Rev. 11/90

DIVISION OF WATER RESOURCE MANAGEMENT

FROM: _____ DATE: 9-16 FILE IN: _____

TO:	INITIAL:		PLEASE:	REMARKS:
___	_____	G. AKITA	___ See Me	
___	_____	L. Nanbu	___ Take Action By_____	
			___ Route to Your Branch	
___	_____	E. Sakoda	✓ Review & Comment	
___	_____	G. Matsumoto	___ Draft Reply for Gov Signature	
___	_____	E. Lau	___ Acknowledge Receipt	
___	_____	L. Chang	___ Xerox ____copies	
___	_____	Y. Shiroma	___ File	
___	_____	_____	___ Mail	
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✓	_____	_____		
___	_____	_____	FOR YOUR:	
✓	_____	_____		
___	_____	_____	___ Approval	
___	_____	_____	___ Signature	
___	_____	_____	___ Information	
___	_____	M. TAGOMORI		
___	_____	S. Kokubun		

Comd w/ DBED
Jan

called Jan 9/17/91 to confirm FAX receipt

WRM

TO: Director, DBED

[✓] PLEASE COORDINATE WITH DLNR / DOH

FOR:

___ Comment/Recommendation (required)
___ Appropriate attention
___ Direct reply (cc/bcc: Governor)
___ Your information/file
✓ Draft reply for Governor's signature
___ Follow up/report
___ Submit copy of response (if any)
___ Send enclosure(s)
___ Return enclosure(s)
___ Other

GOV, JA, CF, SO

DUE seven working days from ___
(If delay is encountered in meeting suspense date, please advise by telephone immediately)

In reply, please refer to: 91:500-13

FAX TRANSMITTAL SHEET

Date: 9/13/91

From: Jim De Mello	Fax #: 933-4579
Company: Governor's Office - Hilo	

Number of pages (including this sheet): 3

To: Lisa/Char	Fax #: 548-1559
Company: Governor's Office - Honolulu	

Comments or Instructions:

RECEIVED
91 SEP 16 P3:51
DIV. OF WATER & LAND DEVELOPMENT

Note: if any of these fax copies are illegible, or you do not receive the same number of pages as stated above, please contact us immediately at: (808) 933-4293

Sept 13th

Hello,

My name is Mary Drew and I am representing my husband, myself & our 4 children in the Need for relocation from 13-667 Hinalo St. Pahoa (Lanipuna Gardens, next to the Geothermal Plant). We are the other family Dr. Reuben requested relocation for health complaints due to our close proximity to the Geothermal Plant. Our family has suffered from the following illnesses; pneumonia (2 cases), "severe allergic reaction to the chemicals" (docter's words); bronchitis, sinus infection, extreme headaches & nauseous and infections rashes and still continue to suffer from these complaints and other too numerous to mention. You have relocated one family. We need to be relocationed! This was Dr. Ruben conclussion for our 2 familees. We are still under a docter care and he want to give us chest x-Ray, blood test (for metals & lead) and lung tests. Please help us in this "emergency" situation. Thank you for your time. (has not this situation been declared a emergency?) Sincerely,

Mary Drew
13-667 Hinalo St

message phone # 959-0252

12 May 91

Dear Div. of Water + Land Dev. staff —

i'm not sure if i'm writing to the correct office – if not, could you forward this? I would like ~~itt~~ to get a copy of the Geothermal Resources of Hawaii (1983) map. Could you tell ~~me~~ the price & postage charges for

DRAFT

Mr. Rick Banning
7329 Carroll Avenue
Takoma Park, Maryland 20912

Dear Mr. Banning,

I regret to inform you that the map you have requested, Geothermal Resources of Hawaii, is out of print, and we are unable to fulfill your request.

Very truly yours,

Manabu Tagomori
Deputy Director

Janet —
Just mail card.

Rev. 11/90

DIVISION OF WATER RESOURCE MANAGEMENT

FROM: _____ DATE: 10/5 FILE IN: _____

TO:	INITIAL:		PLEASE:	REMARKS:
___	_____	G. AKITA	___ See Me	
___	_____	L. Nanbu	✓ Take Action By_____	
			___ Route to Your Branch	
___	_____	E. Sakoda	✓ Review & Comment	
___	_____	G. Matsumoto	___ Draft Reply___	
___	_____	E. Lau	___ Acknowledge Receipt	
___	_____	L. Chang	___ Xerox ____copies	
___	_____	Y. Shiroma	___ File	
___	_____		___ Mail	
✓	for Janet		done 10/16/91	
			FOR YOUR:	
			___ Approval	
			___ Signature	
			___ Information	
___	_____	M. TAGOMORI		
___	_____	S. Kokubun		

OK

Call Seymour

RECEIVED

DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

JOHN WAIHEE GOVERNOR
MURRAY E. TOWILL DIRECTOR
BARBARA KIM STANTON DEPUTY DIRECTOR
Takeshi Yoshihara DEPUTY DIRECTOR

ENERGY DIVISION, 335 MERCHANT ST., RM. 110, HONOLULU, HAWAII 96813 PHONE: (808) 548-4080 FAX: (808) 531-6243

DIV. OF WATER &
LAND DEVELOPMENT

FACSIMILE TRANSMITTAL PAGE

PLEASE DELIVER THE FOLLOWING PAGES TO:

NAME: DR BRUCE ANDERSON / MANABU TAGOMORI

COMPANY: DOH / DLNR

FROM: G. LESPERANCE

DATE: 10/15/91 **TIME:** 12:45

MESSAGE: REQUEST COMMENT ON DRAFT RESPONSE TO GOV REFERRAL 91:540-05 FROM DIANA ALLEGRA

Total number of pages (including Transmittal Page): 5

IF YOU DO NOT RECEIVE ALL OF THE PAGES LEGIBLY,
PLEASE CALL: PHONE (808) 586-2353

Sending Facsimile Number: (808) 586-2536
Receiving Facsimile Number: ( ) _____

91:540-05 DRAFT FOR GOVERNOR'S SIGNATURE

October 14, 1991

Ms. Diana Allegra
RR 2, Box 4874
Kalapana Shores, Hawaii 96778

Dear Ms. Allegra:

Thank you for your October 2, 1991 letter relating to the geothermal incident..

All Puna Geothermal Venture development drilling activity was suspended by the government immediately after the June 12, 1991 blowout and will remain suspended until essential recommendations from third-party investigations are carried out. These recommendations were received in late July 1991. Mayor Lorraine Inouye and I have a Task Force consisting of the Directors of Health; Business, Economic Development & Tourism; Chairman of the Department of Land and Natural Resources as well as the Managing Director, Planning Director and Civil Defense Administrator from the County of Hawaii. They and their staffs have been meeting at least weekly toward implementing essential recommendations. Puna Geothermal Venture will not be allowed to resume geothermal development activity until we are satisfied that it will be done properly and safely.

Thank you for your letter. I assure you that a resolution to those issues of health impacts of geothermal energy development in close proximity to people is of great importance to me.

Thank you for expressing your concern.

With kindest regards,

Sincerely,

JOHN WAIHEE

bcc: Hon. Murray E. Towill
Hon. John C. Lewin, M.D.
Hon. Warren Price III
Hon. William W. Paty

Hale Kipa O Kiana
Beach House

Diana Grace Allegra
Owner

October 3, 1991

Governor Waihee
State Capitol
Honolulu, Hi. 96813

Dear Governor Waihee:

I hope you will respond to our health concerns and stop all geothermal progress on our island as soon as possible. Mahalo.

