/m^3$)	Olancha Wind (mph)	Lone Pine SSI ($\mu g/m^3$)	Lone Pine TEOM ($\mu g/m^3$)	Lone Pine Wind (mph)	Coso Junction SSI ($\mu g/m^3$)	Coso Junction Wind (mph)	Coso Navy SSI ($\mu g/m^3$)	Coso Navy Wind (mph)
1/15/87	100		No data	115		40	25		30	196	36		No data
1/27/87	672		25	37		31	178		25		14		No data
2/2/87	251		20	21		27	140		19	27	13		No data
3/10/87	230		24	13		25	17		20	8	No data		No data
3/22/87	166		28	110		37	13		23	65	No data		No data
1/16/88	394		17	25		37	172		17	15	47	2	27
11/23/88	324		No data	44		32	64		26	12	9	26	23
2/3/89	1861		33			38	126		27	101	50	227	36
4/22/89	326		28	25		25	87		No data	37	17	45	23
5/22/89	165		28	19		22	34		23	16	19	16	No data
5/28/89	587		33	13		19	96		35	15	24	18	31
2/16/90	533		26	6		33	52		34	11	28	3	21
4/23/90	85		No data	200		26			24	866	No data	94	41
5/17/90	43		No data	200		32	26		22	26	No data	33	33
5/23/90	181		No data	65		27	27		25	22	No data		24
11/25/90	858		33	40		18	59		19	14	No data		26
12/19/90	693		27	59		23	18		18	9	26	12	23
3/13/91	144		29	181		29	29		17	8	11	6	21
4/6/91	181		27	25		19	17		24	15	9	15	22
5/31/91	335		33			32	19		27		36		47
4/18/92	151		No data	366		26	31		26		25		25
4/30/92	350		30	19		27	63		22		14		22
6/29/92	526		34	13		27	61		21		14		25
9/3/92	242		25	22		24	23		27	29	16	36	27
1/1/93	781		29	4		29	13		25	6	13		9
3/17/93		513	18			33			21		28		27
3/23/93		276	17			18			24		16		17
3/24/93		257	26			27			31		18		19
4/4/93		225	26			20			22	14	27		24
4/17/93		578	33			24			24		24		25

PM_{10} MONITORING DATA

(PM_{10} and wind speed summary for days that exceeded 150 μg/m³ at any monitoring site)

DATE	Keeler SSI (μg/m³)	Keeler TEOM (μg/m³)	Keeler Wind (mph)	Olancha SSI (μg/m³)	Olancha TEOM (μg/m³)	Olancha Wind (mph)	Lone Pine SSI (μg/m³)	Lone Pine TEOM (μg/m³)	Lone Pine Wind (mph)	Coso Junction SSI (μg/m³)	Coso Junction Wind (mph)	Coso Navy SSI (μg/m³)	Coso Navy Wind (mph)
4/21/93		479	30			22			26		21		18
4/22/93		172	26			27			21		21		33
5/3/93		412	22			26			30		25		No data
5/4/93		231	31			38			33	165	32		32
6/4/93		285	29			22			22		19		21
11/14/93		390	29			37		62	26		43		No data
11/28/93		168	16			25		48	24		14		9
12/11/93		293	29			31		113	40		22		21
12/14/93		259	21			29		170	29		21		11
12/23/93		412	31			26		58	31		31		32
1/5/94		183	26			31		76	29		26		29
1/23/94		259	21			26		307	29		19		11
1/24/94		247	21			28		82	30		19		13
2/10/94		249	21			22		6	16		39		30
2/11/94		345	30	70		33	11	22	27	80	28		31
2/16/94		292	21			28		122	35		15		13
2/17/94		1381	30			32		85	35		23		19
3/12/94		183	29			30		23	28		25		36
3/15/94	117	164	24			22		13	26		19	8	13
3/18/94		1226	26			26		499	24		15		25
3/22/94		961	24			26		91	32		27		32
4/21/94		134	24			23		180	28		21		No data
4/23/94		572	28			25		93	24		38		No data
4/25/94		205	24			24		28	19		32		No data
5/15/94		387	31			20		25	21		21		21
10/4/94		193	24			26		69	33		26		23
11/17/94		402	24		33	No data		10	14		32		21
11/25/94		421	22		93	34		55	26		20		20
12/4/94	158	208	25	3	7	27	32	40	25	4	18	2	9
12/8/94		24	18		262	18		26	22		23		35

PM_{10} MONITORING DATA

(PM_{10} and wind speed summary for days that exceeded 150 $\mu g/m^3$ at any monitoring site)

