SADDLE ROAD (STATE ROUTE 200)
Mamalahoa Highway (State Route 190) to Milepost 41
County of Hawai‘i, State of Hawai‘i
FHWA Project No. 200(00)

SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

Submitted Pursuant to Section 42 U.S.C. 4332(2)(c)
and Chapter 343, Hawai‘i Revised Statutes by the

U.S. DEPARTMENT OF TRANSPORTATION
Federal Highway Administration (FHWA)
Central Federal Lands Highway Division
and
STATE OF HAWAI‘I
Department of Transportation (HDOT)
Highways Division

Cooperating Agencies
U.S. Army Garrison, Hawai‘i

VOLUME II APPENDICES

LIST OF APPENDICES

[This page intentionally left blank]

SADDLE ROAD (STATE ROUTE 200)
Mamalahoa Highway (State Route 190) to Milepost 41
County of Hawai‘i, State of Hawai‘i
FHWA Project No. 200(00)

SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

Submitted Pursuant to Section 42 U.S.C. 4332(2)(c)
and Chapter 343, Hawai‘i Revised Statutes by the

U.S. DEPARTMENT OF TRANSPORTATION
Federal Highway Administration (FHWA)
Central Federal Lands Highway Division
and
STATE OF HAWAI‘I
Department of Transportation (HDOT)
Highways Division

<u>Cooperating Agencies</u>
U.S. Army Garrison, Hawai‘i

Appendix A
Public Involvement and Agency Coordination
A1: Notice of Intent in Federal Register and EISPN Notice in OEQC Environmental Notice

[This page intentionally left blank]

foreign nationals begin participation in this program each year.

In February 2004, the Department announced a pilot program whereby Department designated au pair sponsors could request the extension of program participation beyond the original 12-month maximum period afforded au pair participants. In June of 2006, following a review of the two-year pilot program, the Department amended program regulations to permit designated sponsors to submit requests to the Department for consideration of program extensions for six, nine or 12 month durations for first-year au pair participants beyond the maximum duration of participation allowed under the existing regulations.

As the au pair program enters its twentieth year of operation, the Department has been asked to consider amending the age eligibility requirement for au pair participants by increasing the age limitation from 26 to 30. Further, the Department has been asked to consider permitting foreign nationals who previously participated in the au pair program to repeat program participation.

The Department hereby solicits comments from the general public and other interested parties regarding these two issues. This certification will be published in the **Federal Register**.

Dated: November 26, 2007.

Stanley S. Colvin,

Director, Office of Exchange Coordination and Designation, Bureau of Educational and Cultural Affairs, Department of State.

[FR Doc. E7-23883 Filed 12-7-07; 8:45 am]

BILLING CODE 4710-05-P

TENNESSEE VALLEY AUTHORITY

Paperwork Reduction Act of 1995, as Amended by Pubic Law 104-13; Proposed Collection; Comment Request

AGENCY: Tennessee Valley Authority.

ACTION: Proposed Collection; comment request.

SUMMARY: The proposed information collection described below will be submitted to the Office of Management and Budget (OMB) for review, as required by the Paperwork Reduction Act of 1995 (44 U.S.C. Chapter 35, as amended). The Tennessee Valley Authority is soliciting public comments on this proposed collection as provided by 5 CFR 1320.8(d)(1). Requests for information, including copies of the information collection proposed and supporting documentation should be directed to the Agency Clearance Officer: Alice D. Witt, Tennessee Valley Authority, 1101 Market Street (EB-5B), Chattanooga, TN 37402-2801; (423) 751-6832. (SC: 0003D1Z) Comments should be sent to the Agency Clearance Officer no later than *February 8, 2008.*

SUPPLEMENTARY INFORMATION:

Type of Request: Regular submission; proposal for a reinstatement of a previously approved collection (OMB control number 3316-0009).

Title of Information Collection: Salary Surveys for Engineering Association (EA) and Law Enforcement Employee Association (LEEA) Bargaining Unit Employees.

Frequency of Use: Annually.

Type of Affected Public: State or local governments, Federal agencies, non-profit institutions, businesses, or other for-profit.

Small Businesses or Organizations Affected: EA: 45; LEEA: 30.

Federal Budget Functional Category Code: 999.

Estimated Number of Annual Responses: EA: 30; LEEA: 20.

Estimated Total Annual Burden Hours: EA: 120; LEEA: 60.

Estimated Average Burden Hours Per Response: EA: 4; LEEA: 3.

Need For and Use of Information: TVA conducts an annual salary survey for employee compensation and benefits as a basis for labor negotiations in determining prevailing rates of pay and benefits for represented salary policy employees. TVA surveys firms, and Federal, State, and local governments whose employees perform work similar to that of TVA's salary policy employees.

Steven A. Anderson,

Senior Manager, IT Planning & Governance, Information Services.

[FR Doc. E7-23828 Filed 12-7-07; 8:45 am]

BILLING CODE 8120-08-P

DEPARTMENT OF TRANSPORTATION

Federal Highway Administration

Environmental Impact Statement: Hawai'i County, HI

AGENCY: Federal Highway Administration (FHWA)—Central Federal Lands Highway Division (CFLHD), DOT.

ACTION: Notice of intent.

SUMMARY: FHWA-CFLHD is issuing this notice to advise the public that a supplemental environmental impact statement will be prepared for a proposed highway project in Hawai'i County, Hawai'i.

FOR FURTHER INFORMATION CONTACT: Ricardo Suarez, Division CFLHD Engineer, 12300 West Dakota Avenue, Lakewood, CO 80228 and/or Ronald F. Tsuzuki, State Department of Transportation, Highways Division, Planning Branch, 869 Punchbowl Street, Honolulu, HI 96813.

SUPPLEMENTARY INFORMATION: The FHWA, in consultation with the Hawaii Department of Transportation (HDOT), will prepare a supplemental environmental impact statement (SEIS) for an ongoing project to improve and realign the Saddle Road (State Highway 200), an existing highway in Hawai'i County, Hawai'i. The purpose of the project is to provide a safe and efficient route for access to land uses along Saddle Road and for cross-island traffic between East and West Hawai'i. The ongoing and planned improvements to Saddle Road would also address five general types of needs: Roadway deficiencies, conflicts and hazards with military operations, capacity, safety, and social demand and economic development. The final environmental impact statement (EIS) for the project was completed August 9, 1999, and the Record of Decision (ROD) was signed on October 30, 1999. The project began construction in 2004 and approximately 30% of the project has been completed or is now under construction. In 2006, the Department of the Army (Army) purchased a Parker Ranch property known as the Ke'āmuku parcel. This property included the area planned for the selected alternative (W-3) for western section of the Saddle Road. On September 6, 2006, the U.S. Army Garrison, Hawai'i, requested that HDOT and FHWA consider relocating the highway about a mile southwest towards the southern boundary of Ke'āmuku. This would allow the Army to maximize its training opportunities and minimize conflict with the traveling public. This request meets one of the original purposes of the Saddle Road EIS, which was to minimize conflict between civilian and military uses in the area, and FHWA and HDOT thus have determined that it is prudent to re-examine the alternatives for the western section of the EIS. Alternatives under consideration at this time include (1) taking no action; (2) using the alternative for the western section of the project that was recommended in the Final EIS and selected in the ROD; and (3) relocating this segment of the highway nearer the southern boundary of the Ke'āmuku parcel. The SEIS will also reconfirm the reasons that alternatives for the western section were dropped from consideration in the original EIS, and reconsider them, if appropriate.

Because public scoping meetings for the Saddle Road Improvements project were held in Hilo, Kona and Waimea during the development of the original EIS, no additional scoping is required for an ongoing project, where an SEIS is prepared that does not involve a reassessment of the entire action. However, letters describing the proposed action and soliciting comments will be sent to appropriate Federal, State and local agencies, and to private organizations and citizens who have previously expressed or are known to have interest in this proposal. Public hearings will be held in both West and East Hawai'i. Public notice will be given of the time and place of the hearings. The draft SEIS will be available for public and agency review and comment prior to the public hearing. To ensure that the full range of issues related to this proposed action are addressed and that all significant issues are identified, comments and suggestions are invited from all interested parties. Comments or questions concerning this proposed action and the SEIS should be directed to the FHWA–CFLHD or the HDOT at the addresses provided above.

(Catalog of Federal Domestic Assistance Program Number 20.205, Highway Planning and Construction. The regulations implementing Executive Order 12372 regarding intergovernmental consultation on Federal Programs and activities apply to this program)

Issued on: November 27, 2007.

Ricardo Suarez, P.E.,

Division Engineer, CFLHD.

[FR Doc. 07–5988 Filed 12–7–07; 8:45 am]

BILLING CODE 4910–22–M

DEPARTMENT OF TRANSPORTATION

National Highway Traffic Safety Administration

Denial of Motor Vehicle Defect Petition

AGENCY: National Highway Traffic Safety Administration (NHTSA), Department of Transportation.

ACTION: Denial of petition for a defect investigation.

SUMMARY: This notice sets forth the reasons for the denial of a petition submitted pursuant to 49 U.S.C. 30162 by Mr. Richard H. McSwain of McSwain Engineering Inc. to NHTSA's Office of Defects Investigation (ODI), received June 29, 2007, requesting that the agency commence a proceeding to determine the existence of a defect related to motor vehicle safety with respect to the manual seatback recliner mechanism in model year 1989–1992 Ford Probe vehicles (subject vehicles). After a review of the petition and other information, NHTSA has concluded that further expenditure of the agency's investigative resources on the issues raised by the petition does not appear to be warranted. The agency accordingly has denied the petition. The petition is hereinafter identified as DP07–001.

FOR FURTHER INFORMATION CONTACT: Mr. Steve Chan, Safety Defects Engineer, Defects Assessment Division, Office of Defects Investigation, NHTSA, 1200 New Jersey Avenue, SE., Washington, DC 20590. Telephone: (202) 366–8537.

SUPPLEMENTARY INFORMATION: On June 29, 2007, NHTSA received a petition from Mr. Richard H. McSwain of McSwain Engineering Inc., requesting that the agency investigate the failure of the seatback recliner mechanisms in the subject vehicles. The petition is based on an examination of a passenger side front seat recliner mechanism from a subject vehicle involved in a multi-vehicle collision, of an exemplar seat, as well as mechanical testing of a seat from a subject vehicle. The petitioner identified a failure mode involving bypass of the seatback stop pin (inside the recliner mechanism) during forward movement of the seatback, such as when entering and exiting the rear seat. The petition stated that stop pin bypass allows the recliner mechanism sector gear to over-travel with respect to the pawl. Return of the seatback to the upright position may then bend the first tooth of the pawl, resulting in a false or partial engagement of the sector and pawl teeth. This false engagement condition is transmitted to the opposing recliner mechanism via a mechanical communication cable. According to the petition, the ultimate result is the inability of the recliner mechanism to support the seatback during a collision event. The petitioner concluded that the stop pin bypass that initiated the failure mode is a result of inadequate height of the pin and the resulting inadequate contact between the pin and seatback stop.

The Federal Motor Vehicle Safety Standard (FMVSS) No. 207 "Seating Systems," specifies that seats in passenger cars, multipurpose passenger vehicles, trucks, and buses must meet certain static force test requirements. However, for seats that hinge on folding seatbacks, the restraining device, once engaged, shall not release when a force equal to twenty times the weight of the seatback is applied through the center of gravity for the seat in the direction the seat is facing. It is not uncommon to see the seatbacks of new vehicles moved from their initial positions after a FMVSS simulated vehicular collision.

The identified failure mode may be the result of progressive wear and tear of the seatback stop pin, the seatback stop, and other seat components in vehicles that are, on average, 17 years old. Available data do not suggest that this has occurred with a notable frequency. ODI reviewed its consumer complaint data received over the last nineteen years and found no complaints of seatback collapse (with or without a vehicle collision) in the subject vehicles.

In view of the foregoing, and considering the advanced age of the subject vehicles, it is unlikely that NHTSA would issue an order for the notification and remedy of the alleged defect as defined by the petitioner at the conclusion of the investigation requested in the petition. The statutory requirement that the manufacturer provide a free remedy does not apply if the vehicle was bought by the first purchaser more than 10 calendar years before an order is issued. Therefore, in view of the need to allocate and prioritize NHTSA's limited resources to best accomplish the agency's safety mission, the petition is denied.

Authority: 49 U.S.C. 30162(d); delegations of authority at CFR 1.50 and 501.8.

Issued on: December 4, 2007.

Daniel C. Smith,

Associate Administrator for Enforcement.

[FR Doc. E7–23853 Filed 12–7–07; 8:45 am]

BILLING CODE 4910–59–P

DEPARTMENT OF TRANSPORTATION

National Highway Traffic Safety Administration

[Docket No. NHTSA–2007–0042; Notice 1]

General Motors Corporation, Receipt of Petition for Decision of Inconsequential Noncompliance

General Motors Corporation (GM) has determined that certain model year 2005, 2006 & 2007 Cadillac STS passenger cars equipped with sunroofs do not fully comply with paragraph S4(e) of 49 CFR 571.118, Federal Motor Vehicle Safety Standard (FMVSS) No. 118 Power-Operated Window, Partition, and Roof Panel Systems. GM has filed an appropriate report pursuant to 49 CFR Part 573, Defect and Noncompliance Responsibility and Reports.

Pursuant to 49 U.S.C. 30118(d) and 30120(h), GM has petitioned for an exemption from the notification and

(3) Saddle Road (State Route 200), Mamalahoa Highway (HRS 343 FEA-EISPN)

District: South Kohala
TMK: (3rd): 6-7-001:003
Proposing Agency: State of Hawai‘i, Department of Transportation, Highways Division, 869 Punchbowl Street, Honolulu, Hawai‘i, 96813. Contact: Ronald F. Tsuzuki (808-587-1830)
Accepting Authority: The Honorable Linda Lingle, Governor, State of Hawai‘i, Executive Chambers, State Capitol, Honolulu, Hawai‘i 96813
Consultant: DMT Consultant Engineers, 677 Ala Moana Boulevard, Suite 703, Honolulu, Hawai‘i 96813. Contact: Bruce K. Meyers (808-961-5527)
Status: Final Environmental Assessment and Environmental Impact Statement Preparation Notice, pending 30-day public comment. Address comments to the applicant with copies to the accepting authority, consultant and OEQC.
Public Comment Deadline: January 22, 2008 (Request for 45-day comment period)
Permits Required: Fed Clean Water Act Section 404 Permit*; Section 106 concurrence. State Highways Permit, National Pollutant Discharge Elimination System Permit, Coastal Zone Management Consistency; Conservation District Use Permit* (for portion). County: Grading Grubbing, Excavating and Stockpiling Permits; Subdivision Approval (* - *not yet determined*)

In 1996, Saddle Road was a narrow, two lane road with steep grades, sharp curves, poor pavement, and substandard drainage. The road had become vital for access to the U.S. Army’s Pohakuloa Training Area (PTA), Mauna Kea, Mauna Loa, outdoor recreation areas, ranch lands, and the communities of Waiki‘i Ranch and Kaumana. Its role was increasing as a cross island transportation route linking East and West Hawai‘i for business travel, the transport of goods and services, tourism/recreation, shopping, and commuting. The Saddle Road passed through key training areas of PTA, creating conflicts between motorists and military training units. Roadway deficiencies also hindered the response of emergency vehicles responding to fires and accidents along Saddle Road. A project to improve Saddle Road was initiated by the Federal Highway Administration (FHWA), in cooperation with the State Department of Transportation (HDOT) and the U.S. Army. An EIS was completed in 1999, and since that time 6 miles of the 47-mile road have been built, with another 15 miles now in construction.

In 2006, the Army purchased a Parker Ranch property known as the Ke‘âmuku parcel, which included the area planned for the western section of the Saddle Road. The Army intends to incorporate the property within PTA and use it for military training. In 2006, the Army requested that the HDOT and FHWA consider relocating about 9 miles of the proposed highway about a mile southwest towards the southern boundary of Ke‘âmuku. As this would minimize conflict between military and the traveling public, the agencies have agreed to the request. The joint State-federal SEIS will examine the differences in environmental impact between the originally proposed route and a new route to be identified near the southern boundary of Ke‘âmuku.

(4) University of Hawai‘i, Hilo College of Hawaiian Language Facilities (HRS 343 DEA)

District: South Hilo
TMK: (3rd): 2-4-01:07
Proposing Agency: University of Hawai‘i, Office of Capital Improvements, 1960 East West Road, Biomed Sci. Bld. Ctyd. B-102, Honolulu, Hawai‘i 96822. Contact: Maynard G.. P. Young (808-956-4071)
Determination Agency: Same as above.
Consultant: Geometrician Associates, PO Box 396, Hilo Hawai‘i 96721. Contact: Ron Terry (808-969-7090)
Public Comment Deadline: January 7, 2008
Status: Draft environmental assessment (DEA) notice pending 30-day public comment. Address comments to the proposing agency with copies to the consultant and OEQC.
Permits Required: Hawai‘i County: Planning Department Approval Plan Approval and Building Permit; Planning Commission Height Variance; Public Works Grading Permit, Driveway Permit and Drainage Approval; State: DOH NPDES

The University of Hawai‘i at Hilo proposes to develop facilities to house Ka Haka ‘Ula O Ke‘elikôlani, the College of Hawaiian Language. The facilities will expand educational opportunities and help revitalize Hawaiian language and culture. The College was established at UH Hilo in 1997 and includes the Hawaiian Studies Division, the Hawaiian Language Center Division, the Laboratory School Division and an Outreach Program. The College’s facilities are currently spread among five existing buildings at UH Hilo and another building located six miles from campus. The new facility will accommodate the current programs as well as future growth. Phase 1 is currently in design and will include a two-story building for administrative offices and classrooms and two one-story daycare/preschool structure, connected by covered walkways, with associated parking, utilities, and landscaping. Later phases will accommodate the teacher training program, media/telecommunications services, and graduate students. The College is being developed within the Leadership in Energy and Environmental Design (LEED) Program. It will incorporate many environmentally sustainable features and will meet standards for a silver certificate in this “green building” rating system. Construction would have a minor and easily mitigable effect on traffic. Long-term traffic impacts would be minimal and mitigated through proper design of entry/exit points. Short-term noise, air, and water quality impacts associated with grading and landscaping would be mitigated. A Storm Water Pollution Prevention Plan (SWPPP) to contain sediment and storm water run-off during grading and construction will be developed and implemented. The site has been mostly graded or otherwise disturbed

[This page intentionally left blank]

SADDLE ROAD (STATE ROUTE 200)
Mamalahoa Highway (State Route 190) to Milepost 41
County of Hawai‘i, State of Hawai‘i
FHWA Project No. 200(00)

SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

Submitted Pursuant to Section 42 U.S.C. 4332(2)(c)
and Chapter 343, Hawai‘i Revised Statutes by the

U.S. DEPARTMENT OF TRANSPORTATION
Federal Highway Administration (FHWA)
Central Federal Lands Highway Division
and
STATE OF HAWAI‘I
Department of Transportation (HDOT)
Highways Division

<u>Cooperating Agencies</u>
U.S. Army Garrison, Hawai‘i

Appendix A
Public Involvement and Agency Coordination
A2: Comments to NOI/EISPN and HDOT Responses

[This page intentionally left blank]

Harry Kim
Mayor

Christopher J. Yuen
Director

Brad Kurokawa, ASLA
LEED® AP
Deputy Director

County of Hawaii
PLANNING DEPARTMENT
101 Pauahi Street, Suite 3 • Hilo, Hawaii 96720-4224
(808) 961-8288 • FAX (808) 961-8742

January 22, 2008

Mr. Ron Terry
Geometrician Associates
PO Box 396
Hilo, HI 96721

Dear Mr. Terry:

Subject: Consultation for the Preparation of a Supplemental Environmental Impact Statement (SEIS)
Project: Saddle Road (SR 200) between Mile Post 42 and Mamalahoa Highway
Tax Map Key: (3) 6-7-1: portion of 3; Ke'āmuku, South Kohala, Hawaii

We have reviewed the Environmental Impact Statement Preparation Notice dated December 6, 2007 for the construction of Saddle Road (SR 200) on the Ke'āmuku parcel between Mile Post 42 and Mamalahoa Highway and have the following comments to offer.

The Bike Plan Hawaii lists bicycle lanes on Saddle Road between Mamalahoa Highway and Hilo as a long-term priority that could be implemented with minor improvements to the existing roadway. Although bicycle lanes are not discussed in the EIS Preparation Notice, the SEIS should discuss the feasibility of incorporating bicycle lanes into the proposed project.

Due to the topography in the project area it is likely that with construction of the selected alignment a new scenic view plane will be created for motorists. To enhance the experience of tourism travelers, HDOT should consider constructing roadside turnouts for scenic viewing purposes.

To reduce conflicts between civilian and military vehicles, grade-separated structures such as overpass or underpass crossings should be constructed at all intersections of the selected Saddle Road alignment with the former tank road, which the Army proposed using in their EIS to transport Stryker vehicles from Kawaihae Harbor to PTA. Please provide an illustration in the SEIS of the W-7 and W-3 alignments in relation to the military trail that will be used to transport Stryker vehicles.

Please provide this office with a copy of the draft EA upon its publication. Should you have questions, please contact Maija Cottle of my staff at 961-8288 extension 253.

Sincerely,

CHRISTOPHER J. YUEN
Planning Director

MJC:cs
P:\wpwin60\Maija\EA-EIS\Pre-Consult Comments\Saddle Road MP 42 to Mamalahoa 6-7-1-3 Pre-cmnts doc

xc: Mr. Nelson Sagum
Hawai'i State Department of Transportation
Highways Division
869 Punchbowl Street
Honolulu, HI 96813

Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, HI 96813

LINDA LINGLE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

BRENNON T. MORIOKA
INTERIM DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI

IN REPLY REFER TO:

HWY-PA
2.7123

FEB 21 2008

Mr. Christopher J. Yuen
Director
Planning Department
County of Hawaii
101 Pauahi Street, Suite 3
Hilo, Hawaii 96720

Dear Ms. Yuen:

Subject: Saddle Road (State Route 200)
Mamalahoa Highway (State Route 190) to Milepost 42
Supplemental EIS Preparation Notice (EISPN)

Thank you for your letter, dated January 22, 2008, in which you provided us with your comments regarding the subject project. A brief statement from your comments and our tentative responses are provided below:

1. *The SEIS should discuss the feasibility of incorporating bicycle lanes into the proposed project.*

   Bicycle lanes along the proposed highway will be further evaluated during the development of the project's Supplemental EIS. However, at the moment, the typical section of the proposed highway will definitely include 8-foot shoulders on each side of the highway, which may be used by bicyclists and are favored by the State Department of Transportation (DOT).

2. *. . . DOT should consider constructing roadside turnouts . . .*

   The project's Supplemental EIS will include a discussion of the scenic turnouts along the proposed highway and will consider several possible locations for these facilities. Although there seems to be widespread support of scenic turnouts, these facilities may be costly to construct and operate.

3. *To reduce conflicts between civilian and military vehicles, grade-separated structures such as overpass or underpass crossings should be constructed at all intersections of the selected Saddle Road alignment with the former tank road . . .*

> One of the primary reasons in favor of the relocation of the proposed Saddle Road involves the reduction of conflicts with military vehicles and the necessity to construct such grade-separated structures. We are very hopeful that military training maneuvers will be confined to areas north of the proposed highway and crossings will be infrequent; at locations where multiple or frequent crossings are anticipated, grade-separated structures will be considered.

Please also note, upon its completion, a copy of the draft Supplemental EIS will be forwarded to your office for your review and comments.

If you have any other questions or issues concerning this project, please contact Nelson Sagum, our project manager, at (808) 587-1834.

Very truly yours,

BRENNON T. MORIOKA, Ph.D., P.E.
Interim Director of Transportation

bc: HWY-PA

NS:th

LINDA LINGLE
GOVERNOR

RUSS K. SAITO
COMPTROLLER

BARBARA A. ANNIS
DEPUTY COMPTROLLER

(P)1022.8

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P.O. BOX 119, HONOLULU, HAWAII 96810

JAN 22 2008

Mr. Ron Terry
Geometrician Associates
P.O. Box 396
Hilo, Hawaii 96721

Dear Mr. Terry:

Subject: Supplemental Environmental Impact Statement Preparation Notice
Saddle Road (Route 200), Mamalahoa Hightway (State Route 190)
Island of Hawaii, Kohala
TMK: (3) 6-7-001:003

Thank you for the opportunity to review the information regarding the subject project. The project does not impact any of the Department of Accounting and General Services' projects or existing facilities and we have no comments to offer.

If there are any questions regarding the above, please have your staff call Mr. David DePonte of the Planning Branch at 586-0492.

Sincerely,

Ralph Morita
for ERNEST LAU
Public Works Administrator

DD:vca
c: Mr. Laurence K. Lau, Director, OEQC
Mr. Nelson Sagum, DOT - Highways
Mr. Glenn Okada, DAGS Hawaii District Office

LINDA LINGLE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

BRENNON T. MORIOKA
INTERIM DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI

IN REPLY REFER TO:

HWY-PA
2.7130

FEB 21 2008

Mr. Ernest Lau
Public Works Administrator
State of Hawaii
Department of Accounting and General Services
P.O. Box 119
Honolulu, Hawaii 96810

Dear Mr. Lau:

Subject: Saddle Road (State Route 200)
Mamalahoa Highway (State Route 190) to Milepost 42
Supplemental EIS Preparation Notice (EISPN)

Thank you for your letter, dated January 22, 2008, in which you stated that our proposed highway project would not impact any of the Department of Accounting and General Services' projects or existing facilities.

If you have any questions or issues concerning this project, please contact Nelson Sagum, our project manager, at (808) 587-1834.

Very truly yours,

BRENNON T. MORIOKA, ~~Ph.D.~~, P.E.
Interim Director of Transportation

bc: HWY-PA

NS:th

Harry Kim
Mayor

Jane H. Testa
Director

Diane L. Ley
Deputy Director

County of Hawaii

DEPARTMENT OF RESEARCH AND DEVELOPMENT
25 Aupuni Street, Room 109 • Hilo, Hawaii 96720-4252
(808) 961-8366 • Fax (808) 935-1205
E-mail: chresdev@co.hawaii.hi.us

January 11, 2008

Ron Terry
Geometrician Associates
P. O. Box 396
Hilo, Hawai`i 96721

RE: Environmental Impact Statement Preparation Notice
Saddle Road (State Route 200), Mamalahoa Highway (State Route 190) to Milepost 42
Kohala District, Hawai`i Island

Dear Mr. Terry:

Thank you for providing the County of Hawai`i's Department of Research and Development with an opportunity to review and provide comments on the Environmental Impact Statement Preparation Notice for the proposed realignment of Saddle Road (State Route 200), Mamalahoa Highway (State Route 190) to Milepost 42, Kohala District, Hawai`i Island. Our Department has no comments or concerns at this time.

Sincerely,

Diane Ley

Diane Ley
Deputy Director

C: Director, Office of Environmental Quality Control
Nelson Sagum, Highways Division, Hawai`i Department of Transportation

LINDA LINGLE
GOVERNOR

BRENNON T. MORIOKA
INTERIM DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:

HWY-PA
2.7133

FEB 21 2008

Ms. Diane Ley
Deputy Director
Department of Research and Development
County of Hawaii
25 Aupuni Street, Room 109
Hilo, Hawaii 96720

Dear Ms. Ley:

Subject: Saddle Road (State Route 200)
Mamalahoa Highway (State Route 190) to Milepost 42
Supplemental EIS Preparation Notice (EISPN)

Thank you for your letter, dated January 11, 2008, in which you stated that you had no comments to offer regarding the Supplemental EISPN for this project. We appreciate your review of this document.

If you have any questions or issues concerning this project, we encourage you to contact Nelson Sagum, our project manager, at (808) 587-1834.

Very truly yours,

BRENNON T. MORIOKA, Ph.D., P.E.
Interim Director of Transportation

bc: HWY-PA

NS:th

DEPARTMENT OF WATER SUPPLY • COUNTY OF HAWAI'I
345 KEKUANAO'A STREET, SUITE 20 • HILO, HAWAI'I 96720
TELEPHONE (808) 961-8050 • FAX (808) 961-8657

January 28, 2008

Mr. Ron Terry
Geometrician Associates, LLC
P.O. Box 396
Hilo, HI 96721

SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE
SADDLE ROAD (STATE ROUTE 200) MAMALAHOA HIGHWAY (STATE ROUTE 190) TO MILEPOST 42
TAX MAP KEY 6-7-001:003

This is in response to the subject Supplemental EIS Prepration Notice.

Please be informed that there are no existing Department of Water Supply facilities within the project area. Therefore, we will not need to review the Draft Supplemental EIS for this project when it is completed.

Should there be any questions, please contact Mr. Finn McCall of our Water Resources and Planning Branch at 961-8070, extension 255.

Sincerely yours,

Milton D. Pavao, P.E.
Manager

FM:dfg

copy - Office of Environmental Quality Control
State of Hawai'i, Department of Transportation, Highways Division

... *Water brings progress*...

LINDA LINGLE
GOVERNOR

BRENNON T. MORIOKA
INTERIM DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:

HWY-PA
2.7132

FEB 21 2008

Mr. Milton D. Pavao
Manager
Department of Water Supply
County of Hawaii
345 Kekuanao'a Street, Suite 20
Hilo, Hawaii 96720

Dear Mr. Pavao:

Subject: Saddle Road (State Route 200)
Mamalahoa Highway (State Route 190) to Milepost 42
Supplemental EIS Preparation Notice (EISPN)

Thank you for your letter, dated January 28, 2008, in which you stated that there are no County of Hawaii, Department of Water Supply facilities in the project area, and consequently, your subsequent review of the draft Supplemental EIS will not be necessary.

We appreciate receiving this information, and at this time, we will not be forwarding a copy of the draft Supplemental EIS to your office.

If you have any questions or issues concerning this project, please contact Nelson Sagum, our project manager, at (808) 587-1834.

Very truly yours,

BRENNON T. MORIOKA, Ph.D., P.E.
Interim Director of Transportation

bc: HWY-PA

NS:th

Harry Kim
Mayor

Bobby Jean Leithead-Todd
Director

Nelson Ho
Deputy Director

County of Hawai'i
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

25 Aupuni Street • Hilo, Hawai'i 96720
(808) 961-8083 · Fax (808) 961-8086
http://co.hawaii.hi.us/directory/dir_envmng.htm

December 13, 2007

Mr. Ron Terry
Geometrician Associates
P. O. Box 396
Hilo, HI 96720

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE SADDLE ROAD (STATE ROUTE 200), MAMALAHOA HIGHWAY (STATE ROUTE 190) TO MILEPOST 42
TMK: 6-7-001:003

We have reviewed the subject request and have no comments to offer.

Thank you for allowing us to comment on this project.

BJ Leithead Todd

Bobby Jean Leithead Todd
DIRECTOR

cc: Director, OEQC
Hawai'i State DOT, Highways Division

1022 3A

LINDA LINGLE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

BRENNON T. MORIOKA
INTERIM DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI

IN REPLY REFER TO:

HWY-PA
2.7134

FEB 21 2008

Ms. Bobby Jean Leithead-Todd
Director
Department of Environmental Management
County of Hawaii
25 Aupuni Street, Room 210
Hilo, Hawaii 96720

Dear Ms. Leithead-Todd:

Subject: Saddle Road (State Route 200)
Mamalahoa Highway (State Route 190) to Milepost 42
Supplemental EIS Preparation Notice (EISPN)

Thank you for your letter, dated December 13, 2007, in which you stated that you had no comments to offer regarding the Supplemental EISPN for this project. We appreciate your review of this document.

If you have any questions or issues concerning this project, we encourage you to contact Nelson Sagum, our project manager, at (808) 587-1834.

Very truly yours,

BRENNON T. MORIOKA, Ph.D., P.E.
Interim Director of Transportation

bc: HWY-PA

NS:th

LINDA LINGLE
GOVERNOR

MAJOR GENERAL ROBERT G. F. LEE
DIRECTOR OF CIVIL DEFENSE

EDWARD T. TEIXEIRA
VICE DIRECTOR OF CIVIL DEFENSE

STATE OF HAWAII

DEPARTMENT OF DEFENSE
OFFICE OF THE DIRECTOR OF CIVIL DEFENSE
3949 DIAMOND HEAD ROAD
HONOLULU, HAWAII 96816-4495

PHONE (808) 733-4300
FAX (808) 733-4287

January 3, 2008

Mr. Ron Terry
Geometrician Associates, LLC
P. O. Box 396
Hilo, Hawaii 96721

Dear Mr. Terry:

Supplemental Environmental Impact Statement
Saddle Road, Mamalahoa Highway to Milepost 42
TMK (3rd): 6-7-001:003

Thank you for the opportunity to comment on this Supplemental Environmental Impact Statement (SEIS). After careful review of the documents for this Saddle Road realignment, State Civil Defense (SCD) recommends that the developer not be required to install an outdoor warning siren. SCD already has a siren simulator installed at the Pohakuloa Training Area Military Police office.

If you have any questions, please call Mr. Norman Ogasawara, Assistant Telecommunications Officer, at (808) 733-4300, ext. 531.

Sincerely,

EDWARD T. TEIXEIRA
Vice Director of Civil Defense

Enc.

c: Hawaii Civil Defense Agency
SCD Radio Shop

LINDA LINGLE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

BRENNON T. MORIOKA
INTERIM DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI

IN REPLY REFER TO:

HWY-PA
2.7124

FEB 27 2008

Mr. Edward T. Teixeira
Vice Director of Civil Defense
State of Hawaii
Department of Defense
3949 Diamond Head Road
Honolulu, Hawaii 96816-4495

Dear Mr. Teixeira:

Subject: Saddle Road (State Route 200)
Mamalahoa Highway (State Route 190) to Milepost 42
Supplemental EIS Preparation Notice (EISPN)

Thank you for your January 3, 2008 letter that advises us that the State Civil Defense has installed a siren simulator at the Pohakuloa Training Area. Therefore, our contractor will not be required to install an outdoor warning siren.

If you have any questions or issues concerning this project, please contact Nelson Sagum, our project manager, at 587-1834.

Very truly yours,

BRENNON T. MORIOKA, Ph.D., P.E.
Interim Director of Transportation

bc: HWY-PA

NS:th

LINDA LINGLE
GOVERNOR OF HAWAII

CHIYOME L. FUKINO, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. Box 3378
HONOLULU, HAWAII 96801-3378

In reply, please refer to:
EPO-07-228

January 22, 2008

Mr. Ron Terry
Geometrician Associates
P.O. Box 396
Hilo, Hawaii 96721

Dear Mr. Terry:

SUBJECT: Supplemental Environmental Impact Statement Preparation Notice for Saddle Road (State Route 200), Mamalahoa Highway (State Route 190) to Milepost 42 Project
Keamuku, South Kohala, Island of Hawaii, Hawaii
TMK: (3) 6-7-001: 003

Thank you for allowing us to review and comment on the subject document. The document was routed to the various branches of the Department of Health (DOH) Environmental Health Administration. We have the following Clean Water Branch and General comments.

Clean Water Branch

Please note that our review is based solely on the information provided in the subject document and its compliance with Hawaii Administrative Rules (HAR), Chapters 11-54 and 11-55. You may be responsible for fulfilling additional requirements related to our program. We recommend that you also read our standard comments on our website at http://www.hawaii.gov/health/environmental/env-planning/landuse/CWB-standardcomment.pdf.

1. Any project and its potential impacts to State waters must meet the following criteria:

   a. Antidegradation policy (HAR, Section 11-54-1.1), which requires that the existing uses and the level of water quality necessary to protect the existing uses of the receiving State water be maintained and protected.

   b. Designated uses (HAR, Section 11-54-3), as determined by the classification of the receiving State waters.

   c. Water quality criteria (HAR, Sections 11-54-4 through 11-54-8).

2. The project was granted a National Pollutant Discharge Elimination System (NPDES) individual permit for the section of the project from Milepost 28-42 and Phase 3. This permit is set to expire on November 29, 2009. NPDES general permit coverage for the portion of the project from MP 19-28 expired on November 6, 2007. The CWB has not received a Notice of Intent to renew this coverage and if construction is ongoing as stated in the subject document, then it is considered to be a violation of HAR, Chapter 11 -55.

3. Please note that all discharges related to the project construction or operation activities, whether or not NPDES permit coverage and/or Section 401 Water Quality Certification are required, must comply with the State's Water Quality Standards. Noncompliance with water quality requirements contained in HAR, Chapter 11-54, and/or permitting requirements, specified in HAR, Chapter 11-55, may be subject to penalties of $25,000 per day per violation.

If you have any questions, please visit our website at http://www.hawaii.gov/health/environmental/water/cleanwater/index.html, or contact the Engineering Section, CWB, at 586-4309.

General

We strongly recommend that you review all of the Standard Comments on our website: www.state.hi.us/health/environmental/env-planning/landuse/landuse.html. Any comments specifically applicable to this project should be adhered to.

If there are any questions about these comments please contact Jiacai Liu with the Environmental Planning Office at 586-4346.

Sincerely,

KELVIN H. SUNADA, MANAGER
Environmental Planning Office

c: EPO
CWB
EH-Hawaii

LINDA LINGLE
GOVERNOR

BRENNON T. MORIOKA
DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:

HWY-PA
2.7279

MAR 19 2008

Mr. Kevin H. Sunada, Manager
State of Hawaii
Department of Health
Environmental Planning Office
P.O. Box 3378
Honolulu, Hawaii 96801-3378

Dear Mr. Sunada:

Subject: Saddle Road (State Route 200)
Mamalahoa Highway (State Route 190) to Milepost 42
Supplemental EIS Preparation Notice (EISPN)

Thank you for your letter, dated January 22, 2008, which commented on the Supplemental EIS Preparation Notice based on Hawaii Administrative Rules (HAR), Chapters 11-54 and 11-55. Your letter also provided us with a website containing your standard comments for projects and we are indeed grateful for this information.

Brief statements from the comments of your letter, along with our tentative responses, are provided below:

1. *Anti-degradation policy, designated uses as determined by classification of the receiving waters, and water quality criteria.*

   This project will fully comply with the Consent Decree, dated January 2006, in regards to requirements of Clean Water Act and the regulations developed in accordance with this Act. At this point, it appears that the project will not affect any State waters, and consequently, efforts to comply with Consent Decree may be minimal.

2. *The National Pollutant Discharge Elimination System (NPDES) general permit coverage for the portion of the project from MP 19-28 expired on November 6, 2007.*

   According to our records, the Federal Highway Administration, Central Federal Lands Highway Division, filed a Notice of Intent (NOI) to develop a NPDES general permit with your agency in September 2007. A Department of Health letter, dated October 4, 2007, granted an administrative extension of NPDES general permit, until your agency is able to complete its processing of the NOI.

3. *. . . all discharges related to the project construction or operation activities, . . . must comply with the State's Water Quality Standards.*

   Again, we do not anticipate that this project will affect any waters of the State of Hawaii. In the event that State waters may be impacted, appropriate construction methods will be utilized to control discharges from the project site, which should assure compliance with the State's Water Quality Standards and the Consent Decree, as prepared pursuant to the Clean Water Act.

We appreciate your assistance. If any questions or problems arise, please feel free to contact Nelson Sagum, Project Manager, at 587-1834.

Very truly yours,

BRENNON T. MORIOKA, Ph.D., P.E.
Director of Transportation

bc: HWY-PA

NS:th

LINDA LINGLE
GOVERNOR

CHAD K. TANIGUCHI
EXECUTIVE DIRECTOR

STATE OF HAWAII
DEPARTMENT OF HUMAN SERVICES
HAWAII PUBLIC HOUSING AUTHORITY
1002 NORTH SCHOOL STREET
P.O. BOX 17907
Honolulu, Hawaii 96817

IN REPLY REFER TO
07:CMS/0291

December 14, 2007

Mr. Ron Terry
Geometrician Associates, LLC
P.O. Box 396
Hilo, Hawai 96721

Dear Mr. Terry:

Thank you for your letter dated December 6, 2007 regarding the Saddle Road (State Route 200), Mamalahoa Highway (State Route 190) to Milepost 42 Project in the County of Hawai'i.

We have no comments on the Environmental Impact Statement Preparation Notice for the above project.

Should you have any questions, please call me at 832-6020.

Sincerely,

Derek H. Fujikami
Construction Management Section Chief

c: Director, Office of Environmental Quality Control
Mr. Nelson Sagum, Hawaii State Dept. of Transportation

LINDA LINGLE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

BRENNON T. MORIOKA
DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI

IN REPLY REFER TO:

HWY-PA
2.7278

March 25, 2008

Mr. Derek H. Fujikami
Construction Management Section Chief
State of Hawaii, Department of Human Services
Hawaii Public Housing Authority
P.O. Box 17907
Honolulu, Hawaii 96817

Dear Mr. Fujikami:

Subject: Saddle Road (State Route 200)
Mamalahoa Highway (State Route 190) to Milepost 42
Supplemental EIS Preparation Notice (EISPN)

Thank you for your letter, dated December 14, 2007, in which you stated that you had no comments to offer regarding the Supplemental EISPN for this project. We appreciate your review of this document.

In the future, if you have any questions or issues concerning this project, we encourage you to contact Nelson Sagum, Project Manager, at 587-1834.

Very truly yours,

for

BRENNON T. MORIOKA, Ph.D., P.E.
Director of Transportation

bc: HWY-PA

NS:th

PHONE (808) 594-1888

FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

HRD07/3273C

January 25, 2008

Ron Terry
Geometrician Associates LLC
P.O. Box 396
Hilo, HI 96721

RE: Request for comments on the preparation notice for the Supplemental Environmental Impact Statement for the Saddle Road (State Route 200), Māmalahoa Highway (State Route 190) to Milepost 42

Dear Ron Terry,

The Office of Hawaiian Affairs (OHA) is in receipt of the above-referenced request. The federal and state departments of transportation are planning to develop a new alternative path for a section of the Saddle Road improvement project. The 1999 Saddle Road EIS analyzed two alternative routes for the Saddle Road improvement project. That study will now be revisited by the Supplemental EIS because both alternative routes from the 1999 EIS run through a large property that the U.S. Army purchased from Parker Ranch in 2006 for the Stryker Transformation Project. The Supplemental EIS will investigate a new alignment located near the southern boundary of the Army's newly-acquired, 23,977-acre Ke'āmuku parcel. The new route is expected to lower the frequency of interactions between military training that will occur in the Ke'āmuku parcel and Saddle Road motorists. OHA offers the following comments.

OHA looks forward to participating in all consultations for this project that are conducted in compliance with Section 106 of the National Historic Preservation Act. We also request to be involved in any consultations that occur relating to the 2004 Programmatic Agreement regarding the Section 106 responsibilities for the Army's proposed transformation of the 2nd Brigade, 25th Infantry Division to a Stryker Brigade Combat Team. OHA is a concurring party to that agreement. We also anticipate that the Supplemental EIS will address the impacts the project will have on Native Hawaiian traditional and customary practices and rights, as well as any Traditional Cultural Properties, as defined by National Register Bulletin 38 (National Park Service 1990).