Sincerely,

Diana Allegra

Diana Allegra

TO: Director, DBED
PLEASE COORDINATE with DLNR
DOH

FOR:
___ Comment/Recommendation (required)
___ Appropriate attention
___ Direct reply (cc/bcc: Governor)
___ Your information/file
✓ Draft reply for Governor's signature
___ Follow up/report
___ Submit copy of response (if any)
___ Keep enclosure(s)
___ Return enclosure(s)
___ Other
CA, SO, CF

Due seven working days from OCT 07 1991
(If delay is encountered in meeting suspense date, please advise by telephone immediately)
In reply, please refer to: 91-540-05

RR2 Box 4874 Kalapana Shores, Hi. 96778 (808) 965-8661

October 2, 1991

Dear Editor:

Recently I moved back into my home in Kalapana Shores after having been evacuated for nine months. I was living in Sea View Estates when the geothermal accident occurred and I suffered what I believe to be definite side effects from the environmental stress and pollutants in the air. I often felt as though I was drugged and would spend days on end in bed. Not only was I sleeping an enormous amount of time, but my house guest also found himself doing the same thing. I made an appointment with the Health Department in Hilo to be evaluated and was examined by Dr. Sam Rubin. I was very impressed with the manner in which Dr. Rubin conducted his evaluation and recommendations. He stated to me that indeed it sounded like my symptoms (which included a chronic earache) were environmentally caused. He recommended a homeopathic remedy called Pau D Arco tea (bark of a tree) to strengthen my immune system which I am now taking. I am happy to report that my symptoms are almost all gone (except for chronic congestion in my lungs). I am saddened to hear that Dr. Rubin is leaving his position in the Health Department. We need all the good men and women we can get in our state and county governments to convince our Governor Waihee that we do not want geothermal. Please, Governor Waihee, consider the people that live with geothermal every day and the unhealthy way we are all being effected here, especially our children.

Diana Allegra

Diana Allegra
RR2 Box 4874
Kalapana Shores, Hi. 96778
965-8661

R 11/90

DIVISION OF WATER RESOURCE MANAGEMENT

FROM: [illegible] DATE: 10-8 FILE IN:

TO:	INITIAL:		PLEASE:	REMARKS:
___	___	G. AKITA	___ See Me	
___	___	L. Nanbu	___ Take Action By___	
			___ Route to Your Branch	
___	___	E. Sakoda	___ Review & Comment	
___	___	G. Matsumoto	✓ Draft Reply___	
___	___	E. Lau	___ Acknowledge Receipt	
___	___	L. Chang	___ Xerox ___copies	
___	___	Y. Shiroma	___ File	
___	___		___ Mail	
✓	___	[illegible]		
___	___		FOR YOUR:	
___	___			
___	___		___ Approval	
___	___		___ Signature	
___	___		___ Information	
___	___	M. TAGOMORI		
___	___	S. Kokubun		

DSED to draft ltr.

We simply need to OK their draft.

done, phoned Jerry 10/16/91

WRM

RECEIVED

91 OCT 8 A10:59

DIV. OF WATER &
LAND DEVELOPMENT

Hale Kipa O Kiana
Beach House

Diana Grace Allegra
Owner

October 3, 1991

Governor Waihee
State Capitol
Honolulu, Hi. 96813

Dear Governor Waihee:

I hope you will respond to our health concerns and stop all geothermal progress on our island as soon as possible. Mahalo.

Sincerely,

Diana Allegra

TO: Director, DBED
PLEASE COORDINATE with DLNR / DOH

FOR:

___ Comment/Recommendation (required)
___ Appropriate attention
___ Direct reply (cc/bcc: Governor)
___ Your information/file
✓ Draft reply for Governor's signature
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___ Return enclosure(s)
___ Other
JA, SO, CF

DUE seven working days from OCT 07 1991
(If delay is encountered in meeting suspense date, please advise by telephone immediately)
In reply, please refer to: 91:540-05

RR2 Box 4874 *Kalapana Shores, Hi. 96778* *(808) 965-8661*

540-05

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Diana Allegra

Diana Allegra
RR2 Box 4874
Kalapana Shores, Hi. 96778
965-8661

Rev. 11/90

REGULATION BRANCH
Division of Water Resource Management

FROM: Dean DATE: 9/18 FILE IN: _____

TO:	INITIAL:	PLEASE:	REMARKS:
____	____ G. MATSUMOTO	____ See Me	For yr review and approval:
____	____ F. Ching	____ Call	
		____ Review & Comment	
____	____ T. Kam	____ Take Action	
____	____ S. Samuels	____ Investigate & Report	1) request for PGV change order
____	____ D. Nakano	____ Draft Reply	
____	____ S. Yong	____ Acknowledge Receipt	
____	____ C.P. Chang	____ Type Draft	
____	____ J. Swift	____ Type Final cc:____	
____	____ T. Nakama	____ Xerox ____ copies	2) request for revised monitoring program
____	____ H. Lee	____ File	
____	____ M. Holt	____ Mail	
____	____ B. Micua		
____	____ _____	FOR YOUR:	3) Memo to Tak Yoshihara re additional resources.
____	____ G. AKITA		
____	____ L. Nanbu	____ Approval	
____	____ E. SAKODA	____ Signature	
____	____ E. LAU	____ Information	
____	____ L. CHANG		
____	____ Y. SHIROMA		
____	____ M. TAGOMORI		
____	____ Kokubun		

MT - see Deans corrections.

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
Division of Water Resource Managment
Honolulu, Hawaii

SEP 24 1991

MEMORANDUM

TO: Manabu Tagomori

FROM: Janet Swift

SUBJECT: Investigation Regarding Duane Hanson/Rita Johnson Complaint Regarding Geothermal Venting

Deputy Attorney General William Tam in his memorandum of February 25, 1991 has requested that you investigate and take appropriate action including contact with governmental agencies as may be revellent regarding various complaints of Mr. Duane Hanson.

Attachments to Deputy Attorney General Tam's memorandum document various claims by Hanson, including respiratory distress, emotional distress and damage to his vehicle.

I telephoned Dr. Don Thomas to find out if there had been any unusual incidents either in September 1989 or in January 1991, the two time periods mentioned in Mr. Hanson's complaints. Dr. Thomas said that there were problems with HGP-A in September 1989. For 2-3 days there was a bad smell in the area, but there never was a dangerously high reading on monitoring equipment continuously in use throughout the incident. Dr. Thomas has the files of the H2S monitoring that took place during that period.

As to the January 1991 time period, Dr. Thomas knows of no incident that occurred at that time. There was some concern on the part of residents due to research about to be initiated at the time by the Pacific International Center for High Technology Research. This research was of such a benign nature that it was permitted to take place without monitoring plans in place.

I suggest a memorandum be drafted to Dr. Johnson of the Hawaii County Mayor's Office of Information and Complaint to let her know there were no incidents resulting in emissions significant enough to have caused respiratory problems, and that the records are available should she or her agent wish to study them.

JS:bm

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
Division of Water Resource Managment
Honolulu, Hawaii

SEP 24 1991

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JS:bm

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Centers for Disease Control

RECEIVED
OFFICE OF THE DIRECTOR
DEPT. OF HEALTH

'91 OCT 15 A8:15

OCT 7 1991

copies:
GN
Murray T.
Bill R.
Sus O.
BSA
FYI, THX
Jef

The Honorable Patsy T. Mink
House of Representatives
Washington, D.C. 20515-1102

Dear Ms. Mink:

Thank you for your recent request for intervention by the Centers for Disease Control (CDC) regarding problems caused by geothermal development in Puna, Hawaii. Dr. David Mannino, a CDC epidemiologist, visited Hawaii in August to collect data related to volcanic air pollution. He obtained some information regarding the June 12, 1991, geothermal well blow-out, but the main purpose of his trip was to investigate health effects related to volcanic air pollution. A copy of his trip report is enclosed.

We understand the concerns of the area residents who have had intermittent exposures to hydrogen sulfide at low ambient concentrations. Effects such as nausea, headaches, and mental depression have been reported in the scientific literature at similar low exposure levels. Immunosuppression has not been noted in low-level hydrogen sulfide exposure. Dr. Mannino was not given any objective data regarding immunosuppression resulting from hydrogen sulfide exposure.

re: Health concerns

Community concerns around geothermal resource developments have occurred in Lake County, California. These were ultimately reduced only after establishing credible local permitting, monitoring, and enforcement programs and developing a steering committee with representatives from industry, regulatory agencies, and environmental groups. To our knowledge, such an effort has not been undertaken in Hawaii. A similar organized effort directed to the Puna geothermal developments, including representation from the affected citizenry, may prove very useful in addressing the public health and land-use planning issues that are of concern to area residents, industry, and health and regulatory agencies.

re: Calif. solutions

Another important concern is the steady influx of people into the Puna district, which sits on the volcanically active eastern rift zone of Kilauea volcano. In the October 1990 Hazard Mitigation Team Report prepared by the State and Federal Hazard Mitigation Team (enclosed), several recommendations suggested restricting further development and population influx in this part of the island. Although this report dealt mainly with lava flows, one has to be concerned with exposure to the constant volcanic gas venting that occurs in a volcanic rift zone.

re: Long term issue for county.