DATE	Keeler SSI ($\mu g/m^3$)	Keeler TEOM ($\mu g/m^3$)	Keeler Wind (mph)	Olancha SSI ($\mu g/m^3$)	Olancha TEOM ($\mu g/m^3$)	Olancha Wind (mph)	Lone Pine SSI ($\mu g/m^3$)	Lone Pine TEOM ($\mu g/m^3$)	Lone Pine Wind (mph)	Coso Junction SSI ($\mu g/m^3$)	Coso Junction Wind (mph)	Coso Navy SSI ($\mu g/m^3$)	Coso Navy Wind (mph)
12/12/94		680	24		29	27		61	23		15		16
2/13/95		3883	No data		19	28		228	32		19		26
2/24/95		168	No data		10	20		61	15		21		16
3/3/95		665	No data		6	26		228	21		17		21
3/6/95		55	No data		170	14		28	23		21		19
3/9/95		323	No data		26	31		392	37		19		18
3/20/95		408	No data		36	30		153	25		23		17
3/21/95		2204	No data		21	29		94	30		28		24
3/22/95	238	327	No data	5	8	27	138	174	36	4	21	9	21
4/1/95		65	No data		558	25		20	22		29		27
4/8/95		158	29		128	No data		107	31		23		19
4/9/95	222	331	29		2252	No data		52	33		37	567	25
4/12/95		338	22		32	27		149	33		21		18
4/13/95		3929	33		62	30		117	27		23		28
4/21/95	31	51	24	55	119	29	19	16	25	337	29	268	36
4/26/95		307	20		14	20		42	19		23		17
4/27/95	316	454	20		18	20	54	54	24	11	17	34	23
4/29/95		373	24		52	21		89	24		33		32
5/1/95		208	21		45	22		82	24		No data		28
5/5/95		157	23		169	21		48	22		No data		24
6/1/95		218	30		23	17		27	26		No data		26
6/5/95		440	31		126	28		24	30		No data		33
6/6/95		784	37			34		42	38		No data		38
6/15/95		192	28			No data		29	30		No data		26
11/26/95		306	25			46			27		No data		29
12/12/95		1100	40		46	36		125	33		19		15

PM-10 Monitoring Data

Summary of Quarterly and Annual Averages

Keeler PM-10 Quarterly Averages ($\mu g/m^3$) 1987-1995

Quarter	TEOM Average ($\mu g/m^3$)	# of TEOM Days in Quarter	SSI Average ($\mu g/m^3$)	# of Samples in Quarter	Comments
1st-1987			115.81	15	
2nd-1987			22.93	15	
3rd-1987			20.29	14	
4th-1987			18.87	15	
Annual Avg.			**44.47**	**59**	
1st-1988			52.21	14	
2nd-1988			18.27	15	
3rd-1988			24.39	16	
4th-1988			40.41	15	
Annual Avg.			**33.82**	**60**	
1st-1989			176.53	12	
2nd-1989			102.21	15	
3rd-1989			27.41	15	
4th-1989			25.93	15	
Annual Avg.			**83.02**	**57**	
1st-1990			47.40	15	
2nd-1990			37.07	15	
3rd-1990			12.93	14	
4th-1990			113.94	16	
Annual Avg.			**52.83**	**60**	
1st-1991			36.79	14	
2nd-1991			55.60	15	
3rd-1991			15.88	8	SSI invalid.
4th-1991			34.79	14	
Annual Avg.			Invalid.	**51**	
1st-1992			9.47	15	
2nd-1992			85.00	15	
3rd-1992			33.36	14	
4th-1992			21.53	15	
Annual Avg.			**37.34**	**59**	
1st-1993			58.73	15	
2nd-1993	52.99	91	23.75	16	Teom begins.
3rd-1993	23.95	89	20.07	14	
4th-1993	38.57	92	20.08	13	
Annual Avg.	Invalid.	**272**	**30.66**	**58**	
1st-1994	87.70	81	17.53	15	
2nd-1994	34.86	91	17.33	12	
3rd-1994	21.26	30	14.75	8	Both invalid.
4th-1994	41.70	91	23.50	14	
Annual Avg.	Invalid.	**293**	Invalid.	**49**	
1st-1995	102.87	87	24.79	14	
2nd-1995	115.61	88	59.58	12	
3rd-1995	23.55	79	11.67	6	SSI invalid.
4th-1995	45.39	58	18.29	14	TEOM invalid.
Annual Avg.	Invalid.	**312**	Invalid.	**46**	

Lone Pine PM-10 Quarterly Averages ($\mu g/m^3$) 1987-1995

Quarter	TEOM Average ($\mu g/m^3$)	# of TEOM Days in Quarter	SSI Average ($\mu g/m^3$)	# of Samples in Quarter	Comments
1st-1987			38.27	15	
2nd-1987			18.40	15	
3rd-1987			26.47	15	
4th-1987			12.40	15	
Annual Avg.			**23.88**	**60**	
1st-1988			30.43	14	
2nd-1988			18.93	15	
3rd-1988			18.85	16	
4th-1988			19.18	15	
Annual Avg.			**21.85**	**60**	
1st-1989			30.29	15	
2nd-1989			31.16	15	
3rd-1989			14.92	15	
4th-1989			16.13	16	
Annual Avg.			**23.12**	**61**	
1st-1990			17.53	15	
2nd-1990			17.73	15	
3rd-1990			17.47	15	
4th-1990			16.47	17	
Annual Avg.			**17.30**	**62**	
1st-1991			17.80	15	
2nd-1991			21.21	14	
3rd-1991			17.53	15	
4th-1991			15.07	15	
Annual Avg.			**17.90**	**59**	
1st-1992			10.86	14	
2nd-1992			25.67	15	
3rd-1992			15.71	14	
4th-1992			16.36	14	
Annual Avg.			**17.15**	**57**	
1st-1993			8.40	15	
2nd-1993			18.53	15	
3rd-1993			14.93	15	
4th-1993	27.14	68	21.73	11	SSI invalid.
Annual Avg.	**Invalid.**	**68**	**Invalid.**	**56**	
1st-1994	29.67	90	14.60	10	SSI invalid.
2nd-1994	21.26	85	11.50	10	SSI invalid.
3rd-1994	20.30	83	13.38	16	
4th-1994	19.58	92	16.57	7	SSI invalid.
Annual Avg.	**22.70**	**350**	**Invalid.**	**43**	
1st-1995	27.33	87	17.93	14	
2nd-1995	26.31	91	24.64	14	
3rd-1995	19.38	92	14.14	14	
4th-1995	20.70	90	16.64	14	
Annual Avg.	**23.43**	**360**	**18.34**	**56**	