Finally, OHA asks to be informed on future public meetings regarding this issue in advance so that we may attend. We look forward to reviewing the Supplemental EIS, when it becomes available. Thank you for the opportunity to comment. If you have further questions, please contact Sterling Wong (808) 594-0248 or e-mail him at sterlingw@oha.org.

Sincerely,

Clyde W. Nāmu'o
Administrator

C: Nelson Sagum
State Department of Transportation
Highways Division
869 Punchbowl Street #301
Honolulu, HI 96813

Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, HI 96813

Ruby McDonald
Office of Hawaiian Affairs
75-5706 Hanama Pl., Ste. 107
Kailua-Kona, HI 96740

Lukela Ruddle
Office of Hawaiian Affairs
162 A Baker Avenue
Hilo, HI 96720-4869

LINDA LINGLE
GOVERNOR

BRENNON T. MORIOKA
DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI

IN REPLY REFER TO:

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

HWY-PA
2.7277

MAR 1 9 2008

Mr. Clyde W. Namuo
Administrator
State of Hawaii
Office of Hawaiian Affairs
711 Kapolei Boulevard, Suite 500
Honolulu, Hawaii 96813

Dear Mr. Namuo:

Subject: Saddle Road (State Route 200)
Mamalahoa Highway (State Route 190) to Milepost 42
Supplemental EIS Preparation Notice (EISPN)

Thank you for your letter, dated January 25, 2008, which commented on the proposed Saddle Road and its potential impact on both Native Hawaiian practices and rights and traditional cultural properties in the project area.

We appreciate your willingness to participate in the consultation processes for this project, which will be conducted in compliance with Section 106 of the National Historic Preservation Act. Our archaeological/cultural consultants will be contacting you in order to properly schedule this meeting.

We have not been directly involved in the 2004 Programmatic Agreement regarding the U.S. Army's transformation of the 2nd Brigade, 25th Infantry Division to a Stryker Brigade Combat Team. A copy of your letter will be forwarded to the U.S. Army, Corps of Engineers, for their information and further action.

In addition, we assure you that every effort will be made to notify the Office of Hawaiian Affairs of our future public meetings for this project.

If any other questions or issues arise regarding this project, please contact Nelson Sagum, Project Manager, at 587-1834.

Very truly yours,

BRENNON T. MORIOKA, PH.D., P.E.
Director of Transportation

bc: HWY-PA
NS:th

Dr

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawaii 96850

Z

In Reply Refer To:
2008-TA-0087
(ER 07/1059)

JAN 14 2008

Mr. Ricardo Suarez, P. E.
Division CFLHD Engineer
12300 West Dakota Avenue
Lakewood, Colorado 80228

Subject: Preparation of a Supplemental Environmental Impact Statement for the Proposed Realignment of Saddle Road (Keamuku Parcel), Hawaii

Dear Mr. Suarez:

The U. S. Fish and Wildlife Service reviewed the Federal Highway Administration notice in the Federal Register dated December 10, 2007 (Volume 72, Number 236, Page 69726-69727). The following information is to assist you and the Hawaii Department of Transportation, in preparing the Supplemental Environmental Impact Statement (SEIS) for the realigned portion of Saddle Road. The purpose of the project is to provide a safe and efficient route for access to land uses along Saddle Road and for cross-island traffic between East and West Hawaii. We have reviewed the information in the Record of Decision (ROD) (October 30, 1999) and pertinent information in our files, including data compiled by the Hawaii Biodiversity and Mapping Program, the Hawaii Geographic Analysis Program, and the interagency West Hawaii Wildfire Management Group's wildland fire history.

We offer the following recommendations as potential issues to be reviewed and addressed in the SEIS.

1. The southwestern portion of the Keamuku parcel harbors a significant concentration of plant species that are federally listed as threatened or endangered including *Haplostachys haplostachya, Silene lanceolat* and *Stenogyne angustifolia*. If alternative three from the Federal Register Notice is chosen, "relocating this segment of the highway nearer the southern boundary of the Keamuku parcel" the highway could directly impact listed plants species. We recommend current botanical survey information (i.e., within the last year) be included in the SEIS.

2. The proposed project is located on the dry leeward side of West Hawaii, where wildland fires may affect endangered species and critical habitat. Since the time the original ROD for was finalized in 1999, the threat of wildland fire has increased significantly in West

Hawaii. Measures for wildland fire prevention and suppression should be addressed in the SEIS.

3. We have taken a broad look at the general area of influence for this project, including areas that may potentially be impacted by wildland fires interdependent with the realigned Saddle Road. The following is a list of threatened and endangered species that could be impacted by this project (Table 1).

We hope this information assists you in drafting the Saddle Road SEIS. If you have questions regarding these comments, please contact Dr. Jeff Zimpfer, Fish and Wildlife Biologist, Technical Assistance and Consultation Program (phone: 808/792-9400; fax: 808/792-9581).

Sincerely,

for Patrick Leonard
Field Supervisor

Enclosure

cc: OEPC, Vijai N. Rai

Table 1. Threatened and endangered species within the area of potential influence of Saddle Road.

Scientific Name	Common Name	Status
Plants		
Argyroxiphium sandwicense subsp. *sandwicense*	ahinahina, silversword	Endangered
Asplenium peruvianum var. *insulare*	no common name	Endangered
Clermontia lindseyana	oha, oha wai	Endangered
Clermontia peleana subsp. *singuliflora*	oha, oha wai	Endangered
Haplostachys haplostachya	no common name	Endangered
Isodendrion hosakae	aupaka	Endangered
Melanthera venosa	nehe	Endangered
Portulaca sclerocarpa	ihi	Endangered
Silene hawaiiensis	no common name	Threatened
Silene lanceolata	no common name	Endangered
Solanum incompletum	popolo ku mai	Endangered
Stenogyne angustifolia	no common name	Endangered
Tetramolopium arenarium var. *confertum*	no common name	Endangered
Vigna o-wahuensis	no common name	Endangered
Birds		
Branta sandvicensis	nene, Hawaiian goose	Endangered
Buteo solitarius	Hawaiian hawk, io	Endangered
Hemignathus munroi	akiapolaau	Endangered
Loxioides bailleui	palila	Endangered
Loxops coccineus coccineus	Hawaii akepa	Endangered
Oreomystis mana	Hawaii creeper	Endangered
Pterodroma sandwichensis	Hawaiian dark-rumped petrel, uau	Endangered
Mammals		
Lasiurus cinereus semotus	Hawaiian hoary bat, opeapea	Endangered
Critical Habitat		
Loxioides bailleui	palila	
Isodendrion hosakae	aupaka	
Vigna o-wahuensis	no common name	

LINDA LINGLE
GOVERNOR

BRENNON T. MORIOKA
DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:

HWY-PA
2.7276

MAR 19 2008

Mr. Patrick Leonard
Field Supervisor
Fish and Wildlife Service
U.S. Department of Interior
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawaii 96850

Dear Mr. Leonard:

Subject: Saddle Road (State Route 200)
Mamalahoa Highway (State Route 190) to Milepost 42
Supplemental EIS Preparation Notice (EISPN)

Thank you for your letter, dated January 14, 2008, which provided us with your recommendations and requirements for this project's Supplemental Environmental Impact Statement (EIS). Your letter also provided us with a listing of threatened and endangered species in the vicinity of this project, and we appreciate receiving this information.

In accordance with Section 7, of the Endangered Species Act, botanical surveys will be conducted along the proposed corridors of this project and the results of these surveys will be included in the project's Supplemental EIS. At the moment, we are proposing that these surveys extend 250 feet from the centerline of each alternative alignment, with an expanded width in the southwestern portion of Keamuku.

As stated in your letter, fire risk and wildfire mitigation and suppression will be discussed in the Supplemental EIS. The development of this highway will also be coordinated with the State Department of Land and Natural Resources, Division of Forestry and Wildlife, as they share your concerns on the growing frequency of wildfires in the project area. We assure you that every effort will be made, to reduce wildfires along the proposed highway and minimize the effects of these fires on our protected wildlife in the project area.

If you have any other questions or comments regarding this project, please feel free to contact Nelson Sagum, Project Manager, at 587-1834.

Very truly yours,

BRENNON T. MORIOKA, Ph.D., P.E.
Director of Transportation
bc: HWY-PA
NS:th

United States Department of the Interior

U. S. GEOLOGICAL SURVEY
Hawaiian Volcano Observatory
P.O. Box 51
Hawaii National Park, HI 96718-0051
(808) 967-8824
FAX (808) 967-8890
E-MAIL: jimk@usgs.gov

USGS
science for a changing world

To: Geometrician Associates
From: Jim Kauahikaua, SIC
Date: December 28, 2007
Subject: comments on Supplemental Environmental Impact Statement Preparation Notice, Saddle Road (State Route 200) . . . FHWA Project No. 200(00)

There is a misunderstanding about earthquake shaking probabilities in the following section:

2.1.1 Geologic Resource and Hazards

The Uniform Building Code (UBC) is not a "seismic probability rating," but is a set of minimum construction standards intended to ensure that a building be located, designed, and constructed so that any threat to life, health, and welfare of its occupants and the public is minimized or prevented. Its provisions specify ways to make buildings resistant to damage from earthquakes and are based on expected shaking intensities. The Island of Hawai'i is in UBC Zone 4 in which construction is intended to resist a 10% chance of shaking equivalent to 0.4g within 50 years, where g is the acceleration of gravity.

Recent work shows that maximum shaking on areas of Hawai'i island south of Waikoloa Village (including this study area) have a 10% chance of exceeding accelerations of 0.4g within 50 years (Klein and others, 2001; also see http://pubs.usgs.gov/imap/i-2724/). If designers want to utilize the best estimates on probable future shaking, they should consult these references.

Klein F. W., Frankel A. D., Mueller C. S., Wesson R. L. and P. G. Okubo, 2001. Seismic Hazard in Hawaii: High Rate of Large Earthquakes and Probabilistic Ground-Motion Maps. Bulletin of the Seismological Society of America, 91, 3, pp. 479-498.

Cc: Director, Office of Environmental quality Conrol

Hawai'i State Department of Transportation, Highways Division

LINDA LINGLE
GOVERNOR

BRENNON T. MORIOKA
DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:

HWY-PA
2.7275

MAR 20 2008

Dr. James Kauahikaua
Scientist-In-Charge
Hawaii Volcano Observatory
U. S. Geological Survey
P. O. Box 51
Hawaii National Park, Hawaii 96718-0051

Dear Dr. Kauahikaua:

Subject: Saddle Road (State Route 200)
Mamalahoa Highway (State Route 190) to Milepost 42
Supplemental EIS Preparation Notice (EISPN)

Thank you for your memorandum, dated December 28, 2007, which commented on the the Supplemental EISPN and minimum design standards as stated in the Uniform Building Code (UBC).

Our statements regarding the UBC will be corrected in the draft Supplemental Environmental Impact Statement (EIS) and this information will be passed on to our project design engineers.

We appreciate your concern for your community. If any other issues or problems arise, please feel free to contact Nelson Sagum, our project manager, at 587-1834.

Very truly yours,

BRENNON T. MORIOKA, Ph.D., P.E.
Director of Transportation

bc: HWY-PA

NS:th

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

January 9, 2008

Richard Suarez
Federal Highway Administration
Central Federal Lands Highway Division
12300 West Dakota Avenue
Lakewood, CO 80228

Ronald F. Tsuzuki
Hawaii Department of Transportation
Highways Division - Planning Branch
869 Punchbowl Street, Room 301
Honolulu, Hawai'i 96813

Subject: Scoping Comments for Saddle Road (State Route 200), Mamalahoa Highway (State Route 190) to Milepost 42, Hawai'i County, Hawai'i

Dear Mr. Suarez and Mr. Tsuzuki:

The U.S. Environmental Protection Agency (EPA) has reviewed the Federal Register Notice published on December 10, 2007, and associated project materials submitted to our agency requesting comments on the Federal Highway Administration (FHWA) and Hawaii Department of Transportation (HDOT) decision to prepare a Draft Supplemental Environmental Impact Statement (Draft SEIS) for Saddle Road (State Route 200), Mamalahoa Highway (State Route 190) to Milepost 42.

In 1999, the FHWA published a Final Environmental Impact Statement (FEIS) for Saddle Road, from Mamalahoa Highway to Milepost 6. In 2006, The U.S. Army Garrison, Hawai'i, acquired the Keamuku parcel which is traversed by the proposed western section of Saddle Road (W-3). The SEIS will evaluate western alignment alternatives to maximize army training opportunities on the parcel and minimize conflict with the traveling public.

EPA commented on the original Saddle Road Draft Environmental Impact Statement and FEIS. EPA also provided feedback on the original project through the interagency 1995 *National Environmental Policy Act and Clean Water Act Section 404 Integration Process for Surface Transportation Projects in the State of Hawaii Memorandum of Understanding* (NEPA/404 MOU). To ensure that a revised alignment is the least environmentally damaging and practicable alternative (LEDPA) and to streamline resource and regulatory agency feedback on the supplemental NEPA analysis, EPA recommends following the NEPA/404 MOU process as applicable. We encourage FHWA and HDOT to contact the NEPA/404 signatory agencies so that the appropriate concurrence points can be addressed as early as possible in the NEPA process.

EPA scoping comments are provided pursuant to the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations (40 CFR Parts 1500-1508) and Section 309 of the Clean Air Act.

Clean Water Act Section 404

Avoidance and Minimization of Impacts to Waters

The Draft SEIS should disclose the approximate area of waters of the United States that occur within the study area of the proposed project, including intermittent and ephemeral streams and wetlands. The Clean Water Act (CWA) Section 404(b)(1) Guidelines (Guidelines) at 40 CFR Part 230.10(a) state that "... no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences." FHWA and HDOT will have to demonstrate that potential impacts to waters of the United States have been avoided and minimized to the maximum extent practicable prior to obtaining a CWA Section 404 permit (40 CFR 230.10(a) and 230.10(d)) from the U.S. Army Corps of Engineers (Corps). We urge FHWA and HDOT, in planning alternative designs for the project, to incorporate the following recommendations into the Draft SEIS:

- Demonstrate that all potential impacts to waters of the United States have been avoided and minimized. If these resources cannot be avoided, the project-level analyses should clearly demonstrate how cost, logistical, or technological constraints preclude avoidance and minimization of impacts. Propose mitigation to offset impacts to waters of the United States.

- Quantify the benefits from measures and modifications designed to avoid and minimize impacts to water resources for each alternative studied; for example, number of stream crossings avoided, acres of waters of the United States avoided, etc.

- Identify all protected resources with special designations and all special aquatic sites[1] and waters within state, local, and federal protected lands. Additional steps should be taken to avoid and minimize impacts to these areas.

Rapanos Guidance

In light of the recent Supreme Court decision in the consolidated cases Rapanos v. United States, and Carabell v. United States, 126 S. Ct. 2208 (2006) (jointly hereafter Rapanos), EPA and the Corps are required to coordinate on Jurisdictional Determinations (JDs) under CWA Section 404 in certain situations under joint agency guidance issued on June 5, 2007 (See http://www.usace.army.mil/cw/cecwo/reg/cwa_guide/rapanos_moa_06-05-07.pdf). EPA recommends HDOT and FHWA involve the Corps and EPA as early as practicable in your review of potentially jurisdictional waters to facilitate their coordination on waters subject to the guidance. For Section 404 coordination, please contact Wendy Wiltse of EPA's Region 9 Hawaii Field Office at 808-541-2752 or wiltse.wendy@epa.gov.

[1] Special aquatic sites are defined at 40 CFR 230.40 – 230.45 and include wetlands, mud flats, vegetated shallows, coral reefs, and riffle and pool complexes.

Invasive Species

In accordance with Executive Order 13112, EPA recommends that the Draft SEIS identify proposed methods to minimize the spread of invasive species and utilize native plant and tree species where revegetation is planned. The islands of Hawai`i are particularly vulnerable to invasive species, and construction associated with the project has the potential to aid in the establishment of invasive plants along any newly disturbed corridors. EPA recommends that FHWA and HDOT coordinate invasive species management with local agencies and organizations to stop established invasive species from spreading on Hawai`i. Measures to reduce the potential for the spread of invasive species will be more effective when they are coordinated with other ongoing planning efforts. Resources related to Federal and State programs to address invasive species can be found at: http://www.invasivespeciesinfo.gov/

Air Quality

Construction activities may result in short and long-term impacts on air quality – particularly emissions of nitrogen oxides (NOx - an ozone precursor), particulate matter less than 10 microns in size (PM10), and carbon monoxide. The Draft SEIS should discuss the general air quality impacts of the project and discuss options for mitigating these impacts. To reduce construction-related air quality impacts, EPA recommends that the Draft SEIS address the feasibility of implementing air quality-related mitigation to reduce emissions of Diesel Particulate Matter (DPM) and other pollutants from construction, including:

Fugitive Dust Source Controls:

- Stabilize open storage piles and disturbed areas by covering and/or applying water or chemical/organic dust palliative where appropriate. This applies to both inactive and active sites, during workdays, weekends, holidays, and windy conditions.
- Install wind fencing and phase grading operations where appropriate, and operate water trucks for stabilization of surfaces under windy conditions.
- When hauling material and operating non-earthmoving equipment, prevent spillage and limit speeds to 15 miles per hour (mph). Limit speed of earth-moving equipment to 10 mph.

Mobile and Stationary Source Controls:

- Reduce use, trips, and unnecessary idling from heavy equipment.
- Maintain and tune engines per manufacturer's specifications to perform at EPA certification levels and to perform at verified standards applicable to retrofit technologies. Employ periodic, unscheduled inspections to limit unnecessary idling and to ensure that construction equipment is properly maintained, tuned, and modified consistent with established specifications.
- Prohibit any tampering with engines and require continuing adherence to manufacturer's recommendations
- If practicable, lease new, clean equipment meeting the applicable Federal Standards. In general, only Tier 2 or newer engines should be employed in the construction phase.

- Utilize EPA-registered particulate traps and other appropriate controls where suitable to reduce emissions of diesel particulate matter and other pollutants at the construction site.

Analysis of Indirect and Cumulative Impacts

NEPA requires evaluation of indirect and cumulative effects which are caused by the action (40 CFR Parts 1508.8(b) and 1508.7). "Indirect effects may include growth inducing effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems." CEQ regulations also state that an EIS should include the "means to mitigate adverse environmental effects." (40 CFR 1502.16(h)). This provision applies to indirect effects as well as direct effects. Induced commercial, recreational, and residential growth can adversely affect water quality, wetlands, and other natural resources.

The Draft SEIS should evaluate the increased rates of growth for commercial, recreational, or residential purposes indirectly caused by the proposed changes to the project. Specifically, the Draft SEIS should estimate reasonably foreseeable changes in land use patterns, as well as the increased number of automobile and truck trips associated with new land uses. Impacts to cultural, water, socioeconomic, and community resources associated with new development and increased vehicle miles traveled should be specifically addressed in the Draft SEIS. Appropriate mitigation to minimize impacts should be included.

Cumulative impacts are defined in the CEQ NEPA regulations as the impact on the environment that results from the incremental impact of the action when added to the other past, present, and reasonably forseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such actions (40 CFR 1508.7). These actions include both transportation and non-transportation activities. The cumulative impact analysis should consider all nearby projects such as adjacent roadway improvements, military initiatives, residential development, and other projects that are reasonably foreseeable and are identified in the surrounding area, including those that have occurred or are planned since the 1999 FEIS. Where adverse cumulative impacts are identified, the Draft SEIS should identify appropriate mitigation measures, even if the mitigation is the responsibility of other entities. Disclose the parties that would be responsible for avoiding, minimizing, and mitigating those adverse impacts (CEQ's Forty Most Frequently Asked Questions #19).

EPA recommends using the California Department of Transportation Indirect and Cumulative Impacts Analyses, which are co-authored by EPA and FHWA and are applicable to impact analyses for projects outside of California. This guidance can be found at [http://www.dot.ca.gov/ser/cumulative_guidance/purpose.htm] and [http://www.dot.ca.gov/ser/Growth-related_IndirectImpactAnalysis/gri_guidance.htm].

Environmental Justice

Executive Order 12898 addresses Environmental Justice in minority and low income populations, and the Council on Environmental Quality has developed guidance concerning how to address Environmental Justice in the environmental review process (http://ceq.eh.doe.gov/nepa/regs/ej/justice.pdf). Community involvement activities supporting the project should include opportunities for incorporating public input into the facility area design and location process, especially from any members of the community who may benefit or be adversely affected by the project. The Draft SEIS should identify whether the proposed changes may disproportionately and adversely affect low income or minority populations in the surrounding area and should provide appropriate mitigation measures for any adverse impacts.

We appreciate the opportunity to provide comments on the preparation of the Draft SEIS, and look forward to continued participation in this process as more information becomes available. Please send hard copies of materials to the address above (mail code CED-2) and email information to the email addresses provided above. If you have any questions, please contact me, the lead reviewer for this project. I can be reached at 415-947-4188 or sturges.susan@epa.gov.

Sincerely,

Susan Sturges, Life Scientist
Environmental Review Office

CC: Susan Meyer, Army Corps of Engineers
Michael Molina, US Fish and Wildlife Service

LINDA LINGLE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

BRENNON T. MORIOKA
DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI

IN REPLY REFER TO:

HWY-PA
2.7490

March 25, 2008

Ms. Susan Sturges, Life Scientist
Environmental Review Office
U.S. Environmental Protection Agency
Region IX
75 Hawthorne Street
San Francisco, California 94105-3901

Dear Ms. Sturges:

Subject: Saddle Road (State Route 200)
Mamalahoa Highway (State Route 190) to Milepost 42
Notice of Intent

Thank you for your letter, dated January 9, 2008, which provided scoping comments pursuant to our Notice of Intent to prepare a Supplemental Environmental Impact Statement (EIS) for this project.

The EPA comments, essentially involved four (4) major issues, which will be addressed in the project's draft Supplemental EIS and/or in the development of this document, and the final Supplemental EIS. These critical issues include the Memorandum of Understanding of National Environmental Policy Act and Section 404 of the Clean Water Act; Invasive Species; Air Quality; Indirect and Cumulative Impacts; and Environmental Justice. As recommended, we will be coordinating with appropriate governmental agencies to obtain their input to these processes.

We believe that the proposed highway is highly desired by our residential and visitor commuters on the island of Hawaii, and consequently, we appreciate your support of this project.

If any questions or problems arise, please contact Nelson Sagum, Project Manager, at (808) 587-1834.

Very truly yours,

for

BRENNON T. MORIOKA, Ph.D., P.E.
Director of Transportation

bc: HWY-PA
NS:th

BIG ISLAND BIRD HUNTERS

17-124 Palaai Street
Keaau, HI 96749

December 7, 2007

Geometrician Associates
PO Box 396
Hilo, HI 96721

Attn: Ron Terry

Subject: SEISPN
Saddle Road (State Route 200)
Mamalahoa Highway (State Route 190) to Milepost 42
County of Hawaii, State of Hawaii
FHWA Project No. 200(00)

Due to the preliminary nature of the information included in the SEISPN, we wish to reserve our comments until more definitive information becomes available. However, we do have a definite interest in the project and request informal meetings to establish dialogue and input before the Draft EIS is compiled. Further, we ask to be included on a mailing list to receive all publicly issued documents and announcements related to the project.

We also petition to become a CONSULTED PARTY for this project as allowed in the state Department of Health Administrative Rules (11-200-15B). We base this request on the following.

- Our members have had historical hunting use of the Kaohe Game Management Area (GMA) and the Puuanahulu GMA. The Kaohe GMA is adjacent to the extension of the proposed Saddle Road near mile post 42, and the Puuanahulu GMA immediately abuts the Keamuku land corridor proposed for route W-7. Should the final realignment of Saddle Road from mile post 42 to Mamalahoa Highway infringe on the use of any part of the Kaohe or Puuanahulu GMA, it would deny our members access to our accepted cultural practices and resources.

- Our organization has worked cooperatively with the state DLNR, Division of Forestry and Wildlife and voluntarily installed rain catchment structures and water storage tanks within both Kaohe and Puuanahulu GMA with the intent of supplying water for the wildlife population. Additionally, we want to eventually establish tree and brush outplantings, aided in growth by the water from these catchment systems. These outplantings could then potentially collect dew from fog in the area to further increase moisture collection and serve as windbreaks to create a more hospitable environment for flora and fauna.

Thank you for providing this opportunity to correspond with you, and we look forward to establishing dialogue with you.

Sincerely,

Steven Hurt
President

LINDA LINGLE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

BRENNON T. MORIOKA
DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI

IN REPLY REFER TO:

HWY-PA
2.7493

April 1, 2008

Mr. Steven Hurt, President
Big Island Bird Hunters
17-124 Palani Street
Keaau, Hawaii 96749

Dear Mr. Hurt:

Subject: Saddle Road (State Route 200)
Mamalahoa Highway (State Route 190) to Milepost 42
Supplemental EIS Preparation Notice (EISPN)

Thank you for your letter, dated December 7, 2007, which provided us with your comments pursuant to the Supplemental EIS Preparation Notice for this project.

Your organization will be included in our listing of consulted parties for this project, and consequently, you should be furnished with a copy of our draft Supplemental EIS and other project documents and notices.

In addition, we do not anticipate any infringement of the Kaohe Game Management Area (GMA) and the proposed highway is just northerly of the Puuanahulu GMA as it approaches Mamalahoa Highway. In the vicinity of Mamalahoa Highway, the proposed highway was located as far south as possible in order to intersect Mamalahoa Highway at an appropriate angle.

We appreciate the efforts of your organization regarding the preservation of your hunting areas. We will conscientiously evaluate any impacts and propose mitigation, if these impacts will have an adverse effect on the game management areas for the island of Hawaii.

If you have any questions, please call Nelson Sagum, Project Manager, at (808) 587-1834.

Very truly yours,

BRENNON T. MORIOKA, Ph.D., P.E.
Director of Transportation

bc: HWY-PA
NS:th

Hawaii Island Chamber of Commerce

106 Kamehameha Avenue
Hilo, Hawaii 96720
Phone: (808) 935-7178
Fax: (808) 961-4435
E-mail: admin@hicc.biz
www.hicc.biz

January 19, 2008

Nelson Sagum
Hawai'i State Department of Transportation
Highways Division
869 Punchbowl Street
Honolulu, Hawai'i 96813

Director
Office of Environmental Quality Control
235 S. Beretania, Suite 702
Honolulu, Hawai'i 96813

Ron Terry
Geometrician Associates
PO Box 396
Hilo, Hawai'i 96721

Aloha,

On behalf of the Hawaii Island Chamber of Commerce, our leadership has considered the Supplemental Environmental Impact Statement Preparation Notice for the Saddle Road (State Route 200) Mamalahoa Highway (State Route 190) to Milepost 42, FWA Project No. 200(00).

It has been clear for some time that improvements are needed to the Saddle Road. The improvements will make the road safer for trans-island traffic, and make it easier for a growing number of commuters, including shortening the drive time.

An improved Saddle Road will be good for our workforce, many who find affordable housing on the East Side, but find employment on the West Side. Nor can we discount that reduced travel time also means fuel energy savings in terms of fewer miles driven for these commuters.

While we support careful planning and consideration of all impacts, we urge a timely completion of improvements to this road. It remains one of the most dangerous rural roads in our state.

The 109-year-old Hawaii Island Chamber of Commerce represents more than 330 businesses and nearly 700 members.

Sincerely,

Barbara A Hastings

Barbara A. Hastings
Chair, Government Affairs

LINDA LINGLE
GOVERNOR

BRENNON T. MORIOKA
DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:

HWY-PA
2.7492

March 25, 2008

Ms. Barbara A. Hastings
Chair, Government Affairs
Hawaii Island Chamber of Commerce
106 Kamehameha Avenue
Hilo, Hawaii 96720

Dear Ms. Hastings:

Subject: Saddle Road (State Route 200)
Mamalahoa Highway (State Route 190) to Milepost 42
Supplemental EIS Preparation Notice (EISPN)

Thank you for your letter, dated January 19, 2008, which provided us with your comments for this project pursuant to this project's Supplemental EISPN. We are appreciative of your review of this document.

We are also deeply appreciative of the support of the Hawaii Island Chamber of Commerce for the proposed Saddle Road, and indeed, we are very hopeful of the timely completion of this study.

If you have any questions or comments, please feel free to contact Nelson Sagum, Project Manager, at (808) 587-1834.

Very truly yours,

for BRENNON T. MORIOKA, Ph.D., P.E.
Director of Transportation

bc: HWY-PA

NS:th

----- Original Message -----
From: Paul Normann [illegible]
To: rterry@hawaii.rr.com
Sent: Tuesday, January 22, 2008 3:35 PM
Subject: Comments on Saddle Road Project

Ron Terry,

Here are my comments concerning the Saddle Road realignment.

There are serious health concerns for anyone working on road construction in the area of Pohakuloa Training Area (PTA). Of primary concern at this time are the potential risks posed by airborne Depleted Uranium dust, something neither the Hawaii health department nor the military have tested for in any methodological way.

I strongly urge that air monitoring stations, testing for airborne Depleted Uranium dust particles, be set up along the proposed route of the Saddle Road realignment. The monitoring should start before construction begins and continue throughout the duration of the project. The data from these air monitors should published both in paper form and on the internet where they should be accessible to the general public in real time, 24 / 7. Further, the contractors or engineers working on this project should work with Dr. Lorrin Pang to design and scientifically sound sampling methodology to test for the presence of DU.

Such monitoring will help protect the safety of the workers who will be exposed to windblown dust throughout the project.

Paul Normann
Kurtistown, HI
966-7622

Nelson Sagum/HWY/HIDOT
02/29/2008 03:46 PM

To "Paul Normann" <paulwnormann@yahoo.com>

cc Brennon Morioka/ADMIN/HIDOT@HIDOT, Glenn Yasui/HWY/HIDOT@HIDOT, Dina Lau/HWY/HIDOT, rterry@hawaii.rr.com, bmeyers@okahara.com,

bcc

Subject Saddle Road, Mamalahoa Highway to Milepost 42

Dear Mr. Normann:

Your email to Mr. Ron Terry, dated January 22, 2008, has been forwarded to the State Department of Transportation (DOT), for our consideration and response.

We are certainly aware of the depleted uranium (DU) issue in the project area, and we appreciate your concern for our construction workers in this vicinity. Undoubtedly, we would be seeking the assistance of the U.S. Army in regards to a satisfactory resolution this problem; however, the U.S. Army has been proactively engaged in gathering information on the level and effects of DU in the vicinity of the Pohakuloa Training Area. According to their records, approximately "$5.5 million and countless manhours" have been spent in this study, and we are hopeful that the U.S. Army will continue to monitor the radioactivity in the project area throughout the construction period of the proposed Saddle Road.

For your information, the State DOT will also be preparing an independent study which will focus on a risk assessment involving the probable adverse effects from DU at Pohakuloa. This study will be included in the Supplemental Environmental Impact Study for this project and will be available for review by Dr. Lorrin Pang and other interested parties.

We appreciate your participation in this project. If you have any other comments or questions, please contact me at *nelson.sagum@hawaii.gov*, or (808) 587-1834.

Aloha, Nelson Sagum

Department of Transportation, Highways Division
Attn: Ronald F. Tsuzuki
869 Punchbowl Street
Honolulu, HI 96813

DMT Consultant Engineers
Attn. Bruce K. Meyers
677 Ala Moana Boulevard, Suite 703
Honolulu, HI 96813

Office of Environmental Quality Control
Attn: Leiopapa A Kamehameha
235 South Beretania Street, Suite 702
Honolulu, HI 96813

SUBJECT: Saddle Road (State Route 200), Mamalahoa Highway (HRS 343 FEA-EISPN)

I am a member of the Hawai'i County Transportation Commission, the Hawai'i County Highway Safety Council, and the Hawai'i County Bicycle/Pedestrian Advisory Committee. I am providing the following comments on the proposed supplemental Environmental Impact Statement for the realignment of Saddle Road, not on behalf of these boards but as an individual seeking the best solutions to accommodate all modes of travel

Sincerely,

Robert Ward 01/21/08

Robert Ward
77-6526 Ho'olaupa'i Street
Kailua Kona, HI 96740

SUBJECT: Saddle Road (State Route 200), Mamalahoa Highway (HRS 343 FEA-EISPN)

I would like to take the time to offer a few comments on the proposed supplemental Environmental Impact Statement for the realignment of Saddle Road. Regional transportation is an important issue today and will become even more important in the future as we explore other opportunities including increased transit operations and freight hauling (perhaps including solid waste). Because of the heavy potential use, the design of this transportation corridor will have a significant impact on its users Other ancillary functions of the corridor including vegetation management, fire breaks and emergency access are important considerations as well.

Commencing with the Federal Highway Administration's edicts issued at the beginning of this millennium, moving through the State DOT level with Bike Plan Hawai'i, and all the way to the County of Hawai i General Plan, the need to include facilities for all modes of travel in roadway design is essential Conventional highway travel lanes with paved shoulders can accommodate motor vehicles and the shoulder bikeways may be used by bicyclists that can negotiate the 8% gradients. Something more is required if we want to accommodate all modes of interurban transportation.

Improving the right-of-way corridors adjacent to the central highway cross-section could provide a low cost solution and ultimately create a "complete highway" The portion of corridor laying northerly of the highway cross-section could be lightly graded with major collision hazards removed. This could become a dedicated travel route for "off-road vehicles". Occupying the space between a major highway and a live-fire training facility would be ideal strategic placement and provide compatible land use. This would essentially widen the corridor to provide a much needed expanded fire break.

The second supplemental corridor would include a paved Shared-Use Path and unpaved equestrian trail. These could be curvilinear in design (particularly in areas where the highway maximum grade approach 8%) to achieve a 5 percent grade that is more desirable for cyclists and would also be fully ADA compliant. These paths would closely follow the route of the highway but could more closely follow the natural terrain. The path would further expand the fire break but some trees could remain as a wind break and provide shade for the users as well, without increasing roadside hazards.

Future options could include extending the supplemental corridors along the current Mamalahoa Highway between the existing saddle road and the new intersection with the relocated Saddle Road This would specifically conform to the DOT Bike Plan Hawai'i which intended to utilize the remnants of the old Mamalahoa Highway. The Bike Plan element was planned as a Shared-Use Path with construction in 2013 or later (which could coincide with the proposed Saddle Road realignment)

Total construction costs and phasing are concerns that must be evaluated. Certain elements of the supplemental corridors might lag behind that actual highway construction for various reasons, and could require some funding from alternative sources. However, it is imperative that the planning, right-of-way and design phases incorporate all facilities.

Robert Ward
Kailua Kona, HI

LINDA LINGLE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

BRENNON T. MORIOKA
INTERIM DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI

IN REPLY REFER TO:

HWY-PA
2.7121

FEB 25 2008

Mr. Robert Ward
Commissioner
Hawai'i County Transportation Commission
77-6526 Ho'olaupa'i Street
Kailua-Kona, Hawaii 96740

Dear Mr. Ward:

Subject: Saddle Road, Mamalahoa Highway to Milepost 42, Project No. DP-HI-0200(5)
Supplemental Environmental Impact Statement Preparation Notice

Thank you for your letter and comments, which indicated your concern for bicyclists and other modes of transportation that may be using the proposed Saddle Road, from Mamalahoa Highway (SR 190) to Milepost 42.

Your letter stated that our proposed right-of-way width and the design of the highway should consider its use by off-road vehicles, recreational bicyclists and equestrians. Please note that the proposed minimum right-of-way width is 200 feet which should be sufficient to accommodate various facilities for these modes of transportation. However, our participation in the construction of adjacent facilities is very dependent on the results of our studies, which should be developed pursuant to the Supplemental Environmental Impact Statement for this project. Furthermore, if you have any records or surveys, or if you know of the availability of any information which would be of assistance to us, please provide them to us or let us know of its location.

As you have also indicated, the proposed typical section for the highway will include 8-foot shoulders, which will also be available to island bicyclists.

We sincerely appreciate your participation in this project. If you have any other comments or questions, please contact us at your earliest opportunity.

Very truly yours,

BRENNON T. MORIOKA, Ph.D., P.E.
Interim Director of Transportation

bc: HWY-PA
NS:th

Share the road with aloha!

PATH ~ PEOPLES ADVOCACY FOR TRAILS HAWAI`I

PO BOX 62 ◆ KAILUA-KONA, HAWAI`I 96745 ◆ 808-329-9718 ◆ sharetheroad@pathhawaii.org

Department of Transportation, Highways Division
Attn: Ronald F. Tsuzuki
869 Punchbowl Street
Honolulu, HI 96813

DMT Consultant Engineers
Attn: Bruce K. Meyers
677 Ala Moana Boulevard, Suite 703
Honolulu, HI 96813

Office of Environmental Quality Control
Attn: Leiopapa A Kamehameha
235 South Beretania Street, Suite 702
Honolulu, HI 96813

January 22, 2008

Regarding: **Saddle Road (State Route 200), Mamalahoa Highway (HRS 343 FEA-EISPN)**

PATH, a grassroots bicycle and pedestrian advocacy organization, wishes to bring to the attention of the DOT and OEQC the tremendous opportunity to create safe inter-modal regional transportation facilities with the realignment of the Saddle Road in Keamuku.

The mission of the State of Hawaii's Department of Transportation Highway Division is to: "provide a safe, and efficient and accessible highway system through the utilization of available resources in the maintenance, enhancement and support of land transportation facilities."

The Saddle Road and connecting Mamalahoa Highway represent two HDOT assets that encapsulate this mission with the potential to become a "complete highway" serving all users through this region of the island.

Similar to the notion of 'Complete Streets 'designed for all users, including motorists, transit, pedestrians and bicyclists, a Complete Highway would provide access, safety and efficiency to all users of the transportation system. It would also serve the very necessary functions of fire control, vegetation management and emergency access. Such a complete highway draws upon available resources within DOT and results in a value-added transportation facility that contributes to quality of life and sustainability for the island.

'Complete Highway' design for Saddle Road is supported at the Federal level through FHWA's flexible design guidelines, the State of Hawaii's Bike Plan and the Hawaii County General Plan and emerging Roadway Standards and Community Development Plans.

We urge DOT to envision Saddle Road as a "Complete Highway" with the following components:

Shoulder Bikeways. Just as the mission states, use of existing resources within DOT provides the most efficient and cost effective solution in providing safe, accessible and efficient transportation facilities. The new sections of Saddle road that are completed from Mauna Kea State Park to the Mauna Kea Access Road include shoulder bikeways suitable for bicycling, emergency breakdown and shoulder stabilization for long term roadway maintenance. We urge the continuation of this design for the west side sections. This provides bicycle facilities within the existing highway right of way and adds tremendous value to the transportation facility with minimal additional investment in the form of signage and striping.

Shared Use Path System. That being said, conventional highway travel lanes with paved shoulders can accommodate motor vehicles and the shoulder bikeways may be used by bicyclists that can negotiate the 8% gradients. Something more is required if we want to accommodate all modes of interurban transportation up the 3,000 ascent from Mamalahoa Hwy to Kilohana (Girl Scout Camp). This section would require a curvilinear path to meet AASHTO bicycle guidelines and ADA requirements for pedestrians on the 3,000 ascent from Mamalahoa Highway.

Such a shared use pathway along Saddle Road would then connect with several Bike Plan Hawaii projects that identify old remnants of Mamalahoa Highway. This stretches from Parker Ranch's rodeo grounds in Waimea to the new Saddle Road realignment in Keamuku. From there sections of Old Mamalahoa as well as fire break roads continue to Puu Waawaa and Puu Anahulu and on to Kona.

The Shared-Use Path serves a broader spectrum of potential users (and can provide both emergency access and firebreaks). Conventional paved Shared-Use Paths can accommodate most bicyclists and pedestrians. Optional "green drainage" sections provide a unique equestrian opportunity. Even the growth of motorized off-road users could be accommodated on some segments (specifically the portion of the corridor laying northerly of the highway cross-section could be lightly graded with major collision hazards removed. This could become a dedicated travel route for "off-road vehicles". Occupying the space between a major highway and a live-fire training facility would be ideal strategic placement and provide compatible land use.)

These paths would closely follow the route of the highway but could more closely follow the natural terrain. The path would further expand the fire break but some trees could remain as a wind break and provide shade for the users as well, without increasing roadside hazards.

In order to move forward with a "Complete Highway" concept, it is critical that planning, right-of-way acquisition and design incorporate shoulder bikeways and shared use paths as identified in Bike Plan Hawaii. We urge DOT to take these steps now to insure the best chance of success in creating a "Complete Highway" for Hawaii Island.

Kind Regards,

Laura Dierenfield
Executive Director
PATH Peoples Advocacy for Trails Hawaii

LINDA LINGLE
GOVERNOR

BRENNON T. MORIOKA
DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:

HWY-PA
2.7491

APR - 1 2008

Ms. Laura Dierenfield
Executive director
PATH Peoples Advocacy for Trails Hawaii
P. O. Box 62
Kailua-Kona, Hawaii 96745

Dear Ms. Dierenfield:

Subject: Saddle Road (State Route 200)
Mamalahoa Highway (State Route 190) to Milepost 42
Supplemental EIS Preparation Notice (EISPN)

Thank you for your letter, dated January 22, 2008, which provided us with your comments regarding the proposed Saddle Road, pursuant to the Supplemental EISPN for this project. We appreciate your review of the Supplemental EISPN, and we have the following responses in regards to each of your comments:

The proposed typical section for the highway will include 8-foot shoulders. The use of these 8-foot shoulders will be shared by both island bicyclists and motorists.

In addition, your letter stated that our proposed right-of-way width and the design of the "complete highway" should consider its use by off-road vehicles and recreational bicyclists. Please note that the proposed minimum right-of-way width is 200 feet which should be sufficient to accommodate various facilities for these modes of transportation. However, our participation in the construction of "shared use pathways" is very dependent on the results of our studies, which should be developed in sequence with the Supplemental EIS for this project. Hence, if you have any records or surveys, or if you know of the availability of any information which could be of assistance to us, please provide them to us or let us know of its location.

We sincerely appreciate your participation in this project. If you have any other comments or questions, please contact Nelson Sagum, Project Manager, at (808) 587-1834.

Very truly yours,

BRENNON T. MORIOKA, Ph.D., P.E.
Director of Transportation

bc: HWY-PA
NS:th

PRESS RELEASE

IMMEDIATE RELEASE
Contact person: Cory Harden
Sierra Club, Moku Loa group
P.O Box 1137
Hilo, Hawai'i 96721
808-968-8965 mh@interpac.net
http://www.hi.sierraclub.org

January 15, 2008, Hilo, Hawai'i

Sierra Club, citing risks of dispersing depleted uranium at Pohakaloa, called on the Army to halt both a planned February training, and practice bombing with 2000-pound inert bombs

"We are extremely concerned," said Cory Harden of the Club's Moku Loa group, "because minute amounts of DU can impact health, DU can be transported for miles in the air, and DU can be dispersed by rodents."