As noted in Dr. Mannino's enclosed trip report, CDC will continue to provide technical assistance to the Hawaii Department of Health, the American Lung Association, and the National Park Service concerning these air pollution issues.

We hope this information has been helpful to you. Please contact us if you have any further comments or questions.

Sincerely,

William L. Roper, M.D., M.P.H.
Director

Enclosures

cc:
Hawaii Department of Health

September 30, 1991

Pulmonologist\Medical Epidemiologist, Air Pollution
and Respiratory Health Activity
Division of Environmental Hazards and Health Effects

National Center for Environmental Health and Injury Control

Trip Report - Hawaii

Director, CDC
Through: Director, NCEHIC _____
Director, EHHE _____
Chief, APRHA _____

I. Dates and Places of Travel

August 11, 1991 - Travel to Honolulu, Hawaii
August 13, 1991 - Travel to Hilo, Hawaii
August 14, 1991 - Travel to Kona, Hawaii
August 18, 1991 - Return to Atlanta, Georgia

II. Purpose of Travel

To assist the Hawaii State Department of Health in developing studies to evaluate the health impacts associated with volcanic and geothermal emissions on the island of Hawaii.

III. Principal Contacts

Bruce Anderson, Ph.D., M.P.H, Deputy Director for Environmental Health, Hawaii State Department of Health, Honolulu, Hawaii

Robert Worth, M.D., Ph.D., Director, Office of Health Status Monitoring, Hawaii State Department of Health, Honolulu, Hawaii

Harold Matsuura, M.P.H., County Environmental Health Officer, Hilo, Hawaii

Tamara Elias, Mauka Environmental Monitoring, Volcano, Hawaii

Fred Holshuh, M.D., Director of Emergency Services, Hilo Hospital, Hilo, Hawaii

Barry Stokes, United States Geologic Survey, Hawaiian Volcanoes Observatory, Volcano, Hawaii

Sam Ruben, M.D., District Health Officer, Hawaii State Department of Health, Hilo, Hawaii

Amy Hamane, Hawaii American Lung Assoication, Branch Office Director, Hilo, Hawaii

Jennie Wung, Kona Hospital Administrator, Kealakekua, Hawaii

James Morrow, M.S., Hawaii American Lung Association, Director of Environmental Health, Honolulu, Hawaii

Thomas A. Schroeder, Ph.D., University of Hawaii Assistant Professor of Meteorology, Honolulu, Hawaii

Barbara Siegel, Ph.D., Professor of Public Health Sciences, School of Public Health, University of Hawaii, Honolulu, Hawaii

Harry Kim, Civil Defense Director, Hilo, Hawaii

Terry Gerlach, United States Geologic Survey, Volcano, Hawaii

IV. Background

The Centers for Disease Control (CDC) received a request in mid-July from a Hawaii state senator to investigate health effects that resulted from a geothermal well blowout on the island of Hawaii on June 12, 1991. The Air Pollution and Respiratory Health Activity discussed this problem with Hawaii Department of Health officials Bruce Anderson, Ph.D., and Robert Worth, M.D. Dr. Worth noted that volcanic air pollution was receiving increased attention in Hawaii because of possible health effects related to long term exposures. The CDC received a request for technical consultation from the Hawaii State Department of Health on August 9, 1991, to develop "studies to evaluate the health impacts associated with volcanic and geothermal emissions on the Island of Hawaii."

Volcanic air pollution emanates from two main sources on Hawaii: the Kilauea caldron and eastern rift zone (sulfur dioxide), and lava-sea water interaction (hydrochloric acid aerosols).

Kilauea has been erupting continuously since 1986 and intermittently from 1983 to 1986. During its quiescent phase, Kilauea offgasses from 50 to 150 tons of sulfur

dioxide daily. During active eruptions, this can increase to 500 tons daily. In addition, the vents along the rift system can offgas an additional 1000 tons of sulfur dioxide daily when the volcano is active. In addition to sulfur dioxide, other substances have been detected, including hydrogen sulfide, carbon monoxide, mercury, selenium, and others.

At the interface of seawater and lava, hydrochloric acid aerosols are produced. No estimates as to the volume of hydrochloric acid produced are available. Both the volcanic gasses and the acid aerosols are carried by the prevailing trade winds. Under these normal conditions eddy currents tend to pool these pollutants on the Kona (western) side of the island. Volcanic gasses and this acid aerosol are believed to be the main constituents of vog (volcanic smog).

A third source of pollution on the island is that related to periodic ventings, both planned and unplanned, from geothermal well sites in the Puna district of the island of Hawaii. These developments are located in an area that has seen an influx of population over the past 10 years. Some families live very close to the site (within 500 yards) and over 100 residences are located within a 2 mile radius of the site. This district,through which the eastern rift zone of Kilauea volcano runs, is impacted by vog 10 to 30 percent of the time, but is also relatively close (10-12 miles) to the Pu'u O'o vent that is offgassing 1000 tons of sulfur dioxide daily. The population here has been involved in protests and demonstrations against these developments.

The micrometeorology of the island of Hawaii is important. An inversion layer can be typically found at about the 4,000 to 6,000 foot elevation on Moana Loa, tending to trap gasses and aerosols below this level. The trade winds are out of the northeast and predominate 80 to 90 percent of the time. Southwesterly "Kona" winds take over when the trade winds fail. As a result, vog most frequently affects the Kona (western) side of the island, although the Hilo (eastern) side can be affected intermittently. Daytime wind patterns are from the ocean to the mountain, while nighttime patterns are reversed.

V. Activities and Accomplishments

The main goals of this trip were to review and collect both environmental and health effects data related to volcanic air pollution and geothermal resource

development.

Environmental ambient air sampling data have been obtained at the Hawaii Volcanoes National Park (by scientists at the National Park Service and the National Institute of Occupational Safety and Health (NIOSH), CDC), Hilo and Kona (by scientists at the American Lung Association of Hawaii and the Hawaii State Department of Health), and the Puna district (by scientists at the Puna Geothermal Ventures and the Hawaii State Department of Health). The highest levels of pollutants have been detected in the National Park. Short term (15 minute) exposures to sulfur dioxide were 1.5 ppm. The NIOSH recommended exposure limit (REL) for sulfur dioxide is 2 ppm (8 hour time weighted average) , and the Environmental Protection Agency's National Ambient Air Quality Standard (NAAQS) is 0.14 ppm (24 hour) and 0.50 ppm (3 hour). Short term exposures to hydrochloric acid were 10.5 ppm (Occupational Safety and Health Administration's Permissible Exposure Level (PEL) 5 ppm, no NAAQS level). Long term sampling data at both the National Park and the other areas have detected lower levels of sulfur dioxide, sulfates, and particulates. Measurements of ambient hydrogen sulfide in the Puna district during the June 12 geothermal well blowout showed levels as high as 500 ppb (OSHA's PEL 10,000 ppb, no NAAQS level).

Health effects data are available from several sources, including the Hawaii State Department of Health (HSDH), local emergency rooms, and a study of 100 adults and children upwind and downwind from the volcano. The HSDH has shown, using Hawaii Medical Service Association insurance data, that areas of the island with high vog levels have a higher age/sex-adjusted rate of physician diagnosed respiratory problems (asthma, chronic obstructive pulmonary disease, bronchitis, sinusitis, pneumonia and flu) than areas of the island with low vog levels. The HSDH has also compiled a yearly random health survey of approximately 1.5 percent of the population. This data set, however, does not include questions related to smoking, which might limit its usefulness in epidemiologic applications. Data on emergency room visits at the island's 5 hospitals for asthma and exacerbations of chronic lung disease have been collected for 10 years but not analyzed. Data have also been collected by two local physicians from 50 individuals living in an area with high vog levels, compared to 50 living in an area with low vog levels. Although a clear causal relation between volcanic pollution and health effects was not demonstrated, lower than expected levels of pulmonary function were noted in

both groups.

VI. Recommendations

1. A technically valid study of the health effects associated with volcanic emissions will need to have more detailed environmental monitoring data in populated areas to correlate with health data. This would include better monitoring stations, both long term and short term sampling methodologies, and good industrial/environmental hygiene oversight of air monitoring on the whole island of Hawaii.