Olancha PM-10 Quarterly Averages ($\mu g/m^3$) 1987-1995

Quarter	TEOM Average ($\mu g/m^3$)	# of TEOM Days in Quarter	SSI Average ($\mu g/m^3$)	# of Samples in Quarter	Comments
1st-1987					No sampling.
2nd-1987			25.50	2	SSI invalid.
3rd-1987			21.63	16	
4th-1987			13.20	15	
Annual Avg.			Invalid.	**33**	
1st-1988			20.40	15	
2nd-1988			15.93	15	
3rd-1988			21.68	15	
4th-1988			23.28	15	
Annual Avg.			**20.32**	**60**	
1st-1989			32.07	6	SSI invalid.
2nd-1989			25.79	15	
3rd-1989			23.00	15	
4th-1989			26.50	16	
Annual Avg.			Invalid.	**52**	
1st-1990			9.33	15	
2nd-1990			46.67	15	
3rd-1990			18.40	15	
4th-1990			18.38	16	
Annual Avg.			**23.19**	**61**	
1st-1991			23.87	15	
2nd-1991			18.14	14	
3rd-1991			14.93	15	
4th-1991			15.20	15	
Annual Avg.			**18.04**	**59**	
1st-1992			9.80	10	SSI invalid.
2nd-1992			39.80	15	
3rd-1992			17.13	15	
4th-1992			36.27	15	
Annual Avg.			Invalid.	**55**	
1st-1993			4.50	12	
2nd-1993			24.69	13	
3rd-1993				0	SSI invalid.
4th-1993			19.00	11	
Annual Avg.			Invalid.	**36**	
1st-1994			8.50	10	SSI invalid.
2nd-1994			16.07	14	
3rd-1994			14.07	14	
4th-1994	18.30	54	7.89	9	Both invalid.
Annual Avg.	Invalid.	**54**	Invalid.	**47**	
1st-1995	10.14	84	4.00	12	
2nd-1995	68.50	66	17.57	7	Both invalid.
3rd-1995		0	10.14	7	Both invalid.
4th-1995	14.47	40	11.93	15	TEOM invalid.
Annual Avg.	Invalid.	**190**	Invalid.	**41**	

APPENDIX B

Attainment Demonstration

Top Ten PM-10 Concentration Predictions by Modeling Region

Run Date: 01/16/97

Keeler Modeling Region, SIP Controls (Method 1), Vector Met

High 10 Tables

24-hr PM10 (ug/m3)

No.	xrec(m)	yrec(m)	1-hi PM10	(yrmndy)	2-hi PM10	(yrmndy)	3-hi PM10	(yrmndy)	4-hi PM10	(yrmndy)	5-hi PM10	(yrmndy)
1	710511.00	128874.00	43.27	(950303)	42.53	(950413)	42.32	(950321)	39.30	(950213)	37.95	(950615)
2	710786.00	128693.00	41.71	(950303)	41.30	(950413)	40.34	(950321)	37.97	(950213)	36.48	(950615)
3	708305.00	115290.00	76.46	(950606)	62.27*	(950409)	60.14*	(940312)	55.27*	(940211)	50.79*	(941225)
4	708760.00	115706.00	74.59	(950606)	60.45	(950409)	59.16	(940312)	54.05	(940211)	50.09	(941225)
5	709092.00	116155.00	75.00	(950606)	59.28	(950409)	58.11	(940312)	52.95	(940211)	49.87	(941225)
6	710475.00	119485.00	43.96	(950606)	39.68	(940312)	37.96	(950409)	37.70	(941225)	37.53	(940211)
7	709262.00	117065.00	77.07*	(950606)	58.49	(950409)	56.37	(940312)	52.45	(940211)	49.04	(941013)
8	709562.00	118171.00	64.89	(950606)	51.03	(950409)	50.24	(940312)	47.73	(940211)	43.84	(941225)
9	710028.00	119106.00	58.07	(950606)	48.05	(940312)	47.38	(950409)	44.85	(940211)	42.27	(941225)
10	710902.00	119782.00	37.04	(951216)	36.52	(941225)	35.98	(940312)	35.43	(940516)	35.39	(941013)
11	711440.00	120492.00	40.59	(941013)	39.89	(951216)	39.04	(941225)	37.97	(940312)	35.44	(950409)
12	712152.00	121113.00	42.01	(941013)	38.88	(951216)	38.78	(941225)	38.44	(940312)	35.12	(940211)
13	712603.00	121825.00	41.29	(941013)	38.07	(941225)	37.42	(940312)	37.27	(951216)	35.17	(940211)
14	712960.00	122830.00	38.39	(941013)	35.61	(941225)	34.76	(940312)	34.29	(940211)	33.52	(951216)
15	712716.00	123925.00	36.10	(941013)	34.57	(941225)	33.98	(940211)	33.46	(940312)	32.76	(951126)
16	712878.00	124801.00	32.15	(950408)	32.05	(940515)	31.40	(950601)	31.33	(951126)	31.30	(950321)
17	712283.00	125747.00	33.15	(950303)	32.59	(950321)	32.49	(940515)	32.17	(950408)	31.19	(941225)
18	711772.00	126828.00	35.67	(950303)	33.74	(950413)	33.55	(940515)	33.09	(950321)	32.03	(941117)
19	711286.00	127742.00	39.03	(950303)	37.92	(950413)	36.92	(950321)	35.90	(940515)	34.79	(950213)
20	710581.00	128509.00	44.21	(950303)	43.50	(950321)	42.91	(950413)	39.67	(950213)	38.83	(950615)
21	709979.00	128975.00	47.99	(950321)	45.97	(950303)	45.03	(950413)	42.38	(950615)	42.07	(950213)
22	709469.00	129309.00	49.78	(950321)	45.98	(950303)	44.97	(950413)	44.96	(950615)	44.07	(940318)
23	708864.00	129423.00	53.20	(950321)	48.50	(950615)	48.46	(940318)	47.15	(950303)	46.40	(950309)
24	708446.00	129688.00	52.98	(950321)	49.32	(940318)	48.84	(950615)	46.38	(950303)	45.96	(950309)
25	708043.00	130099.00	52.88	(950321)	50.27	(940318)	48.77	(950615)	45.69	(950309)	45.68	(950303)
26	707718.00	130494.00	51.46	(950321)	49.80	(940318)	47.60	(950615)	44.51	(950303)	44.43	(950309)
27	707469.00	131074.00	47.72	(950321)	47.20	(940318)	44.42	(950615)	42.01	(950303)	41.68	(950309)
28	707370.00	131577.00	45.36	(940318)	45.22	(950321)	42.35	(950615)	40.37	(950303)	39.93	(950309)
29	707198.00	132553.00	43.21	(950321)	43.12	(940318)	40.45	(950615)	38.94	(950303)	38.36	(950309)
30	706312.00	133168.00	46.01	(950321)	45.93	(940318)	42.37	(950615)	41.43	(951212)	40.77	(950303)
31	705429.00	133701.00	43.67	(950321)	43.17	(940318)	41.49	(951212)	40.41	(940515)	40.24	(950615)