The Army does not yet know the exact locations of all the DU, or whether it can be completely cleaned up.

Sierra Club is also calling for air monitoring funded by the Army and designed to detect intermittent spikes in radiation, with results immediately available on the Internet; investigation for decay products of DU; and an information meeting in Hilo by mid-February.

###

Ron - please use as comments on Scoping the EIS
thx
Cory

LINDA LINGLE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

BRENNON T. MORIOKA
DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI

IN REPLY REFER TO:

HWY-PA
2.7507

April 7, 2008

Ms. Cory Harden
Sierra Club, Moku Loa Group
P. O. Box 1137
Hilo, Hawaii 96721

Dear Ms. Harden:

Subject: Saddle Road (State Route 200)
Mamalahoa Highway (State Route 190) to Milepost 42
Supplemental EIS Preparation Notice (EISPN)

Thank you for a copy of your press release and its enclosures, dated January 15, 2008, regarding military activities and the existence of depleted uranium (DU) in the Pohakuloa Training Area (PTA) of the U.S. Army.

For your information, the State Department of Transportation also has several questions regarding the DU in PTA, and consequently, we have initiated an independent study which would develop a risk assessment regarding the adverse effects of the DU that may occur as a consequence of the construction and operation of the proposed Saddle Road. All of our studies and its findings will be included in the Supplemental Environmental Impact Statement (EIS) for this project.

In addition, your comments have been forwarded to our environmental and risk assessment subconsultants, who will evaluate them during the preparation of their studies for the project's Supplemental EIS. We intend to include your press release in the Supplemental EIS; however, because of our copyright concerns, your enclosures will not be duplicated in this document.

If you have any questions or issues concerning this project, please contact Nelson Sagum, Project Manager, at (808) 587-1834.

Very truly yours,

BRENNON T. MORIOKA, Ph.D., P.E.
Director of Transportation

bc: HWY-PA
NS:dn

----- Original Message -----
From: "Aaron Stene" <aaron@hawaiiantel.net>
To: "Ron Terry" <rterry@hawaii.rr.com>
Sent: Saturday, December 15, 2007 9:32 AM
Subject: Re: Saddle Road

Aloha Ron,
>
I'm not sure if the supplemental EIS (for the m.m 41 to Mamalahoa highway) would address this. But I'll give it a shot.
>
I assume the alignment of this segment of roadway would be addressed in the SEIS. So I'd like to put my .02 in.

I think the alignment that would minimize the the civilian/Army interaction and not impact the alignment of the Saddle Road extension would be the best alignment. I tried looking for the map of the different alignments (in WHT). I couldn't find it. But I believe this is the W-7 alignment.
>
Would you suggest I e-mail I e-mail the QEQC and DOT my thoughts too.
>
> Aaron
>
> ********************************
> Aaron Stene
> Kailua-Kona, Hawaii
> http://thekonablog.wordpress.com/
> ********************************

Nelson Sagum/HWY/HIDOT
02/27/2008 03:57 PM

To "Aaron Stene" <aaron@hawaiiantel.net>
cc Brennon Morioka/ADMIN/HIDOT@HIDOT, Glenn Yasui/HWY/HIDOT@HIDOT, Dina Lau/HWY/HIDOT, rterry@hawaii.rr.com
bcc
Subject Saddle Road, Mamalahoa Hwy to Milepost 42

Dear Mr. Stene:

Your email to Mr. Ron Terry, dated December 15, 2007, has been forwarded to the State Department of Transportation, for our consideration and response.

First of all, we appreciate your interest in the proposed Saddle Road, from Mamalahoa Highway to Milepost 42. We believe that island residents and tourists should indeed benefit from the construction of this facility.

Secondly, we are grateful for your support of alignment W-7, and we also believe that this alignment will minimize civilian and military interaction. It should also be noted that at least one grade-separated military crossing will be provided for this highway section.

If you have any additional comments or questions, please forward them to me at *nelson.sagum@hawaii.gov* or call me at (808) 587-1834.

Aloha, Nelson Sagum

WAIKI'I · RANCH

HOMEOWNERS' ASSOCIATION

January 16, 2008

Mr. Ron Terry
Geometrician Associates
PO Box 396
Hilo, HI 96721

Dear Mr. Terry:

These are the comments of the Waiki'i Ranch Homeowners' Association regarding the Environmental Impact Statement Preparation Notice for the Saddle Road, Mamalahoa Highway to Milepost 42 Project.

The Waiki'i Ranch Homeowners' Association (WRHOA) supports the W-7 Proposed SEIS Alignment of the New Saddle Road.

A correction needs to be made on page 14 of the SEIS Preparation Notice. There are two wells at Waiki'i Ranch. The depth is 4,300 feet below ground elevation of 4,260 feet. The water level is 2,730 feet below ground elevation.

Sincerely yours,

J.J. McAniff

Vice President, WRHOA

Copies to:

Director
Office of Environmental Quality Control
235 South Beretania St., Suite 702
Honolulu, HI 96813

Nelson Sagum
Hawaii State Dept. of Transportation
Highways Division
869 Punchbowl St
Honolulu, HI 96813

LINDA LINGLE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

BRENNON T. MORIOKA
DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI

IN REPLY REFER TO:

HWY-PA
2.7505

April 1, 2008

Mr. T. J. McAniff
Vice President
Waiki'i Ranch Homeowners' Association
P. O. Box 6389
Kamuela, Hawaii 96743

Dear Mr. McAniff:

Subject: Saddle Road (State Route 200)
Mamalahoa Highway (State Route 190) to Milepost 42
Supplemental EIS Preparation Notice (EISPN)

Thank you for your letter, dated January 16, 2008, which commented on the Supplemental EIS Preparation Notice for this project. We appreciate your review of this document.

We are also grateful for your indication of the support of the Waiki'i Ranch Homeowners' Association (WRHA) for alignment W-7 and for your efforts involved in correcting the misinformation contained in this Supplemental EISPN, regarding the number of wells at Waiki'i Ranch.

We look forward to hearing from you and the WRHA as this project develops. If you have any questions or comments concerning this project, please contact Nelson Sagum, Project Manager, at (808) 587-1834.

Very truly yours,

BRENNON T. MORIOKA, Ph.D., P.E.
Director of Transportation

bc: HWY-PA

NS:dn

South Kohala Traffic Safety Committee
P.O. Box 383375
Waikoloa, HI 96738

January 15, 2008

Mr. Nelson Sagum
State of Hawaii Department of Transportation
Highways Division, Planning Branch
869 Punchbowl Street
Honolulu, HI 96813

Mr. Ron Terry
Geometrician Associates
P.O. Box 396
Hilo, HI 96721

Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, HI 96813

RE: Saddle Road, Mamalahoa to Milepost 42 to Queen Ka'ahumanu Highway Project Comments

Dear Mr. Sagum;

At the January 8, 2008 Meeting of South Kohala Traffic Safety Committee safety and other concerns related to the Saddle Road, Mamalahoa to Milepost 42 to Queen Ka'ahumanu Highway Project were discussed by the membership. A major concern is that this new road will be a heavily used connector between East and West Hawai'i. As the Island population grows, future traffic on this road will increase substantially. Many members remember the light use at first of the Queen Ka'ahumanu Highway. Today this is a heavily used congested 2 lane route with many safety issues. Most members feel strongly that this project should be designed for the future potential and planned growth. Procurement of a wide Right of Way now will avoid rising procurement costs and access problems in the future. The current situation with the State Waimea Bypass Project is a good example of the problems that can be avoided by establishing a ROW adequate for the future. If funding is not available to build a "super highway now", design and procure the necessary ROW now is the point.

The following comments were made by the membership for your review and consideration;

1. Interchanges:

   a. Grade separated interchanges are preferred. Right of Way and design should be for future needs.

   b. Waikoloa Village, Waikoloa Beach Resort Node and other future subdivision development and the existing Saddle Road are along the route. These properties need interchange access now and accommodation for future growth. None of these mentioned subdivisions are built out at present. Future expanded growth should be in the design.

   c. Design and coordinate with Hawaii County Dept. of Public Works an interchange for a proposed future County Road extension of Paniolo Avenue or KilaKila Street in Waikoloa Village, to run south and connect to the Saddle Road Extension.

   d. Design an interchange for connecting the existing Saddle Road to the new proposed Saddle Road alignment.

2. Slow traffic lane for trucks to pull off on steep grades.

3. Runaway truck ramps designed and constructed concurrently with roadway.

4. Pull offs for tourists to look at views, or tired drivers to rest. Design for future rest stop with restrooms.

5. Need for smooth flow of commercial and military traffic. Road will traverse some steep terrain. No stop lights are preferred to keep trucks and buses moving. Keep traffic moving with separated grade interchange ramps for smooth transition of commercial trucks and other vehicles into and out of traffic flow.

6. Divided highway. Build two lanes now. Eventually build two more as a divided highway with planted medians so that two lanes will be westbound, and two eastbound. This will provide slow and turn lanes while maintaining a free flow lane. Queen Ka'ahumanu Highway design has resulted in too many head on collisions.

7. ROW width should be at least 250 to 300 Feet wide like the present Queen Ka'ahumanu HWY improvement project alignment.

8. **Build the highway beyond present needs - triple what we seem to need now. Build for future needs and expansion.**

9. Accentuate SAFETY in designing grade, and for mix of use: workers, residents, tourists, bicyclists and commercial trucks including trucks hauling fuel.

We appreciate the opportunity to comment on this long awaited project and hope you will keep South Kohala Traffic Safety Committee informed as the project progresses. Hopefully the end result will be a well designed, safe roadway that serves present and future needs. Mahalo for your consideration of these comments.

Sincerely,

Mike Price

Mike Price-Chair South Kohala Traffic Safety Committee

CC: State Representative Cindy Evans
Councilman Pete Hoffmann
Brennon Morioka-Interim Director DOT Highways Division
Stanley Tamura-District Engineer DOT Highways Division
Bruce McClure-Director County Department of Public Works
Galen Kuba-Division Chief County Department of Public Works
Engineering Division
Bruce Tsuchida-Townscape-SKCDP
Andrew Choy-Townscape-SKCDP

LINDA LINGLE
GOVERNOR

BRENNON T. MORIOKA
DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:

HWY-PA
2.7504

April 7, 2008

Mr. Mike Price, Chair
South Kohala Traffic Safety Committee
P. O. Box 383375
Waikoloa, Hawaii 96738

Dear Mr. Price:

Subject: Saddle Road (State Route 200)
Mamalahoa Highway (State Route 190) to Milepost 42
Supplemental EIS Preparation Notice (EISPN)

Thank you for your letter, dated January 15, 2008, which compiled the comments made by your membership regarding the proposed Saddle Road, from Mamalahoa Highway to Milepost 42, EISPN. For each of these comments we have the following:

1. *Purchase additional right-of-way to accommodate future growth. The proposed right-of-way width should be at least 250 to 300 feet wide.*

   At the moment, our proposed minimum right-of-way width is 200 feet, which should be sufficient for anticipated traffic growth. It should be noted that the U.S. Army currently owns the land which may be acquired for the highway, and they are very mindful about preserving an adequate training area and the lessening of the effects of this training on the proposed highway.

2. *Interchanges are preferred.*

   Interchanges are very costly to construct, and consequently, such facilities will usually be implemented only where they may be feasible or significantly improve highway safety. Currently, an interchange will be considered for the Saddle Road/Mamalahoa Highway crossing; however, this interchange will be evaluated as part of the proposed Saddle Road Extension, from Queen Kaahumanu Highway to Mamalahoa Highway. We also believe that an interchange at the junction of the proposed Saddle Road and the old Saddle road may be infeasible; however, additional right-of-way may be acquired in the vicinity of the old Saddle Road intersection in the event that an interchange may be needed.

Interchanges for Waikoloa Village, Waikoloa Beach Resort and Paniola Avenue will also be considered during the development of the proposed Saddle Road Extension, from Queen Kaahumanu Highway to Mamalahoa Highway.

3. *A truck climbing lane is needed.*

   We agree with your statement and are proposing that a truck climbing lane be provided for the length of this project.

4. *Emergency escape ramps are needed.*

   At least one (1) emergency ramp will be constructed along the proposed Saddle Road Extension, from Queen Kaahumanu Highway to Mamalahoa Highway. Additional emergency ramps may be installed, should more of these ramps be necessary.

5. *Scenic turnouts or rest stops should also be provided.*

   The Supplementary EIS will have a discussion regarding rest stops, which will include a diagram of possible locations for these facilities. We also agree that a rest stop is needed; however, there may be issues regarding the availability of adequate infrastructure and the concerns of the U.S. Army.

6. *When four (4) lanes are being proposed for Saddle Road, the proposed facility should be a divided highway.*

   We agree with this statement; however, we believe that this discussion is more likely to occur during the development of another project in the near future.

7. *Accentuate safety, and its use by bicyclists and commercial trucks, during your layout of the proposed grade of this highway.*

   The proposed maximum grade of this highway is 7 percent, which should be suitable for all travelers along this highway. One of the primary purposes of this project is to improve travel safety for all users, and the design of the highway will be reflective of this.

   In addition, the proposed minimum right-of-way width for this highway may be able to accommodate an adjacent facility in the event that recreational bicyclists or off-road enthusiasts also express an avid interest in traveling alongside this highway.

We trust that we have satisfactorily addressed your concerns and the concerns of the South Kohala Traffic Safety Committee, and we appreciate your continuing interest in our highway projects. If you have any other questions or comments, please contact Nelson Sagum, Project Manager, at (808) 587-1834.

Very truly yours,

BRENNON T. MORIOKA, Ph.D., P.E.
Director of Transportation

bc: HWY-PA

NS:dn

Aloha Ron,
Please include the material below in the record for the Saddle Rd. EIS. The Keamuku parcel where the road is intended to go is normally directly downwind of the PTA impact area and may be contaminated with radiation from uranium weapons training. Radiation has been confirmed at PTA on August 20, 2007.

The most serious health hazard involves the inhalation of uranium oxide particles.

I'll include comments by Dr. Lorrin Pang, MD of Maui who I recommend as a consultant on the medical effects issue. He has given me permission to circulate his comments about the military's position on radiation. Lorrin Pang is highly critical of the military and the Hawaii State Dept. of Health not addressing the serious issue of uranium oxide.

Jim Albertini
Malu `Aina Center For Non-violent Education & Action
P.O. Box AB
`Ola`a (Kurtistown), Hawaii 96760
Phone 808-966-7622
email ja@interpac.net
www.malu-aina.org

Comments by Dr. Lorrin Pang, MD January 19, 2008
I have offered to constructively contribute to this effort by joining the investigative committee but this was denied by the Gov. I can now only criticize what has transpired but will try to remain constructive.

It has repeatedly been the community request that a survey be done which will detect markers for all forms of uranium weaponry, both Davey Crocketts(ballast) and penetrators (ballistic, as Army defines). It has always been pointed out that the ballistic type are far more dangerous - releasing far traveling plumes of oxides and nano-particles, which become inhaled then very slowly cleared from the body with a distinct type of distribution (macrophage/lymphatic system). Nano toxicity remains unknown. In contrast the ballast forms released metallic U shrapnel of limited migration, risk of inhalation, with rapid clearance (unless permanently imbedded shrapnel) and more of a blood borne distribution in the body.

Initially the Army said they knew of AT LEAST ballast weaponry but now their latest brochure (Information Booklet - Depleted Uranium in Hawaii, no date but distributed at the JUan 2008 Hawaii legislative meeting) implies that they ONLY address ballast, page 12.. I am rather disappointed that the Army is not willing to address the more dangerous from of U radiation based on the "best of their knowledge" which initially proved incorrect with even ballast usage. A good (epidemiologic and statistically sound) survey for ballistic markers (oxides) at ballistic distances would go a long way to appease the critics. Is this intended in the final report (item 4 page 10)? Many of the brochure's claims about minimal migration of U contamination, heavier non migrating particles, claims of safety based on extrapolation from other U experiences, detection at points far from the target zones, etc. etc seem erroneous until it is pointed out near the end of the brochure they only address ballast weaponry (page 12 last item). That only ballast weaponry is addressed should be in the title of the brochure. The justification for this limited search should be on page 2 - as it is contrary to Army policy for procedures to survey for contamination (which is based on survey rather than the more fallible historical knowledge).

Even IF only ballast weaponry was used - the decades' subsequent conventional explosives used on the target sites could have rendered the initially ballast forms of U airborne with conversion to the more dangerous plumes and oxides.

The public should only be satisfied with comprehensive surveys which will include the search for U Oxides contamination and at distances beyond conventional ballast scattering. The dust samples form the particulate survey could be used for that. If oxides or evidence of extensive migration of ANY U compounds are found, regardless of the pruported source, one must set the objective of the survey as one of contamination (comparison to control sites, IAW Army regulation) rather than health threshold set by the NRC (since these may not be extrapolable to nano U or U oxide toxicity).

Some to the responses to public concerns are misleading and unscientific - for example page 10 item 5: If there is a questions of the high reading one should question the specificity (possibility of false positive) instead the Army makes the argument that the detectors aro insensitive (false negatives). For a high reading the correct response should have been to see if the reading could be repeated at the same site with more sensitive equipment and greater statistical sensitivity. Community volunteers perfomed this at the Kona site with tens of thousands of air samples (counts or decays per minute, CPM readings) using the best detectors available to them. At my own expense and as a private citizen I presented on the Big Island a written analysis with statistical interpretation to the public, Sen Inouye's representative and the media (Army and DOH were invited, though not personally by me, but did not attend). Most importantly I answered questions from the public on the spot (in contrast to the recent legislative hearing). The results were reassuring. There is an Army/DOH claim that repeated sampling was done with sophisticated equipment. We have repeatedly asked for details to examine analysis (for example, means vs frequencies of CPM data), statistical power and scheme to insure sensitive (for example wind/dust conditions) sampling sites. To date this has not been made availabe to the public, hopefully it will be presented in the final report. We seem to always be arguing that it would be wrong to only run the analysis on means. As cited above this would base the risk on the NRC recommendations for health risks based largely on non oxide U forms from other situations. But of course if one chooses to ignore the U oxides based on the presumption that only ballast forms were used then we have a self fulfilling "confirmation" of safety. The argument that General Lee was so concerned seems a bit odd. No one from the Army attended my presentation of the community survey which I presented in Hilo. He would have been happy with my conclusions and could have presented his survey methods and results at the same time. Maybe we might have disagreed on how to proceed, maybe not.

To me it seems very strange that all the collaborators (especially the CDC and NRC) would not have raised the above concerns with the brochure.

Again I offered to collaborate up front but was denied this. As I understand it Sec Davis was willing but not Gov Lingle thought there was enough expertise elsewhere. Allow me at least this constructive criticism before the final report, as I too am a land owner (small vacant plot) on the Big Island. Finally, I am a stakeholder with no conflict of interest who is trying to uphold federal regulations of safety. I have been warned by colleagues to "watch my back" that I am a "marked" man but have told them that whistle blower laws protect me against retaliation. I have confidence in Sec Davis on this point.

Lorrin Pang, MD, MPH
(as private citizen)
Retired Army Medical Corp
Best Doctors of America list 2006-8
Consultant WHO (since 1985)
Consultant Glaxo Smith Kline

Below are comments by Jim Albertini and dialogue with Russ Takata of the Hawaii Dept. of Health.
Jim,

Russ,
Mahalo for your answers.
The truth is you don't have the facts. You do not know how much DU has been used at PTA.
You do not have comprehensive monitoring data.
Show us the data about no radioactivity above background levels. How many readings did you take, for what time frame, and where, under what wind conditions. We have obtained 75 counts per minute (3-4 times background levels) at Mauna Kea State park on May 29, 2007 with dust devils coming right off the PTA impact area. Normally you will get background level readings. Averaging won't cut it. **It is the spikes that concerns us. All that it takes are small particles, carried by the winds, of inhalled DU to cause health problems. That's why we need 360 degress monitoring around PTA with a paper trail and the data available to citizens via home computers. Put the heat on Dan Inouye to come up with the funding for first class monitoring of the military radiation contamination on our Island home. Then we'll have the facts.**

Mahalo.
Jim Albertini
Malu `Aina Center For Non-violent Education & Action
P.O. Box AB
`Ola`a (Kurtistown), Hawaii 96760
Phone 808-966-7622
email ja@interpac.net
www.malu-aina.org
----- Original Message -----
From: Takata, Russell S.
To: Jim Albertini ; imcom-pacific-du@hawaii.army.mil
Cc: Faye Hanohano ; Dwight Takamine ; Cindy Evans ; Robert N. Herkes ; Jerry L. Chang ; Russell S. Kokubun ; Lorrainne R. Inouye ; Harry Kim ; Alan McNarie ; PCRC ; A P ; advertiser ; Garden Ise ; Garden Island ; Hawaii Island Journal ; Hilo Trib ; Hono Weekly ; Honolulu Star-Bulletin ; Ian Lind ; KBOO ; Kevin Dayton ; kgmb tv9 ; khnl tv8 ; KPUA ; Maui news ; namaka@interpac.net ; Rod Thompson ; Audrey McAvoy ; WestHawaii Today ; Honolulu Advertiser ; Pacific Business News ; j Yoshimoto ; Brenda Ford ; Emily Naeole ; Dominic Yagong ; Bob Jacobson ; Angel Pilago ; Donald Ikeda ; Pete Hoffmann ; Stacy K. Higa ; Andy Levin ; Janet Snyder ; Barbara Bell ; Nelson Ho ; Chris Yuen ; Charmaine Shigemura
Sent: Wednesday, January 16, 2008 1:43 PM
Subject: RE: No answers to DU questions

Jim,
Here are my answers: See below in blue.
Russ

From: Jim Albertini [mailto:ja@interpac.net]
Sent: Wed 1/16/2008 12:06 PM
To: Takata, Russell S.; imcom-pacific-du@hawaii.army.mil
Cc: Faye Hanohano; Dwight Takamine; Cindy Evans; Robert N. Herkes; Jerry L. Chang; Russell S. Kokubun; Lorrainne R. Inouye; Harry Kim; Alan McNarie; PCRC; A P; advertiser; Garden Ise; Garden Island; Hawaii Island Journal; Hilo Trib; Hono Weekly; Honolulu Star-Bulletin; Ian Lind; KBOO; Kevin Dayton; kgmb tv9; khnl tv8; KPUA; Maui news; namaka@interpac.net; Rod Thompson; Audrey McAvoy; WestHawaii Today; Honolulu Advertiser; Pacific Business News; j Yoshimoto; Brenda Ford; Emily Naeole; Dominic Yagong; Bob Jacobson; Angel Pilago; Donald Ikeda; Pete Hoffmann; Stacy K. Higa; Andy Levin; Janet Snyder; Barbara Bell; Nelson Ho; Chris Yuen; Charmaine Shigemura
Subject: No answers to DU questions

It's been nearly two months since these questions were presented Nov. 18, 2007 to Army Col. Killian, DOH Russ Takata, Cindy Evans, etc. No answers. How come?

Questions for Meetings on Depleted Uranium Nov. 2007

STATE ONLY ANSWERS

1. Why have you (State & military) refused balanced forums with presenters including Dr. Lorrin Pang, MD, Peace activist Jim Albertini and others?

I will not debate the facts.

2. You have downplayed the health hazards of DU. Isn't that misleading the public?

No, I have not downplayed the health effects. In fact, health effects were covered in my Powerpoint presentation.

3. Where is the data to support your claims minimizing DU health risks?

No evidence of radioactivity above background levels.

4. Did any DU particles on-the-ground become airborne and blow off-base on Oct. 23, 2007 when several 2000-pound bombs were dropped on Pohakuloa (PTA) by B-2 bombers.

There has been no change in background levels in populated areas outside of PTA.

5. Disclose all live-fire weapons and number of rounds fired at PTA, and other training there since DU has been confirmed at PTA on Aug. 20, 2007.

Army

6. Isn't it time we start operating on the precautionary principle. Stop all live-fire at PTA for the following reasons: 1. we have a reasonable suspicion of harm from the possible spread of DU particles; 2. there is uncertainty about the full extent and nature of the DU contamination at PTA; 3. we have a duty to take action to prevent harm to human health and the environment; 4 the cause and effect relationships are not fully known and established scientifically concerning DU.

There has been no radioactivity over normal background levels.

7. Is Army Regulation 700-48 being violated? AR 700-48 ...2-4 Handling of RCE (radiologically contaminated equipment)...During peacetime or soon as operational risk permits, the Corps/JTF/Division Commander's RSP (Radiation Safety Officer) will identify, segregate, isolate, secure, and label all RCE. **Procedures to minimize the spread of radioactivity will be implemented as soon as possible.**

Army

8. Is there any use of DU (past, present, and/or planned) and/ or other activities such as Stryker training at Pohakuloa that could result in the spread of aerosolized DU, and/or DU compounds?

Army

9. Summarize the results of research -past, present and/or planned - on health risks from 1. live munitions exploding on top of DU left on the ground in Hawaii, during forty years of training; 2. vaporized and/or aerosolized DU; 3. DU nanotoxicity. Nanoparticles of a substance may have properties different from those of the original substance, such as becoming toxins or super-catalysts; 4. DU oxides which are insoluble and so are not excreted from the body.

Army

10. Describe past, present, and/or planned use of radioactive substances at PTA.

Army

11. Large areas of PTA and Makua are off-limits because of ICM)Improved Conventional Munitions) which are cluster bombs. Some type of cluster bombs such as ADAM (Area Denial Anti-personnel Mine) contain DU. Is there any use (past, present, and/or planned) at PTA and/or Makua of cluster bombs containing DU

Army

12. The Davy Crockett spotting rounds containing DU used at PTA was one of approximately 60 different nuclear weapons in the U.S. nuclear arsenal during the 1960s and 70s. Have other spotting rounds involving other weapon systems been used at PTA that contain DU? News reports (7/4/07 Big Is. Weekly, p.5) said 714 Davy Crockett DU spotting rounds were shipped to Hawaii. How many remain unaccounted for? Where else have DU Davy Crockett spotting rounds been shipped around the U.S. and outside of the U.S? Identify the sites and the numbers shipped.

Army

13. Will the military pay for 24 hour mass spectrometer independent testing for DU exposure for military and civilian personnel, and/or private contractors at PTA, Schofield, and civilians around such bases who believe they may have been exposed?

Army

14. Have tree bark, animal droppings, and vehicle air filters been tested for DU presence at PTA?

Not by State

15. Why did the Army deny the use of DU in Hawaii for years? Why did the Army fail to publicize the 2005 discovery of DU at Schofield until after citizen groups made the facts known?

Army

16. If State incursion on Federal property is illegal how is it the State is involved in ongoing DU testing?

The State was invited by the Army to participate in activities to obtain a human health risk assessment. The State is not independently conducting DU testing on military property.

17. If the State, CDC, NRC and Army disagree on what should be told to the public, will one party be allowed to speak independently?

The State speaks independently.

Military Clean-Up NOT Build Up!

Contact: Malu `Aina Center For Non-violent Education & Action P.O. Box AB Ola`a (Kurtistown), Hawai`i 96760. Phone (808) 966-7622. Email ja@interpac.net <mailto:ja@interpac.net> http://www.malu-aina.org

"Assuming the machinery is accurate and that the sampling site is truly down wind of the traget site, how many samples (CPM or DPM) will be done? The sampling number should be based on the statistical power to detect the frequency of high CPM above some threshold (say 2 SD's above the mean of background). That frequency based on what Jim first saw in Waikii (4/500) would be quite a bit smaller than 1%. To use the means of CPM is misleading if a one time inhalation exposure is not cleared from the body for such a long time (U oxides with 5 half lives approx several decades) and if the distribution in the body is fixed to a few selected cells."

Lorrin Pang, MD

----- Original Message -----
From: Jim Albertini
To: Takata, Russell S.
Cc: Bob Jacobson ; Clifton Tsuji ; congresswomanmaziehirono@congressionalemaildispatcher.com ; Harry Kim ; Josh Green ; Cindy Evans ; Alan McNarie ; PCRC ; A P ; advertiser ; Garden Ise ; Garden Island ; Hawaii Island Journal ; Hilo Trib ; Hono Weekly ; Honolulu Star-Bulletin ; Ian Lind ; KBOO ; Kevin Dayton ; kgmb tv9 ; khnl tv8 ; KPUA ; Maui news ; namaka@interpac.net ; Bod Thompson ; Audrey McAvoy ; WestHawaii Today ; Honolulu Advertiser ; Pacific Business News ; shannon rudolph ; Dr. Lorrin Pang
Sent: Wednesday, January 16, 2008 11:00 PM
Subject: Re: Action on DU

Russ,
We are not dealing with radiation from a nuclear blast of cold war nuclear weapon testing. DU is much more sinister. It is the inhalation of small DU oxide particles that is of greatest concern. Alpha particles breathed in, not external exposure. You just can't go around and check for an hour here and there and conclude nothing above background therefore PTA can continue business as usual with DU contamination present.
We know the DU is there. We do not know the full extent of the contamination. Likely there are hundreds of Davy Crockette spotting rounds given what was shipped to Hawaii and perhaps other DU rounds as well. The only way to tell if it is going off base (and we have readings to suggest it is) is to encircle the base with high tech 24/7 air monitors with a paper trail and citizen computer access to the data at all times. Otherwise we simply are not going to buy your claims, and the

military claims, of no problem. The cost of such monitors is peanuts to the **$2 billion the military spends PER DAY! waging war and spreading opala like they're doing at PTA.**
The scientific reason for you to pursue cessation of activity at PTA is the DU present could be spread off base by live-fire, and other activities that puts dust into the air. We have already sent you material by radiation expert Dr. Rosalie Bertell strongly critiquing the Army's 6 page DU November 2007 handout. We also sent you material by Dr. Leonard Dietz and DU being carried more than 26 miles from a plant that simply manufactured 30-mm DU rounds near Albany, N.Y. That plant has been shut down because it exceeded a NY state radioactivity limit of 150 microcuries (387 g of DU metal) for airborne emissions in a given month. One DU aircraft 30-mm round contains 272 g of DU metal. By the way, what is Hawaii's radioactivity limit for airborne emissions in a given month? Is there a federal standard as well?

You have plenty of scientific material to call for a halt to B-2 bombing at PTA and the upcoming major live-fire in February 2008.
From the Dept. of the Army, sadly, we expect very little. From the Dept. of HEALTH, we expect more.
Mahalo.
Jim Albertini
Malu `Aina Center For Non-violent Education & Action
P.O. Box AB
`Ola`a (Kurtistown), Hawaii 96760
Phone 808-966-7622
email ja@interpac.net
www.malu-aina.org

----- Original Message -----
From: Takata, Russell S. [illegible]
To: Jim Albertini
Cc: Bob Jacobson ; Clifton Tsuji ; congresswomanmaziehirono@congressionalemaildispatcher.com ; Harry Kim ; Josh Green ; Cindy Evans ; Alan McNarie ; PCRC ; A P ; advertiser ; Garden Ise ; Garden Island ; Hawaii Island Journal ; Hilo Trib ; Hono Weekly ; Honolulu Star-Bulletin ; Ian Lind ; KBOO ; Kevin Dayton ; kgmb tv9 ; khnl tv8 ; KPUA ; Maui news ; namaka@interpac.net ; Rod Thompson ; Audrey McAvoy ; WestHawaii Today ; Honolulu Advertiser ; Pacific Business News
Sent: Wednesday, January 16, 2008 12:58 PM
Subject: RE: Action on DU

Jim,
Too little? This monitoring system provided key data to the Environmental Radiation Ambient Monitoring System for most of the Cold War period! You have no idea of the requisite actions necessary to ensure the public's health and safety. But, I will ignore your comment and continue to pursue my efforts to seek the facts for public health and safety.

The bottom line is that there has been no radioactivity detected above background levels in our ambient surveys of the adjacent proximity of PTA on Saddle Road and the communities in Konawaena, Kealakekua, Holualua, Waikoloa, Waikii Ranch, and the Girl Scout camp! As a matter of fact, the background is quite low. And therefore, there is no scientific reason for me to pursue cessation of activity at PTA.

As I noted in earlier conversations with you, I will give you the facts and will not compromise my integrity for anyone.

Have a good day,
Russ

From: Jim Albertini [mailto:ja@interpac.net]
Sent: Wed 1/16/2008 11:56 AM
To: Takata, Russell S.
Cc: Bob Jacobson; Clifton Tsuji; congresswomanmaziehirono@congressionalemaildispatcher.com; Harry Kim; Josh Green; Cindy Evans; Alan McNarie; PCRC; A P; advertiser; Garden Ise; Garden Island; Hawaii Island Journal; Hilo Trib; Hono Weekly; Honolulu Star-Bulletin; Ian Lind; KBOO; Kevin Dayton; kgmb tv9; khnl tv8; KPUA; Maui news; namaka@interpac.net; Rod Thompson; Audrey McAvoy; WestHawaii Today; Honolulu Advertiser; Pacific Business News
Subject: Re: Action on DU

Aloha Russ,
My initial reaction to your news of an initial air monitoring is that it's something but too little. We citizens, with our own community experts, want in on the decision making process. We want timely access to all the data as well. The key thing at the moment is to STOP all activity at PTA (B-2 bombing and major live-fire planned for Feb.) and other places that could spread the radioactivity before a compolete assessment is completed. You only know that Davy Crockette DU spottings rounds are at PTA. You have no idea if other DU rounds are there and how many. You, and elected officials need to speak out on this to the media if you want to maintain any credibility in the community. Otherwise health and safety of the community is taking a back seat to imperial warmaking. Is there any meaning left to "national security?"
Jim Albertini
Malu `Aina Center For Non-violent Education & Action
P.O. Box AB
`Ola`a (Kurtistown), Hawaii 96760
Phone 808-966-7622
email ja@interpac.net
www.malu-aina.org
----- Original Message -----
From: Takata, Russell S.
To: Jim Albertini
Cc: Bob Jacobson ; Clifton Tsuji ; congresswomanmaziehirono@congressionalemaildispatcher.com ; Harry Kim ; Josh Green ; Cindy Evans
Sent: Wednesday, January 16, 2008 7:56 AM
Subject: RE: Action on DU

Jim,
Happy New Year to you too.
I have made arrangements with EPA to start initial air monitoring using a well validated protocol and monitor for ambient levels. We will shake down the equipment and procedures, identify an initial site, and begin operating within thirty days. More later.
Russ

From: Jim Albertini [mailto:ja@interpac.net]
Sent: Tue 1/15/2008 9:31 PM
To: Takata, Russell S.
Cc: Bob Jacobson; Clifton Tsuji; congresswomanmaziehirono@congressionalemaildispatcher.com; Harry Kim; Josh Green; Cindy Evans
Subject: Action on DU

Aloha Russ,
Happy New Year to you. Below is a copy of a recent email I sent to Col. Killian.

I hereby request you contact U.S. Sen. Dan Inouye and seek funding for first class citizen high tech DU monitors around all confirmed or suspected bases where DU has been used in Hawaii. Afterall, billions are spent on the war and military build up in Hawaii. A few million should be available for monitors. If my math is correct it costs $135,000 in fuel for a B-2 bomber to fly from Guam to Hawaii to drop 2000 lb bombs at PTA risking the spread of DU contamination. Just stopping a few of those bombing flights would help pay for some monitors.

Russ, we want some positive action. Stop the live fire military plans for Feb. at PTA. You and the Army do not even know the full extent of the DU contamination at PTA. To go forward with live-fire is nuts and shows contempt for the health and safety of the troops who will train there and the citizens of this island. You need to speak up and stand up now for public health now.
Mahalo.

Jim Albertini
Malu `Aina Center For Non-violent Education & Action
P.O. Box AB
`Ola`a (Kurtistown), Hawaii 96760
Phone 808-966-7622
email ja@interpac.net
www.malu-aina.org

Aloha Col. Killian:
This is to again put in writing our organization's "Citizen DU Action Demands" that were circulated after the confirmation of DU at Pohakuloa in Aug. 2007 and again presented to you and State DOH employee Russ Takata at the one sided Nov. 18, 2007 meeting on DU. (See below).
I also want to again request a response in writing to the questions I submitted at the Nov. 18, 2007 meeting on DU. To date I have not received any response. You give lip service to concerns for health and safety but your actions and lack of actions speak otherwise.
I look forward to a more positive attitude from you and other military people toward the citizens of Hawaii in 2008.

Jim Albertini
Malu `Aina Center For Non-violent Education & Action
P.O. Box AB
`Ola`a (Kurtistown), Hawaii 96760
Phone 808-966-7622
email ja@interpac.net
www.malu-aina.org

RADIATION MONITORING IN HAWAII!

On Monday, August 20, 2007 the U.S. Army confirmed the presence of depleted uranium (DU) at the Pohakuloa Training Area (PTA) in the center of Hawaii Island.

See <http://www.armytimes.com/news/2007/08/ap_hawaiiuranium_070821/> The DU confirmation came after years of the military denying its presence. Citizen groups kept the pressure on the military and began doing their own radiation monitoring.

Also see http://www.hawaiitribune-herald.com/articles/2007/08/26/local_news/local03.prt
<http://www.hawaiitribune-herald.com/articles/2007/08/26/local_news/local03.prt>
<http://www.hawaiitribune-herald.com/articles/2007/08/26/local_news/local04.prt>

DU is primarily U-238, the isotope of uranium that remains after the fissionable isotope, U-235 has been extracted from natural urarium ore. DU has a half-life of 4.5 billion years. The military has used DU in spotting rounds for the Davy Crockett nuclear weapon system and these spotting rounds have been fired at Schofield Barracks on Oahu and at PTA on Hawaii Island, perhaps other firing ranges in Hawaii and elsewhere too. Other DU spotting rounds may have been fired. Davy Crockett was just one of approximately 60 different kinds of U.S. nuclear weapons in the U.S. arsenal Training with a wide range of weapon systems has taken place at PTA and other live-fire areas throughout Hawaii. The Davy Crockett may just be the tip of a much larger radiation nightmare for Hawaii residents and visitors alike The military says it has no records on the issue. The U.S. used DU armor and bunker piercing weapons in Iraq, Afghanistan and Kosovo. For more on DU weapons and its hazards

See <http://www.informationclearinghouse.info/article18242.htm>

On Tuesday, May 29, 2007 a citizen radiation monitor recorded elevated radiation readings at Mauna Kea State Park adjacent to the military's Pohakuloa Training Area (PTA) in the center of Hawaii Island. The wind on 5/29 blew directly off the live-fire training areas at PTA and dust devils of suspended topsoil were visible in the air. The elevated radiation readings were as high as 75 counts per minute when normal background is 5-20 counts per minute. A number of private citizens are now doing radiation monitoring on Hawaii Island.

It should be noted that Hawaii Island already has a dubious distinction of the nuclear age. According to the U.S. Atomic Energy Commission, of 65 randomly selected worldwide soil samples tested for accumulation of long-lasting plutonium radiation contamination from atmospheric nuclear weapon testing, our Big Island soil ranked NUMBER ONE! Plutonium is one of the most potent carcinogenic substances known. Less than one-millionth of a gram is capable of producing cancer after close exposure. Plutonium has a half-life of 24,000 years, which means it is potentially toxic to humans for at least a half million years. As plutonium is concentrated in the ecological food chain, people can absorb significant quantities. It is preferentially stored in the liver and bone marrow and can cross the placenta into the unborn fetus. (To read the above AEC report see Nature Magazine, Vol. 241, February 16, 1973.)

It should also be noted that the Navy acknowledges discharging millions of gallons of radioactive liquid waste into Pearl Harbor on Oahu and dumping over two thousand 55-gallon steel drums of radioactive solid waste on the ocean floor off Hawaii's shores. What effects such pollution may have on marine life and, in turn, the health and safety of Hawaii's people is simply not clear. But it is commonly accepted that there is no safe level of radiation. (See the book "The Dark Side of Paradise" by Albertini, et. all page 18.)

Military Clean-Up NOT Build-Up!

CITIZEN ACTION DEMANDS

1. Immediate halt to all live-fire and any activity that creates dust at Schofield Barracks, Pohakuloa and other military ranges in Hawaii until there is a complete assessment and clean up of the DU present. Further live-fire and other activities could result in the spread of airborne DU particles which are particularly hazardous if inhaled.

2. Citizen monitors, including Dr. Lorrin Pang MD, former attorney, OHA trustee, and nuclear worker Clarence Ku Ching, and Jim Albertini or some other representative from the peace movement to be involved in the DU assessment and monitoring process to assure transparency and community confidence.

3. The establishment of permanent, continuous, high tech counts per minute (cpm) monitors (at the Army's expense) but independently operated around range impact area where the real-time data is available to the public on line.

4. Testing (at Army expense) for DU exposure of PTA and other military personnel, and members of the civilian community who feel they may have been exposed to DU. (The U.S. is spending $2 billion a day on the military.

There should be funds available to see if citizens are being contaminated by its own radioactive weapons.)

5. Ongoing public balanced informational and Q & A meetings involving the Army, State Dept. of Health, Nuclear Regulatory Commission (NRC), the Center for Disease Control (CDC), Dr. Lorrin Pang and other community resource people.

LINDA LINGLE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

BRENNON T. MORIOKA
DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI

IN REPLY REFER TO:

HWY-PA
2.7506

April 7, 2008

Mr. Jim Albertini
Malu 'Aina Center for Non-Violent Education & Action
P. O. Box AB
Kurtistown, Hawaii 96760

Dear Mr. Albertini:

Subject: Saddle Road (State Route 200)
Mamalahoa Highway (State Route 190) to Milepost 42
Supplemental EIS Preparation Notice (EISPN)

Thank you for your e-mail/commentary, as addressed to Mr. Ron Terry, our project subconsultant, regarding the existence of depleted uranium (DU) in the Pohakuloa Training Area (PTA), of the U.S. Army.

For your information, the State Department of Transportation also has several questions regarding the DU, and consequently, we have initiated an independent study which would develop a risk assessment regarding the adverse effects of the DU, that may occur as a consequence of the construction and operation of the proposed Saddle Road. All of our studies will be included in the Supplemental Environmental Impact Statement (EIS) for this project.

In addition, your comments have been forwarded to our environmental and risk assessment subconsultants, who will evaluate them during the preparation of their studies for the project's Supplemental EIS. We believe that most of your comments will also be included in the Supplemental EIS.

We appreciate your attendance and the participation of your organization at our meeting with Mr. Terry in January 2008. If you have any questions or comments concerning this project, please contact Nelson Sagum, Project Manager, at (808) 587-1834.