2. Ongoing health studies could be strengthened by incorporating additional features. Health surveillance questionnaires must have smoking questions included if respiratory symptom epidemiology is going to be evaluated. Evaluations of pulmonary function in a heterogeneous population that may include many Filipino and Japanese individuals must be done very carefully, as most "standard" populations for lung function are based on data from Caucasians and may not be an appropriate reference for lung function in other populations.

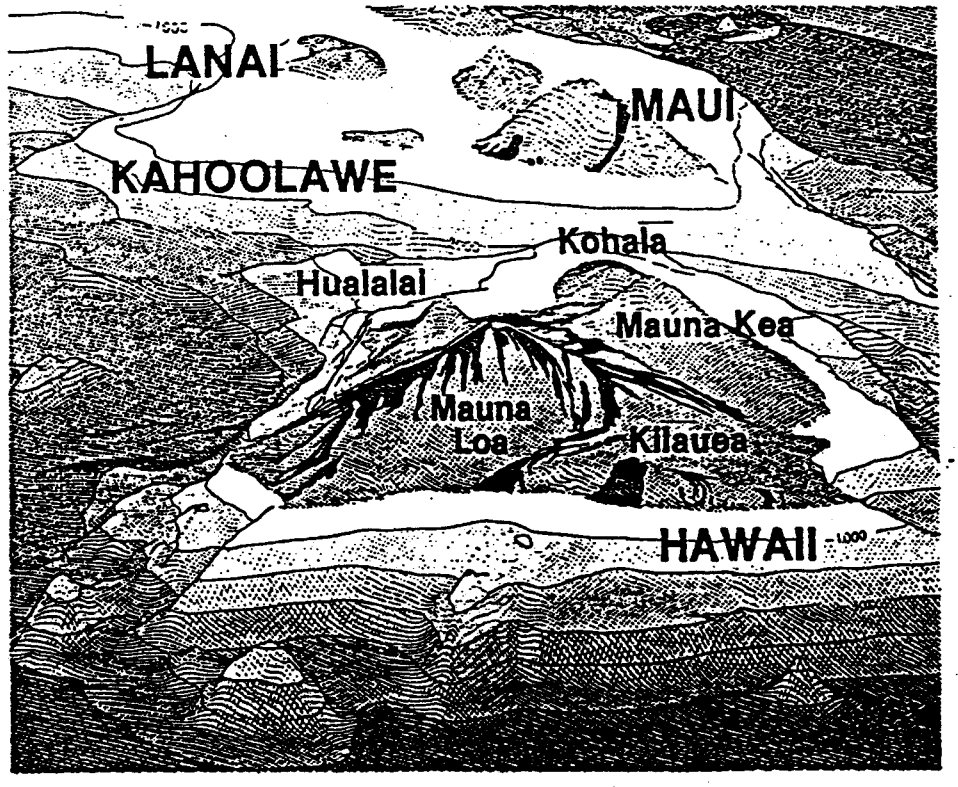
3. CDC will provide technical assistance to the HSDH, NPS, and ALA to fully evaluate the data from the ongoing studies. Recommendations regarding a long term prospective study will be based on review of these data. Because of the ongoing volcanic emissions and the large population affected, a prospective evaluation of the potential effects of vog could be very important in developing suitable intervention and prevention strategies.

With regard to the geothermal ventings, which are intermittent and potentially controllable, the focus should be on active monitoring, development of ambient air and noise criteria, and proper oversight to prevent population exposures. Programs like this have been successful in geothermal developments in California (Hinds et al, Geothermal Resources Council Transactions 1990; 14:1141-1148). Evaluation after intermittent exposures may be possible but will not be a satisfactory approach to dealing with this problem.

David M. Mannino, M.D.

cc: Dr. Vernon Houk
Dr. Henry Falk

U.S. Geological Survey
Hawaiian Volcano Observatory
Library, P.O. Box 51
Hawaii National Park, HI 96718



HAZARD MITIGATION TEAM REPORT

for the

KILAUEA VOLCANO ERUPTION

HAWAII COUNTY, HAWAII

FEMA-86

FRONT COVER:

Physiographic map of the island of Hawaii. The Hawaiian Islands are the tops of volcanoes that rise as much as 30,000 feet above the sea floor. The dark areas represent historic lava flows. The Kilauea lava flows, in the foreground, have destroyed over 170 residences since 1983 and are the focus of this hazard mitigation report. All figures in this report are courtesy of the U. S. Geological Survey.

The reader is referred to "Volcanic and Seismic Hazards on the Island of Hawaii," 1990, Christina Heliker, U. S. Geological Survey General Interest Publication, U. S. Government Printing Office: 1990-259-799.

HAZARD MITIGATION TEAM REPORT

for the

KILAUEA VOLCANO ERUPTION

HAWAII COUNTY, HAWAII

FEMA-864-DR-HI

October 1990

Prepared by:

The State and Federal
Hazard Mitigation Team

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)DUCTION

Hawaii County, Hawaii a major disaster area as a result of
/olcano (FEMA-864-DR-HI). The declaration provided
:sses and public agencies.

ıigation Team's recommendations to the Federal Emergency
rector, the Governor's Authorized Representative, Hawaii County
:deral agencies.

ıdations will provide guidance to Federal, State and County departments and
: volcanic eruption damage in Hawaii County. It is based on an assessment
ıring the January 1983 to present lava flows and a review of existing hazard
ıneasures and procedures.

ıuthority and Background

ı to receiving federal disaster aid, Section 409 of the Disaster Relief Act (Public Law
nended) requires that repairs be done in accordance with applicable codes, specifications,
rds. It also requires the government recipients of this aid to evaluate the natural hazards
:a in which the aid is to be used and, if appropriate, take action to mitigate the hazards. A
roduct and requirement of the Section 409 process is a State/Local Hazard Mitigation Plan
describes actions that have been and will be taken to mitigate hazards.

ıer Section 409, the Federal Emergency Management Agency encourages governments to develop
d maintain a systematic program to identify hazards, monitor changes, and develop and implement
ıeasures for reducing hazard vulnerability. Section 409 is best viewed as a dynamic ongoing process
allowing a disaster declaration to become an opportunity to review and update existing hazard
mitigation programs, rather than an isolated event which results in new and independent plans and
programs.

To implement Section 409, Federal, State and local Hazard Mitigation Coordinators are appointed.
These hazard mitigation coordinators serve on a Hazard Mitigation Team and accomplish the
following:

1. Identify areas of significant hazards,
2. Visit and evaluate the impact of the disaster,
3. Review existing land use regulations, building codes, construction standards, and existing hazard mitigation legislation or programs,
4. Review and evaluate existing warning and evacuation plans,
5. Identify and recommend measures or actions to mitigate the impact of disasters, and

6. Coordinate the necessary actions to implement proposed recommendations.

The Hazard Mitigation Team for the Kilauea lava flow disaster, with members representing County, State of Hawaii and Federal departments and agencies, met from August 27- 31, Hawaii County. Appendix A is a list of Hazard Mitigation Team members. The Team p report based on the information gathered during site visits, discussions and reviews of exi legislation, programs and policy. This report identifies issues that should be considered t damage from future volcanic eruptions and provides guidance to prepare the State/Coun Mitigation Plan. The Hazard Mitigation Plan will include the following:

1. Analysis of the natural hazards in the disaster declared area.

2. Analysis of existing State and County laws, regulations and programs that perta mitigation.

3. Identification of the strengths and weakness in existing programs.

4. Identification of mitigation measures to reduce the impacts of future volcanic

The final element of the hazard mitigation process is to implement the hazard mitiga described in this report and in the State/County Hazard Mitigation Plan.

BACKGROUND

Kilauea is one of the world's most active volcanoes. Over 90 percent of Kilauea's surface is covered by lava less than 1100 years old. Historically, all of Kilauea's eruptions have occurred either at its summit, or along one of two rift zones, which are zones of weakness that extend from the summit to the coastline on the east and southwest flanks of the volcano (see figures 1 and 2).