Run Date: 01/16/97

Keeler Modeling Region, SIP Controls (Method 1), Vector Met
High 10 Tables

24-hr PM10 (ug/m3)

No.	xrec(m)	yrec(m)	6-hi PM10	(yrmndy)	7-hi PM10	(yrmndy)	8-hi PM10	(yrmndy)	9-hi PM10	(yrmndy)	10-hi PM10	(yrmndy)
1	710511.00	128874.00	37.18	(940217)	36.81	(950810)	36.74	(950309)	36.21	(940515)	35.49	(940318)
2	710786.00	128693.00	36.03	(950810)	36.00	(940217)	35.59	(940515)	35.45	(950309)	33.38	(940318)
3	708305.00	115290.00	49.96*	(950421)	49.59*	(941013)	49.35*	(951216)	47.58*	(940311)	46.18*	(950605)
4	708760.00	115706.00	49.19	(941013)	49.02	(951216)	48.93	(950421)	46.89	(940311)	45.76	(950605)
5	709092.00	116155.00	49.45	(941013)	48.77	(951216)	48.33	(950421)	45.97	(950605)	45.59	(940311)
6	710475.00	119485.00	36.89	(941013)	36.78	(951216)	35.97	(940516)	35.01	(950402)	34.92	(940311)
7	709262.00	117065.00	48.56	(941225)	47.10	(951216)	47.07	(950421)	46.30	(950605)	44.67	(951022)
8	709562.00	118171.00	43.24	(941013)	42.66	(951216)	41.97	(950605)	41.87	(940311)	41.87	(950421)
9	710028.00	119106.00	41.35	(941013)	41.03	(951216)	40.05	(940311)	39.49	(950605)	39.27	(950402)
10	710902.00	119782.00	34.51	(950402)	34.44	(941117)	34.05	(940706)	33.71	(950409)	33.35	(950327)
11	711440.00	120492.00	34.66	(950402)	34.58	(951022)	34.55	(950327)	34.34	(940326)	34.31	(940211)
12	712152.00	121113.00	35.10	(951022)	34.57	(950409)	34.46	(940306)	34.00	(950327)	33.89	(940326)
13	712603.00	121825.00	34.66	(951022)	34.16	(940306)	33.38	(950409)	33.35	(941117)	33.13	(950327)
14	712960.00	122830.00	33.00	(940306)	32.98	(951022)	32.65	(951126)	32.52	(941117)	32.21	(941103)
15	712716.00	123925.00	32.69	(950408)	32.46	(950601)	32.03	(950511)	31.92	(940306)	31.89	(940515)
16	712878.00	124801.00	31.27	(941225)	31.22	(940211)	30.99	(950511)	30.35	(941125)	30.29	(941126)
17	712283.00	125747.00	31.13	(950601)	31.10	(941125)	30.89	(951126)	30.74	(950511)	30.70	(950413)
18	711772.00	126828.00	31.61	(950213)	31.47	(941125)	30.98	(940516)	30.94	(950408)	30.70	(940322)
19	711286.00	127742.00	33.91	(941117)	33.16	(940217)	32.99	(950810)	32.45	(950615)	32.11	(940425)
20	710581.00	128509.00	37.69	(940217)	37.46	(940515)	37.28	(950810)	37.10	(950309)	36.19	(940318)
21	709979.00	128975.00	40.86	(950309)	40.03	(940318)	39.63	(940217)	39.61	(940515)	39.05	(950810)
22	709469.00	129309.00	43.44	(950309)	42.87	(950213)	40.95	(940217)	40.78	(940515)	39.74	(950810)
23	708864.00	129423.00	45.38	(950413)	45.02	(950213)	43.83	(940515)	43.53	(940217)	41.29	(950810)
24	708446.00	129688.00	44.74	(940515)	44.03	(950213)	43.62	(950413)	43.45	(940217)	41.36	(951212)
25	708043.00	130099.00	44.88	(940515)	43.08	(940217)	42.96	(950213)	42.15	(950413)	42.13	(951212)
26	707718.00	130494.00	44.21	(940515)	42.08	(951212)	42.07	(940217)	41.60	(950310)	41.51	(950320)
27	707469.00	131074.00	41.37	(940515)	40.54	(951212)	39.97	(950320)	39.74	(940217)	39.71	(950310)
28	707370.00	131577.00	39.48	(940515)	39.31	(951212)	38.84	(950320)	38.29	(940217)	38.25	(950310)
29	707198.00	132553.00	38.32	(951212)	38.06	(940515)	37.49	(950320)	37.08	(940217)	36.50	(950310)
30	706312.00	133168.00	40.14	(940515)	39.79	(950310)	39.43	(950320)	39.32	(950309)	38.34	(940217)
31	705429.00	133701.00	40.10	(950310)	38.58	(950303)	37.82	(950320)	37.69	(950309)	37.08	(950322)