Very truly yours,

BRENNON T. MORIOKA, Ph.D., P.E.
Director of Transportation

bc: HWY-PA
NS:dn

SADDLE ROAD (STATE ROUTE 200)
Mamalahoa Highway (State Route 190) to Milepost 41
County of Hawai‘i, State of Hawai‘i
FHWA Project No. 200(00)

SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

Submitted Pursuant to Section 42 U.S.C. 4332(2)(c)
and Chapter 343, Hawai‘i Revised Statutes by the

U.S. DEPARTMENT OF TRANSPORTATION
Federal Highway Administration (FHWA)
Central Federal Lands Highway Division
and
STATE OF HAWAI‘I
Department of Transportation (HDOT)
Highways Division

Cooperating Agencies
U.S. Army Garrison, Hawai‘i

Appendix A
Public Involvement and Agency Coordination
A3: 9/6/09 Letter, U.S. Army Garrison to HDOT

[This page intentionally left blank]

DIR 1497

DEPARTMENT OF THE ARMY
HEADQUARTERS, UNITED STATES ARMY GARRISON, HAWAII
SCHOFIELD BARRACKS, HAWAII 96857-5000

REPLY TO
ATTENTION OF

September 8, 2006

Office of the Garrison Commander

Mr. Rodney Haraga
Director, Department of Transportation
State of Hawaii
869 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Haraga:

The Federal Highway Administration (FHWA), Central Federal Lands Highway Division, in cooperation with the State of Hawaii Department of Transportation (HDOT) has proposed to improve Saddle Road (State Route 200 from Hilo to Mamalahoa Highway) on the Island of Hawaii (FHWA Project No. A-AD-6(1)). The proposed Section I of the realignment goes through the newly acquired "Keamuku Maneuver Area" which is part of the Army's Pohakuloa Training Area (PTA).

The US Army Garrison, Hawaii (USAG-HI) totally supports the Saddle Road Improvement Project in its entirety. The road will greatly benefit the local community by decreasing cross-island travel times and improving traffic safety. However, with the recent acquisition of the Keamuku Maneuver Area, the Army requests that FHWA/HDOT review the selection of route W-3 as preferred Saddle Road realignment alternative as identified in the Final Environmental Impact Statement (EIS), dated August 1999. This recommended realignment bisects the Keamuku Maneuver Area and divides the maneuver area into two sections. Maneuver trails would have to cross route W-3 at several grade separated underpasses that impose administrative restrictions during training exercises and severely impacts training realism.

To minimize the impact on training, the US Army is requesting that FHWA/HDOT consider a new route that runs along the southern boundary of the Keamuku Maneuver Area (see enclosed map). The intent of the proposed new route is not to adversely affect travel times or public safety. As in the earlier planning effort, the Army is willing to serve as a cooperating agency in the Supplemental EIS process.

In order to coordinate the connection of this new route with the HDOT's Saddle Road Extension Project (Queen Kaahumanu Highway to Mamalahoa Highway), please contact Mr. Michael Kumabe, Chief, Planning Division, Directorate of Public Works at 656-1410 ext. 1207. The US Army greatly appreciates your consideration of this request.

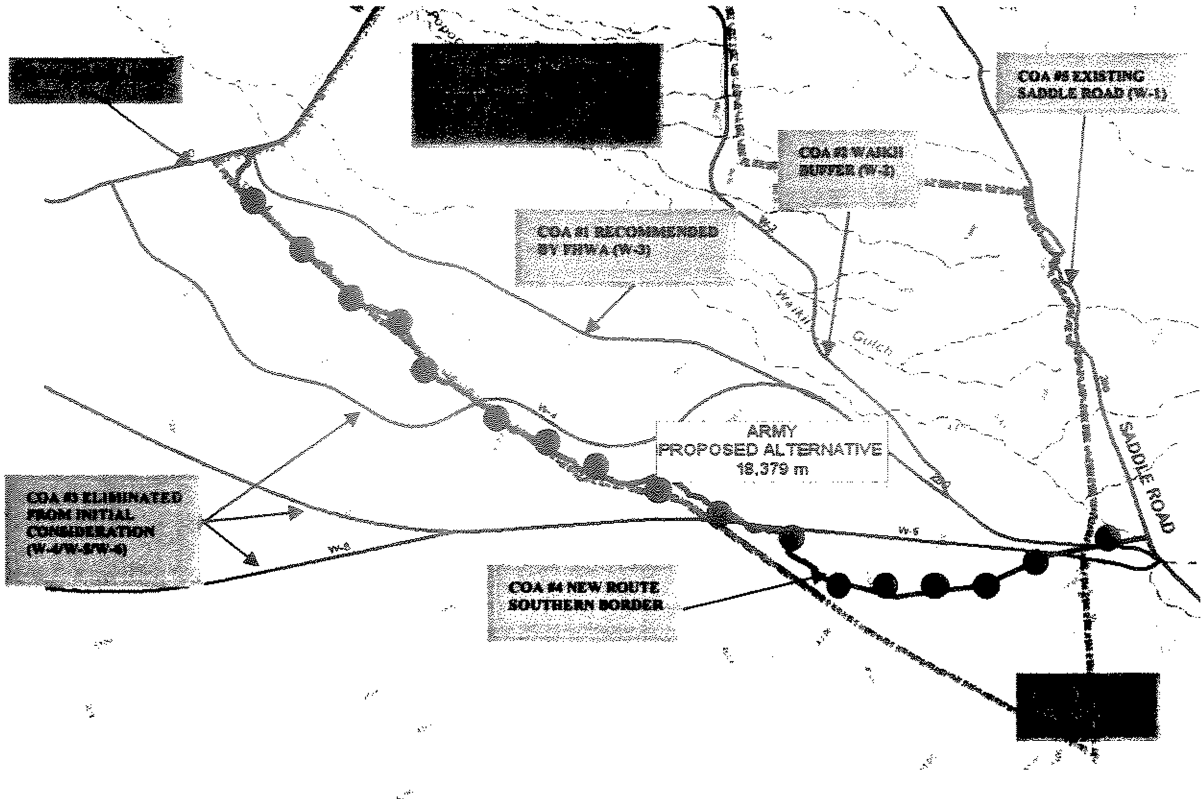
A similar letter is being sent to the co-proponent on this project: Ms. Clara H. Conner, Director, Program Administration, Central Federal Lands Highway Division, Federal Highway Administration, 12300 West Dakota Avenue, Lakewood, Colorado 80228-2683. A copy of both letters is being sent to Mr. Peter Cline, Highways for National Defense - Defense Access Roads Program, Military Surface Deployment and Distribution Command (SDDC), 720 Thimble Shoals Boulevard, Suite 130, Newport News, VA 23606-4537065011.

Sincerely,

Howard J. Killian
Colonel, US Army
Commanding

Enclosure

New Proposed Alignment



US Army's Proposed Alignment

[This page intentionally left blank]

SADDLE ROAD (STATE ROUTE 200)
Mamalahoa Highway (State Route 190) to Milepost 41
County of Hawai‘i, State of Hawai‘i
FHWA Project No. 200(00)

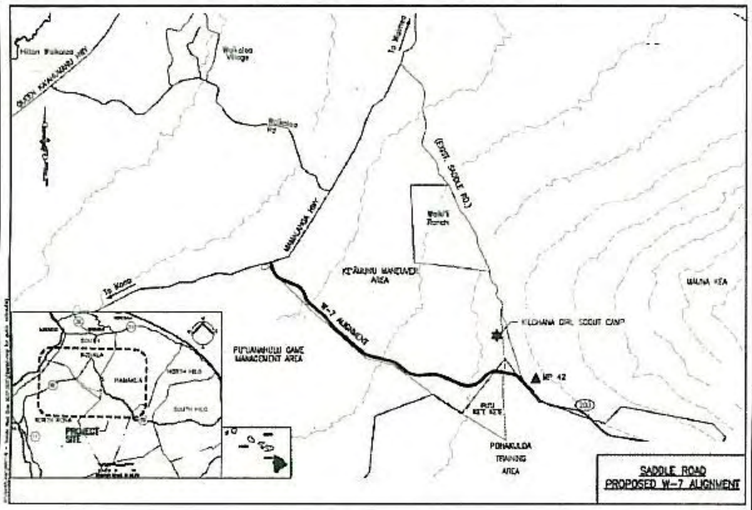
SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

Submitted Pursuant to Section 42 U.S.C. 4332(2)(c)
and Chapter 343, Hawai‘i Revised Statutes by the

U.S. DEPARTMENT OF TRANSPORTATION
Federal Highway Administration (FHWA)
Central Federal Lands Highway Division
and
STATE OF HAWAI‘I
Department of Transportation (HDOT)
Highways Division

Cooperating Agencies
U.S. Army Garrison, Hawai‘i

Appendix A
Public Involvement and Agency Coordination
A4: Public Hearing Notice Sample, Flyer, List of Places Flyer Posted



NOTICE

Notice is hereby given that the State Department of Transportation in cooperation with the Federal Highway Administration has scheduled two (2) public hearings for:

- December 9, 2009, at 5:00 PM, in Aunty Sally's Luau Hale, 799 Piilani Street, Hilo, Hawai'i; and,
- December 10, 2009, at 3:30 PM, in the Natural Energy Laboratory of Hawai'i' Authority, Gateway Energy Center, 73-4460 Queen Ka'ahumanu Highway, Kailua-Kona, Hawai'i

The purpose of these hearings involves the gathering of evidence and testimony relating to the realignment of Saddle Road (State Route 200), from Mamalahoa Highway (State Route 190) to Milepost 41 of Saddle Road, County of Hawai'i, State of Hawai'i, which primarily passes through the Ke'amuku parcel (TMK (3rd): 6-7-001:041). Relocated to the southern boundary of this parcel.

Interested persons will be heard particularly with reference to the social, economic and environmental impacts of the highway improvements being considered. The public hearing will also discuss the proposed highway realignment and its anticipated schedule for construction.

If you have any concerns or an active interest in this project, we urge you to attend and participate at one or both of these meetings. To request language interpretation or an auxiliary aid service (i.e., sign language interpreter, accessible parking, or materials in alternative format), contact Dina Lau at (808) 587-6307 (voice only) fourteen (14) days prior to the meeting dates. TTY users may use TRS to contact our office

Persons unable or desiring not to appear at the public hearing may file a signed statement presenting their views on this project. Such statements should be submitted up to and including January 7, 2010, and should be addressed to:

Mr. Ken Tatsuguchi
Head Planning Engineer
State of Hawai'i, Department of Transportation
Highways Division, Planning Branch
869 Punchbowl Street, Room 301
Honolulu, Hawai'i 96813.

or, by email, to: *Ken.Tatsuguchi@hawaii.gov*

Maps, drawings, and other pertinent information, including written comments received as a result of coordination with other governmental agencies, are available for public inspection and copying at the following location:

Hawai'i Department of Transportation
Highways Division
Planning Branch
869 Punchbowl Street, Room 301
Honolulu, Hawai'i

Notice is also given that the Draft Supplemental Environmental Impact Statement (SEIS) for the proposed Saddle Road (State Route 200) Mamalahoa Highway (State Route 190) to Milepost 41, County of Hawai'i, State of Hawai'i, is available for public review and copying at the following locations:

U.S. Department of Transportation
Federal Highway Administration
300 Ala Moana Boulevard, Room 301
Honolulu, Hawai'i

Hawai'i Department of Transportation
Highways Division
Planning Branch
869 Punchbowl Street, Room 301
Honolulu, Hawai'i

Hawai'i State Library (Main Branch)
Reference Desk
478 South King Street
Honolulu, Hawai'i

Hilo Public Library
300 Waianuenue Avenue
Hilo, Hawai'i

Kailua - Kona Public Library
75-138 Hualalai Road
Kailua- Kona, Hawai'i

New Alignment to Finish Saddle Road

Comment on the Alignment

See Maps of Where the Road Would End

The completion of the road would improve safety and will reduce travel time between Hilo and Kona by at least 30 minutes.

A Supplemental Environmental Impact Statement has been prepared. Your input on environmental impacts, project impacts, and proposed mitigation.

See www.saddleroad.com for more information or a copy of any project-related documents.

Please share your thoughts!

Public Hearings:

Hilo—Wednesday Dec. 9th, 5pm at Aunty Sally's Luau Hale

Kona—Thursday Dec. 10th 3:30pm at NELHA Gateway Center

Comment at the public hearings, or submit written comments to:

Mr. Ken Tatsuguchi
Hawaii DOT, Hwy Division, Planning Branch
869 Punchbowl Street, Room 301
Honolulu, HI 96813

Comments Must be Sent by January 7th, 2010

Saddle Road EIS Hearing Flyers Posted at Following Places/Business

Note: *BB (Bulletin Board)

Hilo/Keaau/Pahoa, Thursday 12/3/09

Hilo Rice Noodle	Kai Store BB	IHOP - Prince Kuhio Plaza
Big Island Built - Prince Kuhio Plaza	CD Wizard BB	Miranda Country Store BB
Magoo's Auto Parts BB	Leung's BB	Dino's Fishing & Tackle
Down to Earth	76 Gas Station on Kilauea Ave	Kope Kope
Cafe 100	New Star Restaurant	Affordable Catering
Punahele Bakery	Suzuki Motorcycle Deal	Lanky's Bakery
Island Naturals – Hilo	Pacific Music	Ina Signs
KTA downtown BB	Aloha Luigi's	Hilo Natural Foods
Kandi's Drive Inn	Ando Store	Wikiwiki - Ainaola
Country Club Store	76 Gas Station Kaumana	Blane's Drive Inn
Basically Books	Cronies	Wilson's by the Sea Shave Ice
Sunny's Gas Station	Bay Front Chevron	Cafe Pesto
Hawaiian Art	Verna's	General Store
Lava Rock Café	Hilo Lunch Shop	Hawaii Printing Corp.
J. Hara Store	Keaau Laundry	Ace Hardware -Keaau
Keaau Steak House	Alibi Bar	Ainaloa Community Center BB
+Prince Kuhio Plaza Digital Billboards		

+Three Electronic 52" vertical billboards rotated Flyer (full 20 sec.) every 3-4 minutes during mall hours from 12/3 to 12/11/09.

Mt.View/Volcano/Ka'u/HOVE/Kona, Sunday 12/6/09

Verna's Too	Mt. View Mini Mart	Mt. View Bakery
Mt. View Video	Hirano Store	Volcano Village Store
Volcano Wash & Dry	Volcano Golf Course	Volcano Golf Course Restaurant
Kame Gas Station	Pahala Mini Mart	Pahala Town Center BB
Pahala Café	Pahala Community Center	Ka'u Hospital
Punaluu Golf Course	Naalehu 78 Gas & Mini Mart	
Punaluu Bake Shop	Naalehu Ace Hardware	Naalehu Island Market
Hana Hou Restaurant	Shaka Restaurant & Bar	Wong Yuen's Store
Kau Outpost	Pohue Plaza Gift Shop	Spirit Gas Station- Ocean View
Movie Gallery	Malama Market	Desert Rock Cafe
Pohue Plaza BB	HOVE Bakery	Ocean View Pizzaria
Rancho Ace Hardware Center	Kahuku Country Market	Kahuku Coffee
Lava Tube Restaurant and Sports Bar	Fujihara Store	Higashi Store
Patel's Spirit Gas & Mini Mart	Keoki's Roadside Café	Big Jake's Island BBQ
Kona Seafood	Coffees N. Epicurea	Ege Store
Keke's	The Coffee Shack	Capt. Cook Video
Kealakekua Ranch Center BB	Senior Billy's Mexican Rest.	Manago Restaurant and Hotel
L & L Drive Inn	Aloha Gas & Mini Mart	Shiraki Dry Cleaners BB
Chevron Gas & Food Mart -Capt. Cook	Capt. Cook Mini Mart BB	Mi's Italian Bistro
State Auto Parts, Inc	Patz Pies	Mango Court BB
Island Naturals	KC Washerette	Sandy's Drive In
Oshima Store	Oshima Surf	Shell Gas & Mini Mart
Teshima's Restaurant	W.S. Hanato's Barber Shop	Aloha Gas Circus Shop'us
KTA –Keauhou	Rocky's Pizza	Sheraton Keauhou Resort
Keauhou Beach Resort	Banyan Mart	Kona Surf Liquor & Deli
Huggo's	Lulu's	Kava Bar
Tante's Restaurant	KTA-Kailua Kona	Denny's
Starbucks		

SADDLE ROAD (STATE ROUTE 200)
Mamalahoa Highway (State Route 190) to Milepost 41
County of Hawai'i, State of Hawai'i
FHWA Project No. 200(00)

SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

Submitted Pursuant to Section 42 U.S.C. 4332(2)(c)
and Chapter 343, Hawai'i Revised Statutes by the

U.S. DEPARTMENT OF TRANSPORTATION
Federal Highway Administration (FHWA)
Central Federal Lands Highway Division
and
STATE OF HAWAI'I
Department of Transportation (HDOT)
Highways Division

Cooperating Agencies
U.S. Army Garrison, Hawai'i

Appendix A
Public Involvement and Agency Coordination
A5: Agenda, Sign-In Sheets, & Transcripts of Public Hearings

[This page intentionally left blank]

Index for Comments to Draft EIS

Notes: Oral testimony in hearing transcripts in App. A5; letters, faxes or emails are contained in App. A6
In App. A5, separate page numbering for Hilo and Kona (H= Hilo page#; K-Kona page#).
Comment letter number is upper left corner on 1st page of each letter.
For those who provided only oral testimony, only FHWA response letter is contained in App. A6 and indexed here

Letter	App. A5	App. A6 Ltr Pg/FHWA reply Pg	
1	H32	1/30	Cory Harden, Sierra Club
2	H62	31/32	Patrick Kahawaiola‘a
3	H49	33/34	Kale Gumapac
4		36/37	Pete Lindsey, Hawai‘i Construction Laborers Union Local 368
5		38/39	Doreen Friberg
6		40/41	David Uhlmann
7		42/43	Peter Boucher, P.E.
8		44/45	S. Troute
9	H39	46/47	Jeffrey Melrose
10		48/49	Michael Dworsky
11	H44	50/52	Simbralynn Kanaka‘ole
12		54/55	Sally Miller
13		56 (see Ltr41)	Laura Dierenfield
14	K38	57/58	Tammy Harp
15		59/60	Isaac Harp
16		62/63	Susan Law
17		64/65	Tim Law
18		66/67	Tim Hershman
19		68/69	Merna Izawa
20		70/71	Takeo Izawa
21		72/73	Adam Jardine
22		74/75	Debbie Baker
23		76/77	Jon Kunimura
24		78/79	Peggy M. Ciriako
25		80/81	Margaret K. Masunaga
26		82/83	Marsha Boyle
27		84/85	Sheryl Henderson
28		86/87	John Buckstead
29		88/89	Steve Hurt
30		91/92	Phyllis Tarail
31		93/94	Tom Geballe
32		95/96	Roger Harris
33		97/101	U.S. Environmental Protection Agency, Region IX, Environmental Review Office
34		102/103	Edward Brown, Goodfellow
35		104/105	Hawai‘i Fire Department
36		106/107	Mark McGuffie, Director, Enterprise Honolulu
37		108/109	Hawai‘i County Police Department
38		111/112	Hartwell Aloha Kaeo
39		113/115	Robert Ward
40		117/118	U.S. Geological Survey, Pacific Island Water Science Center
41		119/121	Laura Dierenfield, People’s Advocacy for Trails Hawai‘i
42		123/124	Eugene H. Nishimura, Japanese Chamber of Commerce
43		125/126	Stephanie Nagata

Letter	App. A5	App. A6 Ltr Pg/FHWA reply Pg	
44		127/129	State Historic Preservation Division
45		130/133	Mike Price, Chair, South Kohala Traffic Safety Committee
46		134/135	Department of Business Economic Development & Tourism, Office of Hawaiian Strategic Industries
47		136/149	Department of Land and Natural Resources (Engineering Division, Land Division, Office of Coastal and Conservation Lands)
48		151/152	David Tarnas and M. Carolyn Stewart
49		153/154	Verne Wood, President, Puna Water Services Inc.
50		155/161	University of Hawaiʻi Environmental Center
51		164/165	University of Hawaiʻi at Hilo, Marketing/Alumni
52		166/169	Tom Lenchanko and Alika Poe Silva
53		170/172	Department of Business Economic Development & Tourism, Office of Planning
54		173/174	Aaron Stene
55		175/185	Michael Reimer
56		189/190	Representative Faye Hanohano, District 4
57		191/192	Department of Accounting and General Services
58	H4	193	Joel Tuck*
59	H4	194	Hugh Ono*
60	H4	195	Claudia Wilcox Boucher*
61	H24	199	Bill Davis, for Hawaiian Homes Commission, Chairman*
62	H25	197	County Council Vice-Chair Emily Naeole Beason
63	H27	198	Shalan Crysdale, The Nature Conservancy*
64	H28	199	Sharon Hettema*
65	H30	200	Galen Kelly*
66	H35	201	Jim Albertini, Malu ʻAina*
67	H38	202	Dean Au, Hawaiʻi Carpenters Union Local 745*
68	H40	203	Mary Begier, Hawaiʻi Isl. Chamber of Commerce*
69	H41	204	Michael Cadaoas* (H42)
70	H41	205	Deborah Ward, Sierra Club*
71	H47	206	Joseph Kualiʻi Camara
72	H51	208	Christian Rygh*
73	K2	210	Rodney Watanabe*
74	K3	211	Mel Ventura*
75	K3	212	Arnold Kanai*
76	K4, 35	213	Ken Melrose*
77	K5, 32	214	John Parazette*
78	K40	215	Diane Quitiquit*
79	K24	216	Rep. Denny Coffman, District 6*
80	K25	217	Michael Matsukawa*
81	K27	218	Walter Kunitake, Chair, Saddle Road Task Force*
82	K28	219	Norman Kaimuloa*
83	K32	220	Vivian Landrum, Kona-Kohala Chamber of Commerce* (K32)
84	K35	221	Robert Meierdiercks*
85	K37	222	James Boyle*
86		242	U.S. Fish and Wildlife Service

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 9, 2009
Aunty Sally's Luau Hale
799 Piilani Street
Hilo, Hawaii

AGENDA

I. OPENING REMARKS — *Mr. Jiro Sumada*

- A. Introductions
- B. Purpose of the Hearing

II. PRESENTATION

- A. History of the Project — *Mr. Dave Gedeon*
- B. W-7 Route and Characteristics — *Mr. Bruce Meyers*
- C. SEIS Findings — *Mr. Ron Terry*
- D. Schedule: SEIS, Design, and Construction — *Mr. Dave Gedeon*

III. FORMAL TESTIMONY PERIOD

IV. RECESS, 15-MIN.

V. RESPONSE TO WRITTEN QUESTIONS (if time permits) — *Mr. Jiro Sumada*

VI. ADJOURNMENT

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 10, 2009
National Energy Laboratory of Hawaii Authority
Gateway Energy Center
73-4460 Queen Ka'ahumanu Highway
Kailua-Kona, Hawaii

AGENDA

I. OPENING REMARKS — *Mr. Jiro Sumada*

A. Introductions

B. Purpose of the Hearing

II. PRESENTATION

A. History of the Project — *Mr. Dave Gedeon*

B. W-7 Route and Characteristics — *Mr. Bruce Meyers*

C. SEIS Findings — *Mr. Ron Terry*

D. Schedule: SEIS, Design, and Construction — *Mr. Dave Gedeon*

III. FORMAL TESTIMONY PERIOD

IV. RECESS, 15-MIN.

V. RESPONSE TO WRITTEN QUESTIONS (if time permits) — *Mr. Jiro Sumada*

VI. ADJOURNMENT

SADDLE ROAD

Mamalahoa Highway to Milepost 41
Island of Hawaii

Please Print

NAME	ORGANIZATION	ADDRESS	EMAIL	TELEPHONE
Steven Hunt	Big Island Bird Hunters	17-124 Palani st, Keaau, 96749		808 966-6190
Peter Bacher		1537 Kalote Pl. Hilo 96720	pbacher@hawaii.rr.com	981-0827
STEPHEN ARNETT		BOX 839 KEALAKEKUA		323-2282
Joel Nakamoto		1208 N. Kumuwama Pl Hilo 96720		987-8564
WARREN LEE	COH	Aupuni CTR	wlee@co.hawaii.hi.us	961-8324
Joseph Camara		192 Kualua Pl. Hilo	kualiic@hotmail.com	443-1229
Geoff Casburn		185 Lahaina St Hilo	cmf@hawaii.rr.com	961-9142
Julie Hugo		1405 Waianuenue		
Bill Moore		159 Halai St. Hilo	billmoore@hawaii.rr.com	
Chester A Rabowitz SR	COH	PO Box 91 Mt View Hi 96771		
James Kajimoto	COH	40 Ala Muku St. Hilo		
Tim Mason	C of H	17-210 Paalii St		315-8966

SADDLE ROAD

Mamalahoa Highway to Milepost 41
Island of Hawaii

Please Print

NAME	ORGANIZATION	ADDRESS	EMAIL	TELEPHONE
MIKE DWORSKY	C of HAWAII	108 RAILROAD AVE		961-8515
~~LEONARD BISEL~~	~~LEONARD BISEL ASSOC. LLC~~	~~1166 RYCROFT ST.~~	~~LBISEL@HAWAII.RR.COM~~	~~969-9533~~
Meredith Tanioka	Leonard Bisel Associates	14-D Makaala Street	mtanioka@hawaii.rr.com	969-9533
Stephanie Nagata		PO Box 1172 Volcano HI 96785	snagata@hawaiiantel.net	9876658
Claudia Wilcox Boucher	Hawaii Community College	Social Sciences 200 W Kawili St. Hilo 96720	claudiab@hawaii.edu	895-4457
Hugh H. Willocks	Willocks Const Corp	16-209 Melekahiwa Pl. Keaau 96749	hugh@willockshawaii.com	936-2371

SADDLE ROAD

Mamalahoa Highway to Milepost 41
Island of Hawaii

Please Print

NAME	ORGANIZATION	ADDRESS	EMAIL	TELEPHONE
Jeff Melrose	Island Planning	1405 Waianuenue Ave	jmelrose[illegible]@ hawaiiantel.net	989-8322
Nancy Wassman	Okahara Assoc.	PO Box 155, Laupahoehoe	nwassman@hawaii.rr.com	961-5527
Alan McNarie	Big Island Weekly	P.O. Box 180342, HNL HI 96718	amcnarie@yahoo.com	985-8882
Nelson Ho	Sierra Club		nhoihoku@gmail.com	
Mary Begier	HICC	101 Aupuni St #315	mary@marybegier.com	935073[illegible]
Edith Nomer		3051 Kaumana Dr	enomer@gmail.com	3155101
Tommy Adkins		3051 Kaumana Dr	TommyPAdkins@gm[illegible]	430 5071
Danny Li		HC 1 Box 5295	dlimay7@flex.com	982-7147
Donald Okahara	Okahara & Assoc.	200 Kohola St		9615527
Eugene Nishimura	Japanese Chamber	c/o 30 Kalakaua St.	eugene.nishimura@hnbhawaii.com	345 3[illegible]
W. Allen Reaves	FHWA			
BARRY TANIGUCHI	KTA SUPER STORES	50 E. PUAINAKO ST. HILO 96720	barry_taniguchi@ktasuperstores.com	959-2817
Michael T. Cadaocs	Hi. Carpenter #745	P.O. 908 Kurtistown 96760	mtcadaocs@hotmail.com	936-6981
Yen Wen Fang	Engineering Partners, Inc.	455 Lanikaula St. Hilo, HI 96720	yen@epihawaii.com	933-7900
Jacqui Hoover	HIEDB	117 Keawe St, Ste 107, Hilo HI 96720	jhoover@hiedb.org	935 2180
Bobby Lee	SSPM		bobbyleejr@hawaii.rr.com	
Deborah Ward	Sierra Club	P.O. Bx 918 Kurtistown 96760	dward@hawaii.edu	966-7361
VERNE WOOD	WATERWORKS	2405 KALANIANAOLE AVE HILO	hawaiianwater@gmail.com	

SADDLE ROAD

Mamalahoa Highway to Milepost 41
Island of Hawaii

Please Print

NAME	ORGANIZATION	ADDRESS	EMAIL	TELEPHONE
M. Tanaka	Self	131 Kupaa St Hilo		—
Miles Yoshioka	Hi Island Chamber of Comm.		admin@hicc.biz	935-7178
Allan R. Young	self	160 Lahi ST		935-5715
Randy Kurohara	COH R&D		rkurohara@co.hawaii.hi.us	961-8366
Bob Rechtman	Self	507A E. Lanikaula St Hilo 96720	bob@rechtmanconsulting.com	969-6066
Bob Alder	SELF	PO Box 10162, Hilo 96721	RLALDER@AOL.com	935-8606
Rob Gavel	Self	HCR2-9501 Keaau, HI 96749	redline808@hotmail.com	969 9353
Sharon Hettema	Self	360 Kauila St Apt 110, Hilo HI	None	961-0508
Judith D. Kaeo	SELF	222 Hoohua St. Hilo HI	—	—
Hartwell A. Kaeo	"	" "	—	—
Arnold T. Okamura	SRTF	212 Pohakulani St, Hilo	atokamura@hawaiiantel.net	959-8619
Patrick L. Kahawaiolaa	KCA	1260 ELAMA RD 96720		937-8217
Sandy	Kanaka Council.	HC2 Box 9607 Keaau.		982-9020
Keith Marrack	Edward Jones	1159 Hokulea Pl 96720	keith.marrack@edwardjones.com	935-1970
Jim Albertini	Malu Aina	PO Box AB Kurtistown 96760	ja@interpac.net	966-7622
Cory Harden	SIERRA CLUB	Box 1137 Hilo 96721	mh@interpac.net	968-8965
Allyson A. Bozilla	Self	222 Pua Ave	hono052688@yahoo.com	756-4917
Beth Dykstra	COH R&D	25 Aupuni St.	edykstra@co.hawaii.hi.us	961-8035

SADDLE ROAD

Mamalahoa Highway to Milepost 41
Island of Hawaii

Please Print

NAME	ORGANIZATION	ADDRESS	EMAIL	TELEPHONE
Raymond Benson				
Reginald David	Ranei Biological Consult, Inc	PO #1371 Kailua Kona HI	RDAVID@ILHAWAII	808-329-9141
Dean Takebayashi	DLNR-State Parks		DeanH.Takebayashi@hawaii.gov	974 6200
Robert Misajon	USAG-PTA		robert.misajon@us.army.mil	96-1945
Simbralynn Kanekaole	KHBCI Kuhio Council	P.O. Box 1599 Keaau HI	[illegible]@hotmail.com	966-4959
Hanna Aloka	KHO	PO BOX 6413 Kamuela 96743	wolhanna1@gmail.com	557-8397
STEVE YEE	SSFM INTL	99 AUPUNI ST #202 96720	SYEE@SSFM.COM	933-2727
SHALAN CRYSDALE	TNC	PoBox 11 NAALEHU 96772	SCRYSDALE@TNC.ORG	769 1135
Pete Lindsey	Laborer Union 368	749 Mililani St., Hilo, Hi. 96720		935-2809
MAKNAE PEREZ		50A Maile st, HILO HI 96720		631-9540
Donnalyn Kalei	Citizen	201 Hoohina St. Hilo 96720	johnsd@hawaii.edu	896-4015
Zachary Wilson	Citizen/UH Hilo	525 Kaahoui Street Hilo 96720	ztwilson@hawaii.edu	295-9416
Ray Schimpf		PO Box 1365 Pahoa		965 9412
Michael Kaneda	HPT	PO Box 6789 Hilo, HI	mikeshawaii@[illegible].com	960-6989
Carolyn Pulliam	citizen	346 Kapualani St		959-7218
Vanessa Hulihee		80 Pi'ilipua St Hilo HI		9759[illegible]572
David Uhlmann	Citizen	111 E Puainako St. STE 585 PMB 193 Hilo	uhlmann_david@yahoo.com	935-3599
Lanette Guerrero	HAWCC	PO Box 6945 Hilo HI 96720	lanetteg@hawaii.edu	935-5106

SADDLE ROAD

Mamalahoa Highway to Milepost 41
Island of Hawaii

Please Print

NAME	ORGANIZATION	ADDRESS	EMAIL	TELEPHONE
Miranda Schwartz	hcc	200 Kanoelehua Ave. # 288	amanda29@hawaii.edu	
Frank Alokoa	Hcc	PO Box 6413 Kamuela HI 96743	fsalokoa@gmail.com	
Tranquilino Pascual	Hcc POLS	P.O. Box 7569 Hilo HI, 96720	pascualt@hawaii.edu	
Gary Nishimura	HCC	1130 Mililani St.	GNishimura4@hotmail.com	—
Julian Kors	HCC	HC 3 Box 13019 Keaau HI 96749	Korsjulian@gmail.com	
Dwayne Mukai	SKTF	71 Wainohia St. Hilo	DANOPKIIE@GMAIL.COM	
Aaron Sugimoto	HCC	1034 Puku St. Hilo, HI 96720	aaronbs@hawaii.edu	
Sal Panem	HDOT	50 Makaala St.		
Christian Rygh		P.O. Box 10922 Hilo, HI 96721		
Edward Britton		3331 Kaumana Drive	ebritton@prodigy.net	808-631-9540
Jackie Johns				
Sally Miller	Malu Aina	282 Kukuau St. Unit C	—	808-934-7361
Galen Kelly	Self	Box 6121 Hilo 96720	—	[redacted]
Kale Gumapac	Kanaka Council Moku O Keawe	HC 2 Box 9607, Keaau 96749	kanakacouncil@gmail.com	982-9020
Grant Gerrish	OKAHARA + ASSOCS	PO Box 782 Laupahoehoe 96764		
Karen Pierce		2129 Kaiwiki Rd 96720		
Dean Pierce		" " " "		
John Bowles	Moku o Hawaii	16-184 Pilimua St 96749		

SADDLE ROAD

Mamalahoa Highway to Milepost 41
Island of Hawaii

Please Print

NAME	ORGANIZATION	ADDRESS	EMAIL	TELEPHONE
Bill Davis	DHHL	160 Baker Ave Hilo		[illegible]
Fay Cochran				
Jon Olson	SELF	13-631 Leilani Ave	Jon631@EARTHLINK	443-1036
Tom Cumming	SELF	11-2655 WAIMAKAOPELE	—	—
GLENN ESCOTT	SCS, INC.	PO Box 155 KEA'AU	ggescott@yahoo.com	938-0968
LEONARD TANAKA	T&T ELECTRIC, INC	456-A Kekuanaoa St Hilo	Ltanaka@tntelectric.com	935-9029 x14
Wesley Nagatori	Self	HCR1 Box 5712 Keaau, Hi		982-5744
Skylark Rossetti	HIEDB	117 Keawe St #107 Hilo	sky@hiedb.org	935-2180
Madeline Babs Keamo	HIEDB	117 Keawe St #107 Hilo	madeline@hiedb.org	935-2180
Peter Tui Silva	self	941 Pohakulani St. Hilo HI 96720	manua72@hotmail.com	333-5192
Kyle Hicks	HCC			
Doreen Friberg	SELF	270 Kaiulani St Hilo		961-5469
DR. P. FRIBERG	SELF	" " " "	friberg@jach.hawaii.edu	969-6522
Donna Madrid	Hawaii CC POLS	200 W. ~~Lanik~~ Kawili St.	dhkanek@hawaii.edu	933-0701
Peter K. Akoni	Hawaii CC POLS	273 Desha Ave Hilo Hi	Pakoni@Hawaii.edu	935-0727
Ruanne K Manuel	Hawaii CC Pols	PO Box 823 Volcano HI 96785	k9rumanu@gmail.com	217-5956
Douglas Zang	Self	1128 Kamehameha St. Hilo 96720	dzang@ssfm.com	933-2727
Austin Drake	SELF	PO Box 10201 Hilo, HI 96721	adrake@ssfm.com	933-2727

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 9-10, 2009

I wish to present my testimony on this project.

My name is: Bill Davis
Organization, if any: DHH
My mailing address is: 160 Baker Ave.
Hilo, Hi 96720
My email address is:

(Please return to the information desk.)

✓ 4:35 1

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 9-10, 2009

I wish to present my testimony on this project.

My name is: Emily Naeole Beason.
Organization, if any: County Council Vice Chair
My mailing address is: 15-2237 Kaohuwalu St
Pahoa, Hi 96778
My email address is: enaeole@co.hawaii.hi.us

(Please return to the information desk.)

✓ 4:40

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 9-10, 2009

I wish to present my testimony on this project.

My name is: SHALAN CRYSDALE
Organization, if any: TNC
My mailing address is: PO Box 11
NAALEHU, HI 96772
My email address is: SCRYSDALE@TNC.ORG

(Please return to the information desk.)

✓ 5:00

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 9-10, 2009

I wish to present my testimony on this project.

My name is: Sharon Hettem
Organization, if any: Self & Ohana
My mailing address is: 360 Kauila St Apt 110
Hilo, HI 96720
My email address is: NONE

✓ 5:05 4

(Please return to the information desk.)

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 9-10, 2009

I wish to present my testimony on this project.

My name is: Galen Kelly
Organization, if any: —
My mailing address is: Box 6121
Hilo 96720
My email address is: —

✓ 5:07 5

(Please return to the information desk.)

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 9-10, 2009

I wish to present my testimony on this project.

My name is: CORY HARDEN
Organization, if any: SIERRA CLUB
My mailing address is: Box 1137
Hilo 96721
My email address is: mh@interpac.net

✓ 5:11 6

(Please return to the information desk.)

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 9-10, 2009

I wish to present my testimony on this project.

My name is: Jim Albertini
Organization, if any: Malu 'Aina
My mailing address is: Box AB
Kurtistown, Hi 96760
My email address is: ja@interpac.net

(Please return to the information desk.)

✓ 5:1

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 9-10, 2009

I wish to present my testimony on this project.

My name is: Dean Au
Organization, if any: Hawaii Carpenters Union Local 745
My mailing address is:
My email address is: dau-hcu745@hawaii.rr.com

(Please return to the information desk.)

✓ 5:5 8

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 9-10, 2009

I wish to present my testimony on this project.

My name is: Jeffrey Melrose
Organization, if any: Island Planning
My mailing address is: 1403 Waianuenue
Hilo
My email address is: jmelrosehugo@hawaiiantel.net

(Please return to the information desk.)

✓ 5:18 9

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 9-10, 2009

I wish to present my testimony on this project.

My name is: Mary Begier
Organization, if any: HCC
My mailing address is: 101 Aupuni St Suite 315
Hilo HI 96720
My email address is: mary@marybegier.com

(Please return to the information desk.)

✓ 5:2(

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 9-10, 2009

I wish to present my testimony on this project.

My name is: Michael T. Cadaoas
Organization, if any:
My mailing address is: P.O. Box 908
Kurtistown, Hi. 96760
My email address is: mtcadaoas@hotmail.com

(Please return to the information desk.)

✓ 5:52PM 11

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 9-10, 2009

I wish to present my testimony on this project.

My name is: Deborah Ward
Organization, if any: Sierra Club MEMBER (not repres
My mailing address is: P.O. Box 918
Kurtistown 96760
My email address is: dward@hawaii.edu

(Please return to the information desk.)

✓ 6:22pm 12

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 9-10, 2009

I wish to present my testimony on this project.

My name is: Kimberlynn Kanaka'ole
Organization, if any: Na Ohana O Keawe/KHBCI
My mailing address is: P.O. Bx 1599
Keeau, Hi., 96749
My email address is: haynsunshine247@hotmail.com

(Please return to the information desk.)

6:33 13

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 9-10, 2009

I wish to present my testimony on this project.

My name is: Joseph Kualii Camara
Organization, if any:
My mailing address is: 192 Kualua Pl
Hilo, HI 96720
My email address is: Kualii@hotmail.com

(Please return to the information desk.)

6:49p 14

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 9-10, 2009

I wish to present my testimony on this project.

My name is: Kale Gumapac
Organization, if any: Kanaka Council Moku O Keawe
My mailing address is:

My email address is: KanakaCouncil@gmail.com

(Please return to the information desk.)

5:50

SADDLE ROAD

Mamalahoa Highway to Milepost 41

Island of Hawaii

Public Hearing

December 9-10, 2009

I wish to present my testimony on this project.

My name is: Christian Rygh

Organization, if any:

My mailing address is: P.O. Box 10922
Hilo, HI 96721

My email address is: ChristianRygh@hughes.net

16

6:48pm

(Please return to the information desk.)