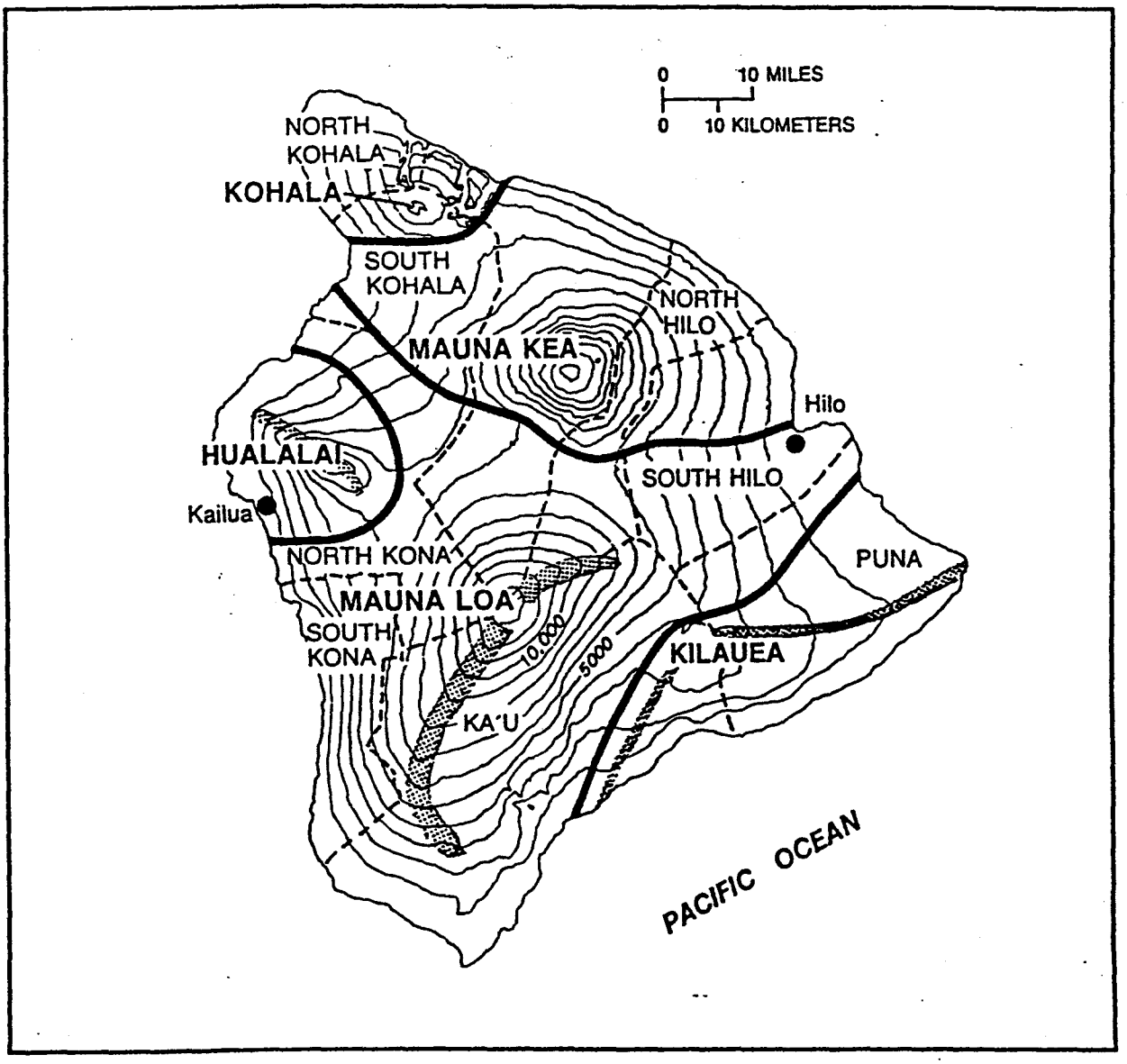

Figure 1. Topographic map of the island of Hawaii showing its five volcanoes (solid lines) and its district boundaries (dashed lines). The historically active Mauna Loa volcano and Kilauea volcano rift zones are in stippled gray.

Figure is from Heliker, C., 1990, Volcanic And Seismic Hazards On The Island Of Hawaii, U. S. Geological Survey General Interest Publication, U. S. Government Printing Office: 1990-259-799.

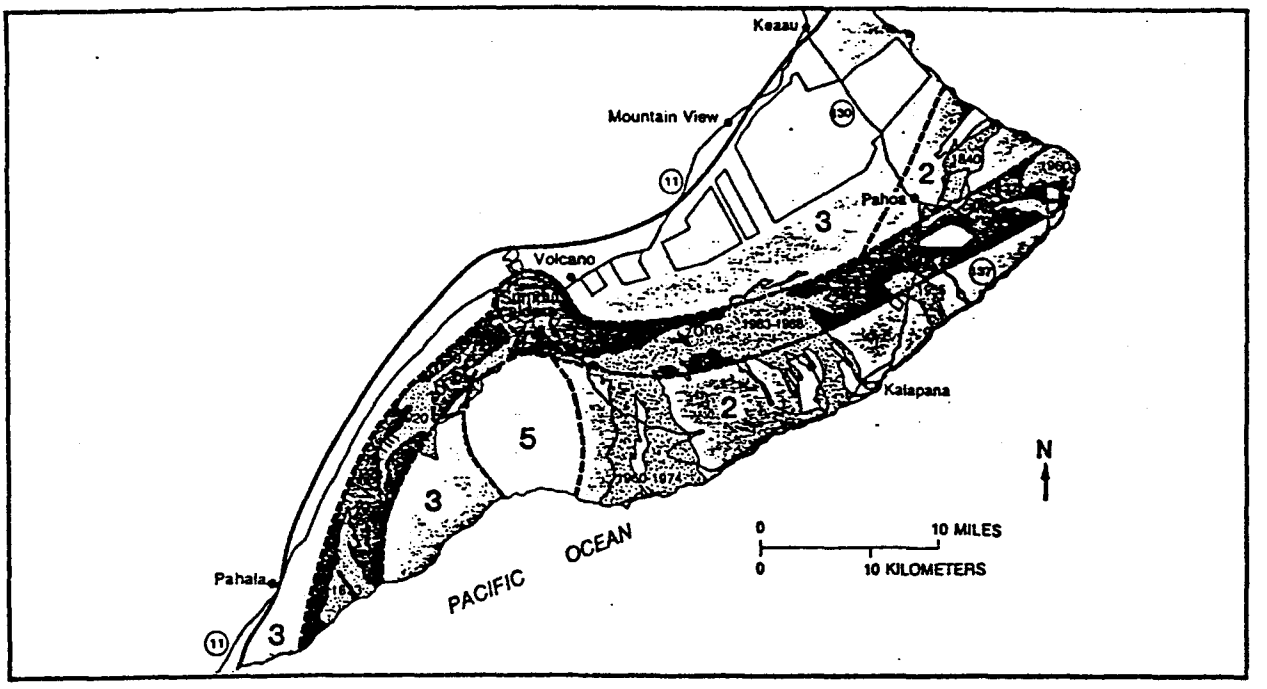

Figure 2. Kilauea's rift zones. Lava erupts from the Summit Caldera, the Southwest Rift Zone, and the East Rift Zone. The flows which have erupted since 1800 are shown in stippled gray and are dated. The major housing subdivisions on the slopes of the volcano are shown in light gray. The numbered Lava Flow Hazard Zones (1 - 5) are explained in Figure 3 and Table 1.

Figure is from Heliker, C., 1990, Volcanic and Seismic Hazards on the Island of Hawaii, U. S. Geological Survey General Interest Publication, U. S. Government Printing Office: 1990-259-799.

The Disaster

The eruption involved in this Presidential disaster declaration began in January 1983 from two vents on the middle east rift zone of Kilauea. The continuous and uninterrupted lava flow from the Kilauea Volcano has resulted in the devastation and destruction of businesses and residences in the rural communities and subdivisions of the Puna District, County of Hawaii. To date, these communities include Royal Gardens, Kapaahu, Pacific Paradise Ocean Front Estates, Keone, Kalapana Gardens and Kalapana.

The lava flow cannot be stopped or diverted. It chooses its own path, traversing into one area and then another in a rather unpredictable manner, dependent primarily on terrain features. This unpredictable movement of lava has put all of the residents in a constant state of anxiety and fear of property loss for over seven years.

County, State and Federal agencies have provided fire suppression assistance in the district as the result of lava and drought related fires since 1983. The State has rebuilt and repaired public roads that have been covered by lava flows to provide routes of ingress and egress in the district.

The County, in coordination with the U. S. Geological Survey, Hawaiian Volcano Observatory has provided continuous alerting and warning to the residents of the lava flow inundation areas.