Run Date: 01/16/97

Olancha Modeling Region, SIP Controls (Method 1 Emissions), Vector Met
High 10 Tables

24-hr PM10 (ug/m3)

No.	xrec(m)	yrec(m)	1-hi PM10	(yrmndy)	2-hi PM10	(yrmndy)	3-hi PM10	(yrmndy)	4-hi PM10	(yrmndy)	5-hi PM10	(yrmndy)
1	699012.00	105667.00	30.32	(941014)	29.78	(950512)	29.77	(950504)	29.75	(940129)	29.74	(950505)
2	700340.00	105044.00	31.57	(940129)	31.53	(941014)	30.96	(940128)	30.79	(950327)	30.66	(950505)
3	699410.00	108634.00	29.86	(941014)	29.64	(950504)	29.59	(950512)	29.30	(940129)	29.23	(950505)
4	700647.00	108935.00	31.11	(941014)	30.55	(940129)	30.32	(950505)	30.30	(950512)	30.07	(950504)
5	701403.00	109325.00	32.32	(941014)	31.93	(940129)	31.20	(940128)	31.13	(950512)	31.10	(950505)
6	702159.00	109842.00	34.77	(941014)	34.27	(940129)	33.19	(940128)	32.78	(941102)	32.65	(950327)
7	702550.00	110452.00	37.33	(941014)	35.95	(940129)	34.75	(941102)	34.58	(951004)	34.53	(940128)
8	703182.00	110761.00	40.60	(950409)	38.29	(951216)	38.24	(951004)	38.17	(941014)	37.61	(941225)
9	703769.00	111102.00	48.04	(950409)	44.08	(940312)	42.15	(941225)	40.98	(951004)	40.40	(951216)
10	704278.00	111587.00	57.64	(950409)	54.14	(940312)	47.44	(941225)	44.88	(951216)	44.41	(950421)
11	704693.00	112603.00	76.44	(950606)	63.97	(950409)	61.15	(940312)	53.28	(941225)	51.63	(940211)
12	705641.00	113168.00	81.21	(950606)	69.10*	(950409)	66.57*	(940312)	57.74*	(941225)	55.35	(940211)
13	706432.00	113579.00	80.64	(950606)	65.42	(950409)	63.89	(940312)	56.33	(941225)	54.35	(940211)
14	707552.00	114476.00	81.65*	(950606)	63.53	(940312)	63.39	(950409)	56.34	(941225)	55.40*	(940211)
15	698585.00	120873.00	30.76	(940606)	30.51	(940515)	29.83	(940423)	29.30	(950109)	29.16	(940516)
16	698981.00	118897.00	30.23	(940515)	29.85	(940606)	29.44	(940423)	29.12	(941014)	29.08	(941102)
17	698612.00	117031.00	29.05	(941014)	28.95	(940515)	28.94	(940424)	28.84	(941102)	28.82	(950109)
18	698669.00	114997.00	29.04	(940424)	29.03	(941014)	29.02	(940509)	28.83	(941119)	28.83	(950505)
19	697590.00	113254.00	29.05	(940509)	28.93	(940912)	28.89	(941014)	28.76	(950929)	28.75	(940424)
20	697941.00	111270.00	29.38	(950929)	29.09	(940509)	28.98	(940912)	28.93	(941014)	28.88	(950928)
21	698248.00	109322.00	29.34	(950929)	29.17	(950512)	29.04	(941014)	29.02	(950928)	28.88	(940509)

Run Date: 01/16/97

Olancha Modeling Region, SIP Controls (Method 1 Emissions), Vector Met
High 10 Tables

24-hr PM10 (ug/m3)