[This page intentionally left blank]

SADDLE ROAD

Mamalahoa Highway to Milepost 41

Island of Hawaii

Please Print

NAME	ORGANIZATION	ADDRESS	EMAIL	TELEPHONE
Hugh Y. Ono	SSFM International	455 Ekela St.	hono@hawaii.rr.com	959-1342
DAVID MULLIGAN		PO Box 44699 KAMUELA HI 96743	davewsc@hawaiiantel.net	895-3372
Brayden Dilley-Simpson	131 Boy scouts			
George Kamauu	Boyscouts 131			
Peggy M. Ciriako		77-6494 Maile St. KK	peggy@konaself.com	937-2380
John Oakes	EMK Son Inc		emksoninc@aol.com	325 5236
John Buckstead		77-6356 Halawai Pl KK	JBuckstead@Hawaii.rr.com	326-9779
Clayton Tromaine	131 Boy Scouts	73-1147 Kahuna Ao Rd	hapalaka69@hotmail.com	345-3774
TAKEO IZAWA	Kona Japanese Civic Ass.	81-6236 41MD. capt cook	uki47@hotmail.co.jp	936-6659
Susan Law		73-1093 Makilani Dr. KK	naritalaw@yahoo.com	325-1602
Timothy P. LAW	Carpenter Union	" "	"	"
diane s. quitiquit		75-5591 hienaloli rd # 11 KK	dianeq@hawaii.rr.com	936-1660

SADDLE ROAD

Mamalahoa Highway to Milepost 41
Island of Hawaii

Please Print

NAME	ORGANIZATION	ADDRESS	EMAIL	TELEPHONE
Jonah Pooha-Poli	BSA Troop 131	73-4341 Kapuah St.	jpooha-poli@gmail.com	
Marni Herkes	SRTF			
Tim Hershman	Carpenter Union 745	POB 5644 Kona HI 96740	—	—
MERNA IZAWA	Kona Japanese Civic Assoc.	87-6236 Hind Dr Capt Cook, HI 96704		936-6639

SADDLE ROAD

Mamalahoa Highway to Milepost 41
Island of Hawaii

Please Print

NAME	ORGANIZATION	ADDRESS	EMAIL	TELEPHONE
Mike Matsukawa	self	75-5751 Kuakini Hwy Kailua-Kona		329-1385
BOB HAMMOND	Self	77-6494 KALIIKI ST KAILUA KONA		345-7747
SALLY HAMMOND	"	"		345-7065
[illegible] Kunitake	SRTF	76-5861A Mamalahoa Hwy	Kunitake@earthlink.net	938-3624
Tammy A. Harp		P.O. Box 437347, Kamuela, HI 96743	maha-oi@hotmail.com	885-8540
Sheryl Henderson	self	73-4328 AkaAka Pl KK, HI 96740		325-3033
Ken Melrose	self	PO Box 109 Kealakekua HI		345-6854
Margaret Masunaga	County Planning Dept	POB 345 Kealia 96750	mkmasunaga@aol.com	327 3557
COREY MATSUOKA	SSFM	501 Sumner St. #620, Honolulu 96817	cmatsuoka@ssfm.com	531-1308
ROBERT MEYERDIERCKS	HCV - SELF	75-126 LUNAPULE RD. KK HI 96740		329-7355
Glenn ESCOTT	SCS	PO BOX 155	ggescott@[illegible]	959-5956
Joseph Hine, Jr	BSA - TROOP 131	73-1133 KAIMINANI DR, KK, HI 96740	jhinejr@hotmail.com	936-0252
Richard Gillette	FHWA	68-3883 Lakula, Waikoloa		961-0832
Andrew Sort	FHWA	68-3831 Lua Kula, Waikoloa		720-280-6410
Gavin Motoyama	Boy Scouts 131	75-5837 Kuikini Hwy	mormon_boiz@yahoo.com	329-3956
Kahookano Lino	Boy Scouts 131	74-5166 Halekono Pl.	hookanolino@yahoo.com	355-8833
Blake Aholelei	Boy Scouts 131		SK8rboyblake@live.com	325-5235
JON KUNIMURA	Local 745	76-7010 HI KIWALE Rd Holualoa	———	808 960-2462

SADDLE ROAD

Mamalahoa Highway to Milepost 41
Island of Hawaii

Please Print

NAME	ORGANIZATION	ADDRESS	EMAIL	TELEPHONE
Leonard Librizzi	Haw. ModularSpace	73-4092 Huliko'a Dr., KK 96740	llitriz@willscot.com	960-7377
Karin Stanton	Hawaii247.org	73-1257 OneOna Dr KK 96740	Karin@hawaii247.org	217-2867
Mike Trich	S. Kohala Traffic Safety Com	P.O. Box 383375 Waikoloa 96738	WHAO@hawaii.rr.com	883-2918
Arnold K Kawai	HCFCU	73-5611 Olowalu St, 96740	arnoldk@hicommfcu.com	930-7611
Norman Kaimuloa	Carpenters Union	78-7108 B Kamehameha III Rd		
Jean Lievens		Akaka Farms .	—	326-2122
Laura Dierenfield	P.A.T.H.	PO Box 62 Kailua Kona HI 96745	Share the road @ pathhawaii.org	936-7653
Bill Moore		159 Halai St. Hilo HI 96720	billmoore@hawaii.rr.com	
Joel Nakamoto		1208 N. Kumukuwaina Pl Hilo 96720		987-8524
Sky Frost	BSA 131	73		
Anton Palepoi	BSA 131			
Thunder Frost	BSA 131			
Nainoa Hoe	BSA 131			
Jim Ednie		256 Kaiulani St. Hilo 96720	jim@ednie.com	935-3072
Aaron Stene	—	73-4191 Malina Pl	aaron@hawaiiantel.net	
Warren Lee	COH-DPW		wlee@co.hawaii.hi.us	961-8321
Skylark Rossetti	HIEDB	117 Keawe St. #107	sky@hiedb.org	
Tarah Hina-Medeiros	BSA 131	73-1133 Kaimanani Drive	thmgk@hotmail.com	333-9035

SADDLE ROAD

Mamalahoa Highway to Milepost 41
Island of Hawaii

Please Print

NAME	ORGANIZATION	ADDRESS	EMAIL	TELEPHONE
Kenneth Kaniho	Self	67-1779 Mamalahoa Hwy	—	885-4427
DENNY COFFMAN	State House of Rep. D.#6	77-258 Hookaʻana St. KK HI	COFFMAN@Hawaiiantel.net	322-5076
Al Chong	Task Force	Box 312 Kamuela, HI		885-6584
Rodney Kuakaukaule		77-564 Olowalu St. Kailua Kona	rodney@hicommercecu.com	987-8557
MEL VENTURA		Po Box 2045 KAILUA-KONA	MCV@HAWAII.RR.COM	938-9280
DON KAULIA	Grace Pacific Corp	PO BOX 5337 KK 96745	dkaulia@gracepacificcorp.com	960-4658
PETE HOFFMANN	COUNTY COUNCIL	68-1283 LUA KULA PL WAIKOLOA		895-0834
JOHN PARAZETTE	—	POBOX 9021 KAILUA KONA 96745	J.PARAZETTE@HAWAIIANTEL.NET	329-1151
Isaac Harp	Self	PO Box 437347 Kamuela, 96743	imua-hawaii@hawaiian.com	345-6085
Bobby Command	County of Hawaii		rcommand@co.hawaii.hi.us	217-2387
FRED HOUSEL	SELF	24-5063 Hamilton 96740	FRED@KIELEKONA.COM	331-8602
Russell Nanod	Waste Management	90-266 Farrington Hwy 96707	rnanod@wm.com	474-5140
Vivian Landrum	Kona-Kohala Chamber	75-5737 Kuakini Hwy #208	vivian@kona-kohala.com	329-1758
Bob McLaren	UH Institute for Astronomy	2680 Woodlawn Drive Hono 96822	mclaren@ifa.hawaii.edu	956-8768
Arnold Okamura	SRTF	212 Pohakulani St Hilo	atokamura@hawaiiantel.net	959-8019
Glenn Okoji	—	74-1418 Hao Kuni St. K-K	Sokoji@hawaii.rr.com	987-9812
MARSHA BOYLE	—	73-4550 Mamalahoa Hwy, K-K 96740	mnboyle2@msn.com	325-6119
JAMES Boyle	—	" "	JRBoyle702@MSN.COM	" "

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 9-10, 2009

I wish to present my testimony on this project.

My name is: Denny Coffman
Organization, if any: Dist 6. State House of Rep.
My mailing address is: 77-258 Ho'okaiana St.
Kailua Kona HI 96740
My email address is:

(Please return to the information desk.) Testimony submitted 4:45 pm ✓ 3:25p 1

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 9-10, 2009

I wish to present my testimony on this project.

My name is: Michael Matsukawa
Organization, if any: Self
My mailing address is: 75-5751 Kuakini Hwy
Kailua-Kona, 96740
My email address is:

(Please return to the information desk.) ✓ 2 3:26p

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 9-10, 2009

I wish to present my testimony on this project.

My name is: Rodney Watanabe
Organization, if any:
My mailing address is: 73-5611 Olowalu St.
Kailua Kona HI 96740
My email address is: rodneyw@hicommfcu.com

(Please return to the information desk.) ✓ 3:28 3

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 9-10, 2009

I wish to present my testimony on this project.

My name is: MEL VENTURA

Organization, if any:

My mailing address is: PO BOX 2045
KAILUA-KONA HI 96745

My email address is: MCV@HAWAII.RR.COM

(Please return to the information desk.)

3:28

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 9-10, 2009

I wish to present my testimony on this project.

My name is: ARNOLD KANAI

Organization, if any:

My mailing address is: 73-5611 ~~[illegible]~~ St OLOWALU St
K.K HI 96740

My email address is: arnoldk@hicommpco.com

(Please return to the information desk.)

3:2

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 9-10, 2009

I wish to present my testimony on this project.

My name is: Walter Kunitake

Organization, if any: Self - SRTF

My mailing address is: 76-5861A Mamalahoa Hwy
Holualoa, Hi 96725

My email address is: Kunitake@earthlink.ne

(Please return to the information desk.)

3:29 pm

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 9-10, 2009

I wish to present my testimony on this project.

My name is: NORMAN KAIMUKOA
Organization, if any: CARPENTERS UNION
My mailing address is: 78-7108 B KAMEHAMEHA III RD
KAILUA KONA, HAWAII 96740
My email address is:

(Please return to the information desk.)

✓ 3:30 p

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

QUESTION ON BLUE LINE ON DOT

Public Hearing
December 9-10, 2009

I wish to present my testimony on this project.

My name is: Isaac Harp
Organization, if any: Self
My mailing address is: PO Box 437347
Kamuela, HI 96743
My email address is: imua-hawaii@hawaii.rr.com

(Please return to the information desk.)

✓ 3:32p 8

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 9-10, 2009

I wish to present my testimony on this project.

My name is: JOHN FARAZETTE
Organization, if any: ARCHITECT
My mailing address is: PO BOX 9021
KAILUA KONA HI 96745
My email address is: J.FARAZETTE@HAWAIIANTEL.NET

(Please return to the information desk.)

✓ 3:34p 9

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 9-10, 2009

I wish to present my testimony on this project.

My name is: Vivian Landrum
Organization, if any: Kona-Kohala Chamber
My mailing address is: of commerce
75-5737 Kuakini Hwy #208
K-K, HI 96740
My email address is: vivian@kona-kohala.com

(Please return to the information desk.)

3:58

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 9-10, 2009

I wish to present my testimony on this project.

My name is: Ken Melrose
Organization, if any: self
My mailing address is: PO Box 109
Kealakekua, HI
My email address is: melrosek001@hawaii.rr.com

(Please return to the information desk.)

3:53p

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 9-10, 2009

I wish to present my testimony on this project.

My name is: ROBERT MEIERDIERCKS
Organization, if any: HAWAII CARPENTERS UNION
My mailing address is: 75-126 LUNAPULE RD.
KK HI 96740
My email address is:

(Please return to the information desk.)

3:55

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 9-10, 2009

I wish to present my testimony on this project.

My name is: JON KUNIMURA
Organization, if any: SELF
My mailing address is:

My email address is:

(B)
4:00

(Please return to the information desk.)

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 9-10, 2009

I wish to present my testimony on this project.

My name is: JAMES R. Boyle
Organization, if any: N/A
My mailing address is: 73-4550 MAMALAHOA Hwy
Kailua Kona HI 96740
My email address is: jrboyle702@msn.com

4:05

(Please return to the information desk.)

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing
December 9-10, 2009

I wish to present my testimony on this project.

My name is: Tammy Harp
Organization, if any:
My mailing address is: P.O. Box 437347
Kamuela, HI 96743
My email address is: maha_oi@hotmail.com

completed 5:05 PM
15

(Please return to the information desk.)

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION, PLANNING BRANCH

PUBLIC HEARING

Saddle Road
Mamalahoa Highway to Milepost 14
Island of Hawai'i
Project No. HI 200 (00)

December 9, 2009
6:00 p.m.
Aunty Sally's Luau Hale
799 Pi'ilani Street
Hilo, Hawai'i

[This page intentionally left blank]

A P P E A R A N C E S

State DOT: Mr. Jiro Sumada

Central Federal Lands: Mr. Dave Gedeon

Consultants: Mr. Bruce Meyers
Mr. Ron Terry
Mr. Glenn Escott
Mr. Reggie David
Mr. Russell Koji

Opening Pule: Skylark

I N D E X

December 9, 2009

(Public testimonies given informally to the court reporter before formal commencement of public hearing)

MR. TUCK: My name is Joel Tuck. I'm a resident of Hawaiian Beaches in the district of Puna. I travel to Kona regularly. I support the realignment and because when I have visitors here from the mainland they can't drive their rental cars over the Saddle Road which no one has been able to do since the 1970s when I first started coming. That's about it.

MR. ONO: What I would like to say I support this last segment of the Project because an initiative that was started off with the mayor, Mayor Dante Carpenter, as his campaign platform when he got elected as mayor of the County of Hawai'i to make a more expedient and better connection between East Hawai'i and West Hawai'i. And this is the last and final segment. Therefore I support it. Thank you.

MS. BOUCHER: Aloha. My name is Claudia Wilcox Boucher. I'm an instructor at Hawai'i Community College. And I am very supportive of an access road that will bring East and West Hawai'i together so we can truly operate as a unified county. Mahalo.

December 9, 2009

MR. SUMADA: Good evening, ladies and gentlemen. I just want to welcome everybody for coming tonight. My name is Jiro Sumada. I'm the deputy director for the Department of Transportation, Highways Division. I'd like to officially declare the public hearing open.

At this time I'd like to introduce some public officials that are here. From the State we have Representative Hanohano; from the Federal Government we have Dave Gedeon, Melissa Dickard and Steve Hallisy from Central Federal Lands; from the County, Councilmember Emily Naeole.

We also have some DOT staff from our highways division; Ken Tatsuguchi, Dina Lau from our planning branch, Dean Yogi from rights-of-way; we have Stan Tamura and Sal Panem from our Hawai'i district office. Was there anybody else?

From the consultants we have Donald Okahara and Bruce Meyers from Okahara & Associates. They'll come up later. The Saddle Road Task Force, these guys were there from the very beginning. We have Alvin Chong, Dwayne Mukai standing up in the yellow shirt, Mr. Okumura, Arnold.

And I want to make special recognition for the task force. Because it was through that effort that they brought the whole community together, both sides of the island, government agencies. They brought the whole planning effort together. You're seeing part of it and being part of it tonight. But they were the originators. How long ago was that, Mr. Okumura? Over 15 years ago. So their continued commitment to the Project is very inspiring. But thank you, folks for coming. (Applause)

The purpose of tonight's hearing is to discuss the location and design of the proposed Saddle Road State Route 200, from the Mamalahoa Highway, the mauka highway in West Hawai'i to Milepost 41 of Saddle Road as well as socio-economic and environmental impacts.

The alignment is being considered which would essentially pass through the Keamuku parcel and locate the new highway closely following the southern boundary of that parcel.

We were asked by the Army to consider this new alignment, I think, in 2007. And we agreed to it because it would push the roadway farther south and away from the military operations that they do at the Pohakuloa Training Area.

This public hearing is being held for

several reasons and I have to mention all of them. First, it's a means of informing you of the State Department of Transportation's plans that are being developed through the State Highways Division.

Our intent is that you should be informed and determine on a factual basis how you as the general public, property owners, motorists and other interested citizens may be affected either beneficially or adversely by the proposed highway.

Secondly, this public hearing is held in order that we may obtain facts from you folks that have not formally been brought to our attention in connection to the location, the design and the potential impacts of the proposed Project.

The notices for tonight's meeting were published in the "Honolulu Star-Bulletin" on November 19, 2009 and on December 2, 2009. Notices were also published in "West Hawaii Today" and "The Hawaii Tribune Herald."

The basic agenda for tonight: First, we'll go over some of the history of the Project with Dave Gedeon from Central Federal Lands in Denver. Then we'll have our planning consultants come up and speak on behalf of the State department of transportation, go over the basic design, the alignment and the environmental impacts for the Project.

Then we're going to take formal testimony from you folks so that you can share with us your concerns or issues and even your support if you want to share that tonight; take a short break after the testimony and then we'll get into some questions and answers. So we appreciate you folks coming out for this thing.

And I'd like to cover very briefly some of the more important guidelines for the meeting tonight. It is a very formal meeting. For me personally I'm not too comfortable going through this process but I wish, pray you bear with me.

First, we're not here tonight to debate the Project, the benefits, the pros and cons for it but to solicit factual testimony from you. We're not here -- also, this hearing is not intended to be a popular referendum. We're not going to take a vote at the end about the Project, whether it should proceed or stop or change in any way. That's not what this hearing is about.

We do want to extend every opportunity for all of you to express your concerns and present any facts that the department may not be aware of or had not properly considered.

Secondly, we want to emphasize the importance of your testimonies. All proceedings from this hearing are being recorded. We have our court reporter right here. And it's important that all the questions and testimonies are clearly stated into the microphone.

Testimony should be factual, brief, unemotional and free of any political references. Extraneous material of any nature whatsoever is not properly a part of these proceedings. And all speakers we ask they confine their statements to the subject matter under discussion.

As moderator I'm supposed to monitor that and if need be interrupt to make sure we stay on track and in accordance with the guidelines.

Thirdly, all of those wishing to testify are asked to fill out a speaker information card. And, let's see, I think that's this quarter sheet that you got at the entrance, and turn that in. And we will take your testimony in the order that they were received. I think we are going to try to limit it based on the number to maybe 3 to 5 minutes each. And I'll give you a time.

Anybody wishing to ask questions, then you're asked to fill out this half sheet of paper that was also at the entrance and turn that in. Then I'll read the questions and then we'll have the panel of experts available to answer them.

And now let's see. Some of you who may be reluctant to give testimony or to ask questions, the department feels very strongly that we want to get your input. So if you folks -- we have this full size sheet of paper if you want to give written testimony. And we'll take testimony or input from the public up until January 7th, 2010, okay, of next year.

So we want to get your input. That's what these public hearings are for. There's one here in Hilo; there's going to be another one tomorrow in Kona. The more input we receive the better it is to strengthen the decision-making process that we go through as we go through this supplemental environmental document.

Following the public hearing the highways division staff will evaluate your testimonies and information presented tonight and tomorrow night, together with the factual data that we already have.

I'd like to mention that all information gathered in regards to the location, design, or the environmental impacts for this Project including the public hearing transcript, that Holly's helping us with, and the written statements received will be available upon request for public inspection and copying.

We will now get into the details of the proposed Project so I'd like to call up Dave Gedeon to give a brief history.

MR. GEDEON: Thank you, Jiro. Good evening, everyone. I do appreciate everyone coming. From our organization on behalf of the Federal Highway Administration we certainly are happy that you all were able to make it tonight.

I'm going to give a very brief history of the Saddle Road Project, the Saddle Road Improvement Project. There are four agencies primarily responsible for the improvements to Saddle Road. At the local level county of Hawai'i, who has been maintaining Saddle Road since 1957, at least, under an agreement with the State of Hawai'i.

At the state level the Hawai'i department of transportation who actually owns the road and will take over maintenance responsibility as each new section of Saddle Road is completed and opened to public traffic.

At the federal level, the Department of the Army whose lands, either leased or owned lands, we cross over approximately 22 miles of Army land.

And finally the Federal Highway Administration whose responsibility is to oversee and administer federal construction monies. We also are the lead design and construction management agency for the Saddle Road Project.

In terms of Hawaii DOT and the Department of Army both have also been major financial contributors to the Project. The state of Hawai'i through the federal aid system has provided nearly $110 million to Saddle Road Project to date.

And the Department of Army has also contributed approximately $112.5 million to the Saddle Road Project. The origins of the Saddle Road Project can be traced back to the mid 1980s when the county of Hawai'i was seeking ways of improving the road of badly needed improvements. I believe that was under Mayor Carpenter's administration.

Over the next several years efforts were made to secure funds to advance the Project. In 1989 the Department of Defense agreed to provide funds from its military construction program for its fair-share of improvements to the Saddle Road Project serving their defense installation, Pohakuloa Training Area.

In 1991 it was -- let me back up just a

second. Those funds that were approved from the Department of Defense were only for improvements to Saddle Road within PTA on the existing road. So that was about a 12-mile section of existing Saddle Road through PTA.

In 1991 it was agreed that we should move the alignment of Saddle Road to north of PTA to separate civilian traffic from military training operations. That decision triggered a subsequent decision to prepare an environmental impact statement for the entire Saddle Road route from Milepost 6 in Kaumana to SR 190, Mamalahoa Highway.

Work on the EIS began in 1994 and was completed in 1999. A Record of Decision was signed by our office on October 31st of 1999. We immediately began design work for the first construction project in the year 2000. That was culminated in a project award, our first project award, in late 2003. Actual ground breaking began in February of 2004.

In 2007 we finally opened the very first section of Saddle Road 7 miles from Milepost 28 which was the access to Mauna Kea observatories up to mile 34, 35 which is Mauna Kea State Park.

The two subsequent years after that we opened two additional sections of Saddle Road to public traffic. And as of today approximately 23 miles of Saddle Road of the 48-mile-long route have been improved and open to public traffic.

As I mentioned 23 miles have been opened. I'm not sure if I'm going to be able to reach this but that begins at Mile 19 and extends all the way to Mile 41 or roughly 42 which is at the bottom of the 7 Steps area.

Under construction -- and this is a project we just awarded two or three months ago -- is for construction, the next construction which is from Milepost 11 to Milepost 19.

The remaining east side from mile 11 down to Milepost 6 which ties into Puainako, is presently in design. It's at about a 70 percent stage of completion. And pending availability of funding to build that portion we will have that project ready by late next summer to advertise for competitive bid.

I want to swing over to the west side because this gets into why we're really here tonight. Our original EIS selected the W-3 alignment. I know that's difficult for all of you to see. But we selected the W-3 alignment in our original EIS as the west side alternative that would be constructed. That was in 1999.

In 2006 the Department of Army acquired 23,000 acres of land which is shaded in this green area here; acquired that 23,000 acres of land and subsequently requested that the Hawai'i Department of Transportation and the Federal Highway Administration consider a new alternative that would move that alignment further to the south.

The purpose of that, again, would be to separate civilian traffic from military training. That is why we are here tonight. We are in the process of preparing a supplemental environmental impact statement to assess this W-7 alignment.

And with that I'm going to turn it over to Bruce Meyers, our consultant, who will talk more specifically about that W-7 alignment.

MR. MEYERS: I'm going to talk about the design basically, the design aspects of this Project. The green line represents the W-7 alignment. And it is -- the length of it's approximately 10.3 miles in length. It connects to the portion that's completed now near Milepost 41, 41 and-a-half at the lower section or the low side of the bottom of the 7 Steps area.

And the alignment itself was chosen basically because of the environmental resources in the area and also because of the grades. We didn't want to let the grades be too step. That's basically the reason for the curves and what you see here is to avoid the natural resources, some of the archaeological resources as well as the grades of the road, the steepness of the road.

The road ties into the Mamalahoa Highway at Milepost 14. You can -- if you drive it you can probably see the stakes out there. I don't know if they're still there. Maybe not. But you can see a lot of paint marks in the road anyway. But it's at Milepost 14.

MR. SUMADA: Bruce, can you give some references between Waikoloa and Queen K.

MR. MEYERS: This is the Waikoloa Road right here. This is Queen K Highway, Mamalaoha to Waimea, Mamalahoa to Kona. This is the Old Saddle Road right here -- the existing Saddle Road. I'm sorry, the existing Saddle Road; Waiki'i Ranch and the Kilohana Girl Scout Camp.

So that's basically it about the alignment itself. This is an artist's rendition of what it kind of looked like. This is taken kind of from a photo looking towards -- this is Mauna Kea. And the highway is two 12-foot lanes, wide lanes east and westbound as well as a climbing lane going uphill. So this is the eastbound lane here.

This is a climbing lane, as well as an 8-foot shoulder on each side. At this time the climbing lane is shown right from Mamalahoa all the way to where it flattens off near Milepost 41, 42 area.

The speed limit will be 55 miles an hour. There will be -- during the design portion of it they'll look at sites for scenic pull-outs. There will also be an underpass. There's a rough location of where that might be at this point. But there will be a military underpass so that those training can go under the highway. I think that's it. At this time I'll turn it over to Ron Terry.

Sorry. I forgot about this slide. This is the east side what was completed. Basically as far as the road is concerned what it will look like. The 8-foot shoulder, the two westbound lanes. This is the truck lane or the climbing lane. And then this is the eastbound lane the other side with the 8-foot shoulder. Basically the same thing. Sorry.

MR. TERRY: Good evening. I know this is a formal proceeding. But I want to do something maybe a little irregular. I just want to thank everybody another time for coming out. I'm really gratified to see this level of interest in the community. And I see my family, my friends, students, teachers that I've had, people that I've worked with in the community for a long time. It's just fantastic to see this kind of participation in a project.

As Dave said we're doing a supplemental environmental impact statement. And we've had teams of researchers out on this land for about two years now. And this summarizes the major studies that we've done. We had teams of archaeologists out there who did, who looked at existing studies that had been done. The entire Keamuku parcel had been inventoried for sites on a low level and then looked at the specific corridor as well.

We had biologists -- most of the corridor is actually basically a glorified cow pasture -- but we had biologists looking intensively at every aspect of it. We spent weeks out there and looked at plants and birds and other animals as well. There are endangered plants that are identified nearby. We had to study those areas.

We looked at wildfire because that's a big issue on this part of Kona. Pu'uanahulu is wildfire central. We went and examined drainage and streams. We did soil sampling for depleted uranium because that had come up as an issue. And we found no evidence of depleted uranium in the corridor in any of our sample sites.

We did an extensive cumulative impacts study. We looked for hazardous materials and unexploded ordnance on a low-level, just a visual. Next slide.

We want to get to the testimony. And I don't want to belabor this stuff. Mostly we found not much in the way of impacts. We found one archaeological site that will be impacted. There were six in the general areas, all from historic era, in other words post-1778. Most of them are 20th Century sites that are associated with ranching. There is one 20th Century Site that is a long roadbed.

If you're driving along the Kona road you can see it above you. You see kind of traces of an old roadbed. This site's almost nine miles long and we're going to take out about a 100-foot section of that. And the rest of it's actually going to be preserved.

Next slide. Okay. Biological resources. As I said we had important resources nearby. And we routed the road to miss that. We did some special studies not only in the summer but also in the rainy periods so we could look for sprouts of this endangered plant.

We looked at -- the army is doing intensive wildfire mitigation management up there. So we looked at the way we could get our road to integrate well with that, to have our road be a good fire prevention tool and a fire fighting tool. And if you've looked at some of the typical sections, we have different approaches in different parts of the road.

Next. We identified no unexploded ordnance in the core, or none is known from there, none was observed. But there's going to be a preconstruction sweep of this area to make sure.

It was part of the Keamuku maneuver area. There was training here in World War II. There doesn't appear to be much live fire but there's a potential, and we're going to look for it.

Scenic impacts. Mostly they're positive. This is going to open up some fantastic views of Hualalai, Mauna Kea, Mauna Loa, and kind of distantly out to the coast. We looked at it in the context of other things that are going on including the military training, and the possibility of a Saddle Road extension road that would head down towards Waikoloa.

Socio-economic impacts. I'd say these are generally beneficial. There's no communities, towns, houses, anything located anywhere near this road.

It's completely enclosed on a military base. So the socio-economic impacts are basically uniting our island, getting it closer together. This is going to cut about 20 minutes off the trip to Kona, between Hilo and Kona. If I'm in Kona I'm gonna say 20 minutes off the trip to Hilo.

It's going to make it 20 minutes shorter, just that section. Altogether we're probably looking at a half hour difference for the entire Saddle Road but just this section.

And not only faster because faster isn't everything, the main purpose behind this road it's safe. And it's going to make us safer.

Just yesterday I was the first car coming across the Saddle Road when there was a really pretty bad accident right in front of me. It just brought it home to me what this road is all about. It was on the existing section of the 7 Steps area. Many of you saw it in the paper today. It was a terrible thing to see in person. I hope the person who was medivac'd out of there is okay.

This is the kind of thing we can avoid by having a safe, modern road.

I'm going to turn it back over to Dave and he's going to talk about schedules.

MR. GEDEON: This is a very brief schedule, obviously, just to summarize. The draft supplemental EIS was published in November 2009. What is important here is the close of the formal comment period. The date for that is January 7th of 2010. And that would be any written comments that are submitted by mail must be postmarked by January 7th.

Our target date for completing the supplemental EIS is February-ish of next year with the Record of Decision in March, assuming that we have no major issues that arise through this public comment period.

We have two additional items up there, final design and construction. I know everybody's interested in that if this job does move forward. I think the important thing there is to emphasize that both of them are dependent on funding being available. And at this point we are not in a position to say we have money to move forward.

But we will move forward as soon as money is available. What we are estimating on the design work is anywhere from 12 to 18 months to finish up the design. And for construction anywhere in the neighborhood of 18 to 24 months to build out the full 10 miles of the W-7 alignment.

And with that I think we're pretty much done with most of the presentation. And Jiro will be back up to close out.

MR. SUMADA: Thanks, Dave and Bruce and Ron. Now we'd like to get to the testimony part, the second purpose of this meeting. We'll call you up in the order that you signed up for to testify.

What we'd like is if you could limit your testimony to 3 minutes 'cause there's quite a bit folks that want to testify.

If others in the audience that haven't signed up and you feel moved to testify, you know, feel free at any time to go fill out this quarter sheet form that was at the entrance when you came in and we can add you at the tail end.

Really the purpose of this whole thing is to get as much input, feedback from the public to make sure that, you know, before any decision is made that all the different pertinent facts are considered before we move forward or stop it or back up or regroup or whatever.

So nothing's a done deal. Nothing's a done deal. Okay? And it depends -- the environmental process, it depends on input from the public.

That's why I would like to echo what Ron said that we appreciate you folks coming out and being participants of the process. To me it's always better to hear firsthand what's going on as opposed to secondhand from a friend or reading it in the paper. So thank you for coming out.

First up if you could just state your name and the organization you're with. Bill Davis, if you could come forward and just speak into the microphone and our court reporter will get everything down.

(Mr. Davis reading testimony of Kaulana H.R. Park, Chairman, Hawaiian Homes Commission)

"Thank you, Mr. Sumada. Thank you for the opportunity to provide comments on the draft supplemental environmental impact statement covering Alignment W-7 of the Saddle Road from Mamalahoa to Milepost 41.

"We support the realignment and improvement program of the Saddle Road. Likewise, we support the alignment of W-7 as noted in the supplemental EIS. This alignment appears to be the most reasonable overall access between east and west as well as allows for reasonable use of property affected by the alignment.

"These improvements to the Saddle Road will increase safety for those driving the road in addition to shortening the drive time between East and West Hawai'i.

"As you know the Department of Hawaiian Home Lands has been involved in the planning process of our lands at Humu'ula and Pi'ihonua Mauka known as the 'Aina Mauna Legacy Program.

"We intend to restore much of the native forest that once dominated much of this landscape as well as provide for homesteading pasture and other economic opportunities for our beneficiaries. An improved Saddle Road will benefit these proposed uses on our property.

"We appreciate that various governmental agencies are cooperating in the Saddle Road realignment and improvement program. We encourage you to move forward with alignment W-7 in this phase of the improvements. Aloha and mahalo, Kaulana H.R. Park, Chairman, Hawaiian Homes Commission." Thank you.

MR. SUMADA: Thanks, Mr. Davis. Next Councilmember Emily Naeole Beason.

COUNCILMEMBER BEASON: Aloha. My name is Emily Naeole Beason. And I rarely go to these kind of public hearings but I'm glad I'm here tonight. I drive -- it's been -- this is my 4th year as a county councilwoman of the 5th district. And I drive to Kona every month.

And I go -- I drive on the Hamakua Coast as I go to Kona because there's a part that, you know, the road is not fixed yet up at Saddle Road from the Girl Scouts all the way down to Waimea. And that's the reason I don't go up that route. That road, that route is kinda real junk. And I promised my car I wouldn't bus' her up. (Audience laughter) So I go around Hamakua even though it takes a little longer.

So, you know, there's a lot of good things that I see. We need to connect Hilo to Kona in the shorter term. So there's a lot of good things I see that's gonna happen when this road come to pass. Like you said the military has purchased the lands. And best we get out of their way, you know.

I've had people come to the council to talk to us about depleted uranium. So if we moved the road down aways out of the military, you know, where they're doing their thing, I think it's a good thing.

So there's a lot of good things I see that this, you know, this alignment W-7 will help the people of this island.

For myself too I wanna thank the people that's been on this course for over 15 years. I look on the side I see some of our uncles there pretty high in age. So they must have been working quite a many years to help things move along. We just have to be in support and make things move. I just want to say thank you. Mahalo.

MR. SUMADA: Thank you. Next we have Shalan Crysdale.

MR. CRYSDALE: Good evening, everybody. My name is Shalan Crysdale. I'm currently working for the Nature Conservancy in Ka'u. From mid-October to 2006 to just January 2009 I worked at Keamuku for the military doing a hazard assessment of the gulches and gullies of the area of the ranch. I tried to be very observant of the patterns and the things I was seeing out there.

We had the opportunity to do quite a bit of the gulch and gully systems that run along the area of this alignment. And from what I was able to see I'd say this was the alignment that would avoid the most dangerous and prone-to-flooding areas of the ranch area -- of the ranch itself.

I think the only things I'd like to draw attention to would just be not so much the native resources of the area, as Mr. Terry had stated it's a glorified ranch.

And the problem that would come up, I would imagine, would really just be the non-native migration of animals moving back and forth between the lava flow and the ranch area. Quite a few miles of the lava flow doesn't actually have any fencing along it. And goats have come into the habit of moving in and out of the lava flow I'm guessing for protection from God knows what day in day out. The same would be with pigs.

And so that would be probably the only concern I'd like to raise as a question to those doing the environmental impact statement. Thank you.

MR. SUMADA: Thank you, Shalan. Next we have Sharon Hettem.

MS. HETTEM: My name is Sharon Hettem. I'm here to testify for myself and my family. I'm concerned about the depleted uranium issue. We, a year ago, tried to get the Army to admit that there actually was depleted uranium there and passed a resolution to ask them to do testing. And none of which has been accomplished to date.

However, the alignment of the road I think it's better that they're not putting it through the middle of the training area. However, it's still going through the base.

And the problem with the depleted uranium is not the depleted uranium that may be in the soil. The area where the road is being built on the one side was pasture. It was not even used for training. So there's probably that the soil samples were accurate and that there probably isn't there in the soil.

But what I'm really concerned is airborne depleted uranium. Some training areas where there has been in the past use of depleted uranium weaponry, when that area is bombed it creates microscopic ceramitised airborne particles. It bakes them into a little tiny particle that you can't see that's blown in the air that no longer is soluble.

Anybody that is downwind of that, whether you're driving along that road through the military base and the wind blows across the road and your windows are open, you're going to be breathing the contamination from the depleted uranium when the bombing is occurring. So that it is creating these airborne things.

These depleted uranium particles, as I said, are not soluble. So that when you breathe them into your lungs they're there forever. And you can be affected by accumulation of minute amounts of radio activity which can cause cancers and various other things. The air exposure, which they have not tested for, is my main concern with this road or any road going through that area when they're building it and when people are traveling on it.

MR. SUMADA: Thank you, Sharon. Next we have Galen Kelly.

MS. KELLY: Aloha. I just kind of wanted to comment on the restrictions about not getting emotional. To me it's like asking me to be dishonest. So I just had to mention that. I'm also here with concern for the DU. I saw the little poster up there that said "Depleted Uranium," and spoke with Russell over here who's from an independent company that did the DU study. And was shocked when he told me they only tested the soil.

Because all the scientific experts are telling us it's about what's stirred up in the air. And some of us who have Geiger counters and have been taking readings have gotten high spikes. Your study only showed background radiation but we had different results.

Our challenge to bring this issue forth is that it's invisible depleted uranium. You can't see it. So it's very hard to prove. But there are things going on all over the planet that are showing birth defects and cancers, contaminations of various degrees.

It's pretty much been proven that the areas that there were war zones where depleted uranium was used, that these type of defects are showing up.

Some brought up the idea that the area where you want to put the new road had not had any bombing since World War II. But, again, we go back to, you know, when there's air stirring it up the radiation flows downwind. So it puts all of us at risk. Let's see.

And also the returning vehicles, Strykers, coming back from Iraq having been in the battles using depleted uranium, and their armor contains the depleted uranium as well that's brought back. And we're told the cleaning process of vehicles doesn't get all the radiation off.

So, and also just right now we're having the NRC talking with us. They're supposed to come here in January, let us know if they're going to move forward with further investigation of the Army and further cleaning up. So just wanted to make you aware of that, but you probably already are.

The only other thing in closing I would say is that it's always interesting to me that these type of meetings where the officials are here that there are so few native Hawaiians.

And I would love to see that those chairs over there filled with our kupuna. And we would be asking them for the direction and the guidance. And there's a great sadness in my heart that that issue always has to be in the background. So thank you.

MR. SUMADA: Thank you, Galen. Next we have Cory Harden.

MS. HARDEN: Good evening. Thanks for taking comments. Making comments for Sierra Club, Makaloa Group. We commend the EIS preparers for many passages which show sensitivity to native Hawaiian culture and concern for preserving Hawai'i Island's natural resources.

We support the chosen route as the best alternative. We support plans for wide shoulders for pedestrians and bicyclists.

However, it appears assessment of some impacts is inadequate which would mean the mitigation plans would also be inadequate.

We commend the preparers for conducting a depleted uranium study. Unfortunately, as others have said, the study fails to test for airborne DU and DU compounds. The study raised many concerns for

Dr. Mike Reimer of Kona who holds a Ph.D. in Geology.

The study relies on Army information to mention only one DU ground at Pohakuloa. But there may this 2000 based on two lines of evidence, one from Army Colonel Killian, in training manuals and one from a Sierra Club consultant.

Also the Army DU studies are facing a legal challenge from four individuals in Hawai'i. There will be a proceeding in Hilo in January. I'm one of the folks challenging as an individual.

We support clearance of unexploded ordnance for the road. We wish the military would follow suit to clear explosive toxins and other hazards neglected for decades on more than 50 old sites on Hawai'i Island. We are really concerned about fire risk, giving ongoing military training, plus the Strykers, plus the new road.

The EIS states accurately that wildfire threatens Hawaiian ecosystems because few native Hawaiian animals or plants are adapted to wildfires. They generally perish when exposed to fire.

Native plant communities are often subsequently overwhelmed by more aggressive alien species. Many non-native species thrive in the aftermath of fires. And the entire west side of the

Big Island is subject to extensive wildfires.

We're glad to see that an Integrated Fire Plan is being developed by numerous agencies and that a recent study has been done. And we hope that fire safety will be greatly improved.

For the overpass of the military area we feel that details should be included in the Draft EIS so the public can have input. We also feel distractions to motorists from military training should be evaluated, dust, pyrotechnics at night, noise and light from explosions and noise from helicopters and large airplanes and large vehicles.

They call for more thorough assessment of impacts to formerly remote areas when a better road brings more tourists and residents. We'd like as much mitigation as possible from the loss of beautiful viewplanes.

We suggest that funding be sought from astronomers and developers who will benefit from the road. We ask for more information on the convoys and construction water trucks.

We ask for evaluation of induced demand. That means when there's better road people start driving more. We would like to see some traffic calming features, even something simple like the dots in the center line being closer together so you realize how fast you're going.

We hope there would be bus service on the improved road. Thanks for listening to our concerns.

THE WITNESS: Thank you, Cory. Next we have Jim Albertini.

MR. ALBERTINI: Aloha and thanks for everyone coming out. I don't have any contentions with the road. Although I do think that we need to think in terms of peak oil.

That means when the supply begins to be below the demand the price of gas continues to escalate. That may not be that far off when gas gets to twenty dollars a gallon. So we maybe need to think beyond roadways to other means of transportation.

But I'm here to speak mainly on the depleted uranium issue. I have several statements from doctors, both medical and scientific people, that say that the depleted uranium as stated in this report may be understated. And they will be submitting their own testimonies here.

I want to make the comments that on May 27th -- May 29, 2007 I was at Mauna Kea State Park. We had our own radiation monitors. And the winds were blowing from the southwest right toward the park with dust devil's visible in the air.

Our monitors spiked at 75 counts per minute when the normal readings were 5 to 15 counts per minute. We knew at that point that something serious with radiation was coming up Pohakuloa.

It was three months later in August of 2007 when it was officially confirmed that depleted uranium weapons had been used at Pohakuloa from 1962 to 1968. Now, the military says the weapons have been banned since 1996 used in training.

But that's 34 years from 1962 when other depleted uranium weapons besides the Davy Crockett may have been used there. I have a list I'll be submitting as part of my testimony where there are dozens of weapons in the U.S. arsenal. Army, Navy, Air Force, Marines, and other countries have used depleted uranium weapons.

We suspect there's a nightmare at Pohakuloa with depleted uranium contamination. It's not just here in Hawai'i. It's now been confirmed that weapons have been used in training in 13 states, and three foreign countries by the United States.

I want to briefly read one sentence from Dr. Helen Caldicott, who's a mover and shaker internationally with the Physicians for Social

Responsibility and Doctors Beyond Borders. Her organization was awarded the Nobel peace prize. She's a pediatrician and a professor at Harvard Medical School.

She says, "Here's what depleted uranium is. It's a deadly carcinogenic and mutagenic poison that remains radioactive for over 4.5 billion years.

"When used it is converted to tiny aerosolized particles that are inhaled and translocated to the lymph nodes and also deposited in bone, kidneys, and excreted in the semen where almost certainly the uranium can cause birth defects. It also causes bone cancer, leukemia, lung cancer, lymphoma, and kidney cancer.

"As a heavy metal it is also a renal poison and in high doses can cause acute kidney damage. There's large literature occurring about the various pathogenic ways that uranium causes mutation and cancer. Refer to my book The New Nuclear Danger."

Then she goes on to talk about how the United States has used thousands of tons of it in Iraq. And she says, "This is contaminating the cradle of civilization for eternity, inducing more and more cancers especially in children, genetic disease and congenital malformations. Such U.S. military policy is beyond a war crime."

MR. SUMADA: Can you please wrap it up, Mr. Albertini.

THE WITNESS: Yes. I think that this issue is going to be a long time to be dealt with. The studies that have been done are inconclusive and we need more attention on it. Thank you.

MR. SUMADA: Thank you very, very much. Next we have Dean Au.

MR. AU: Hello, everyone. Carpenters' Union Local 745. We support the Saddle Road mainly for the reason of work. There's no carpentry work on this Project, but it will give Hilo carpenters union and non-union a safe road that will get them to their job in a timely manner.

There are a number of big future developments on the west side of the Big Island. Some of them are Palama Nui, Forest City, Bridge of Aina Le'a and Villages of Lai'opua. These are big subdivisions. It's going to keep a lot of construction workers, not only carpenters in Hilo, work.

I myself have traveled this road for a number of years. Many contractors, union and non-union, will benefit with this proposed road. Many construction companies ban their employees from traveling on this roads with company vehicles. The danger and conditions of this road take its toll on company trucks.

As a result, employees need to wake up at 4:00 a.m. in the morning, get to our jobs and get to our baseyards at 4:30, leave our baseyards at 5 so we can get to work at 7. To come back home a lot of times we don't get back to our families until 6:30, 7, sometimes even 8 at light.

Most importantly, the safety for carpenters, all construction workers and everyone, everyone traveling this road will benefit from this. We want to get home safe and in a timely manner. Thank you.

MR. SUMADA: Thank you. Next we have Jeffrey Melrose.

MR. MELROSE: Thank you for the opportunity to comment. My name is Jeffrey Melrose. I'm a land planner. I've driven the Saddle Road at least once a week for the better part of 20 years. I've seen my share of close calls and accidents. I know people, friends who have passed away on it.

In my younger years as a hunter I have walked portions of the alignment. I don't by any means believe I know it well. But I really, in all of Hawai'i I don't think there's a better place to build a road than this particular piece of land, just given the way the resources that are there, the slope. It's a good piece of property to put a road in.

It's also -- somebody made the comment that this is kind of wildfire central. I think we have all seen that happen. This road would do a lot to keep that from happening.

I do want to add a word of thanks to somebody who's not here, to former Mayor Dante Carpenter who I think during his time in office made the Saddle Road a priority. And we're still living with that attention he placed and that we're following.