Evacuation assistance and temporary sheltering has been provided to the residents on a continuous basis when endangered by lava flow through the affected subdivisions. Fire suppression, security, police protection and evacuation assistance were provided on a recurring, as needed, basis in the entire affected district.

Description of Damages

The lava, flowing into the Puna District at the rate of more than 650,000 cubic yards per day, has inundated an area of approximately 35 square miles since January 24, 1983; the flow continues. It has destroyed public and private roads, water systems, park/beach areas, residences, residential lots and home sites, churches and businesses. In some areas the lava flow exceeds fifty feet in depth and has rendered the land useless for generations. There is no economically feasible method of removing the lava.

The continuing eruption has also affected agriculture elsewhere in the County. In addition to the loss of agricultural land in the inundated area, production of papaya, macadamia nut, coffee, avocado and other crops are being affected in West Hawaii. The air pollutants produced by the volcano, in combination with rain, creates sulphur dioxide or acid rain, which reduces the yield and affects the quality of crops. This has indirectly affected farmers located downwind of the disaster area that are not otherwise inundated by lava flow.

Because the lava flow changes direction from time to time there are some surviving homes and other structures which are now completely isolated. This has required some of the residents in the Royal Gardens area to make a circuitous drive of over 100 miles to conduct their normal business and personal affairs. In all cases, residents and lot owners in the affected areas cannot sell their property as it has no real market value. In addition, many are still paying for their property even though it has been covered by tons of lava.

Adding to the residents' burden is the escalating cost of replacement land elsewhere in Hawaii County where property has been appreciating rapidly in recent years. Even those people who had homeowners insurance will have difficulty in securing a suitable replacement home or land due to land value escalation. Furthermore, the current waiting list for public housing is more than five years without considering any of these potential applicants from the disaster being added to the list.

As of May 3, 1990, the lava flow had destroyed 131 residences (including three National Park Service residences). Additionally, 21 residences and one church were removed or dismantled from the inundation area. There are approximately 30 isolated residences in the area that have been cut off from essential utilities and services which render them uninhabitable. Public infrastructure, such as, roads, water and private utilities (telephone, electrical, water and roads) have been destroyed. Subsequent to the declaration, the number of destroyed structures increased to 175 (with 173 listed as homes).

EXISTING MITIGATION PROGRAMS

Lava Flow Hazard Zones

The U. S. Geological Survey has prepared maps showing volcanic hazard zones in Hawaii County. Figure 3 is the most recent map (Table 1 is a legend for Figure 3).

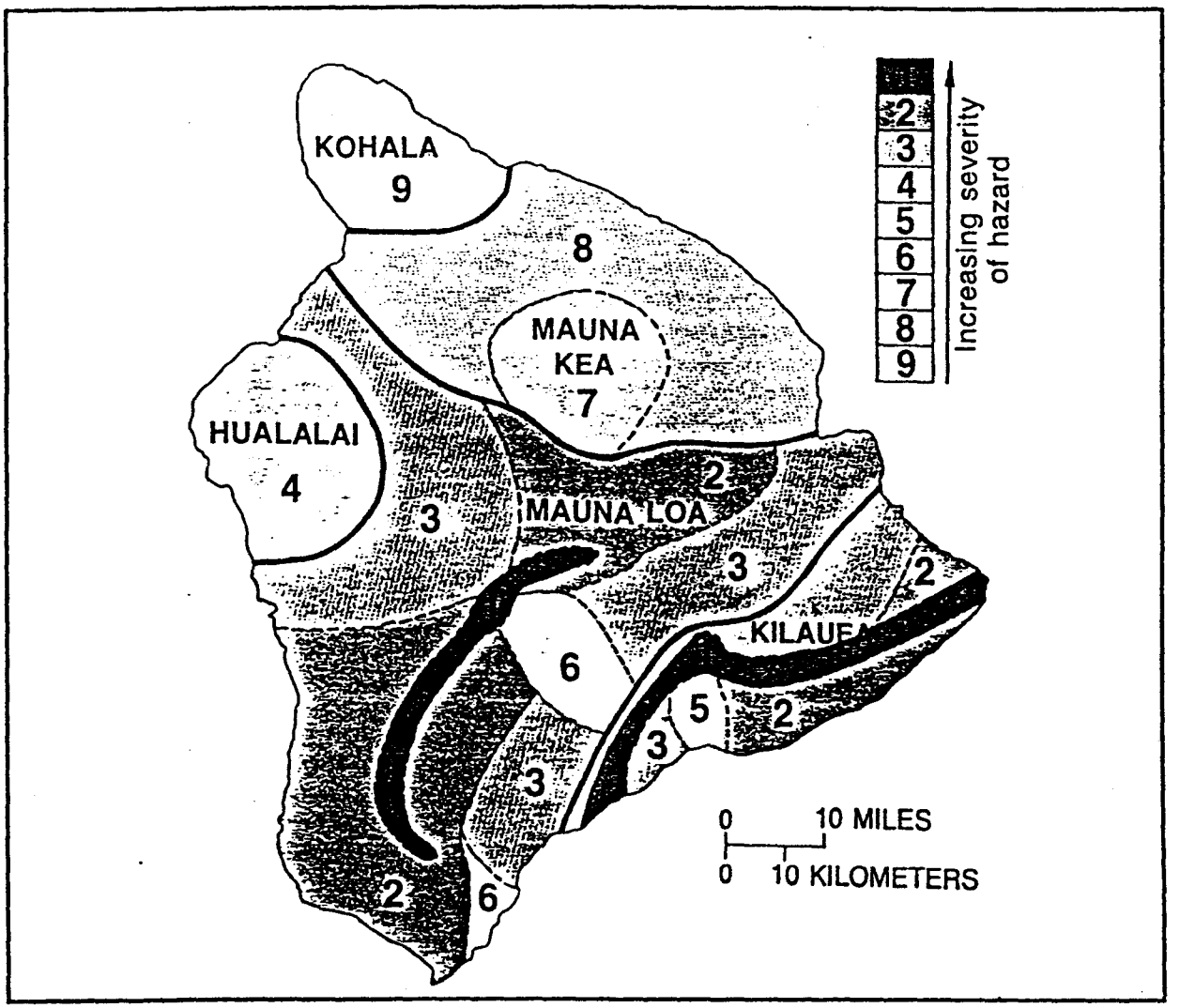

Figure 3. Lava Flow Hazard Zone Map. The island of Hawaii is divided into zones according to the degree of hazard from lava flows: Zone 1 is the area of the greatest hazard; Zone 9 is of the least hazard. Of the five volcanoes composing the island of Hawaii, Mauna Loa and Kilauea have been historically active: Mauna Loa erupted as recently as 1950 while Kilauea continues to erupt today. An explanation of the nine Lava Flow Hazard Zones accompanies this figure in Table 1 on the following page.

Figure is from Heliker, C., 1990, Volcanic and Seismic Hazards on the Island of Hawaii, U. S. Geological Survey General Interest Publication, U. S. Government Printing Office: 1990-259-799.

Hazard Zones for Lava Flows

Zone	Percent of area covered by lava since 1800.	Percent of area covered by lava in last 750 yrs.	Explanation
Zone 1	greater than 25 pct	greater than 65 pct	Includes the summits and rift zones of Kilauea and Mauna Loa where vents have been repeatedly active in historic time.
Zone 2	15-25 pct	25-75 pct	Areas adjacent to and downslope of active rift zones.
Zone 3	1-5 pct	15-75 pct	Areas gradationally less hazardous than Zone 2 because of greater distance from recently active vents and/or because the topography makes it less likely that flows will cover these areas.
Zone 4	about 5 pct	less than 15 pct	Includes all of Hualalai, where the frequency of eruptions is lower than on Kilauea and Mauna Loa. Flows typically cover large areas.
Zone 5	none	about 50 pct	Areas currently protected from lava flows by the topography of the volcano.
Zone 6	none	very little	Same as Zone 5.
Zone 7	none	none	20 percent of this area covered by lava 3,500-5,000 yrs ago.
Zone 8	none	none	Only a few percent of this area covered in the past 10,000 yrs.
Zone 9	none	none	No eruption in this area for the past 60,000 yrs.

Table 1. The nine Lava Flow Hazard Zones for the island of Hawaii. (For use with figures 2 and 3).