No.	xrec(m)	yrec(m)	6-hi PM10	(yrmndy)	7-hi PM10	(yrmndy)	8-hi PM10	(yrmndy)	9-hi PM10	(yrmndy)	10-hi PM10	(yrmndy)
1	699012.00	105667.00	29.44	(940509)	29.40	(941003)	29.31	(950327)	29.13	(940128)	29.06	(941102)
2	700340.00	105044.00	30.53	(941102)	30.18	(940509)	30.02	(941003)	29.97	(950512)	29.69	(950409)
3	699410.00	108634.00	29.23	(950929)	29.18	(940509)	29.03	(941003)	28.94	(950928)	28.92	(950409)
4	700647.00	108935.00	29.93	(940509)	29.93	(950327)	29.86	(940128)	29.82	(941003)	29.67	(941102)
5	701403.00	109325.00	30.85	(950327)	30.76	(941102)	30.64	(940509)	30.45	(950504)	30.37	(941003)
6	702159.00	109842.00	32.30	(950505)	32.26	(950512)	32.01	(940509)	31.96	(941119)	31.86	(951004)
7	702550.00	110452.00	34.49	(941119)	34.43	(950409)	34.33	(950327)	33.82	(950512)	33.50	(940509)
8	703182.00	110761.00	37.05	(940312)	37.04	(941119)	36.99	(951022)	36.89	(950402)	36.46	(940128)
9	703769.00	111102.00	40.06	(951022)	39.69	(950402)	38.51	(940228)	38.40	(940128)	37.49	(941014)
10	704278.00	111587.00	44.22	(951022)	43.07	(951004)	42.69	(950402)	41.97	(941013)	41.52	(950606)
11	704693.00	112603.00	50.25	(951216)	50.17	(941013)	49.73	(950421)	47.68	(951022)	45.73	(950402)
12	705641.00	113168.00	53.41*	(951216)	53.12*	(941013)	52.42*	(950421)	50.14*	(951022)	48.36*	(950402)
13	706432.00	113579.00	52.05	(941013)	51.51	(951216)	50.26	(950421)	47.74	(951022)	47.09	(950605)
14	707552.00	114476.00	53.28	(941013)	51.51	(951216)	50.62	(950421)	47.96	(950605)	47.31	(940311)
15	698585.00	120873.00	29.04	(941102)	28.97	(941014)	28.79	(950108)	28.73	(950512)	28.68	(941119)
16	698981.00	118897.00	28.85	(940516)	28.78	(950512)	28.78	(950929)	28.72	(950109)	28.64	(940129)
17	698612.00	117031.00	28.72	(940606)	28.72	(950512)	28.70	(940129)	28.65	(941119)	28.63	(950929)
18	698669.00	114997.00	28.77	(940129)	28.77	(950512)	28.71	(950428)	28.69	(950327)	28.62	(940912)
19	697590.00	113254.00	28.74	(941119)	28.72	(950505)	28.66	(950428)	28.66	(950512)	28.65	(940129)
20	697941.00	111270.00	28.78	(950512)	28.73	(951216)	28.69	(950505)	28.68	(940129)	28.68	(941119)
21	698248.00	109322.00	28.77	(940129)	28.70	(950327)	28.63	(950504)	28.61	(951216)	28.59	(940912)

Run Date: 01/16/97

Lone Pine Modeling Region, SIP Controls (Method 1 Emissions), Vector Met
High 10 Tables

24-hr PM10 (ug/m3)

No.	xrec(m)	yrec(m)	1-hi PM10	(yrmndy)	2-hi PM10	(yrmndy)	3-hi PM10	(yrmndy)	4-hi PM10	(yrmndy)	5-hi PM10	(yrmndy)
1	694780.00	141778.00	33.20	(940318)	30.95	(940515)	30.56	(950321)	30.55	(940606)	30.48	(950310)
2	704526.00	134694.00	44.62*	(950303)	41.04*	(950213)	39.96*	(950321)	39.65*	(950615)	39.03*	(951212)
3	703399.00	134971.00	42.06	(950303)	39.37	(940318)	38.44	(951212)	38.29	(940515)	38.23	(950213)
4	702337.00	135174.00	39.30	(950303)	37.91	(940318)	36.94	(951212)	36.56	(940515)	35.43	(950213)
5	700958.00	135392.00	38.98	(950303)	34.88	(940318)	34.82	(951212)	34.81	(950213)	33.86	(950310)
6	700136.00	134574.00	38.49	(950303)	35.18	(940318)	35.11	(950213)	34.15	(950310)	34.04	(950615)
7	699141.00	134273.00	36.30	(940318)	35.63	(950303)	34.64	(950310)	34.25	(950213)	33.75	(950321)
8	697787.00	133698.00	34.39	(940318)	31.58	(950109)	31.51	(950310)	31.50	(940515)	30.94	(950213)
9	696274.00	133058.00	32.30	(940318)	30.19	(940515)	29.87	(950321)	29.84	(950109)	29.76	(941004)
10	696382.00	131807.00	32.31	(940318)	30.23	(940515)	30.02	(950108)	29.98	(950109)	29.81	(941004)
11	696970.00	129895.00	32.47	(940318)	30.68	(950109)	30.38	(940515)	30.15	(950108)	29.94	(941004)
12	697697.00	128594.00	32.87	(940318)	30.95	(950109)	30.62	(940515)	30.32	(950108)	30.13	(941004)
13	697069.00	128214.00	32.05	(940318)	30.92	(950109)	30.37	(950110)	30.19	(940515)	30.17	(950108)
14	696310.00	126530.00	30.70	(950110)	30.58	(950109)	30.33	(940318)	29.82	(940606)	29.81	(950108)
15	696968.00	124557.00	30.97	(950110)	30.83	(950109)	29.93	(940318)	29.82	(940606)	29.51	(950108)
16	697844.00	122654.00	31.26	(950109)	31.23	(950110)	29.77	(940606)	29.72	(940318)	29.63	(950108)