I think it's a good sign -- or it's a sign to us, I don't know if it's a good sign, but it's a sign to us of how long roads take to get done. And I think it's the persistence the guys who have been working on this for a long time deserve our thanks. I thank you and my car thanks you (Laughter).

MR. SUMADA: Thank you. Next were Mary Begier.

Ms. BEGIER: Good evening. My name is Mary Begier. I'm the president of the Hawai'i Island Chamber of Commerce. We would like to speak in support of this road being placed in this position. I've, like many other testifiers here this evening, been a first responder, so to speak, at an accident site or even just a flat tire. You have to think twice about can you safely pull over to help them with your cellphone or something like that. So I do think that this is not only good for our economy, good for jobs, et cetera. Setting that all aside it's just good for humankind. Thank you.

MR. SUMADA: Thank you. Next is Michael Cadaoas.

MR. CADAOAS: Everybody, my name is Michael Cadaoas. I'm a construction worker. And I work all over this island doing construction. And I'm sure a lot of you've seen the traffic problems we've been having forever wherever you're going.

A straightening of Saddle Road was needed yesterday but I'm glad it's getting done now. Imagine 25, 50 years from now what our kids going be going through traffic-wise? Thank you.

MR. SUMADA: Thank you. Next Deborah Ward.

MS. WARD: Good evening. My name's Deborah Ward. I'm a Sierra Club member, environmentalist and a biologist. But I'm speaking on my own behalf tonight.

The reason that I came is that I'm concerned when I look at the new sections in the middle near the Mauna Kea access road and just between Hilo and that area that the shoulders are very broad.

But the broad cleared areas on the side of the shoulders are being invaded now with mullan, senecio, the pink plant. I forget the name of it. It ceases to stick in my brain right this minute. But the mullein and senecio for sure are moving in at tremendous rate.

And I'm afraid that that invasion of non-native plants on the cleared areas that are so broad on both sides is actually going to cause us problems in the future either because they are fire-tolerant plants and also because they will then invade the native areas on the adjacent sides of the road.

So I'd like to ask you to consider not having the broad, cleared areas beyond the shoulders because I think that at least in the area that I've seen those have not been conducive to good ecological principles. They're actually causing more damage.

So if there's a way to avoid doing that in the future I think it would be good and I think there needs to be somebody to address what's going on on those areas now.

I'm not one to advocate herbicide, but I don't know any other way. There may be saltwater or something else that might be effective in killing those invasive plants around those high graded areas. But I think avoiding that kind of problem in the future would be good.

As I was listening to Jim and Cory talking, talking about the DU, I was thinking about my dear friend Lani Stemmermann who was a biologist who spent many years in the late '80s and early '90s studying the ecological areas within the Pohakuloa Training Area.

She eventually prevailed in a lawsuit that made the Army reconsider its environmental assessment that ignored the native plants that were indigenous and endemic to that area. And although she prevailed, she also died. She died of lymphoma at the age of 42.

It could well be -- it's hard to do an epidemiological study on soldiers that are going to be moving from a training area into a war area. But when someone has not been exposed to anything other than working in native forests, then works at Pohakuloa and dies at the age of 42 of lymphoma, I think it's instructive and we might want to look into the effects of people who live here and their proximity to the depleted uranium. Maybe there's an epidemiological pattern there that we should consider. We thank you for your time.

MR. SUMADA: Thank you, Deborah. I hope I can pronounce this. Simbralynn Kanaka'ole.

MS. KANAKA'OLE: Aloha. Good evening. I'm here today representing myself and my 'ohana. But mainly I need to know what is your consultation protocols for this Project. Are they in compliance with section 106 of the National Historic Preservation Act?

If not, or you don't have one in there, I'd like to advise that this be included in your Project studies; that you need to consultant with Na 'Ohana O Keawe, that means the families of Keawe, before you start doing any more damage.

I was recently informed by Dan Ho of a situation that happened here in Hilo that he was a party to. And he filed a complaint, he submitted it to the county council, in regards to the flooding that occurred in 2000. Apparently what I have in my hand is documented evidence of racketeering on this flooding that occurred.

He basically says that alterations were done on top, like a one foot -- a one foot hill. And that caused -- and that he notified the county and those concerned about what was happening. And that if they continued to do this that it would incite another flooding that would jeopardize the families and subdivisions of Waiakea Uka.

This occurred in November 2008, last year, exactly what he had said. Apparently -- I just got through looking at your map -- and it coincides with what he's saying occurred. That's because you guys went and already made the road, right?

MR. SUMADA: Okay.

MS. KANAKAOLE: Now, this flooding, you altered on the top the natural course of the water went and diverted into another area. It made those subdivisions existing in jeopardy. People were put in jeopardy and are in jeopardy because of that.

Now, if you're gonna do this to the other side, your alteration of natural historical sites, the natural flow on the other side of the mountain will jeopardize the people and families living at the base because the water will redirect itself because you just altered the road on the other side.

Now, I'm not sure if you guys went and looked into that or if you guys are not claiming that you're responsible for what happened to Waiakea Uka. Because you guys just did this road up there making it nicer and everybody can get there and drive faster, you know.

Yeah, you guys went open the road. Yeah, it's a benefit. It cuts 30 minutes. But guess what? People speed. They go faster because they have a bigger road. That causes more accidents.

My understanding Mr. Kevin Dayton has informed me they're not even capable of performing, which is the county administrative facilities fence, they couldn't even perform a tsunami drill as required by the EPA since 2000.

To date they were supposed -- it's required that the county perform an evacuation drill just for a tsunami, let alone a worst case scenario.

Now, if you guys -- the military's up on the hill and they're doing whatever they're doing up there, we get all contaminated, where everybody going run? There's no shelters available. These shelters are not adequate. This is what the county is telling us. And we're all in jeopardy.

All this stuff that you guys do on the top of the mountain, guess what? It goes into the watershed. Now they're talking in the mainland that the water's contaminated. Guess what? You're contaminating the water. We don't drink the water. Is that worth it?

Thirty minutes? Is it worth it?

You know, Akua made the land. Our tutus made the land for a reason. It's not to play games up on the top of the mountain and be detrimental to the people. You're supposed to be protecting us? How are you protecting us?

Have you guys ever come and consulted with us? No. 'Cause I sure wasn't consulted and I'm a practitioner. I go up there all the time. I don't appreciate historical -- I mean cultural encroachments on historical sites either.

That is exact -- to me, all of it from one end of the Hawaiian Islands to the other is historical. My tutus, our tutus navigated the entire Hawaiian archipelago. It is all historical.

And I do not appreciate war games when we are a neutral nation. I mean I have a lot of stuff to say but this is shameful. I don't benefit. My children won't benefit. My grandchildren won't benefit. If we allow this we're allowing you to poison us. Cease and desist. Thank you.

MR. SUMADA: Thank you very much. Next we have Joseph Kuali'i Camara.

MR. CAMARA: Hi. My name is Joseph Kuali'i Camara. I'm a resident of Kaumana. I have mixed feelings about this road. On the one hand I think it's mostly good for people of the Big Island especially for safety and, um, speed of transporting in between Kona and Hilo as well as the jobs that it will provide for contractors.

But the one thing, the one thing that I wanted to bring up -- similar issue to one that was brought up already was this road being, um, you know, the width of the road and with the large embankments on the side be inundated with weeds, and the movement of weeds along the road.

I know the benefits of the road is going to be good. But especially on the Hilo side new section there that they're making, I drove the road last week. And I heard about this hearing.

After seeing all the forests that's been cleared in this swath I felt I had to come down here and just make some things known.

I mean, like, even though in that section there might not be any endang -- federally listed or endangered or threatened species. It's a functioning Ohia-dominant watershed, you know. Those kinda things ah, you know, it's, um, it's sad because they also get put second to our needs.

But, yeah, I would hope, I would hope that in the planning that more care be given to, to the, um, environmental impacts that these weeds that are now coming on these cleared sites and spreading out into the native habitat up there.

I just hope that in the future, like, more care would be given towards that because, because once you, um, push something with a bulldozer, you know, um, chances are it's going to come back non-native. And, yeah, once it's done it's hard to be undone.

Um, and especially with the Stryker Brigade coming and doing, I'm not exactly sure what they're doing to the Pacific, but I would hope that care be given that they're not, the vehicles themselves are not becoming vectors for exotic plants from other places in the world coming into our watershed above Hilo. Thank you very much for this time.

MR. SUMADA: Okay. Thank you, Joseph. Next is Kale Gumapac.

MR. GUMAPAC: My name's Kale Gumapac. I'm with the Kanaka Council of Moku o Keawe. And in looking at all of this from what I've heard, from what I've seen it's unfortunate that we don't have more kanaka ma'oli sitting there. As we take a look at all of these, all of the issues that's coming down in the extension of the road, it's very difficult when we're not hearing more of the impact on the traditions and the cultural side.

Because the EIS that you guys did ten years ago, ten years ago is different from what's happening today. But yet you're still using the EIS in order to proceed with this construction.

The other thing that I heard that was difficult, I hope some archaeologist was up there taking a look what they said was, "It's only a ranch." Well, you know what? Before the ranch that was a Hawaiian forest. And when it was there it was used by our kupuna.

So there's suspect when it comes to an archaeological assessment that's being done when somebody says, "It's only a ranch." That's the way they look at that. That's all that's there. Bruddah, what about underneath the grass?

We have seen many times where these kinds of things proceed and you run into who? Our kupuna iwi. "It wasn't there. We never know it was there. We did the assessments." So the archaeologists that we have here today around Hawai'i, they're all suspect. We don't trust them because we have seen what they have done. We have been involved in many of these cases.

And it's all about the money. It's not about protecting our culture and our traditions and our kupuna. I'm not hearing that tonight.

I'm hearing everything else. Yes, we do need a road for transporting people. But who did you guys consult? Who was the consultants? I don't see any Hawaiians over here that you were consulting.

We have many of us that's been involved in kupuna iwi. Many of us who had to go in, re-inter the iwi because of the destruction that construction has made. We need to bring this up. This needs to be reassessed. And your assessment back in 1999 on the EIS is flawed. It's a flawed assessment. It's too old.

What is the impact on the kanaka maoli? What is the cultural impact? What is the psychological impact? Have you guys addressed that in your EIS? 'A'ole. That's why we are having to come here do this all the time.

This is not the first time. And this will not be the last time. The Kanaka Council stands ready if you run into iwi, which we know you will, we're going stop you.

MR. SUMADA: Thank you, Kale. Last testifier we have so far is Christian Rygh.

MR. RYGH: My name is Christian Rygh. I

worked at PTA with Shalan Crysdale last year, a temporary. I was up there four or five months. I was fortunate to be able to explore some of the Keamuku on foot which apparently just because of the ranching, the access I guess not a lot of people actually get down to go there. So I thought I'd come because I have been out there.

I haven't read the whole EIS. I don't want to present that I have. And there are some issues that I'm not really fully informed on.

But I wanted to speak to that -- kind of remind everybody here I believe we are here to talk about the W-7 alignment which is just the portion of the Saddle Road going through the Keamuku parcel.

So some of the comments being made about DU, don't get me wrong, I'm not a proponent of nuclear weapons by any stretch, but I don't know how much of it -- we're not actually here debating that the military started the base and was bombing.

And the impact area we're talking about a segment of the road going through Keamuku parcel which I guess there's a few Charley Crockett -- the Davy Crockett, sorry, weapons. It's not like we're proposing here tonight to talk about making the highway go through the impact area. We are talking about a stretch of the highway going through the ranch-land.

So I don't know that much about DU, what everyone's talking about they did the soil analysis but they didn't do the airborne analysis. What struck my mind if it's really that airborne does it make a difference -- aren't we already driving through it when we go on Saddle Road now? Is there really -- the winds.

So what are we really talking about here? Like a lot of these people mentioned there's a lot of good to be had on this road.

A lot of lives are going to be spared from the road being safer and having better shoulders and the turning radius, modern engineered road.

I'm not sure that we are not here to debate that there's an impact area up there on Mauna Kea. I don't really like that that's there either.

We need that for our national defense and things like that. Personally I kind of wish that we didn't have to bomb with nuclear materials on our island but that's not really the issue here.

I like the point that people brought up about the mullan on the sides of the road. Some people in the panel mentioned this is going to be a great new fire fighting tool.

That may be but I think there's a counter to that too. This new alignment that we're talking about -- not to the whole Saddle Road -- but this particular alignment is cutting through an area that right now doesn't have anything going through it.

So there's going to be an influx of weed seeds maybe, not new weed, the same weeds are already around, but there's going to be a new corridor now opening up. I would testify with my time on the ground out there it's not like, you know, a tremendous amount of rare native plants around it.

It's an overgrown ranch-land, and things like that. So I wouldn't be that concerned that much about bulldozing over rare and threatened species out there.

However, we are going to be introducing a new corridor of the existing weeds that's already up there on Saddle Road that we see.

And also with the fire that, yeah, it could be a tool to fight fire but really with cigarette butts now there's a new source where the fire can start.

I'd be interested in knowing how much cooperation there's going to be between the military and the people that's maintaining the highway as, you know, what the protocol not really if a fire breaks out but when. Also I didn't know if it's appropriate to pose a question now to the council, if I just open it now and they answer it later?

MR. SUMADA: Later. We're going to take a little recess.

MR. RYGH: Okay. I was wondering, you know, exactly how close, I know it varies, but on average is the W-7 alignment going to go to the actual Keamuku flow? And what implications does that have for the fighting of wildfire? I know the terrain on the Keamuku flow it would be a lot harder to fight fire on foot.

MR. SUMADA: That would be good. Just write it down on this half sheet. And then hang around for the question period.

MR. RYGH: That's all I have. Thank you.

MR. SUMADA: All right. That's all we have for testifiers. We're going to take about a short 15 minute break right now, recess. You know, we still want to get input.

If you feel you want to give written testimony that's another way of doing it. So just grab a form, this full sheet of paper at the front and you can make written testimony. We'll take a short break and we'll do question and answer with the panel up front. Thank you.

(Recess was held.)

MR. SUMADA: (7:30) This is the question-and-answer period. I'll get it going. But if during the process if you folks come up with more questions just fill out this sheet. It's up front and they'll get it to me.

The first question came from Cory Harden: "Why was no testing done for airborne depleted uranium?" Let me back up. I should introduce the panel, the panel of experts.

So we have Reggie David for Zoology, Russell Okoji for the depleted uranium, Grant Gerrish for Botany -- we'll get him here -- Glenn Escott for Archaeology. Is Glenn here? We have Steve Hallisy from Federal Highways. That's Steve in the green.

So why don't I go back to the question from Cory: "Why was no testing done for airborne depleted uranium?"

DR. KOJI: Hi. My name is Russell Koji. I have a Ph.D. in Toxicology. I work for a company called AMEC Earth Environmental. We did the depleted uranium study.

And the short answer to that question really is that we felt -- first of all, we are working with the W-7 portion of the alignment. And our study evaluated that portion of the alignment.

It did not evaluate the impact area or areas around the impact area. So what would the potential impacts or health risks be in that area?

The short answer would be to depleted uranium or uranium particles found in that area. And it's exactly what we evaluated. We took soil samples along five different areas along the W-7 alignment.

We compared the concentrations with what we found to the naturally occurring uranium levels determined in the literature and found that they were below background.

We didn't do this one way. We did it two different ways. We actually used analytical methods that were more sensitive to -- we use ICPM, and ICPMS. That's one analytical method to evaluate uranium and uranium isotopes.

That particular method is more sensitive to picking up Uranium 234 and Uranium 239. Two thirty-five is another isotope of particular importance. What we did we used alpha-spectroscopy to determine the concentration of Uranium 235.

And in all cases what we found was

concentrations were below background. In general we would just stop the assessment there. But we took it one step further.

And we said, well, let's take a look at what the isotopic ratios would be, which is another way of source determination. And, again, we found this is naturally occurring or below naturally occurring concentrations of uranium.

Generally you'd stop there. But we took it one step further. And we said, okay, do a human health risk assessment on this stuff. What if we put a child sitting along the alignment where we took our samples from?

And we put them there every single weekend, let them play in the dirt for two hours a day. And what would the risk be? Again, cancer risks and non-cancer risks were well below what would be considered a problem. So that's in a nutshell the AMECH assessment.

Airborne concentrations, we're looking at the W-7 alignment. We felt that the soil concentrations right near the alignment would be the most indicative what would be the most representative of what people would be exposed to without looking at the impact area. I'm sorry.

MR. SUMADA: Thank you, Russell. I don't know if that answered your question, Cory. But we'll take your question and talk amongst the team, figure out what's the best approach to deal with that.

Next question is also from Cory. "What will happen to the old Saddle Road running by Waiki'i Ranch?"

I think the county -- it's going to get turned over to the county. Actually they maintain it anyway. But it will still be open for use for those residents as an access to their property and everybody else too. But just the traffic on there would be a lot less. Okay.

This is a whole bunch of questions from one individual: "The Saddle Road website mentions that the State intends to provide the area near Pu'umali for bird hunting. It's been 10 years since the Record of Decision was signed. Why has bird hunting not been allowed?"

MR. HARDEN: They're all related questions.

MR. SUMADA: Okay. "Kaohe was supposed to be mowed. Nothing has happened. It is a fire hazard."

Number 3. "Why has the total thousand seven hundred forty acres not been fenced if it is considered a critical habitat for the Palila?"

The last question was: "Given these discrepancies why should we think that the provisions of this supplemental EIS will be followed?"

So who wants to take that one on?

MR. GEDEON: Question No. 1 regarding the State's intention to provide the one area for bird hunting. It's indicating Pu'umali area. I think that's really a question for the State. Probably DOFAW. I don't know if it has not been allowed, bird hunting has not been allowed up there or not. That's certainly outside of our jurisdiction.

The second question is with regards to a line item in the so-called Palila MOU in which we made a commitment to provide funds for various mitigation elements totaling nearly $15 million.

To date we have spent well over $20 million on mitigation related to the Saddle Road impacts. The item specifically that's being asked here is a very small item for providing funds to DOFAW to purchase a mower and to fund a mower operator for a, I believe, period of three years. Total dollars on that was in the neighborhood of about $115,000. That has not been an item that anyone has been clamoring that we provide the funds to DOFAW for.

I have personally talked to DOFAW two or three times over the last couple of years and said whenever they do want the money, because it is a relatively small amount, we can transfer that money to them. The question just came up maybe 5, 10 minutes ago. As soon as DOFAW contacts me we will move the money to then to proceed with the acquisition of the mower.

There is a question here about: "Why has the total 1740 acres not been fenced?"

As far as I know we have completely fenced all of the areas that we had agreed to fence at Pu'umali as well as the Kaohe site. I'm not sure which of those the 1740 acres is but that has all been fenced.

And it was done, completed probably about three years ago, two or three years ago. Probably took us two or three years to build it just because it's such a difficult installation on the steep slopes and the remoteness.

And then the last question is: "Basically given these deficiencies why should we think the provisions of this SEIS will be followed?"

I believe, in my opinion, we certainly have addressed all of the first three with the exception of providing the $115,000 to DOFAW. Again, we can pursue that at any time.

MR. SUMADA: Thank you, Dave. Is there anybody else that wanted to ask a question that they didn't fill out a form or something?

MR. KAWAIOLA: I did. That was based just on the last question.

MR. SUMADA: Okay. Patrick, why don't you come up to the mic. Yeah. We want Holly to make sure -- I'll give her the spelling of your last name. Kahawaiola'a. Go ahead, Patrick.

MR. KAHAWAIOLA'A: Yeah, Pat Kahawaiola'a The last question just goes to the federal government's prepared to give DOFAW $115,000 get a mower, provide an operator. State Highway Department has a mower. They have an operator. They're gonna take the land. I mean they're being, taking care of the road. Why don't you give the 150,000 to the State Highways?

It will probably go four years as opposed to three based on the fact they got the mower and they got the operator? Thank you.

MR. SUMADA: Okay. Now, speaking on behalf of State Highways, (audience laughing) Patrick, we would encourage Mr. Gedeon to give the DOFAW the appropriate amount of money in accordance with the MOA so that they can fulfill their obligation. And we'll just take care of the road maintenance from our side. Although that probably's a very practical recommendation, Patrick and which we appreciate your input on. Always thinking. That's what we love about Patrick. Kale? Am I breaking the rules here? Joel, Sorry.

MR. GUMAPAC: That's okay. I'll ask the question anyway. For the archaeologist. "What has been done as far as cultural and traditional assessments so far? And also, in addition to the cultural assessments has there been any findings that you've done?"

MR. ESCOTT: To answer that question, there have been a number of archaelogical studies on that parcel. The Army, of course, did an archaeological inventory survey of that parcel. And then on top of that we went back out there, did another study, another archaeological inventory survey. So that area of the corridor has been studied twice.

And sites that were along the corridor, most of which are along the edges of the corridor, there are five rock mounds which correspond to the boundary of the Parker Ranch parcel there which is also the boundary between Pu'uanahulu and the boundary of Keamuku. So those two areas.

And they're probably, they seem to be from the maps that we have looked at when they were surveyed in the early historic eras also when the ranch surveyed their own land. So we have those.

There's also a ranch fence and then the road that Ron Terry mentioned. So there was a size of it done.

As far as the research that has been done we've done a lot of consultation. We've looked at old mo'olelo. We've looked at documentation such as the heart-stirring story of Kamiki and Makaia'ole.

We've consulted a lot of work, a couple Kepa Maly did for Waiki'i, Pu'uanahulu so properties on either side. So we have talked to a lot of people, done a lot of research in the archives as well.

So from what we found the majority of early activity in that area is travel through it, not actual habitation. No one was living up in that area. Was pili grasslands.

Some people came to get their pili. Most of the habitations was Waimea, more towards Kohala Mountain. That's where we have the archaeological remains that show that.

This on this piece of property not so much. Of course there's been ranching out there for quite sometime.

So it's possible if there were some earlier sites they might have been disturbed. But we're not finding anything that looks like habitation. So it's just travel through the area and what we have, the ranching features.

I don't know if that answers your question but that's what we have, what we have done.

So, Kale and, Patrick so I don't get in trouble can you fill out the written piece of paper, and write down your question. (Audience chuckling)

MR. SUMADA: What I'd like to do is close the meeting and thank everybody for coming. We really appreciate your sticking with the whole process.

Again, if you want to make written testimony, you know, you get a form like this and just mail it in to us. We're taking testimony to January 7th, 2010. Okay. Anyway, thank you, everybody, for coming. We really appreciate your taking the time out of your schedules to spend time with us. Thank you very much.

(The proceedings were closed at 7:40 p.m.)

--oo0Ooo--

C E R T I F I C A T E

I, HOLLY HACKETT, CSR, RPR, in and for the State of Hawai'i, do hereby certify;

That I was acting as court reporter in the foregoing Saddle Road Alignment Public Hearing held on the 9th day of December 2009;

That the proceedings was taken down in computerized machine shorthand by me and was thereafter reduced to print by me;

That the foregoing represents, to the best of my ability, a true and correct transcript of the proceedings had in the foregoing public hearing.

DATED: This______ day of_____________________2009

____

HOLLY M. HACKETT, CSR #130, RPR
Certified Shorthand Reporter

PUBLIC HEARING

DECEMBER 10, 2009

4:00 P.M. - 7:00 P.M.

SADDLE ROAD

MAMALAHOA HIGHWAY TO MILEPOST 41

ISLAND OF HAWAII

NATIONAL ENERGY LABORATORY OF HAWAII AUTHORITY

GATEWAY ENERGY CENTER

73-4460 QUEEN KA'AHUMANU HIGHWAY

KAILUA-KONA, HAWAII

PRESIDING OFFICER: JIRO SUMADA

REPORTED BY: PATRICIA L. NELSON, CSR-465
RALPH ROSENBERG COURT REPORTERS, INC.

(Individual private testimony.)

3:53 p.m.

RODNEY WATANABE: Rodney Watanabe, and my address is 73-5611 Olowalu Street, Kailua-Kona, 96740.

Yeah, I think actually I'm very much in favor of the alignment. I'm a transplant from Hilo. I've been living on the Kona side for about 26 years now, but I still have family, obviously, on the Hilo side, and so periodically I like to go back to the Hilo side to visit family. However, I refuse to go on the Saddle Road and haven't been on that road for years now because of the disrepair on the west Hawaii side, and I think this would be a great addition.

And in addition to all of that, when the economy was much better a lot of people were, shall we say, commuting from the east side to the west side, you know, because the jobs were largely here, and I think, you know, at some point the economy will recover and it's going to be a benefit to them as well.

Besides, I think we also need jobs. We definitely need jobs, and, unfortunately, I think this recovery is going to be pretty slow, and so we need to start setting up the jobs now to make sure we have economic growth.

3:55 p.m.

MEL VENTURA: My name is Mel Ventura, V-e-n-t-u-r-a, address is P.O. Box 2045, Kailua-Kona, 96745, and I would provide testimony in favor of the proposed road realignment. I think that the road in its current state is at best uncomfortable to travel and at worst hazardous.

I would agree with everyone who would argue about, everyone who would argue in favor of the economic benefits of a better Saddle Road. I would agree with everything they say.

Because of the current state it's in I don't think the road is being utilized to its fullest extent, and I don't think we are realizing the full economic benefits as well as the benefits that a more integrated west Hawaii community and east Hawaii community could have that a better Saddle Road could provide us.

3:57 p.m.

ARNOLD KANAI: My name is Arnold Kanai, A-r-n-o-l-d, K-a-n-a-i. My address is 73-5611 Olowalu Street, Kailua-Kona, Hawaii, 96740, and I'm testifying in favor of the Saddle Road realignment mainly because through personal experience.

Up to about six months ago and the preceding 18 months I had to take my mother to

Hilo Hospital to unclog a fistula for her dialysis because that procedure was not available in Kona. What normally would take less than a two-hour trip ended up to be three hours because of construction, and to have an 80, you know, 85-year-old lady, who is disabled, sitting in a car for three hours is just unbearable. And I believe the alignment would have cut that time down to, again, well under two hours and at least provide my mother, which is basically a life and death procedure, to have done in a reasonable amount of time and reduce the fatigue on her.

So I'm hoping, though my mother has passed, that I may not need to go through that trauma and benefit from this alignment, as well as other members of both ends of the island.

3:58 p.m.

KEN MELROSE: Ken Melrose, Post Office Box 109, or do you want street address, 81-950 Onouli Road, Kealakekua.

I think what the federal government has done in the first phases of the Saddle Road is absolutely gorgeous, and I really look forward to seeing it connect to Mamalahoa and having it come as far as south toward Kona as it can. It is a benefit to the overall island circulation plan and a real benefit to the community and

I completely support it, alignment W-7.

4:00 p.m.

JOHN PARAZETTE: John Parazette, P-a-r-a-z-e-t-t-e, P.O. Box 9021, Kailua-Kona 96745.

It's just very simple, I just want to state that I don't believe that a double line is necessary on a two-lane road unless there is limited vision in the distance ahead. And too commonly around here we see double lines used when there's good visibility, and a double line is never supposed to be crossed in passing or for any purpose, and it limits, you know, to my mind to that extent it limits the use of the road and, of course, and forces people to make the decision whether or not to break the law by crossing a double line to pass a slow moving vehicle.

(Individual private testimony concluded at 4:02 p.m.)

(Off the record.)

(Back on the record at 4:12 p.m.)

JIRO SUMADA: It's 4:15, so I declare the public hearing officially open.

I want to apologize, folks, I don't like usually to run formal meetings, but they tell me this is a very formal process that we have to follow. I have to, they gave me a script, so I have to follow the script, and last night I only stumbled once and they gave me scoldings at the end of the meeting, so hopefully I will do better today.

Anyway, my name is Jiro Sumada. I'm the deputy director for the Department of Transportation. I would like to introduce some of the dignitaries we have in the audience. We have Rep Denny Coffman from the State Legislature from the federal government. We have Dave Gedeon, Steve Hallisy, Melissa Dickard and Matt Ambroziak from Central Federal Lands out of Denver.

We also have from the federal government Pat Phung and John Nicholson from the Federal Highways Administration Hawaii office.

From the county we have council member Pete Hoffmann and are there any other council members here?

SPEAKER: They all ran away.

JIRO SUMADA: We also have Bobby Command from the mayor's office, Warren Lee from public works, I thought I saw him. Hey, Warren, thank you for coming.

From the DOT staff in Honolulu we have Ken Tatsuguchi and Dina Lau, they are from our planning branch, Dean Yogi from rights of way. We also have Stan Tamura and Sal Panem from the Hawaii district office here on the Big Island.

The consultants, I will just introduce Bruce Meyers, Okahara & Associates, he is the prime consultant for this environmental effort.

We also have members of the Saddle Road task force, and I'd really like to ask them to stand and be recognized. Walter Kunitake and Arnold Okamura, I think they are the co-chairs of the task force right now, Alvin Chong, Robert Kim, and did Marni Herkes come? She said she would.

Anyway, you know, I want to thank these folks. They started this whole effort, I forget, was it 13 or 15 years ago, but they brought this task force together of community members from east Hawaii, west Hawaii, government officials, that are all involved in this process, and it's truly been a successful collaboration, and I would like to recognize them and thank them for their commitment to staying with it for this much needed project.

The purpose of tonight's meeting, or this afternoon's meeting, is twofold, mainly, it's to discuss the location and the design of the proposed Saddle Road from Mamalahoa Highway to Milepost 41 on Saddle Road, as well as not only that alignment, but also the social, economic and environmental impacts that the project would have.

A new alignment is being considered. The previous alignment passed through this Ke'amuku parcel that the Army bought a few years ago, and the new alignment will relocate that, the roadway, this segment of Saddle Road, farther south along the border of that parcel.

The public meeting is held for several reasons. First, it's a means of informing you, the public, of what the State Department of Transportation is doing in developing the Saddle Road project.

Our intent is that you should be informed on the factual basis on how you, as the general public, property owners, motorists, and other interested citizens, may be affected, either beneficially or adversely by the proposed highway.

Secondly, the public hearing is held in order that we may obtain facts from you folks that was not previously brought to our attention, and in connection with the location, the design, and the potential impacts.

Notices for tonight's meeting were put in, published in the Honolulu Star Bulletin on November 10th, 2009 and on December 2nd, 2009. Notices were also published in West Hawaii Today and the Hawaii Tribune Herald.

Now, I would like to cover the agenda for tonight that we have up here. First, we will have a short presentation by Dave Gedeon, Bruce Meyers and Ron Terry about the project, a short history, and then they will get into the details of the project.

Then we will receive testimony from you, and that's a really important part of this whole process that we are going through. So we encourage folks to come forward and give their testimony. Then we will take a short recess and then we will resume with some questions and answers.

Now, I'd like to cover some of the guidelines for tonight, today's meeting, and how we are going to run it.

First, the purpose of the meeting is we're not here to debate the proposed improvements but to solicit factual testimony from you folks, nor is the hearing intended to be a popular referendum, that is, we are not going to be voting on whether to build the road or not to build the road in the proposed alignment.

We do want to extend to you every opportunity to voice your concerns and to present any new facts that the department may have not been aware of or not properly considered.

Secondly, we'd like to emphasize the

importance of your testimony. All proceedings of the hearings are being recorded. It is important that all questions and the testimony are clearly stated into the microphone and should be factual, brief, unemotional and free of political references, extraneous material of any nature whatsoever not properly part of the, will not be properly a part of the proceedings, and all speakers must confine their statements to the subject under discussion.

Myself as the moderator today, it's my job to make sure we all stay on course, on track, and if need be, interrupt to make sure that the testimony isn't wandering off in one side direction.

Thirdly, all of those wishing to testify are asked to fill out a speaker information card. I think it was made available as you came in and signed in at the front desk.

Testimony will be received in the order those cards are received, and in order to give everyone a chance to testify, we are going to limit the speakers to about three minutes each.

Also those wishing to ask questions, if you could write those questions out on the forms, it was the half sheet sized forms that were also given at the front when you signed in, and we will take questions at the tail end of the meeting.

Then to make sure that we get all of the, as much public input as we can, and for those of you that may be shy and don't want to give testimony or to ask questions, we provided a full-page sign up, I mean, a written input that you can make and just send it in to us. Those, we will be taking those until January 7th of 2010.

Following the public hearing the highway division staff will evaluate your testimonies and information presented today together with the factual data that we already have.

So I would like to mention to all that all information gathered in regards to the location, design and environmental impacts of this project, including the public hearing transcript that Patty is helping us with, and written statements received, will be available upon request for public inspection and copying.

We will now get to the details of the proposed project, so let me just call on Dave Gedeon from the Federal Highways Central Federal Lands office to give you some brief history on the project.

David.

DAVID GEDEON: Thank you, Jiro.

Good afternoon everyone. On behalf of the Federal Highway Administration I too would like to welcome you and express my appreciation for you coming this afternoon.

The Saddle Road improvement project is actually being sponsored or improved by four agencies.

At the local level, County of Hawaii, who has been maintaining the road since, I believe, 1957 or earlier under an agreement with the State of Hawaii, and at that time Territory of Hawaii.

At the state level the Hawaii Department of Transportation, who actually owns the road and who is taking over maintenance responsibility as each segment of Saddle Road is improved and open to the public.

At the federal level the Department of the Army, who approximately 22 miles of the new road crosses through their lands, either owned or through lease.

And then finally the Federal Highway Administration, which is my agency. We are responsible for administering the federal dollars in this project. We are also the lead agency for design and construction of the Saddle Road project.

I just might mention that the Hawaii DOT has provided approximately $110 million for the Saddle Road project to date, and the Department of Army has also contributed about approximately $112.5 million.

The Saddle Road project, the origins of the Saddle Road project go back to the mid 1980s when the County of Hawaii was seeking ways to make much needed improvements to the road. My understanding is that was under Mayor Carpenter's administration back then.

Over the next several years the four agencies sought ways to find funds to make the improvements. In 1989 the Department of Army, through congressional action, appropriated the first funds to improve Saddle Road.

However, in 1991 the four agencies decided that the road should actually be moved to north of PTA rather than through PTA, so that decision led to a subsequent decision to prepare an EIS for the entire Saddle Road out from Milepost 6 on Kaumana all the way to State Route 190.

We began work on the EIS in 1994 and we completed the EIS in late 1999. The Record of Decision was signed, I believe it was on October 31st of 1999. Design began immediately in January of 2000 and our first construction project was awarded in late 2003.

Official ground breaking began in February of 2004 and our very first project was open to public traffic in I believe it was February of 2007.

Since then we have opened two additional sections of Saddle Road and to date approximately 23 miles of Saddle Road have been improved and opened to public traffic.

Bruce, can you show that next slide?

So the little things I don't think many of you will be able to see. The portion that has been opened to date begins at mile 19 on the east side, extends past the Mauna Kea observatory access road, past the state park, past PTA, and ends at approximately milepost 41 or 42, which is at the bottom of the so-called seven steps area.

Under construction is a project that we just awarded, oh, I don't know, maybe three months or so ago, that begins at milepost 11 and extends to mile 19. This project is scheduled to be completed by fall of 2011.

The last remaining project on the east side extends from mile 11 down to milepost 6 where it ties into Puainako Street. That project is at the 70 percent design stage and pending the acquisition of right of way for that five-mile stretch as well as the appropriation of funds this project should be ready to be advertised by fall of next year.

On the west side, the original EIS that we prepared in 1999 went forward with a selected alternative of this W-3 alignment.

In 2006 the Army acquired 23,000 acres of land referred to normally as the Ke'amuku parcel, which is shaded in this. And at that time the Department of the Army requested that the Hawaii Department of Transportation and the Federal Highway Administration shift the W-3 alignment further south to, I will use a military term I was taught, deconflict civilian traffic, civilian traffic from military training operations.

So the W-7 alignment follows closely to the property line of this Ke'amuku parcel. And with that I am going to turn it over to Bruce Meyers who has more details with regards to the specific of the W-7 alignment.

BRUCE MEYERS: Thank you, Dave.

My name is Bruce Meyers. I am with Okahara & Associates and we will be talking about the design aspects of the project.

This is a closer view of the W-7 alignment. The alignment, as Dave mentioned, goes from approximately milepost 42 and follows this green line here and connects to the Mamalahoa Highway at milepost 14.

You might recognize this area. This is, this bend right here is the area that they had the earthquake repairs right here. So it's, I think, about three, three miles from the Waikoloa Road, sorry, the Waikoloa junction. This alignment was selected based on trying to stay out of the way of historical as well as natural resources, as well as trying to keep the grades not too steep. That's basically the reasons for this alignment that is shown.

This is about 10.3 miles in length. There will probably, there will likely be some places where they will have either a turnout or a pullout for scenic and historical interpretive sign opportunities.

There will also be an approximate location here a military underpass so that, so that it is separated, the traffic is separated from the military traffic.

This is an artist rendition of what it might look like. This is looking towards the east so you are going uphill just after you get off of Mamalahoa Highway, and the lanes are 12-foot lanes, you will see one eastbound here, one westbound. And also going east we will have a climbing lane. This is also a 12-foot climbing lane and then the shoulders on the sides are eight-foot wide paved shoulders.

The speed limit is, if you can see there, is 55 miles an hour.

This is very, basically it's the same as what it looks like on the east side. This is the section that was recently completed, the same cross-section here, eight-foot shoulder, 12-foot climbing lane, 12-foot through lane, 12-foot through lane going east and then the shoulder.

So that's the basic design elements of the project.

At this time I will turn the panel over to Ron Terry on the environmental aspects of the project.

RON TERRY: Lost the background? Okay. I will have to turn around to read it.

I am sorry, we have some pictures behind here and the PowerPoint fixer gods took them away apparently.

I would just like to discuss the EIS that we prepared for this. It's a supplemental EIS. We had a team of researchers that did work on it. We did a bunch of major studies on it and those interested can pick up a little light bedside reading here. It's available at saddleroad.com and it's at all the libraries. We have several copies.

The archeological studies that we did were conducted by SES Archeology, a local firm out of Honolulu and Hilo. We supplemented the work that we had done in the original EIS, which included an extensive cultural impact assessment by Pualani Kanaka'ole Kanahele and Ed Kanahele and we integrated technographies that were done subsequently by Kepa Maly for the Ke'amuku area and other interviews that were done around and we evaluated the cultural resources.

Getting closer? Thank you.

Okay. We did botanical surveys, and our botany, our botanist is here tonight, Dr. Grant Gerrish from the University of Hawaii. He just showed up, so those of you at the open house portion of the hearing probably didn't get to meet him, but he will be available for questions.

We did zoological studies with Reggie David, a Kona resident, who had done the avian studies for the earlier EIS as well. Socioeconomic assessments and, next slide, we also studied wildfire. I think that anybody who lives in Kona knows that fire is a huge issue.

Pu'uanahulu is sometimes called ground central, ground zero for the, for fire danger, and our alignment comes very close to Pu'uanahulu, so we studied the Army's fire plan. We integrated measures that are being used by the Army as well as developed new measures in our road design to accommodate fire danger to make our road as fire safe as possible and at the same time make it a firefighting tool. This will increase access to Pu'uanahulu where many of the fires come up from Mamalahoa Highway and then threaten into PTA and they have to fight it out of there.

We also did depleted uranium studies and Dr. Russell Okoji is here from AMET and he has been out at the open house talking to people. And we looked for evidence of depleted uranium in various ways, it was a very thorough assessment, and we found no evidence whatsoever of depleted uranium dust in the corridor.

The environmental assessment looked at cumulative impacts from all the projects that were taken place nearby, and looked for hazardous materials and unexploded ordinance on a high level.

Okay. Our major findings in terms of archeology, we were able to work our road around most of the archeological sites, in fact all but one. All the archeological sites we found anywhere near the corridor related to ranching. They were mostly 20th century survey markers, fence posts, that sort of thing.

The one feature that we are impacting is the old Waimea Kona Road. If you drive along Mamalahoa Highway you can see above you remnants of this old road, stacked rock, nice road beds sometimes, it's here in some places and not in others. It's about a nine-mile feature, I believe, and we're going to effect a hundred feet of it. We are going right through that 100 feet, and the rest of the site is actually going to be preserved. So we have very small archeological impacts.

The area has not been used for gathering in many years or other Hawaiian cultural practices and it's now a military base and our extensive set of interviews did not reveal the presence of any Hawaiian cultural practices on the particular alignment or any interference with such.

Also there were no burials located anywhere near the alignment. We do have knowledge of burials and did find burials in different parts of the area, but nowhere near the alignment.

We were also able to avoid any sensitive biological resources, in particular threatened and endangered species. There is a concentration of endangered species located on the edge of PTA, the old part of PTA, and we routed our road just to maintain a distance of at least 500 feet. We did extensive surveys, both in the dry and rainy season, to look for individuals of these.

And unexploded ordinance, we didn't find any evidence of that during our, our surveys by our biologists or archeologists and other folks that were out on the land, but prior to construction we are going to do a systematic sweep of the area looking for the UXO that might be buried under the ground.

Any road has some scenic impacts but probably the major impact you could say is beneficial. It's going to open up sweeping views of Hualalai, Mauna Loa, Mauna Kea, from angles that most of you have probably never seen the land from, really beautiful views that I feel like I have been privileged to see and now our whole island is going to be able to see these.

Our road construction techniques are such that they minimize terrain alteration. We try to keep the cutting and filling to a minimum and naturalize the sides of the road.

Socioeconomic impacts. We have about a 30-page chapter on this full of tables and charts and bells and whistles that show, you know, what's happening with housing and commuting and population, but I think the major finding could be summarized as it's an incredible benefit for our island, and we have the ability to link east Hawaii and west Hawaii in a way that's probably an opportunity that's never happened before.

And this is what we heard in all our

interviews with folks, is that there are many people who work on one side of the island or the other and live on the other and they need to get back and forth between the island.

This will reduce the commuting time, for example, between Kona and Hilo by 20 minutes. And this is not primarily a time saving exercise, I mean, this is about safety. And we heard last night from carpenters who regularly travel the road, and, you know, they talked about what it means to get up at 4:30 in the morning and travel across the road and worrying about the safety of the road. And I think that socioeconomically can be summarized by that, principally it will unite our island and will provide for much safer travel.

And with that I'll turn it back over to Dave Gedeon for scheduling.

DAVE GEDEON: We're just showing the major milestones remaining here. As everyone probably knows, the draft supplemental EIS was published last month November. The close of the public comment period is January 7th of next year. All written comments sent by mail must be postmarked by midnight on January 7th.

E-mails, I would assume we will accept e-mails that are sent by midnight Hawaii time.

The target date for completion of the

supplemental EIS is February of next year, end of February of next year, and that would be followed by a Record of Decision by late March, assuming we do not run into any major new issues that come forward through the public hearings or the agency comments.

Assuming we have a signed ROD by the end of March, final design can begin immediately at that point, and we are estimating that final design will take 12 to 18 months to complete.

Construction will begin after final design and we are estimating construction will take 18 to 24 months.

I want to emphasize that for final design and construction, both are pending the availability of funding, and at this point we're not, we're not ready to go forward with at least the construction project due to the lack of funds at this point.