Table is from Heliker, C., 1990, Volcanic and Seismic Hazards on the Island of Hawaii, U. S. Geological Survey General Interest Publication, U. S. Government Printing Office: 1990-259-799.

The following quotation, from "Volcanic and Seismic Hazards on the Island of Hawaii," 1990, authored by Christina Heliker and published by the U. S. Geological Survey, describes these lava flow hazard zone maps:

> Maps showing volcanic hazard zones on the island of Hawaii were first prepared in 1974 by Donal Mullineaux and Donald Peterson of the U. S. Geological Survey and were revised in 1987. The current map divides the island into zones that are ranked from 1 through 9 based on the probabilities of coverage by lava flows. Other direct hazards from eruptions, such as tephra fallout and ground cracking and settling, are not specifically considered on this map; however, these hazards also tend to be greatest in the areas of highest hazard from lava flows.

Hazard zones from lava flows are based chiefly on the location and frequency of both historic and prehistoric eruptions. "Historic eruptions" include those for which there are written records, beginning in the early 1800's, and those that are known from the oral traditions of the Hawaiians. Our knowledge of prehistoric eruptions is based on geologic mapping and dating of the old flows of each volcano. The hazard zones also take into account the larger topographic features of the volcanoes that will affect the distribution of lava flows. Finally, any hazard assessment is based on the assumptions that future eruptions will be similar to those in the past.

Hazard zone boundaries are approximate. The change in the degree of hazard from one zone to the next is generally gradual rather than abrupt, and the change can occur over the distance of a mile or more. Within a single hazard zone, the severity of hazard may vary on a scale too fine to map. These variations may be the result of gradual changes that extend across the entire zone. For example, the hazard posed by lava flows decreases gradually as the distance from vents increases.

There may be abrupt changes, however, in the relative hazard because of the local topography. For example, the hills behind Ninole stand high above the adjacent slopes of Mauna Loa and consequently are at a much lower risk from lava flows than the surrounding area, even though the entire area is included in a single zone. To determine the hazard differences within a single zone, more detailed studies are required.

State Land Use Policy

The State Land Use Law establishes an overall framework of land use management whereby all lands in the State of Hawaii are classified into one of four categories urban, rural, agricultural and conservation. The Land Use Commission (LUC) is responsible for administering this law. It consists of nine members who are appointed by the Governor and confirmed by the Senate. One member is appointed from each county. The remaining five members are appointed on an at large basis.

The LUC acts on petitions for boundary changes submitted by state and county agencies, landowners and developers for lands over 15 acres in the agricultural, urban and rural districts, and for all lands in the conservation district. The affected county acts on boundary changes for lands 15 acres or less in the agricultural, urban and rural districts.

The county governments regulate specific uses within the urban district. Jurisdiction over the rural district is shared by the state and county governments with state law specifying certain minimum standards. Jurisdiction in the agricultural district is also shared. Permitted uses are established by statute and the Commission. Counties may further restrict uses through zoning or other ordinances. Uses within conservation districts are governed by the State Board of Land and Natural Resources.

The Office of State Planning (OSP) and respective county planning departments are mandatory parties to boundary amendment proceedings. The OSP formulates and presents the state's position on boundary amendment petitions. In preparing the state's position, the OSP consults with other affected state agencies including the State Office of Civil Defense, Department of Defense and selected Federal and County agencies. Specifically, for petitions for lands subject to potential lava hazards, the OSP has requested input from the Hawaiian Volcano Observatory and the State and County Civil Defense agencies.

In addition, among other provisions, the Land Use Law requires that land use district boundary amendments and other actions by the LUC shall conform to the goals, objectives and policies of the

Hawaii State Plan. One of the plan's policies is to reduce the threat to life and property from erosion, flooding, tsunamis, hurricanes, earthquakes, volcanic eruptions, and other natural or man induced hazards and disasters. Lava hazards are among the factors which are weighed and considered by LUC in its deliberations on land use district boundary amendments and special permits.

County Land Use Policy

County policy considers volcanic hazards in its land use and zoning process. As part of the application requirement for major land use changes, the county has considered and continues to consider the risk of natural hazards as part of its decision criteria. In reviewing major land use changes, County goals relating to land use call for the location of such uses in appropriate areas. Part of this consideration of appropriateness is the potential exposure to natural hazards, including lava inundation and the imposition of appropriate mitigative conditions, where appropriate.

Generally, these major land use changes require the preparation of an Environmental Impact Statement (EIS). The EIS rules specifically require consideration of the project on "environmentally sensitive areas such as ... geologically hazardous land." Consequently, information relating to such factors are provided and considered as a matter of course during the review of these projects.

In addition, the County Planning Department involves the County Civil Defense Agency in the review of appropriate land use petitions. In this way, Civil Defense has an opportunity to review and comment on the potential impact of projects on the community.

State and County Disaster Plans

The State and County have comprehensive Disaster Plans that are reviewed and updated at least annually. A review of the plans indicate they are up to date and adequate to meet existing and future volcanic inundation threats.

Kalapana Task Force

The Governor of Hawaii and the Mayor of Hawaii County established a joint State County Task Force on May 31, 1990. The Task Force will address the long term impacts of the ongoing volcanic activity on the residents and property owners in the Kalapana Region. Task Force representatives were appointed by the Governor and the Mayor. They include State and County Government members as well as selected representatives from the affected communities.

U. S. Department of Housing and Urban Development Volcanic Hazards Policy

The U. S. Department of Housing and Urban Development (HUD) supports or facilitates land development activity in a number of ways. Through its grant programs, funds may be provided directly to State and local general purpose units of government. Through its subsidy, loan, and mortgage insurance programs, the department can assist nonprofit organizations, businesses, and individuals for the purpose of supporting a variety of development activities. However, when administering its programs and when extending financial support HUD must fulfill certain fundamental obligations. These include the responsibility to avoid exposing residents of HUD assisted housing to life or health threatening hazards; the responsibility to anticipate and avoid unnecessary losses to the

Insurance Fund and to its loan programs; and the responsibility to actively encourage the use of its grant programs for sound and socially productive long term investment.

In 1971 HUD established a policy which responded to volcanic and seismic hazards on the island of Hawaii. Under this policy certain areas were identified as being unacceptable for HUD programs. These included the Puna areas exposed to the Kilauea east rift zone and the South Kona and Ka'u west of Naalehu exposed to Mauna Loa and its rift zone.

The 1971 policy, although based on geologic data current at that time, was expressed as a very generalized boundary line. Areas within the boundary line are considered HUD program nonparticipating areas.

During the 1970's and 1980's the policy was rarely used as a basis for evaluating or rejecting proposals for HUD assistance, essentially because urbanization in general and HUD assisted projects in particular were not located in high hazard zones. In recent years, as land development activities expand, HUD has increasingly received inquiries regarding program assistance near or within the volcanic hazard nonparticipation areas. HUD is currently in the process of updating its map and policy statement relative to volcanic hazards.

SUMMARY AND RECOMMENDATIONS

Preventive actions are needed to minimize the damage from lava flow hazards and to protect the public health, safety and welfare. Land use planning, public information, and warning and evacuation planning are important tools which should be used to mitigate lava flow disasters. The Kilauea eruption destroyed over 175 structures, caused over $60 million worth of damage and caused emotional pain and suffering to those who lost homes, buildings and possessions. In addition, there could have been even greater damage if homes had been constructed on the approximately 2,500 empty lots which were covered with lava during the eruption.

Moreover, Kilauea is an active volcano. Approximately 30% of the area in Kilauea Lava Flow Hazard Zones 1 and 2 have been covered with lava since 1955. The hazards posed by volcanic eruption is a function of natural processes. Risk, by contrast, is directly tied to human activities. Risk increases as property is developed or people settle in areas having significant natural hazards. In such areas, land use decisions have no effect on the hazard but can increase or decrease risk.

Potential lava hazards should be an explicit consideration in land use planning along with other, more traditionally considered, physical and socioeconomic factors. In addition, such planning must take into consideration the needs and desires of the people affected both directly and indirectly by the lava flow hazard.

Hawaii County Civil Defense relies on the Hawaiian Volcano Observatory to provide accurate and timely information to protect lives and property. Coordination between County Civil Defense and the Hawaiian Volcano Observatory has resulted in excellent warning, alerting and evacuation in the areas affected by this eruption. However, there are other geographic areas also subject to lava flow inundation, where warning, alerting and evacuation will be more difficult.