Run Date: 01/16/97

Lone Pine Modeling Region, SIP Controls (Method 1 Emissions), Vector Met
High 10 Tables

24-hr PM10 (ug/m3)

No.	xrec(m)	yrec(m)	6-hi PM10	(yrmndy)	7-hi PM10	(yrmndy)	8-hi PM10	(yrmndy)	9-hi PM10	(yrmndy)	10-hi PM10	(yrmndy)
1	694780.00	141778.00	30.24	(950109)	30.09	(940423)	30.07	(950213)	29.98	(950322)	29.81	(941004)
2	704526.00	134694.00	38.67*	(950413)	38.39*	(940515)	38.03*	(950310)	37.87*	(940318)	37.48*	(950309)
3	703399.00	134971.00	37.48	(950321)	37.41	(950310)	36.37	(950615)	35.38	(950413)	34.61	(950309)
4	702337.00	135174.00	35.17	(950310)	34.63	(950321)	33.63	(950413)	33.57	(950615)	33.47	(940606)
5	700958.00	135392.00	33.38	(940515)	33.15	(940606)	33.05	(950413)	33.04	(950615)	32.82	(950109)
6	700136.00	134574.00	34.01	(950321)	33.46	(951212)	33.12	(940515)	32.89	(940423)	32.87	(950309)
7	699141.00	134273.00	33.52	(940515)	33.06	(950615)	32.96	(940423)	32.13	(941004)	31.96	(941212)
8	697787.00	133698.00	30.94	(950321)	30.92	(940423)	30.64	(941004)	30.53	(950303)	30.48	(940606)
9	696274.00	133058.00	29.68	(940123)	29.68	(940423)	29.58	(950322)	29.55	(941212)	29.55	(950310)
10	696382.00	131807.00	29.73	(940123)	29.73	(950321)	29.60	(940322)	29.57	(940910)	29.51	(940423)
11	696970.00	129895.00	29.85	(940910)	29.81	(940123)	29.76	(950110)	29.73	(950321)	29.72	(940606)
12	697697.00	128594.00	30.12	(950110)	29.98	(950321)	29.94	(940123)	29.86	(940606)	29.69	(940423)
13	697069.00	128214.00	29.86	(940606)	29.85	(941004)	29.78	(940123)	29.57	(940910)	29.48	(950114)
14	696310.00	126530.00	29.44	(941004)	29.38	(940515)	29.28	(940910)	29.27	(940123)	29.26	(950114)
15	696968.00	124557.00	29.30	(941004)	29.23	(950114)	29.22	(940515)	29.15	(950513)	29.07	(940123)
16	697844.00	122654.00	29.23	(950114)	29.19	(941004)	29.14	(940515)	29.10	(950513)	28.91	(940425)

APPENDIX C

EXAMPLE PERMIT TO OPERATE FOR AN INDUSTRIAL FACILITY

PERMIT TO OPERATE

GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT

157 Short St. Suite #6 - Bishop, CA 93514
(619) 872-8211

PERMIT NUMBER 632

Pursuant to the authority granted under the Rules and Regulations for the Great Basin Unified Air Pollution Control District, the

Federal White Aggregates
870-789 West Pender Street
Vancouver, B.C., Canada V6C1AZ

operations and associated equipment and buildings located at:
Dolomite Ghost Town, on Dolomite Loop Road, off Hwy 138, 7 miles southeast of Lone Pine, Inyo County.

is hereby granted a permit to operate as of July 22, 1991.

This Permit to Operate is granted for one year and may be renewed upon payment of the renewal fee on or before the anniversary date above.

EQUIPMENT DESCRIPTION FOR PERMIT: Dolomite Crushing & Screening Plant.

1 - 10 ton ore hopper	n/a	hp
1 - vibrating feeder	n/a	hp
1 - Cedar Rapids jaw crusher	50	hp
2 - conveyors (jaw to screen) 3 hp ea.	6	hp
1 - Overstrom triple deck screen	7 1/2	hp
1 - conveyor (screen to rolls)	3	hp
1 - Columbia rolls crusher	70	hp
1 - conveyor (rolls to jaw)	3	hp
2 - belt conveyors @ 5 hp ea.	10	hp
2 - coarse ore storage bins	n/a	hp
2 - Union Special sewing machines	1	hp
1 - sacking bin & sacker	n/a	hp
2 - conveyors (Overstrom to Sweco) 3 hp ea	6	hp
1 - Sweco triple deck screen	3	hp
2 - valve packers 3 hp ea	6	hp

CONTROL SYSTEM:

1 - Water truck controls pit and haul road fugitive dust emissions.

PERMIT CONDITIONS: See the attached conditional approval.

This Permit does not authorize the above permittee to violate any of the Rules and Regulations of the Great Basin Unified Air Pollution Control District or Division 20, Chapter 2, Article 3, of the Health and Safety Code of the State of California.