So I think that's it. Jiro.

JIRO SUMADA: Okay. Thank you Dave and Bruce and Ron.

Now we would like to get to the testimony part of the presentation. And while Melissa brings that forward, those people that signed up, I would like to offer that if you haven't already and you would still like to testify -- oh, okay.

They just encouraged me to ask folks if you could fill in chairs in the front. They are going to put some more chairs in the back, so if you could just move forward and fill up, and, you know, they will bring out some more chairs for the guys standing in the back.

So if you haven't, if you want to testify and you, and you haven't done so already, please fill out this short quarter sheet form. It's available at the table as you walked in.

If you have a question to ask, then you fill out the half-sized sheet form and just write down your question on those forms and they will give me the question and I will read the question and we will have our experts answer them. This is after the break. Okay.

So when you step forward to deliver your testimony, to help our court reporter, Patty, if you would speak into the microphone, state your name and the organization you represent, if any, and if you can just speak calmly and slowly so that she can get everything.

The first testifier we have is Denny Coffman followed by Mike Matsukawa.

DENNY COFFMAN: Yes, my name is Denny Coffman. I'm the State House and District Representative for District Six here in the Big Island.

My comments I want to make is that I

represent about 15,000 registered voters in the north Kona district. This information about this Saddle Road was published in West Hawaii Today sometime during the summer.

As a State House representative I usually get e-mails from lots of people when there's issues and concerns. I have not received any negative comments on this. The only discussions I have had are all positive dealing with issues that were just raised a minute ago about the safety of the road. This last section being finished will greatly finalize the safety aspects of it and the community sees this as an economic boost for the entire island, so thank you.

JIRO SUMADA: Thank you, Rep Coffman.

Next we have Mike Matsukawa followed by Rodney Watanabe.

MICHAEL MATSUKAWA: Thank you. My name is Mike Matsukawa. I'm a resident of Kona and I'm a local attorney there.

I think it would be very prudent if the people preparing the supplemental EIS would address Judge King's recent ruling. He rendered a ruling dealing with old boundary lines on the Big Island. His decision was on November 20th, I think, of this year, and the State was a party to the case, as was the United States

National Parks Service, and some private landowners, and the issue had to do with how do you locate the ancient boundaries that had been laid out during the early period when grants were being awarded.

I say this because if I were going to oppose the EIS, that's what I would jump on, and I think that would be something prudent to address ahead of time. The State surveyor is aware of the case because they were parties, and I think it would really put to rest those type of issues so that people can focus on the project itself and its potential impacts.

I support the road. I support the project. I hope it makes money flow quicker from Hilo back to Kona. Thank you.

JIRO SUMADA: Thank you, Mike.

Next Rodney Watanabe followed by Mel Ventura.

RODNEY WATANABE: Excuse me, I provided to this lady earlier.

JIRO SUMADA: Oh, okay. Thank you, Rodney.

So Mel.

MEL VENTURA: Same thing, I did provide my testimony.

JIRO SUMADA: Boy, you guys are very

efficient here. Okay, Mel.

Arnold Kanai.

ARNOLD KANAI: Same here.

JIRO SUMADA: Okay. Moving right along.

Walter Kunitake.

WALTER KUNITAKE: Yes, I'm one of those that's been on this task force for a while, and one thing that I would like to say, you know, first of all, you know, I'm totally in support of this W-7 to go ahead.

Over the years that I've participated as a task force member I feel very proud that I'm on this team because, you know, there are a lot of agencies talked about who is involved, whether it be federal highways or state DOT or county or engineers or consultants, Army.

We hold quarterly meetings for the Saddle Road task force. It's a working meeting and it's attended by 20 to 30 people at each of these meetings and it is a working meeting, and this is a time when we share our concerns, issues, how the progress is going on different segments, because this Saddle Road project, you know, even though today we are focusing on W-7, it's been a project that really started from, it's really from mile marker 6, which is the Puainako extension all the way across the island.

And I can say this much, that the players in this project have been very, very meticulous, very up front about various issues. And you heard Ron talk about the various concerns about biological, historical, cultural, and I think the groups that's involved, the players that are involved are doing a really tremendous job, and I think we should be very happy that we have this team of people, because the meetings that we have are very, very productive. If there are concerns, the concerns are addressed head on, and I think the resolve is very reasonable.

So I feel very comfortable with what we are proposing here, the realignment to W-7, and I would like to say thank you very much to everybody for doing this great highway that will connect east Hawaii and west Hawaii. Thank you.

JIRO SUMADA: Okay. Thank you, Walter.

Next we have, now forgive me if I pronounce your name wrong, Norman Kaimuloa --

NORMAN KAIMULOA: Kaimuloa.

JIRO SUMADA: -- sorry, from the carpenters union.

NORMAN KAIMULOA: That's okay, that's every day.

JIRO SUMADA: Thanks, Norman.

NORMAN KAIMULOA: Aloha everybody. My

name is Norman Kaimuloa. I represent the carpenters union and last week we had a task force come to our union meeting and they spoke about this realignment of this Saddle Road and they kind of explained to us it was 16 years in the making, and for the carpenters union, this road, we are for this road because this road will help us.

We have the observatory coming up and when this road comes up it will have our members drive that road safer in less time so they can spend time with their families. Yeah.

I remember driving this Saddle Road. The first time I drove it was 30 years ago, yeah, it was brand new. You know, it was brand new. I couldn't believe it. And at that time I was living in Honolulu, and I'd say, gee, this island, I got to move back because I was born here, yeah, I got to move back, the roads are so nice.

But since 30 years ago to now, you know, the roads are opposite, it's all bust up, you know what I mean. So for me, I'm glad, I'm glad to see this happen, and, you know, like I say, I like to see this go through.

Thank you.

JIRO SUMADA: Thank you, Arnold.

Next we have Isaac Harp followed by

John Parazette.

ISAAC HARP: Aloha. Isaac Harp representing myself.

I am just wondering why the overall project appears to be broken down into several smaller projects or phases and why we are not discussing the blue dash line that was on the map out there that start from Mamalahoa Highway and goes down makai to the ocean highway. And it appears that, that there is a part of a plan for the future, from what I see on the maps out there, and why is consideration not given to connecting to the existing Waikoloa Road rather than creating a new road taking up more land just south of Waikoloa Road.

Waikoloa Road could use the improvements, as we all know, and I think as far as cost consideration, that should be taken into account. I think creating an entirely new road would cost more than fixing up an existing road.

And I'm concerned that the alignment of the section up here to go over State controlled lands and I think the State has been giving up enough lands to development and roadways and things as it is.

And I would also like to request, I think a lot of Hawaii would be interested in viewing the documentation that proves that clear title to this land is proper and correct, including the former Parker Ranch land which was purchased by the military, that 23,000 acres.

And I understand that you did the depleted uranium study in the area and I'm concerned that the study was on such a small scale, from what I had a little discussion out there with the gentleman about the depleted uranium study, and it seems to have occurred at a very small scale, and I think we need a much larger scale than that.

And this material has a half life of 4.5 billion years, older than the plans itself, I understand, and this could be similar to the asbestos situation. It took many decades before they figured out that asbestos was bad for a human's health.

I think we need to be absolutely certain that depleted uranium is not a threat to human health before we go disturbing anymore land within the Pohakuloa training area.

And I would just like to mention that Kona is considered a downwind area from the Pohakuloa training area, and Kona has the highest per capita rates of various forms of cancer in all of Hawaii.

Thank you.

JIRO SUMADA: Okay. Isaac, thank you for

your testimony. The first part you had a question, yeah, about the, talking about the other road.

ISAAC HARP: Yeah, I was wondering why it was --

JIRO SUMADA: So if you can fill out that half sheet paper with your question, then after the break you can ask that one. Okay?

ISAAC HARP: Thank you.

JIRO SUMADA: Thank you, Isaac.

Next, Jack Parazette.

JOHN PARAZETTE: This is just a general concern but it relates to this road. I think that a double line, which is commonly used on the road, is inappropriate except for areas where site distance is restricted, and that way people aren't, aren't forced to break the law to pass a slow moving vehicle. That's all.

JIRO SUMADA: Okay. Thank you, Jack.

Next Vivian Landrum and following is Ken Melrose.

VIVIAN LANDRUM: Aloha everyone. My name is Vivian Landrum. I am the president and CEO of the Kona-Kohala Chamber of Commence. We represent over 500, 550 now, our numbers went down a little bit but they are coming up again, so proud to say 550 businesses.

We are the leading business advocacy

organization on the west side here. I actually went through the draft EIS, all 346 pages I think it was, something like that, went through and concur with so many of the points made in there, but there's only a couple that I wanted to touch on here.

As Ron pointed out, the economic impact to the island is extremely beneficial and it's really critically needed at this time. Our tourism numbers are, they are just woeful. The highway offers us the opportunity to finish the link between the east and west and enables us to promote this destination truly as one island allowing visitors and their residents to commute between both sides with ease.

Our businesses here will be able to expand their reach and offer services to both the east and the west in a timely and a more efficient manner. Cutting down that driving time is critical. It saves them on gas mileage.

For the past year and a half the Chamber has been preaching shop, buy, and buy local. This road will expand those possibilities as well and still continue to keep our local dollars on this island.

This road will enable us to support each other east and west. For the west side the easier accessibility to government offices is probably very important to our member businesses, especially when they are trying to get permits.

We rarely get to take advantage of all the offerings that UH Hilo has and this will change that.

And now I would like to talk just a moment about the safety of that road. As the draft SEIS pointed out, the road is narrow, winding, two lane, we could go on about the challenges with it. Some sections I don't think could have been considered a two-lane road.

In 2000 a group of students from the high school spent the weekend at Mauna Kea State Park. Around 2 p.m. on a Sunday afternoon, it probably was a pretty rainy day, a car came around a bend and sent a car with four high school students off the road. They rolled three times and hit a tree. Miraculously no one in that car was killed, but my daughter suffered a broken back. She spent the next three months learning how to walk again with a titanium cage in her back. So I personally know this road is dangerous the way it is now.

There are many other stories out there and they are far worse, their endings are far worse than ours. We were very lucky. So I wanted you to know that we support this road. We like that you have addressed the sensitive issues here. We think that you have done an excellent job of covering all the challenges and we urge you to move forward with the project.

Excuse my voice. It got a little cracky. Thank you.

JIRO SUMADA: Thank you, Vivian.

Next Ken Melrose.

KEN MELROSE: Thank you. My name is Ken Melrose. I did provide testimony to the court reporter in support of this W-7 alignment. I have been driving the existing Saddle Road for about 35 years now and I want to compliment the highway administration and those involved.

The new sections of the road are absolutely incredibly safe and scenic. We get to see parts of this island that we never would have gotten to see, and it's a wonderful benefit. And one day maybe they will take the Saddle Road off the endangered list for the rental cars.

Thank you very much.

JIRO SUMADA: Thank you, Ken.

Next is, now forgive me on this name, Robert Meierdiercks from the carpenters union.

ROBERT MEIERDIERCKS: My name is Robert Meierdiercks, I'm a resident of the state for 46 years, grew up in Honolulu, Kailua, moved to Kona in 1971, worked construction 20 years. I've been on staff at the carpenters union for 20 years.

I have worked personally in Waikoloa. I lived in south Kona so that was quite a drive, I built homes down in Puako where we had to drive all the way through Waimea down to Puako to work on houses we built down there.

We have approximately 450 members in Kona and a little over 300 in Hilo, and it depends on the economic climate where it was good in the past seven, eight years, well, it's, from about two years ago, seven, eight years a good economic climate, especially on the Kona side.

We have members that drive over from Hilo and one of the standing jokes from the guys that drove over from Hilo, even though they carpooled, we asked them what car are you on, the second, third or fourth or fifth car they had gone through commuting from Hilo to Kona to work, because that's where the jobs were.

That's just some of the things that happen and they always have concerns about the roads, what the best times to drive, what time to stay away from, what time the fogs came in, what times the fogs left, and that type of thing. So they had to time their trips on the specific climate changes on the different elevations you encounter on that road.

So any improvement to the existing, especially on the Kona side, we've seen Hilo, Kona, Hilo, Kona, Hilo, Hilo, and now we want to see something in Kona to make the improvements for our people on this side, whether they work.

What we see in the future for our people is more of the jobs are going to be in Hilo right now so our guys are going to be transferring from, you know, driving daily from Kona to Hilo on the jobs that are coming up in the future in Hilo.

Just for the record, we're over 90 percent unemployed here in Kona, our members, and approximately 60 percent unemployed in Hilo.

Thank you.

JIRO SUMADA: Thank you, Robert.

Next Jon Kunimura.

JON KUNIMURA: Sorry, I already submitted by testimony on paper.

JIRO SUMADA: Okay. Thank you, Jon.

James Boyle.

JAMES BOYLE: Aloha everyone. I'm James R. Boyle, I'm a resident of Kailua-Kona and I strongly support this project. I don't want to be too redundant. All the positive reasons that I support it have basically been covered by the previous presenters, but I might also add that my wife and I had the pleasure of recently driving to Hilo over the Saddle Road which we religiously avoided in the past. I figured at the time of day I could squeak over to Hilo the fast way.

The first part of the trip was devastatingly harrowing, it was scary, it was bumpy, I had to ride the middle of the road all the way to where the improvements began.

Once we got to the improvements, it was awe-inspiring. The roadway was absolutely fantastic. The work that they did is better than any road that I have ever seen in Hawaii in my entire life. I felt I was already in Hilo it was so good. Just kidding.

Anyway, I think that this project is going to greatly improve that area and also will benefit so many people they are too numerous to mention right now.

Again, I strongly support this project. It's a great gift to the island of Hawaii.

Thank you.

JIRO SUMADA: Thank you, James.

Our last speaker is Tammy Harp.

TAMMY HARP: I put it into questions.

JIRO SUMADA: Okay. So why don't we take a 15-minute break, and right after that we will get into question and answers. So if you folks have any questions, feel free to fill out that half-sized sheet and turn it in to the attendant and they will bring it forward.

Thank you very much.

(At 5:05 p.m. a break was taken.)

(Back on the record at 5:21 p.m.)

JIRO SUMADA: Okay. Now, if we can come to order.

Let's see, we have questions and answers, and one question we have is from Laura Dierenfield. What will the intersection at Mamalahoa Highway look like, and is there an opportunity for a staging area at the intersection of Mamalahoa and Saddle Road for ride share or bus or recreational use in the future?

Let me ask Bruce Meyers from Okahara & Associates to answer this.

BRUCE MEYERS: The intersection at Mamalahoa Highway at this time will be a T-intersection, so it's what's called an at-grade intersection. There will be full channelization there and probably will have an island, a wide island between directions on Mamalahoa Highway, deceleration lanes, acceleration lanes. As far as the details of the intersection, it will come out during the final design of the project.

In terms of a staging area, is this, I

think this is like a park and ride facility. This is a good, good point. This wasn't really considered for this intersection and it will now be considered. All we can say is we will look at it and see what kind of opportunities there will be to do something like this. That's it.

JIRO SUMADA: Are there any other questions that folks wanted to make?

Okay. If not, you know, we still want to receive comments, as many people as possible. If you were shy and didn't want to come up and speak, we have this written testimony form that you can still fill out and mail into us or even e-mail your comments to us. We will take them until January 7th, 2010, right?

So at this time I would like to close the public hearing, and it looks like it's about 5:25, and I want to thank everybody for coming and sticking with us and getting the information firsthand and being part of this whole process that we have.

Thank you and have a safe drive home.

Thank you.

(Presentation concluded at 5:24 p.m.)

6:24 p.m.

(Individual private testimony.)

DIANE QUITIQUIT: My name is

Diane Quitiquit, Q-u-i-t-i-q-u-i-t, 75-5591 Hienaloli, H-i-e-n-a-l-o-l-i Road, Number 11, Kailua-Kona 96740.

I came to testify in support of the Saddle Road improvement and encourage the federal government to continue the project for several reasons.

First, it is, our economy is in great need of assistance and having a more direct route from the east side to the west side will help employment on the Big Island of Hawaii and help our economy grow.

Secondly, for safety reasons. It's important that we have a secondary road on the island for, in times of road closures in other locations it's important to have that, that route.

I think it will do much to build the community on the Big Island as we are able to bring people closer together.

And I think that will suffice.

6:27 p.m.

(Public Hearing concluded at 6:55 p.m.)

C E R T I F I C A T E

STATE OF HAWAII)
) SS
CITY AND COUNTY OF HONOLULU)

I, PATRICIA L. NELSON, do hereby certify;

That on December 10, 2009, at 3:57 p.m. that the proceeding was taken down by me in machine shorthand and was thereafter reduced to typewritten form under my supervision, and that the foregoing represents, to the best of my ability, a true and correct transcript of the proceedings had in the foregoing matter.

I further certify that I am not an attorney for any of the parties hereto, nor in any way concerned with the cause.

DATED this 4th day of January, 2010, in Honolulu, Hawaii.

____
PATRICIA L. NELSON, CSR-465
My Commission Expires: 9-28-2012

[This page intentionally left blank]

SADDLE ROAD (STATE ROUTE 200)
Mamalahoa Highway (State Route 190) to Milepost 41
County of Hawai‘i, State of Hawai‘i
FHWA Project No. 200(00)

SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

Submitted Pursuant to Section 42 U.S.C. 4332(2)(c)
and Chapter 343, Hawai‘i Revised Statutes by the

U.S. DEPARTMENT OF TRANSPORTATION
Federal Highway Administration (FHWA)
Central Federal Lands Highway Division
and
STATE OF HAWAI‘I
Department of Transportation (HDOT)
Highways Division

<u>Cooperating Agencies</u>
U.S. Army Garrison, Hawai‘i

Appendix A
Public Involvement and Agency Coordination
A6: Comments to Draft EIS and Responses

[This page intentionally left blank]

Index for Comments to Draft EIS

Notes: Oral testimony in hearing transcripts in App. A5; letters, faxes or emails are contained in App. A6
In App. A5, separate page numbering for Hilo and Kona (H= Hilo page#; K-Kona page#).
Comment letter number is upper left corner on 1st page of each letter.
For those who provided only oral testimony, only FHWA response letter is contained in App. A6 and indexed here

Letter	App. A5	App. A6 Ltr Pg/FHWA reply Pg	
1	H32	1/30	Cory Harden, Sierra Club
2	H62	31/32	Patrick Kahawaiola‘a
3	H49	33/34	Kale Gumapac
4		36/37	Pete Lindsey, Hawai‘i Construction Laborers Union Local 368
5		38/39	Doreen Friberg
6		40/41	David Uhlmann
7		42/43	Peter Boucher, P.E.
8		44/45	S. Troute
9	H39	46/47	Jeffrey Melrose
10		48/49	Michael Dworsky
11	H44	50/52	Simbralynn Kanaka‘ole
12		54/55	Sally Miller
13		56 (see Ltr41)	Laura Dierenfield
14	K38	57/58	Tammy Harp
15		59/60	Isaac Harp
16		62/63	Susan Law
17		64/65	Tim Law
18		66/67	Tim Hershman
19		68/69	Merna Izawa
20		70/71	Takeo Izawa
21		72/73	Adam Jardine
22		74/75	Debbie Baker
23		76/77	Jon Kunimura
24		78/79	Peggy M. Ciriako
25		80/81	Margaret K. Masunaga
26		82/83	Marsha Boyle
27		84/85	Sheryl Henderson
28		86/87	John Buckstead
29		88/89	Steve Hurt
30		91/92	Phyllis Tarail
31		93/94	Tom Geballe
32		95/96	Roger Harris
33		97/101	U.S. Environmental Protection Agency, Region IX, Environmental Review Office
34		102/103	Edward Brown, Goodfellow
35		104/105	Hawai‘i Fire Department
36		106/107	Mark McGuffie, Director, Enterprise Honolulu
37		108/109	Hawai‘i County Police Department
38		111/112	Hartwell Aloha Kaeo
39		113/115	Robert Ward
40		117/118	U.S. Geological Survey, Pacific Island Water Science Center
41		119/121	Laura Dierenfield, People’s Advocacy for Trails Hawai‘i
42		123/124	Eugene H. Nishimura, Japanese Chamber of Commerce
43		125/126	Stephanie Nagata

Letter	App. A5	App. A6 Ltr Pg/FHWA reply Pg	
44		127/129	State Historic Preservation Division
45		130/133	Mike Price, Chair, South Kohala Traffic Safety Committee
46		134/135	Department of Business Economic Development & Tourism, Office of Hawaiian Strategic Industries
47		136/149	Department of Land and Natural Resources (Engineering Division, Land Division, Office of Coastal and Conservation Lands)
48		151/152	David Tarnas and M. Carolyn Stewart
49		153/154	Verne Wood, President, Puna Water Services Inc.
50		155/161	University of Hawaiʻi Environmental Center
51		164/165	University of Hawaiʻi at Hilo, Marketing/Alumni
52		166/169	Tom Lenchanko and Alika Poe Silva
53		170/172	Department of Business Economic Development & Tourism, Office of Planning
54		173/174	Aaron Stene
55		175/185	Michael Reimer
56		189/190	Representative Faye Hanohano, District 4
57		191/192	Department of Accounting and General Services
58	H4	193	Joel Tuck*
59	H4	194	Hugh Ono*
60	H4	195	Claudia Wilcox Boucher*
61	H24	199	Bill Davis, for Hawaiian Homes Commission, Chairman*
62	H25	197	County Council Vice-Chair Emily Naeole Beason
63	H27	198	Shalan Crysdale, The Nature Conservancy*
64	H28	199	Sharon Hettema*
65	H30	200	Galen Kelly*
66	H35	201	Jim Albertini, Malu ʻAina*
67	H38	202	Dean Au, Hawaiʻi Carpenters Union Local 745*
68	H40	203	Mary Begier, Hawaiʻi Isl. Chamber of Commerce*
69	H41	204	Michael Cadaoas* (H42)
70	H41	205	Deborah Ward, Sierra Club*
71	H47	206	Joseph Kualiʻi Camara
72	H51	208	Christian Rygh*
73	K2	210	Rodney Watanabe*
74	K3	211	Mel Ventura*
75	K3	212	Arnold Kanai*
76	K4, 35	213	Ken Melrose*
77	K5, 32	214	John Parazette*
78	K40	215	Diane Quitiquit*
79	K24	216	Rep. Denny Coffman, District 6*
80	K25	217	Michael Matsukawa*
81	K27	218	Walter Kunitake, Chair, Saddle Road Task Force*
82	K28	219	Norman Kaimuloa*
83	K32	220	Vivian Landrum, Kona-Kohala Chamber of Commerce* (K32)
84	K35	221	Robert Meierdiercks*
85	K37	222	James Boyle*
86		242	U.S. Fish and Wildlife Service

1

SADDLE ROAD

December 9, 2009

Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing

FOR QUESTIONS ONLY

WHY WAS NO TESTING DONE FOR AIRBORNE DEPLETED URANIUM?

My name is: CORY HARDEN

6:28

(Please return to the information desk.)

SADDLE ROAD

December 9, 2009

Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing

FOR QUESTIONS ONLY

WHAT WILL HAPPEN TO THE OLD SADDLE ROAD RUNNING BY WAIKI'I RANCH?

My name is: CORY HARDEN

FIS CHAIRMAN'S COPY PLUS ENCLOSURES

Comments on Saddle Road Draft Supplemental Environmental Impact Statement
Wednesday, December 9, 2009 5 PM Aunty Sally's Luau House, Hilo
Cory Harden, Sierra Club, Moku Loa group, PO Box 1137, Hilo, Hawaii 96721
808-968-8965, mh@interpac.net

SUMMARY OF COMMENTS

We commend the preparers for numerous passages which show sensitivity to native Hawaiian culture and concern for preserving Hawai'i Island's natural resources. We support the W-7 route as the best alternative. We support plans for wide shoulders for pedestrians and bicyclists. However, it appears assessment of many impacts is inadequate, which renders mitigation plans also inadequate..

We commend preparers for conducting a depleted uranium study. Unfortunately, the study fails to test for airborne DU and DU compounds, and raised many concerns for Dr. Mike Reimer of Kona, who holds a PhD in geology. The study relies on Army information to mention only one DU round at Pohakuloa. But there may have been 2,000--based on two different lines of evidence, one from Army Colonel Killian, and one from a Sierra Club consultant. And Army DU studies face a legal challenge from me, as an individual, and several other people.

We support clearance of unexploded ordnance for the road, and once again call on the military to clear explosives, toxins, and other hazards neglected for decades on more than fifty old sites on Hawai'i Island.

We are very concerned that fire risks seem to be underestimated, given ongoing military training, plus Stryker impacts, plus the new road. The SDEIS states, accurately, that wildfire "poses a grave threat to Hawaiian ecosystems ...Because few native Hawaiian animals or plants are adapted to wildfires, they generally perish when exposed to fire…native plant communities are often subsequently overwhelmed by more aggressive alien species. Many nonnative species…thrive in the aftermath of fires…The entire west side of the Big Island…is subject to extensive wildfires." [p. 3-73]

Unfortunately, a fire study cited by the SDEIS is not current, since it is based on data from ten years ago. In addition, the ignition source for many fires is unknown, and most Army fire history files are incomplete because some were destroyed after five years.

For the overpass of the military area, we feel details should be included in the SDEIS so the public can have input. Distractions to motorists from military training should be evaluated--dust, pyrotechnics at night, noise and light from explosions, and noise from helicopters, large airplanes, and large vehicles.

We ask that comments on the archaeological report appear in the SDEIS so the public can comment.

We call for more thorough assessment of impacts to formerly remote areas when an improved road brings more tourists and residents.

We call for as much mitigation as possible for the loss of relatively pristine vistas.

We ask that funding be sought from astronomers and developers who will benefit from the road.

We ask for more information on convoys and construction water trucks. We ask for evaluation of induced demand (better roads encouraging more driving.) We call for traffic calming features. We support bus service on the improved road.

Thank you for your attention to our concerns.

SPECIFIC COMMENTS

FUNDING

p. S-9 "Astronomers, support staff, and suppliers with bases in Hilo or Waimea use the road as access to Mauna Kea and its 13 observatories."
p. 1-1 "Saddle Road is the only paved road serving...the Mauna Kea Astronomical Observatory Complex..."
How much are observatories contributing to the cost of building and maintaining the road? If nothing, have they been approached--or will they be--about contributing? Which agency or agencies would be the appropriate ones to approach them?

p. 1-15 "The underlying reason for the projected increase is a variety of demands including... residential development in the Kohala, Waikoloa, and Waiki'I Ranch areas..."
How much are developers contributing to the cost of building and maintaining the road? If nothing, have they been approached--or will they be--about contributing? Which agency or agencies would be the appropriate ones to approach them?

MULTIPLE IMPACTS

p. S-11 "An improved Saddle Road would increase the number of tourists visiting the east side of the island since, at present, only about one-third include the Hilo area in their itineraries."
Evaluate impacts--economic benefits, wear and tear on roads, trash, traffic.

p. 3-40 "The 1999 EIS noted that increasing use of Saddle Road could somewhat degrade the quality of the experience of wild areas, cause overcrowding, and contribute to the usage of off-road vehicles and mountain bikes within the study corridor. Improvement of Saddle Road within Sections II and III has already been a factor in the increase in traffic and use of the Saddle area, and completing the critical Section I link would likely continue this trend. Increased accessibility and use of formerly isolated recreational areas does bring with it increased management responsibilities, but overall it is a substantial recreational benefit."
Give more specifics--

- *estimate the increased number of trips from tourism, hiking, hunting, mountain bikes, off-road vehicles, and others*
- *evaluate impacts*
- *propose management measures, including responsible agencies and funding sources*

p. 3-97 Prior to construction, a final review will be conducted to determine the probability of caves or lava tubes in the construction corridor. Should significant caves be present, final design and/or construction techniques will be developed to avoid or minimize impacts.
Define "significant."

UNEXPLODED ORDNANCE

S-27 "Prior to construction, FHWA will conduct an unexploded ordnance survey. If the risk of encountering UXO is low, then the USACE will be consulted to provide UXO construction support. If the risk of encountering UXO is high, then full UXO clearance will be performed to ensure the safety of the site. The Army will document UXO surveys and removal actions in full accordance with applicable laws, regulations, and guidance. All ordnance found will be removed from the project area in accordance with DOA regulations in coordination with USAG-HI...In all training activities at Ke'āmuku and other areas of PTA, the Army will continue to educate soldiers on how to identify UXO and the proper safety procedures for marking and reporting UXO, in order to reduce impacts not only to soldiers but also to motorists on W-7."
We support this.
We also call on military forces to clean up all unexploded ordnance, toxins, and other hazards left on the 50-plus old military sites on Hawai'i Island. Children should not be digging up grenades in their school gardens in Waimea. Teenagers should not be finding three-foot-long mortar rounds

while hiking, also in Waimea. Swimmers should not be finding unexploded ordnance in 30 feet of water off Hapuna. Divers should not be finding shells 50 yards off Leleiwi Beach. We're told Congress won't put enough money into cleanup. We urge that money be put in escrow for cleanup whenever a new military project goes forward. If old hazards are neglected while new hazards are generated, we'll never catch up.

DEPLETED URANIUM
SDEIS
p. S-11 "The project included sampling of soil at five locations, using two independent methods to determine if DU or other forms of uranium above natural levels were present. No above-normal levels were found. A baseline human health risk assessment was performed to evaluate the potential risk posed by the uranium isotopes detected for both construction workers and recreational receptors. Neither risk level exceeded the most conservative U.S. EPA (Environmental Protection Agency) lifetime cancer risk regulatory level of concern or the noncarcinogenic Hazard Index regulatory level of concern."
See comments on Appendix E.

pp. 4-4 to 4-5 "Naturally occurring 234U/238U ratio in soil has been determined to be in the range of 0.5 to 1.2 (Sansone et al. 2001).234U/238U ratios at the Saddle Road alignment ranged from 0.74 to 1.79..."
Is the 1.79 level significant?

Appendix E study
The study raised many questions for Dr. Mike Reimer, who will send detailed comments.

Testing should be done for airborne DU and DU compounds from PTA or other sources.

Why did the Saddle Road researchers have enough information for a BHHRA, while the Army, despite finding some DU at Pohakuloa, didn't?

p. ES-2 "In August 2007, US Army contractors discovered one intact M101 spotting round during a screening survey of the remote Impact Area at PTA...Subsequent surveys uncovered aluminum firing tubes for the spotting round, but no additional spotting rounds themselves."
Over 2,000 spotting rounds may have been used, and searches may have missed them because only a small fraction of the impact area was searched, and search conditions were difficult.
Note that several people, including myself as an individual, plan to argue these points before an Atomic Safety and Licensing Board in January 2010.
Note also that Dr. Mike Reimer, PhD and Dr. Lorrin Pang have raised numerous concerns about Army DU studies. [their resumes are attached]

The DSEIS should include and evaluate the following information:

Re. 2,000 spotting rounds

"An environmental consultant [Peter Strauss, hired by Sierra Club] estimated there may be as many as 2,000 depleted uranium rounds at Pohakuloa Training Area...The consultant's analysis was based on an Army report estimating that between 120 and 400 firing pistons are scattered around impact ranges at PTA...Each piston would have fired up to five of the DU rounds, for a total of between 600 and 2,000 rounds fired, Strauss said. " *[Sierra Club consultant disputes Army's DU tally, Hawai'i Tribune-Herald, 8-26-08]*

The 2,050 figure was based on old training manuals, which specify how many rounds soldiers had to shoot to be qualified on the weapon system. *[from my notes on Col. Killian's presentation to Hawai'i County Council 2-3-09, and conversations with him that day]*

From a County meeting….
Councilmember Pete Hoffmann …the Sierra Club consultant continues to say 2,000 spotting rounds may be at Pohakuloa. What…what's your comments on that?

Colonel Killian I know that there are 714 rounds shipped to Hawai'i that…my sensing is most of them were fired at Schofield…I would, I would estimate that probably, and what we've been using is conservative numbers, to say at least 50% of them were used at Pohakuloa. Now if you go through the training manuals of the era…it would require more than 714 rounds over an 8 year period of time to qualify the requisite amount of crews. However, when you look at … archival research at other places they, for whatever reason, the Army did not send that many rounds out to the field, so I can't account for that. All I can say factually is that we believe 714 rounds were shipped and expended here.

Councilmember Pete Hoffmann Is there any possible support for a figure of 2,000 spotting rounds at PTA?

Colonel Killian If you, I you do the math, if you extrapolate the math with the, the contemporary training manuals I think you'd come up with a number of 2,050.
[my transcription, from County DVD, of Hawai'i County Council Public Works & Intergovernmental Relations Committee meeting held 2-3-09]

"U.S. Army Colonel Killian…said the types of exercises conducted at PTA (Pohakuloa Training Area) would require the firing of at least 2,050…spotting rounds." [*Depleted Uranium at Pohakuloa, West Hawai'i Today, 2-4-09]*

The Army quotes a report to support a lower number of spotting rounds. But in my copy of the report, the text in bold is missing.

> "Total rounds verified shipped from Oahu from Lake City Ordnance Plant were 714 rounds on 27 April 1962. Notice this date coincides with the first weapons arriving at Oahu in the spring of 1962. **As discussed in Section 8.1, this original shipping quantity is not close to the "worst case scenario" estimate of usage for six years with 14 weapons (2,520 rounds.)** This shipping quantity averages only 8.5 rounds fired per year per weapon. It is highly probable that additional stocks of the Cartridge, 20 mm Spotting M101 were order *[sic]* from one of the Ordnance Depots (Letterkenny or Pueblo) during the six active years of the Davy Crockett Weapon System in Hawaii." *[Army extract from Archives Search Report, cited in a letter to U.S. Rep. Mazie Hirono, dated about 5-20-09]*

Re. limited search
"Due to the potential presence of UXO/MEC, improved conventional munitions (ICM), and terrain conditions at the PTA range, only limited access for GWS and soil sampling was anticipated to be available." *[Final Technical Memorandum for Pohakuloa Training Area (PTA) Aerial Surveys, 7-24-09, p. 1-1]*

"UXO avoidance was practiced in other GWS areas and coverage was dependent on the ability to enter an area." *[Final Technical Memorandum for Pohakuloa Training Area (PTA) Aerial Surveys, 7-24-09, p. 4-5]*

[see enclosed Figure 3-1, PTA Areas of Interest, which shows limited area searched]

Note also that air searches were hampered by debris kicked up by helicopters, ground searches were hampered by dangerous terrain, and satellite imagery was not tried yet.

CULTURAL/ HISTORIC
p. 2-10 Table 2.2.2 SEIS Alignments Comparison Matrix
Why is "Minimize impacts to historic properties and cultural resources" "not fully assessed" *for W-7 a, b, and c?*

p. S-24 "The archaeological report discussing historic properties was provided to various agencies and groups, including the State Historic Preservation Division, the Office of Hawaiian Affairs, Hawaiian Civic Clubs, the Royal Order of Kamehameha, and others, for their comment, as part of consultation under Section 106 of the National Historic Preservation Act. The Final SEIS will present the results of this coordination."
This should be in the DEIS so the public can comment.

VISUAL
p. S-27 Construction of the proposed highway would result in a substantial change in visual character due to the introduction of a paved road to the existing pastoral setting.
p. 6-22 **Visual Quality...Current Character...**Viewshed offers unique, far-ranging scenic vistas that are relatively pristine...**Effect of Proposed Action...**Will insert a built element into the environment, changing the vistas.
This impact is unfortunate.

p. S-28 As determined appropriate during final design, the project may include informal scenic Typical Sections s with interpretive signage in a few locations, such as the Old Waimea-Kona Road and the overlook above Ke'āmuku Village.
We support this.

TRAFFIC
Evaluate the effects of induced demand (more and better roads encouraging more driving.) Include issues from the enclosed Wikipedia article.

Include traffic calming features in road design..

How will the noise, glare, and distraction of nighttime military training affect motorists? Will they think it's an emergency situation?

We support planning bus service on W-7.
Will the old section of Saddle Road running by Waiki'i Ranch be open to the general public?

p. S-7 "Mamalahoa Highway would be crossed at-grade or by a grade-separated structure."
p. 1-8 "The W-7 alignment is expected to only require one crossing, the details for which will be determined in cooperation with the Army during final design."
p. 2-21 "Military traffic passing between Ke'āmuku and the main sections of PTA would be required to cross W-7. This would occur at one point, the location of which is not yet specified, which would be a grade-separated crossing. It is likely that military traffic would pass *under* Saddle Road."
Since traffic overpasses on Hawai'i Island are uncommon, simply announcing the final design in the FEIS is insufficient. The DEIS should describe options for the details below, so the public can have input through the EIS process.

- *location*
- *which traffic will go on top--military or civilian*
- *expected military traffic volume*

- *safety measures, including measures to reduce motorist distraction, and to separate military and civilian activities*

p. 1-1 "The transportation of ammunition, training equipment, and troops from harbors on both the west and east side of the island periodically involves long, slow moving convoys on Saddle Road. About 1,150 military vehicles made trips to PTA in 2008, primarily in convoys between PTA and the port at Kawaihae. The convoys only travel during non-peak periods, are escorted by Hawai'i County Police Department vehicles in the front and back to enhance safety, and move at 10 miles an hour below posted speed limits. Military trips currently comprise less than one percent of all Saddle Road traffic. Due to continuing overseas deployments, the annual training levels at PTA are lower than previously in the decade, a trend which is expected to reverse within several years."
Give high and low estimates, per year, re. number of convoys, size, and frequency, for 2010-2015.
Are there any regulatory limits on the number, size, and frequency of convoys?
What recourse do citizens have if they feel there are too many convoys?
Will convoys use W-7, or the old Saddle Road running by Waiki'i Ranch?
When will the tank trail from Pohakuloa to Kawaihae be completed, and how will this affect convoy traffic?

Fig. 1.1.2
Does the new Section II mean no more military firing over the highway?

p. 1-14 "The conclusion based on these predictions *[of traffic volume]* was that the level of need far exceeded the road's existing traffic capacity."
Consider saying "demand", not "need."
Evaluate how the slowed-down economy and increased overseas military deployments will affect the demand for traffic capacity.

p. 3-57 "...widened, paved shoulders proposed for the project would minimize the hazards to pedestrians and bicyclists..."
We support this..

AIR QUALITY
Evaluate how dust from Strykers will affect motorists. Consider this information.

> *Stryker FEIS May 2004*
> Chapter 4 p 22 "Effective mitigation measures *[for dust]* are more difficult to identify for off-road maneuver areas. Rotating maneuvers among available areas is effective only when those areas are substantially larger. Such activity rotation **may** be possible at PTA..." *[bold added]*
> Chapter 4 p 23 "Wind erosion issues are of particular concern near the WPAA because soils in that area are derived from very low-density volcanic ash. In July 1999, a severe dust storm resulted from wind blowing over areas denuded of vegetation by a recent fire. The result was fugitive dust emissions at high enough levels to require temporary evacuation of residences at Waiki'i Ranch. ...It is unlikely that vegetation reseeding programs would be sufficiently effective to reduce the net increase in annual erosion to a less than significant level at all installations."
> Chapter 4 p 24 "The effectiveness of reseeding programs depends on having adequate germination and vegetation establishment periods between repeated disturbances. This may not be possible for the large off-road maneuver areas that would become available at PTA..."

p. 3-69 "The construction worker was found to have... a noncarcinogenic risk of four in one thousand...The noncarcinogenic risk was calculated to be three in one thousand for the Child Receptor and one in one thousand for the Adult Receptor."

These seem to be unacceptably high.

NOISE
p. 3-71 "...there are no areas for which noise impacts require study..."
Evaluate how military noise from Strykers and other vehicles, airplanes, and helicopters, may distract motorists.

FIRE
The DSEIS appears to underestimate cumulative risks of fire from military activities plus W-7, and impacts on plants, animals, and safety for motorists and residents.

Include the following information in analysis:

Letter from Jeff Mikulina of Sierra Club to Cindy Barger, Stryker EIS Project Manager, 1-3-04
Last year, over 2000 acres burned in Makua Valley on Oahu by a 'controlled' fire that... turned into a wildfire...

Army responses to Sierra Club comments on DEIS
Army response p 94-1 "The impact to biological resources from wildland fires has been changed to significant. The mitigation measures proposed, including the updated IWFMP, [Integrated Wildland Fire Management Plan] will substantially reduce the severity of the impact on biological resources but not to less than significant levels." *[underline added]*

4.10.3 p 4-69 "impacts to biological resources from fire could not be mitigated to the less than significant level."
"Fire would have a significant impact on...PTA." [Pohakuloa Training Area]

4.10.3 p 4-70 "there is a risk that wildfire could result in an irretrievable loss of individuals of sensitive species"
"The mitigation measures...will substantially reduce the impact but not to less than significant."

Stryker FEIS May 2004
Chapter 3 p 91 "According to the WFMP, in the recent past, the entire Hawaiian ecosystem has experienced an increase in wildfire frequency...Causes for the increase in fire frequency include the spread and intensification of alien grasses. On Army land, technological advances in ammunition and supporting pyrotechnic devices used for training have contributed to the fire frequency increase...*[on Oahu]* Military live-fire activities start many of the fires within ordnance impact areas..."

Stryker DEIS
Chapter 2 p 39 "Nonlive-fire exercises use blank ammunition, laser weapons, and simulated artillery and mortar fire with pyrotechnics."

Chapter 4 p 25 "Tracers, flares, and pyrotechnics have the potential for starting wildfires on training range areas. The use of such munitions would increase somewhat under the Proposed Action, with a corresponding increase in the potential for wildfires."

Chapter 4 p 83 "...no FMAs [fire management areas] and wildland fire SOPs [standard operating procedures] have been completed for installations where Transformation would occur." *[Cory's note: are these completed yet?]*

Chapter 8 p190 "Tracer ammunition, which easily starts fires and is one of the most commonly used ammunitions, has started the largest number of fires at PTA."

Chapter 8 p193-194 "...under the Proposed Action, the quantity of ammunition rounds fired during Army training on all Army training ranges in Hawai'i would increase from 16 million to 20 million rounds per year, a 25 per cent increase

Chapter 8 p199 there will be "...a significant increase of ammunition use (an additional four million rounds)... [at PTA but] ...the impact of this increase would not be significant, as management of artillery and ammunition would not change..."

Appendix O p1-1 "In the past, military activities on Army lands have burned areas of native vegetation and threatened the habitat of endangered species of plants and animals."

Appendix O p1-4 "The Hawaiian ecosystem is not resistant to, nor dependent on fire...Wildfire is the single largest impact made by military activities in the Hawaiian ecosystem. The use of Army lands must include fire avoidance efforts."