At the present time, the Hawaiian Volcano Observatory does not have adequate instrumentation on the southwest rift zone of Mauna Loa. An eruption there could pose a hazard to developed areas from both lava flows and earthquakes that could result in loss of life. Approximately nine villages and communities, including Hawaiian Ocean View, Hawaiian Ocean View Ranchos and Milolii Beach, could be affected by flows in this area.

Scientists, who are monitoring volcanic activity in the field, need the capability to provide critical, time-sensitive lava flow information in a timely manner. Aerial evaluations are also required during lava flow events to produce critically needed information to make life saving decisions.

The following recommendations were made by the Hazard Mitigation Team to encourage Federal, State and County departments and agencies to continue to take a proactive role to reduce potential future problems associated with lava flow hazards.

RECOMMENDATION #1:

The State should assess the effectiveness of the State law requiring notification of hazards to potential purchasers to ensure that volcanic hazards are fully disclosed.

Responsible Agencies:

State Department of Commerce and Consumer Affairs

RECOMMENDATION #2:

Federal, State and County agencies and departments should not promote or encourage higher density development in the Lava Flow Hazard Zones 1 and 2 in the east rift zone of Kilauea unless:

1. Information can be provided by the U. S. Geological Survey that the area in question is of lower risk to lava flow inundation or

2. A strong case can be made that to do otherwise would not be in the best public interest.

Responsible Agencies:

Federal, State and County of Hawaii departments and agencies involved in development decisions

RECOMMENDATION #3:

Hawaiian Volcano Observatory personnel will assist Federal, State and County departments and agencies to clarify issues regarding volcanic hazards.

Responsible Agency:

U. S. Geological Survey, Hawaiian Volcano Observatory

RECOMMENDATION #4:

The State and County should examine and review their land use policies and regulations with respect to development within high lava flow hazard areas in order to protect public safety and with due consideration to other objectives and policies in State and county land use policy documents.

Responsible Agencies:

Office of State Planning
State Department of Land and Natural Resources
County Planning Department

RECOMMENDATION #5:

The State and the County of Hawaii should examine the appropriateness and feasibility of reclassifying lands in Kilauea Lava Flow Hazard Zone 1 to Conservation, giving consideration to existing uses in the area.

Responsible Agencies:

Office of State Planning
State Department of Land and Natural Resources
County Planning Department

RECOMMENDATION #6:

The State and County should examine existing land uses within Kilauea Lava Flow Hazard Zones 1 and 2 and the potential problems that increased development of these areas may create in terms of:

1. Risk to lives and property from lava flow, and

2. The cost of potential hazards in relation to the cost of potential mitigation. As necessary, recommendations shall be proposed.

Responsible Agencies:

Office of State Planning
State Department of Land and Natural Resources
County Planning Department

RECOMMENDATION #7:

Federal, State and County agencies should enhance existing volcanic hazard awareness programs by developing and providing information which:

1. Shows affected hazard areas, particularly Lava Flow Hazard Zones 1 and 2 as described by the U. S. Geological Survey.

2. Encourages the public to be aware of possible inundation and destruction of their property.

3. Provides criteria for moving homes on public roads should it be deemed necessary.

4. Provides evacuation information.

Responsible Agencies:

U. S. Geological Survey, Hawaiian Volcano Observatory
Federal Emergency Management Agency
State Department of Transportation
Office of State Planning (Information only)
State Department of Land and Natural Resources
Hawaiian Home Lands
State Department of Business and Economic Development and Tourism
State Civil Defense
Housing Finance and Development Corporation
County Council
County Planning Department
County Department of Public Works
County Department of Water Supply

RECOMMENDATION #8:

The Federal Emergency Management Agency and the U. S. Geological Survey, will report on insurance initiatives of the Federal Government.

Responsible Agencies:

Federal Emergency Management Agency
U. S. Geological Survey

RECOMMENDATION #9:

The Federal Emergency Management Agency and the U. S. Geological Survey, Hawaiian Volcano Observatory will investigate the National Earthquake Hazard Reduction Program (NEHRP) and other

1. Risk to lives and property from lava flow, and

2. The cost of potential hazards in relation to the cost of potential mitigation. As necessary, recommendations shall be proposed.

Responsible Agencies:

Office of State Planning
State Department of Land and Natural Resources
County Planning Department

RECOMMENDATION #7:

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1. Shows affected hazard areas, particularly Lava Flow Hazard Zones 1 and 2 as described by the U. S. Geological Survey.

2. Encourages the public to be aware of possible inundation and destruction of their property.

3. Provides criteria for moving homes on public roads should it be deemed necessary.

4. Provides evacuation information.

Responsible Agencies:

U. S. Geological Survey, Hawaiian Volcano Observatory
Federal Emergency Management Agency
State Department of Transportation
Office of State Planning (Information only)
State Department of Land and Natural Resources
Hawaiian Home Lands
State Department of Business and Economic Development and Tourism
State Civil Defense
Housing Finance and Development Corporation
County Council
County Planning Department
County Department of Public Works
County Department of Water Supply

RECOMMENDATION #8:

The Federal Emergency Management Agency and the U. S. Geological Survey, will report on insurance initiatives of the Federal Government.

Responsible Agencies:

Federal Emergency Management Agency
U. S. Geological Survey

RECOMMENDATION #9:

The Federal Emergency Management Agency and the U. S. Geological Survey, Hawaiian Volcano Observatory will investigate the National Earthquake Hazard Reduction Program (NEHRP) and other

funding sources to purchase instrumentation to increase monitoring of volcanic activity along the Southwest Rift Zone of Mauna Loa.

Responsible Agencies:

Federal Emergency Management Agency
U. S. Geological Survey, Hawaiian Volcano Observatory

RECOMMENDATION #10:

Federal, State and County agencies will explore the possibilities of enhancing communication capability between the Hawaiian Volcano Observatory, County Civil Defense and State Civil Defense.

Responsible Agencies:

State Civil Defense
County of Hawaii Civil Defense, U. S. Geological Survey, Hawaiian Volcano Observatory

RECOMMENDATION #11:

The County and Hawaiian Volcano Observatory will examine alternatives to make sufficient aerial surveillance/monitoring flights available for County Civil Defense and Hawaiian Volcano Observatory personnel to provide alert and warning in case of emergencies during volcanic eruptions that may have a direct impact on lives and property.

Responsible Agencies:

County of Hawaii Civil Defense
U. S. Geological Survey, Hawaiian Volcano Observatory

RECOMMENDATION #12:

The Hawaiian Volcano Observatory should review its existing Kilauea alerting and warning infrastructure for possible future upgrading or improvements.

Responsible Agencies:

U. S. Geological Survey, Hawaiian Volcano Observatory

APPENDIX A

HAZARD MITIGATION TEAM MEMBERS for the Kilauea Volcano Eruption (FEMA-864-DR-HI)

State of Hawaii

State Civil Defense

Roy Price	Vice Director
Tom Batey	Chief, Plans and Operations
Ken Fisher	Disaster Assistance Planner

Department of Transportation

Leighton Wakata	Special Assistant

Office of State Planning

Mary Lou Kobayashi	Planning Program Manager

Department of Agriculture

Seiichi Sako	Agricultural Loan Officer

State Dept of Taxation

Roy Hamakawa	Auditor

State Dept of L&N Resources

Sterling Yong	Flood Control Engineer

Hawaii Housing Authority

Neil Gyotoku	Public Housing Supervisor

Housing Finance and Development Corporation

Janice Takahashi	Planner

County of Hawaii

Susan Labrenz	Managing Director
Harry Kim	Civil Defense Administrator
William Moore	Deputy Director, Planning
Kazumi Okamura	Operations Head, Dept. of Water Supply
Gary Takamura	Budget Administrator, Finance Department
Bob Yanabuh	Civil Engineer, Dept. of Public Works

Federal Agencies

Federal Emergency Management Agency

Frank Kishton	Federal Coordinating Officer
Viki Doty	Mitigation Preparedness Officer
Maggie Tenorio	Hazard Mitigation Specialist

U. S. Geological Survey, Hawaii Volcano Observatory

Tom Wright	Scientist in Charge
Christina Heliker	Geologist

U. S. Army Corps of Engineers

Jimmy Lee	Director, Emergency Management

Department of Housing and Urban Development

Frank Johnson	Environmental Officer