Ellen Hardebeck
AIR POLLUTION CONTROL OFFICER

Date July 22, 1991

Conditional Approval for Permit to Operate No. 632

Federal White Aggregates
870-789 West Pender Street
Vancouver, B.C., Canada V6C1AZ

Located at:
Dolomite Ghost Town, on Dolomite Loop Road,
off Hwy 138, 7 miles southeast of Lone Pine

PERMIT CONDITIONS:

1. The District will be notified 48 hours prior to equipment start up and 48 hours prior to commencing seasonal start up by calling (619) 872-8211.
2. Federal White Aggregates is responsible for dust control from commencement of this project to final completion and is also responsible for insuring that subcontractor(s), employees, and all other persons connected with the project abide by the conditions of this permit.
3. The hourly input feed rate shall be limited to 10 tons per hour and is restricted to processing no more than 240 tons of dolomite aggregate per day. Daily production records shall be kept on site and made available to the District staff upon request.
4. Within 90 days after placing the crushing plant into operation, the applicant shall offset all increased emissions by dismantling the equipment covered under former Permits to Operate No. 521 (crushing plant # 2), and No. 487 (aggregate wash plant).
5. To prevent violations of District Rule(s) 400, 401 and 402, Federal White Aggregates shall have at a minimum one (1) watering truck available full time to apply water to areas in and around the plant. The applicant will give particular attention to controlling dust from:
   a. unimproved access roads used for entrances to or exit from the material pit.
   b. areas in and around the open quarry, and aggregate crushing plant.
   c. dirt and mud carried on and deposited on adjacent improved streets and roads, and these streets are maintained in a clean manner.
   d. the materials pit, and ore storage pile fugitive emissions when needed to maintain fugitive dust emissions below a Ringelmann 1 (20% opacity).
   e. all dust emissions, and that any dust emission is kept below a Ringelmann 1 (20% opacity).
6. Federal White Aggregates shall post and observe a 15 mph speed limit at the project. During normal daily activity, Federal White Aggregates, their contractor(s), and employees will observe this speed limit. The speed limit will be strictly enforced by the applicant. (Authority cited rules 402 & 210).
7. If wind conditions are such that the applicant cannot control dust, Federal White Aggregates shall shut down all operations (except for equipment used for dust control). Under no circumstance will wind generated dust be allowed to blow across a property boundary.
8. The height of all aggregate storage piles and its conveyor drop distance shall be kept to a minimum. Aggregate storage pile height shall not be allowed to exceed a 20 foot maximum height. If District Rule(s) 400, 401 or 402 are violated, water shall be applied to the storage piles as necessary to minimize fugitive dust emissions cause by high winds.

9. Federal White Aggregates shall pursue and explore potential buyers for the reject waste collected by the baghouse. Any progress towards finding a market for this waste material shall be reported to the District. Until a market is established, the applicant shall take every reasonable precaution necessary to prevent this waste material from becoming airborne and prevent the transport of dust or dirt beyond the property boundary by continuously stabilizing and controlling the material. Reasonable available dust control measures may include, but need not be limited to: covering the waste material with 4 inches of overburden material, or rocks, sealing, re-vegetation, or by paving. On a temporary basis, the fine waste dust may be controlled by use of a resinous or petroleum based dust suppression agent, or otherwise stabilizing the spoils with a chemical surfactant, or latex binder. This control operation shall be performed before the close of business each operating day or at least once a day when the plant is in continual operation. Since waste crankcase oil is a hazardous waste it will not be considered or used as a dust suppression agent.

10. In the quarry, core and blast holes shall be properly drilled, using water injection, cyclone collection, or other approved methods to decrease the amount of dust created to below a Ringelmann 1 (20% opacity). During blasting, the generation of fugitive dust shall be reduced by minimizing the amount of explosives used and by preventing overshot. No blasting shall take place during periods of high winds where the wind velocity is high enough to carry dust or dirt cross a property boundary.

11. Federal White Aggregates shall keep the active quarry as small as possible. Once any portion of the quarry is exhausted of useful material, the applicant shall immediately begin reclamation of the disturbed surface. Federal White Aggregates shall not allow any abandoned portion of the quarry to remain subject to wind erosion for a period in excess of six (6) months without applying all reasonably available dust control measures necessary to prevent the transport of dust or dirt beyond the property boundary. Reasonable available control measures may include, but need not be limited to: sealing, re-vegetation, paving, or otherwise stabilizing the soil surfaces with chemical surfactants, or latex binders.

12. At the termination of mining, and prior to abandoning the site, Federal White Aggregates shall apply reasonable available control measures to prevent fugitive dust emissions from being emitted after the quarry is closed. The applicant shall comply with the mitigation measures specified by the Inyo County Planning Commission's Conditional Use Permit #88-3 dated November 17, 1988 and by the mitigation measures outlined in Reclamation Plan #88-1.

13. The provisions of this permit may be modified by the District if it determines the stipulated controls are inadequate, or if District Rule(s) 400, 401, or 402 are violated. If requested by the Air Pollution Control Officer, Federal White Aggregates shall within thirty (30) days submit a written plan to the District describing how the dust emissions will be controlled and maintained below a Ringelmann I (20% opacity). The Air Pollution Control Officer will approve or modify the plan. Federal White Aggregates shall implement the plan immediately following the APCO's approval.

14. Federal White Aggregates shall promptly notify the District in writing should they learn of or encounter conditions where toxic air emissions of concern are emitted and allowed to disperse into the ambient air. Toxic air emissions are those listed on the AB2588 list of substances as required by the California Health & Safety Code Section 44321.