Appendix O p1-2 "Prescribed fire will be considered as a viable tool to manage fuels and will be utilized under environmentally appropriate conditions."

p. 3-74 "Eleven 80,000-gallon dip tanks are located on PTA, three of which are under construction to support the Ke'āmuku Training Area..."
Is training on Ke'amuku going forward although three of the dip tanks are not completed? Will the three tanks be completed before W-7 construction begins? If not, evaluate any additional fire hazard.

p. 3-75 "Ke'āmuku was assigned a high pre-suppression priority (only Mauna Kea and Kipuka Kalawamauna were considered to have a greater priority)."
We urge that fire risks, impacts, and mitigation measures be thoroughly evaluated.

p. 3-75 "..data for many fires was incomplete...A detailed analysis of fires at PTA between 1987 and 1999 indicated that...The ignition source was generally unknown or associated with tracer firing...The larger fires were generally associated with non-military ignition sources. More than 7,700 acres, or 91 percent of all acres burned, were burned by fires caused by lightning, arson, or carelessly discarded cigarettes, and the largest of these started off of Army lands and later burned into PTA (U.S. Army 2003: p. 7-51)."
Include this information: "The WFMP [Wildland Fire Management Plan] for Pohakuloa... acknowledges that most fire history files are incomplete...after five years, following the disposition of records, they were destroyed, in accordance with the Modern Army Recordkeeping system..." [Stryker FEIS, Chapter 3 p 90]

Was the "detailed analysis" funded by the Army, or done by an independent, peer-reviewed research?

If the "ignition source was generally unknown" ,what is the basis for the statement that "the larger fires were generally associated with non-military ignition sources"?

Given that "data for many fires was incomplete" and the "detailed analysis" is 10 years old, evaluate more recent data, preferably from non-military sources.

Include analysis of impacts from Stryker training, which was projected to "increase the level of training...seven times over..." [Study:PTA training would rise, Hawai'i Tribune-Herald, 10-14-03]

p. 3-75 to 3-76 "Many firebreaks, fuelbreaks, and other fire management improvements that will aid firefighters in containing and suppressing fires have been or will be constructed."

Will they be completed before W-7 construction begins? If not, evaluate impacts.

WATER

p. 3-83 "Water would be consumed in the construction process, much of it for dust control. The specific source of water to be used for construction would be the responsibility of the contractor, but contractors to date on Saddle Road have purchased and trucked water mostly from County Department of Water Supply standpipes in Kaumana, above Hilo. As the W-7 alignment is closer to Waimea, and the construction would involve an outlet on the Mamalahoa Highway, Waimea may prove to be the best source."

Estimate

- *how many trucks a day*
- *times of day, days of week, and approximate dates when trucks will run*
- *effects on traffic*

CUMULATIVE IMPACTS

Fig. 1.5.1

Include in cumulative impacts--impacts of the Saddle Road extension that will be enabled by W-7.

p. 3-2 "A project to lengthen the *[PTA]* runway from its existing length of 3,700 to 6,000 feet is currently under review by the Army. The longer runway would allow fully loaded C-130 aircraft and C-17 aircraft operating at 80 percent capacity to utilize the airfield."

Include this in analysis of cumulative impacts, especially noise and distractions for motorists.

For several impacts, the DSEIS says impacts from Saddle Road won't have much additional impact on the already degraded environment. Are cumulative impacts adequately assessed?

> *p. S-19 and 3-105* Construction and operation of Saddle Road on W-7 are unlikely to lead to the severe spread of alien plant species in the region, because the area is already heavily invaded by those alien plants that thrive in the region. Furthermore, the general area is already subject to land uses such as highways, grazing, military use, and hunting, which contribute in various degrees to the spread of alien species.
>
> *p. 3-109* The relatively poor habitat and relative lack of native bird species within the W-7 corridor indicates that it is unlikely that any negative impacts on native bird species would result from the construction and operation of the roadway.
>
> *p. 3-112* Road construction in the W-7 route alignment could generate a corridor along which introduced species, both plant and animal, might be able more readily to gain access to native habitat. Numerous species of alien wasps and alien ants (including Argentine ants) exist along portions of the existing Saddle Road. However, the most valuable such habitat currently lies within a disturbed setting adjacent near Pu'u Ke'eke'e, crossed by Saddle Road and various Army roads, and thus already subject to invasion.
>
> *p. 3-120* During the course of the biological surveys conducted along the 500-foot wide W-7 corridor, no botanical, avian or mammalian species currently listed as endangered, threatened or proposed for listing under either the federal or state of Hawai'i's endangered species statutes were recorded within or near the corridor itself (see Appendices C and D). These findings are not unexpected given the highly degraded nature of the habitat present within the corridor.
>
> *p. 3-124* It was difficult to separate the current adverse effects on Mauna Kea sites that came from then-inadequate State of Hawai'i management from those potential adverse effects that would result from the implementation of improvements to Saddle Road.

Induced demand

From Wikipedia, the free encyclopedia

Induced demand is the phenomenon that after supply increases, more of a good is consumed. This is entirely consistent with the economic theory of supply and demand; however, this idea has become important in the debate over the expansion of transportation systems, and is often used as an argument against widening roads, such as major commuter roads. It is considered by some to be a contributing factor to urban sprawl.

Contents

Effect in transportation systems

Latent demand has been recognised by road traffic professionals for many decades. J. J. Leeming, a British road-traffic engineer and county surveyor between 1924 and 1964, described the phenomenon is his 1969 book:[1]

> Motorways and bypasses generate traffic, that is, produce extra traffic, partly by inducing people to travel who would not otherwise have done so by making the new route more convenient than the old, partly by people who go out of their direct route to enjoy the greater convenience of the new road, and partly by people who use the towns bypassed because they are more convenient for shopping and visits when through traffic has been removed.

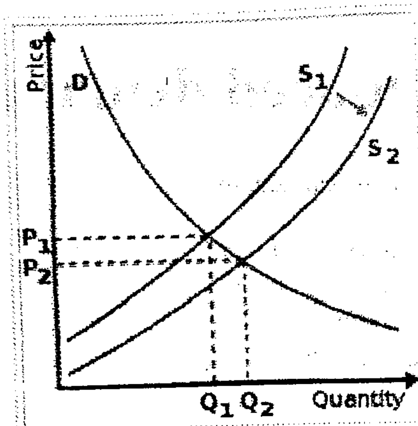
He went on to give an example of the observed effect following the opening of the Doncaster Bypass section of the A1(M) in 1961.

Price of road travel

A journey on a road can be considered as having an associated cost or *price* (the generalised cost, *g*) which includes the out-of-pocket cost (e.g. fuel costs and tolls) and the opportunity cost of the time spent travelling, which is usually calculated as the product of travel time and the value of travellers' time.

When road capacity is increased, initially there is more road space per vehicle travelling than there was before, so congestion is reduced, and therefore the time spent travelling is reduced - reducing the generalised cost of every journey (by affecting the second "cost" mentioned in the previous paragraph). In fact, this is one of the key justifications for construction of new road capacity (the reduction in journey times).

A change in the cost (or price) of travel results in a change in the quantity consumed. This can be explained using the simple supply and demand theory, illustrated below.



When supply shifts from S1 to S2, the price (explained below) drops from P1 to P2, and quantity consumed increases from Q1 to Q2

For roads or highways, the supply relates to capacity and the quantity consumed refers to vehicle-kilometres travelled. The size of the increase in quantity consumed depends on the elasticity of demand.

Elasticity of traffic demand

Research indicates that the elasticity of traffic demand with respect to roadway expansion is between 0 and 1, indicating that a 1% increase in roadway expansion will generate less than a 1% increase in traffic demand. However it is greater than 0%, so new roadway construction will result in some additional traffic that would not have occurred but for the new capacity. In the long term, however, traffic demand may increase by more than 1%, since elasticity of demand is a partial derivative defined in the short term only. In other words, this figure between 0 and 1 assumes that, apart from the increased supply, all else is constant, which is unlikely to be true in the long term.

In the short term, new demand arises from either people making trips they wouldn't have made before (because the cost of the trip has decreased), or from people retiming trips to nearer their preferred time (i.e. they can reduce schedule delay). For example, people might travel to work earlier than they would otherwise like, in order to avoid peak period congestion - but if road capacity is expanded, peak congestion is lower and they can travel at the time they prefer.

New demand may also come from those who had used public transport before a roadway expansion, now deciding to switch to car use.

In the long term, land use patterns alter - e.g. new development occurs around the road with the new capacity, increasing demand for travel. Peoples' choice of home and workplace locations also alter because of the new road (and although this is to be expected from urban economics, it also constitutes induced travel, usually because people travel farther to get to work as a result of the new road, increasing overall levels of vehicle-kilometres). Increased employment along a road may result in homebuilding along the same road, attract more businesses in a positive feedback loop. Eventually, the induced demand may cause road capacity to be reached (again).

Induced demand & transport planning

Although planners take into account future traffic growth when planning new roads (this often being an apparently reasonable justification for new roads in itself - that traffic growth will mean more road capacity is required), this traffic growth is calculated from increases in car ownership and economic activity, and does not take into account traffic induced by the presence of the new road (i.e. it is assumed that traffic will grow, regardless of whether a road is built or not).[2]

In the UK, the idea of induced traffic was used as a grounds for protests against government policy of road construction in the 1970s, 1980s and early 1990s, until it became accepted as a given by the government as a result of their own SACTRA (Standing Advisory Committee on Trunk Road Assessment) study of 1994 [1] (http://www.dft.gov.uk/stellent/groups/dft_econappr/documents/divisionhomepage/031568.hcsp) . However, despite the concept of induced traffic now being accepted, it is not always considered.

A classic example of induced demand was the construction of an orbital motorway around London, the M25, in the late 1980s and early 1990s. In the short term (almost from opening), the motorway became extremely busy and often congested (as planners underestimated the level of demand, because some was induced, and thus the road did not have high enough levels of capacity to accommodate it). In the long term (over a few years), new development occurred around the new motorway and people adjusted their home and work locations to depend upon it, further increasing demand.

Mitigating the induction of demand

Induced traffic can be avoided if the generalised cost of travel does not decrease when new road capacity is added (known as "locking in" the benefits (e.g. journey time reductions) of new capacity). This may be achieved through:

- Road pricing - i.e. the user pays for the journey time reduction
- Increasing the cost of parking, by limiting parking spaces. This has been done with success in Sydney, Australia.
- Allocation of the new road space to particular users, e.g. using HOV lanes - the generalised cost of travel for some users will remain similar, but the cost for particular users will decrease, encouraging a shift to that use. HOV or multiple occupancy lanes are the classic example, an example being the widening of the M1 motorway to the north of London, where the extra capacity will be used for an HOV lane during the peaks. However, HOV lanes which are additional to existing capacity do result in an induced rise in overall traffic, because the shift of HOVs to the new lane releases capacity in the existing lanes, reducing the generalised cost of journeys in those lanes and thus increasing demand.
- Zoning to prevent excess development of new areas served by increased road capacity has been proposed as a solution; however, municipalities often lack the power or the will to counter development interests.
- Increasing the cost of travel, for example by increasing fuel excises or car registration costs.
- Increasing the cost of drivers licenses in certain undesirable motor vehicle classes (such as SUVs), while decreasing costs for more desirable modes of transportation (such as buses).

Reduced demand (the inverse effect)

Just as increasing road capacity reduces the cost of travel and thus increases demand, the reverse is also true - *decreasing* road capacity *increases* the cost of travel, so demand is reduced. This means that theoretically, in the long term, the closure of a road or reduction in its capacity (e.g. reducing the number of available lanes) will result in the adjustment of traveller behaviour to compensate - for example, people might stop making particular trips, retime their trips to less congested times or switch to public transport, depending upon the values of those trips or of the schedule delay they experience.

Reduced demand has been demonstrated in a number of studies associated with bridge closings (to be repaired) or major roads rehabilitation projects. These studies have demonstrated that the total traffic, considering the road or bridge closed and alternative roads where this traffic is diverted, is lower than that of the previous situation. In fact, this is an argument to convert roads previously open to vehicle traffic into pedestrian areas, with a positive impact on the environment and the congestion, as the example of the central area of Florence, Italy.

Similarly, reducing public transit services will reduce to some extent the use of those facilities, where trips again may be avoided or switch to private transport.

The debate

Many environmentalists believe that by encouraging development many kilometres away from jobs and services, freeways contribute to increasing traffic flows, and thus the freeway ends up just as congested as previously, thus requiring the freeway to be widened (again). The evidence is that the congestion will not be as bad as prior to the new construction, but that traffic congestion will not simply disappear.

Propononents of road construction will note that the fact that there is additional travel indicates that the roadway construction or expansion is adding value to those users (consumer surplus). This argument ignores that consumer surplus of a group of road users does not guarantee an increase in aggregate utility. It also ignores that some negative externalities such as global pollution often go unvalued in economic analyses of road projects (some countries ignore these externalities altogether, and others evaluate them qualitatively).

Some roadway advocates note that because of underlying factors (e.g. population and income growth), traffic will grow anyway, whether or not freeways are expanded (this being the argument mentioned previously in relation to traffic forecasts). Thus, without widening, traffic would be even worse than it is, contributing even more pollution, something which occurred in Sydney, Australia, during the New South Wales state government's "No Freeways" era in the late 1970s and early 1980s. Environmentalists reply that the new induced traffic will generate more pollution and exacerbate the greenhouse effect more than leaving the road unbuilt, a theory that is with merit if public transport initiatives are not developed in accordance with the freeway construction such as the provisioning of a dedicated bus lane on the Sydney Harbour Bridge when the Sydney Harbor Tunnel was built.

See also

- Externality
- Lewis-Mogridge Position
- Say's law
- Positive feedback
- Traffic flow
- Schedule delay

References

1. ^ J. J. Leeming (1969). *Road Accidents: Prevent or Punish*. Cassell. SBN 304932132.
2. ^ Coleman, S B (2001). "Generated Traffic: Implications for Transport Planning (http://www.allbusiness.com/management/885364-1.html) ". http://www.allbusiness.com/management/885364-1.html.

External links

- UK Department for Transport guidance on modelling induced demand (http://www.webtag.org.uk/webdocuments/2_Project_Manager/9_Variable_Demand_Modelling/2.
- *A statistical analysis of induced travel effects in the US mid-Atlantic region (http://www.cts.cv.imperial.ac.uk/documents/publications/iccts00003.pdf)* (Fulton et al.), Journal of Transportation and Statistics, April 2004 (PDF)
- *Generated traffic and induced travel (http://www.vtpi.org/gentraf.pdf)* , Victoria Policy Institute (PDF)

Retrieved from "http://en.wikipedia.org/wiki/Induced_demand"
Categories: Transport economics | Transportation planning | Sustainable transport

Curriculum Vita
G. Michael Reimer, Ph.D., Geologist
Consultant and Advisor

75-6081 Ali'i Drive RR-103
Kailua-Kona, Hawaii 96740
Home Phone: (808) 334-0108
e-mail: mreimer@att.net

G. Michael Reimer received a B.A. in Science Education from Alfred University, Alfred, NY in 1967 and his Ph.D. in Geology from the University of Pennsylvania, Philadelphia, PA in 1972. He was selected as a National Academy of Science/National Research Council postdoctoral fellow at the U.S. National Bureau of Standards (now National Institute of Standards and Technology) from 1972 to 1974 in the Nuclear Analytical Chemistry Section. He co-developed standards for trace metal analysis in glass and established quality control/quality assurance guidelines for use of the standards.

In 1974, he joined the U.S. Geological Survey as a Research Geologist where he pioneered the development of mobile high-resolution analytical equipment and soil-gas sampling methods for energy resource exploration including uranium, oil and gas, and geothermal. He has investigated the application of these techniques to hazard prediction regarding earthquakes and volcanoes. He established a gas monitoring station at Kilauea Volcano in 1981 and determined that the release of carbon dioxide from the summit during periods of quiescence were as great as during eruptive episodes. Dr. Reimer was the Director of the Gas Geochemical Laboratory at the U.S. Geological Survey, focusing on environmental studies and risk mapping. He served as chief of the Radon Studies Project within the USGS, and developed techniques to provide a refined radon risk map for the U.S. on a county-level scale by establishing ground-truth measurements for estimating the radon potential of the soils. He was Principal Investigator on several radon projects funded through interagency agreements and served as Radon Principal Scientist with the U.S. Department of Energy and has received numerous awards and honors for his pioneering work. He wrote the EPA chapter on Hawaii for its national Radon Risk Guide. From 1991 to 2006, he established and chaired the environmental radioactivity section for the special meetings of Methods and Applications of Radioanalytical Chemistry for the American Nuclear Society. In addition to his scientific duties, he has supervised upward mobility opportunity programs and developed guidelines for retraining and outreach activities.

Dr. Reimer was appointed Research Professor and Director of the Institute for Resource and Environmental Geosciences at the Colorado School of Mines in 1998. He has sponsored and advised students participating with him through research grants. He was a founding member of the CSM Diversity Committee and he chaired the CSM Geochemistry Graduate School Program. He has participated in various international studies including using gases to delineate seismic-induced faults at volcanoes in Italy, radon risk mapping in Ireland, radiation-site contamination evaluations in Eastern Europe, and environmental applications using gas tracers to determine pathways for toxic material transport including the proposed Yucca Mountain High Level Waste Repository. He has applied the gas sampling techniques he had developed to defining the release of methane from coal as it relates to loss of resource and creating potential hazards for nearby urban development.

He participated as an international expert with the International Atomic Energy Agency in reviewing and cataloging worldwide radioelement mapping. Currently he participates in independent research attempting to establish a theoretical base for the transport of elemental and particulate matter in the natural environment. He is a member of the Geological Society of America and the American Geophysical Union.

He has served as guest editor for Geophysical Research Letters and the Journal of Radioanalytical and Nuclear Chemistry. He has authored or coauthored over 100 peer reviewed scientific publications and over 50 abstracts with presentations at national and international symposia. He has consulted for Oil and Gas companies and provided technical expertise for modifying gas analytical equipment for specific tasks. He also was a Senior Advisor to the independent ES^2P^2AR Group concerned with the ethical use of science in support of public policy and regulation.

Dr. Reimer retired from the Colorado School of Mines and moved to Hawaii. He now works part time as a private consultant and advisor to several different companies.

May 2007

CURRICULUM VITAE

Name: Lorrin Wayie Pang

Military Rank: LtColonel, Medical Corp (Retired)
Walter Reed Army Institute of Research

Date/Birthplace: 30 March 1953
Honolulu, Hawaii

Wife's Name: Kathleen K. Shida Pang

Children/Date of Birth:
Selena T. Pang
8 December 1985

Genevieve C. Pang
13 September 1988

Education/Training:

1971-75 Princeton University, BS Chemistry, Cum Laude

1975-79 Tulane Medical School, MD

1976-79 Tulane School of Public Health MPH in Tropical Medicine

1979-80 Federal University of Brazil; Recife, Pernambuco, Post Graduate Studies in Pathology and Infectious Diseases

1980-81 Letterman Army Hospital, San Francisco, CA, Medicine Intern

1981-82 Walter Reed Army Institute of Research, Washington DC, Preventive Medicine Residency

Positions Held:

1982-87 Epidemiologist, AFRIMS (Walter Reed Inst. Overseas Laboratory) Bangkok, Thailand

1987-90 Chief, Preventive Medicine Service, Tripler Army Medical Center, Honolulu, Hawaii

1987-89 Clinical Associate Professor, School of Public Health, University of Hawaii

1990-92 Medical Officer, Malaria Unit, World Health Organization, Geneva, Switzerland.

1992-97 Clinician/Epidemiologist, Walter Reed Institute of Research Overseas Laboratory, Brazil.

1994-5 Adviser to Pan American Health Organization (Meningitis Vaccine)

1985-Present Adviser to World Health Organization (Tropical Disease Research Unit: Chagas Disease, Leishmaniasis, Malaria, Clinical Trials)

1997-2000 Chief, Department of Bacteriology and Molecular Genetics, AFRIMS, Walter Reed Institute of Research Overseas Laboratory, Bangkok, Thailand.

1997-2000 Faculty of Tropical Medicine,
Mahidol University, Bangkok, Thailand.

2000-present District Health Officer, Maui County
State of Hawaii

2001-present Independent Advisor Glaxo Smith Kline Pharmaceutical

Awards: Army Achievement Medal, 1982, 1996.
Army Research and Development Medal, 1987.
Army Meritorious Service Medal, 1990, 1997.
Selected as on of Hawaii's top (3%) physicians for 2006-7.
Selected as on of the Nations top (3%) physicians for 2006-7.

Selected one of 10 Citizens of Hawaii who "Made a Difference" in 2001 for eradication of Dengue on Maui, Hawaii

2002 Discovery Channel documentary on Dengue outbreak and eradication in Maui
2006-7 Selected as one of Hawaii's top (3%) physicians
2006-7 & 2007-8 Selected to America's Best Doctors List (3% of physicians)

Certification: Medical License State of Louisiana, 1980- 2000.
Hawaii State License, 2000-present
Board Certification in Preventive Medicine, 1990.
Featured on Discovery Health Documentary 2002 for Eradication of Dengue on Maui, Hawaii

Publications (chronologically out of order):

1. Lemon SM, Miller RN, Pang LW, Prier RE, Bernard KW. Failure to achieve predicted antibody responses with intradermal and intramuscular human diploid cell rabies vaccine. Lancet 1984;19:1098-1100.

2. Webster HK, Boudreau EF, Childs GE, Yongvanitchit, Pang LW. Antimalarial drug susceptibility testing of *P. falciparum* in Thailand using a microdilution radiosotope method. Am J Trop Med Hyg 1985;34(2):228-35.

3. Pang LW, Boudreau EF, Childs GE, Webster HK, Supernantalerk C, Somutsakorn P. The failure of large dose erythromycin in combination with standard doses of chloroquine or quinine to treat human falciparum malaria. Bull WHO 1985;63(4):739-43.

4. Tan SG, Green CA, Andre RG, Baimai V, Pang LW. Genetics of esterases and 6 phosphogluconate dehydrogenase in the anopheles maculatus complex. Acta Tropica 1986;43:113-23.

5. Childs GE, Pang LW, Wimonwattrawatee T, Pooyindee N, Nanakorn A, Limchitee S, Webster HK. *In vitro* mefloquine resistance of *Plasmodium falciparum* isolated from the Burmese border region of Thailand. SEA J Trop Med Publ Hlth 1987;18(4):438-43.

6. Boudreau EF, Pang LW, Chaikummao S, Witayraut C, Thiemanum W, Pookasorn M. Comparison of mefloquine, choroquine plus fansidar and chloroquine alone as malarial prophylaxis in eastern Thailand. SEA J Trop Med Publ Hlth 1991;22:183-9.

7. Pang LW, Limsomwong N, Boudreau EF, Singharaj P. Doxycycline prophylaxis for falciparum malaria. Lancet 1987;23:1161-4.

8. Boudreau EF, Pang LW, Dixon KE, Webster HK, Pavanand K, Tosingha L, Somutsakorn P, Canfield C. Treatment efficacy of halofantrine (WR171,669) in initial field trials in Thailand. Bull WHO 1988;66(2):227-35.

9. Limsomwong N, Pang LW, Singharaj P. Malaria prophylazis with proguanil in children living in a malaria endemic area. Am J Trop Med Hyg 1988;38(2):231-6.

10. Pang LW, Limsomwong N, Singharaj P. Falciparum and vivax malaria prophylaxis with low dose doxycycline. J Infect Dis 1988;158(5):1124-7.

11. Pang LW, Limsomwong N, Webster HK, Karwacki JJ. Circumsporozoite antibodies and falciparum malaria incidence in children living in a malaria endemic area. Bull WHO 1988;66(3):359-63.

12. Webster HK, Boudreau EF, Pang LW, Permpanich B, Sookto P, Wirtz RA. Development of immunity in natural *Plasmodium falciparum* malaria antibodies to the falciparum sporozoite vaccine 1 antigen (R32tet32). J Clin Microbiol 1987;25(6):1002-8.

13. Harbach RE, Gingrich JB, Pang LW. Some entomological observations on malaria

transmission in a remote village in northwestern Thailand. J Am Mos Contr Assn 1987;3(2):296-301.

14. Pang LW. Doxycycline prophylaxis for malaria (letter). Lancet 1987;24:970.

15. Childs GE, Pang LW. Analysis of dose-response curves for the *in vitro* susceptibility of *Plasmodium falciparum* to antimalarials using a pocket computer. Am J Trop Med Hyg 1988;38:15-8.

16. Pang LW, Limsomwong N, Singharaj P, Canfield CJ. Malaria prophylaxis with proguanil and sulfisoxazole in children living in a malaria endemic area. Bull WHO 1989;67(1):51-8.

17. Childs GE, Boudreau EF, Milhous WK, Wimonwattratee T, Pooyindee N, Pang LW, Davidson DE. A comparison of the *in vitro* activities of amodiaquine and desethylamodiaquine against isolates of *Plasmodium falciparum*. Am J Trop Med Hyg 1989;40:7-11.

18. Shida KK, Lewchalermvongse B, Pang LW. *Plasmodium berghei* malaria infection causes increased cardiac output in rats. Experiment Parasitol 1989;68:253-9.

19. Pang LW. Chemoprophylaxis and treatment of malaria (letter). NEJM 1989;320:1561.

20. Boudreau EF, Fleckenstein L, Pang LW, Childs GE, Schroeder AC, Ratnavotorn B, Phintuyothin P. Mefloquine kinetics in cured and recrudescent patients with acute falciparum malaria and in healthy volunteers. Clin Pharm Ther 1990;48(4):399-409.

21. Desowitz R, Shida K, Pang L, Buchbinder G. *Plasmodium berghei* malaria in the rat: a model for malaria in pregnancy. Am J Trop Med Hyg 1990;41(6):630-4.

22. Sanchez JJ, Hoke CC, McCown J, DeFraites RF, Takafuji ET, Diniega BM, Pang LW. Further experience with Japanese encephalitis vaccine. Lancet 1990;21:972-3.

23. Roscelli JD, Bass JW, Pang L. Guillain-Barre syndrome and influenza vaccination in the US Army, 1980-1988. Am J Epidemiol 1991;133:952-5.

24. Sasaki D, Pang LW, Minette H, et al. Incidence and risk factors of leptospirosis in Hawaii. Am J Trop Med Hyg 1993;48(1):35-43.

25. Shmuklarsky MJ, Boudreau EF, Pang L, et al. Failure of doxycycline as a causal prophylactic agent against *Plasmodium falciparum* malaria in healthy non-immune volunteers. Ann Intern Med 1994;120(4):294-9.

26. Withers BJ, Kelley PW, Pang LW, et al. Vaccine-Preventable disease susceptibility in a young adult Micronesian population. SEA J Trop Med Publ Hlth 1994;25(3):569-72.

27. Kramer KJ, Pang LW, Minette HP, Perrone JB. Evaluation of the quantitative buffy coat analysis (QBC) system for the detection of Leptospira in human blood. SEA J Trop Med Publ Hlth 1994;25:788-9.

28. Andrade AL, et al. High prevalence of asymptomatic malaria in gold mining areas of Brazil. Clin Infect Dis 1995;20:475.

29. Pang LW, Alencar FEC, Cerutti C, et al. Hepatitis E infection in the Brazilian Amazon. Am J Trop Med Hyg 1995;52(4):347-8.

30. Alencar FEC, Cerutti C Jr, Durlacher RR, et al. Atovaquone and Proguanil for the treatment of malaria in Brazil. J Infect Dis 1997;175:1544-7.

31. Berman JD, Badaro R, Thakur CP, et al. Efficacy and toxicity of liposomal-amphotericin B (AmBisome) for visceral leishmaniasis in developing nations: A review of a TDR clinical development program. Bull WHO 1998;76(1):25-32.

32. Gomes M, Wayling S, Pang LW. Interventions to improve the use o antimalarials in Southeast Asia: an overview. Bull WHO 1998;76(S1).

33. Zalis MG, Pang L, Silveira MS, Milhous WK, Wirth DF, et al. Characterization of *Plasmodium falciparum* isolated from the Amazon region of Brazil: evidence for quinine resistance. Am J Trop Med Hyg 1998;58(5):630-7.

34. Cerutti C Jr, Durlacher RR, de Alencar FEC, Segurado AAC, Pang LW. *In Vivo* Efficacy of Mefloquine for the Treatment of *Falciparum* Malaria in Brazil. J Infect Dis 1999;180:2077-80.

35. Dalsgaard A, Forslund A, Bodhiddatta L, Serichantalergs O, Pitarangsi C, Pang L, Shimada T, Echeverria P. A high proportion of *Vibrio cholerae* strains isolated from children with diarrhoea in Bangkok, Thailand are multiple antibiotic resistant and belong to heterogenous non-O1, non-O139 O-serotypes. Epidemiol Infect 1999;122:217-26.

36. Fonseca MO, Pang L, de Avila Sdo L, Arruk VG, Tozetto-Mendoza TR, Ferreira AW, Saes-Alquezar A, Boulos M. Cross-reactivity of anti-Plasmodium falciparum antibodies and HIV tests.
Trans R Soc Trop Med Hyg. 2000 Mar-Apr;94(2):171-2.

37. Sethabutr O, Venkatesan M, Yam S, Pang LW, Smoak BL, Sang WK, Echeverria P, Taylor DN, Isenbarger DW. Detection of PCR products of the ipaH gene from Shigella and enteroinvasive Escherichia coli by enzyme linked immunosorbent assay.
Diagn Microbiol Infect Dis. 2000 May;37(1):11-6.

38. Cunha ML, Piovesan-Alves F, Pang LW. Community-based program for malaria case management in the Brazilian Amazon.
Am J Trop Med Hyg. 2001 Dec;65(6):872-6.

39. Pang LW, Piovesan-Alves F. Economic advantage of a community-based malaria management program in the Brazilian Amazon.
Am J Trop Med Hyg. 2001 Dec;65(6):883-6.

40. Duarte EC, Pang LW, Ribeiro LC, Fontes CJ. Association of subtherapeutic dosages of a standard drug regimen with failures in preventing relapses of vivax malaria. Am J Trop Med Hyg. 2001 Nov;65(5):471-6.

41. Duarte EC, Gyorkos TW, Pang L, Avila S, Fontes CJ. Inter-test reliability of the anti-RESA indices based on ELISA tests using eluates from whole blood spots dried on filter paper.
Epidemiol Infect. 2002 Aug;129(1):139-45.

42. Wongsrichanalai C, Lin K, Pang LW, Faiz MA, Noedl H, Wimonwattrawatee T, Laoboonchai A, Kawamoto F. In vitro susceptibility of Plasmodium falciparum isolates from Myanmar to antimalarial drugs. Am J Trop Med Hyg. 2001 Nov;65(5):450-5.

43. Isenbarger DW, Hien BT, Ha HT, Ha TT, Bodhidatta L, Pang LW, Cam PD. Prospective study of the incidence of diarrhoea and prevalence of bacterial pathogens in a cohort of Vietnamese children along the Red River.
Epidemiol Infect. 2001 Oct;127(2):229-36.

44. Wongsrichanalai C, Sirichaisinthop J, Karwacki JJ, Congpuong K, Miller RS, Pang L, Thimasarn K. Drug resistant malaria on the Thai-Myanmar and Thai-Cambodian borders.
Southeast Asian J Trop Med Public Health. 2001 Mar;32(1):41-9. Review.

45. Houng HS, Sethabutr O, Nirdnoy W, Katz DE, Pang LW. Development of a ceuE-based multiplex polymerase chain reaction (PCR) assay for direct detection and differentiation of Campylobacter jejuni and Campylobacter coli in Thailand.
Diagn Microbiol Infect Dis. 2001 May-Jun;40(1-2):11-9.

46. Sanchez JL, Bendet I, Grogl M, Lima JB, Pang LW, Guimaraes MF, Guedes CM, Milhous WK, Green MD, Todd GD. Malaria in Brazilian military personnel deployed to Angola.
J Travel Med. 2000 Sep-Oct;7(5):275-82.

47. Cerutti Junior C, Marques C, Alencar FE, Durlacher RR, Alween A, Segurado AA, Pang LW, Zalis MG. Antimalarial drug susceptibility testing of Plasmodium falciparum in Brazil using a radioisotope method. Mem Inst Oswaldo Cruz. 1999 Nov-Dec;94(6):803-9.

48. Duarte EC, Gyorkos TW, Pang L, Avila S, Fontes CJ. Inter-test reliability of the anti-RESA indices based on ELISA tests using eluates from whole blood spots dried on filter paper. Epidemiol Infect 2002 Aug;129(1):139-45

49. Faiz MA, Yunus EB, Rahman MR, Hossain MA, Pang LW, Rahman ME, Bhuiyan SN. Failure of national guidelines to diagnose uncomplicated malaria in Bangladesh. Am J Trop Med Hyg 2002 Oct;67(4):396-9.

50. Sanders JW, Isenbarger DW, Walz SE, Pang LW, Scott DA, Tamminga C, Oyofo BA, Hewitson WC, Sanchez JL, Pitarangsi C, Echeverria P, Tribble DR. An observational clinic-based study of diarrheal illness in deployed United States military personnel in Thailand: presentation and outcome of Campylobacter infection. Am J Trop Med Hyg 2002 Nov;67(5):533-8.

51. Noedl H, Faiz MA, Yunus EB, Rahman MR, Hossain MA, Samad R, Miller RS, Pang LW, Wongsrichanalai C. Drug-resistant malaria in Bangladesh: an in vitro assessment. Am J Trop Med Hyg 2003 Feb;68(2):140-2.

52. Murine Typhus - Hawaii 2002, MMWR vol 52/No 50 19 Dec 2003, pp 1224-25.

In Press/submitted:

Paracoccidiomycosis: An epidemiologic survey in a pediatric population from the Brazilian Amazon using skin tests. Published, AJTMH

Treatment of Falciparum Malaria with Proguanil + sulf in the Brazilian Amazon. Published, SEAJTM

The Efficacy of Hepatitis B vaccinations in HIV Infected adults. In Press, Vaccine

Dengue in Hawaii 2001-2001, In Press EID.

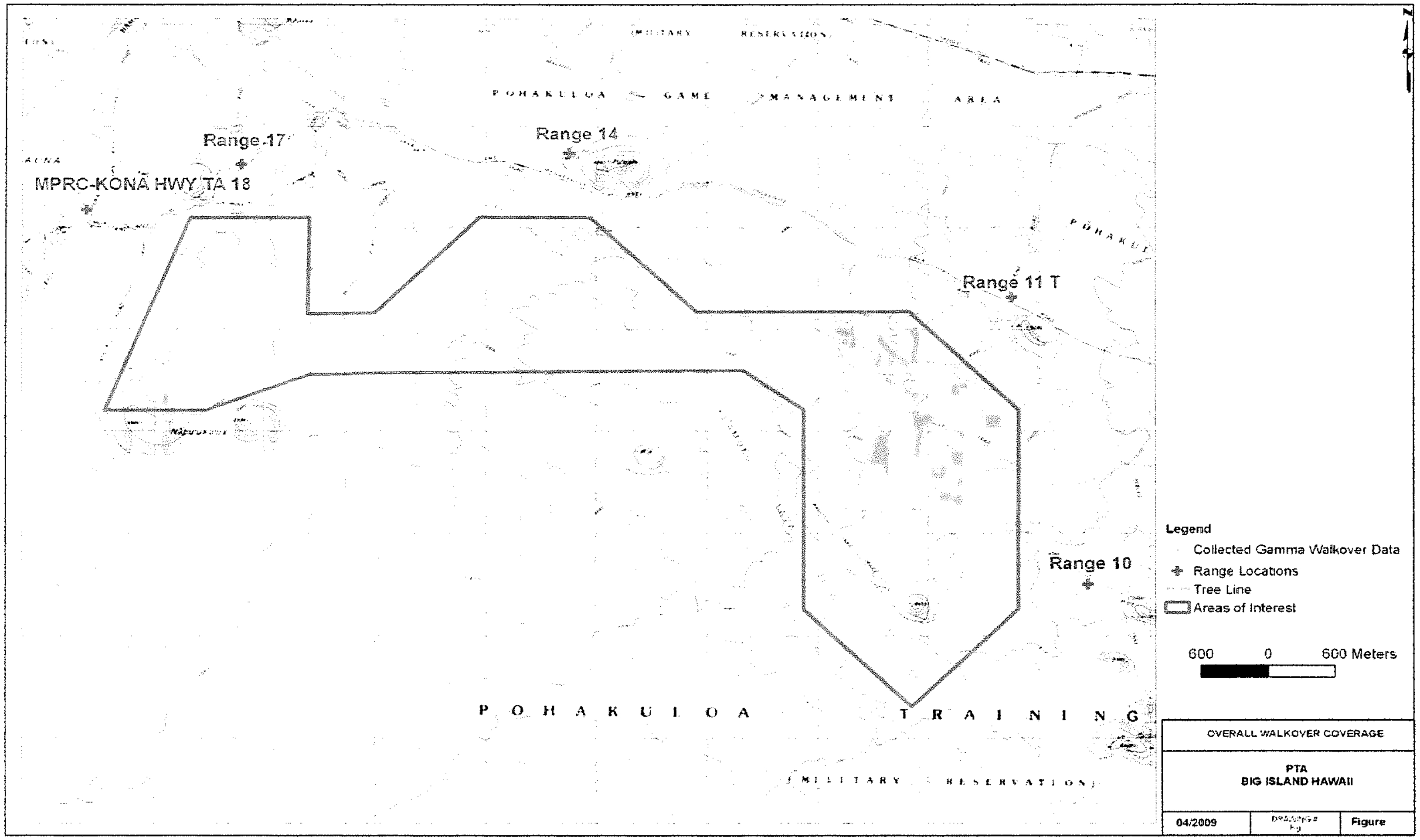


FIGURE 4-2: PTA GWS WALKOVER COVERAGE MAP

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Cory Harden
Box 1137
Hilo, HI 96721

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Ms. Harden:

Thank you for the comments you provided at the Hilo hearing for the SEIS in the form of hand written questions, oral testimony, a summary letter, and a detailed letter with attachments. We appreciate your acknowledgment of the sensitivity of the SEIS to a number of concerns and your endorsement of many aspects of the project, including support for the W-7 route. For the issues on which you had concerns or questions, we have attempted to respond by topic in the responses below.

Existing Saddle Road
The existing Saddle Road will remain open and under County of Hawai'i jurisdiction.

DU
Air testing for DU
Testing of the air has been conducted by both the Army and HDOH. For the Army testing, monthly reports on air quality monitoring that began in February 2009 at Pohakuloa Training Area (PTA) (see http://www.imcom.pac.army.mil/du/Reports.htm) have consistently shown that the total uranium mass found on most filters is above the laboratory's latest determined instrument detection level (IDL) but below the practical reporting level (PRL) of 0.00025 microgram (μg). The fact that most total uranium values continue to be less than the PRL remains significant from a public health perspective. At a nominal sampler flow rate of 5 lpm, the laboratory's PRL of 0.00025 microgram (μg) corresponds to an airborne uranium concentration of 0.000035 μg/m3, a value several orders of magnitude below health effects guidelines. Uranium isotopes 234-U and 235-U have been undetectable.

We would note that if DU were present in the air in the W-7 area, it would likely be deposited over time and would almost certainly be detected in soil samples. This information has been added to the Final SEIS.

DU comments to Mr. Reiner
We have supplied you a copy of our response to Dr. Reimer.

Baseline health risk
The soil samples provided sufficient data for a baseline health risk assessment per Hawai'i Department of Health accepted scientific methodology. Soil samples were collected at five distinct locations along the proposed W7 alignment. These samples were not collected using discreet sample collection techniques, but rather were collected using multi-increment sampling methods which significantly reduce the probability of false negative results and provide a better measurement of the true concentration. Each multi-increment sample was composed of approximately 50 individual "increments" across a 10,000 sq ft area. In addition, one of these areas was sampled in triplicate.

Please note that a baseline human health risk assessment by definition evaluates the risk of a specific site to hypothetical receptors under reasonably foreseeable exposure scenarios assuming no remedial action is undertaken and that a baseline risk assessment is generally performed only if accepted screening criteria and background concentrations are exceeded. Neither of these criteria existed based on the data collected. In fact the data collected and subsequent analyses provided the following 3 lines of evidence indicating that a baseline human health risk assessment was excessive and was not required:

1) Site total uranium concentrations were orders of magnitude below USEPA Region 9 screening criteria for residential scenarios.
2) The AMEC analysis strongly indicated that uranium levels found were well within the background range for naturally occurring uranium.
3) The isotopic ratios of the U234/238 strongly suggested that the uranium at the site was of natural origin.

These lines of evidence notwithstanding, AMEC did perform a baseline human health risk assessment. The rationale for performing additional quantitative risk assessment was to address public concerns and to account for health effects due to radioactivity.

Number of spotting rounds
The information on the number of spotting rounds has been added to the Final SEIS. On the larger issue, we understand that there is uncertainty regarding the quantity of DU that may reside at PTA. Based on results of soil sampling and air monitoring, this does not currently appear to be an important factor for assessing the safety of the use and construction of the realigned highway. FHWA and HDOT will continue to keep apprised of DU monitoring at PTA as construction of the highway progresses.

Range of 234U/238U
Sansone et al. (2001) report that naturally occurring U234/U238 ratios are in the range of 0.5 to 1.2. The U234/U238 ratio reported in the AMEC study is within this background range. U234/U238 ratios for the Site ranged from 0.74 to 1.79 with an arithmetic average of 1.16. Only a single sample (U2334/U238 ratio = 1.79) was outside of the identified Sansone background range. AMEC considers this single value to be completely normal and within the realm of sampling and natural variability. Additionally, the fact that the one sample outside of the identified background range had a higher U234/U238 ratio further supports the notion of a naturally occurring source. U234/238 mass ratios from depleted sources would invariably be lower than mass ratios from natural sources.

Construction worker risk
The risk was misstated in the Draft SEIS (but not in the technical report). The Final SEIS now states that "the construction worker was found to have a carcinogenic risk of one in ten million, and a noncarcinogenic risk of 0.004, compared to the noncarcinogenic Hazard Index regulatory level of concern of 1.0.... The noncarcinogenic risk was calculated to be 0.003 for the Child Receptor and 0.001 for the Adult Receptor, compared to the noncarcinogenic Hazard Index regulatory level of concern of 1.0."

UXO
FHWA and HDOT will work with the U.S. Army Corps of Engineers and the U.S. Army to ensure that all UXO found in the corridor or in other areas that poses a hazard is removed.

Air quality
Dust
The wind pattern in Ke'āmuku is usually upslope, downslope, or calm. In the upper section of W-7, where the underpass will likely be located and in which military training activities may occur upslope or downslope of the highway, the Army will need to take special precautions to ensure that dust does not substantially affect the public roadway. Short-term and long-term dust abatement is part of the Army's planning for use of the property, as noted in the sources you quote. This information has been added to the Final SEIS.

Water trucks
Based on experience in similar portions of the Saddle Road, it estimated that 30,000 to 40,000 MGals will be used for dust control, earthwork compaction, and irrigation. We estimate that a total of 3,000 to 5,000 truck trips will be required to supply the water necessary to construct the new road, depending on the hauling capacity of the equipment used. Assuming a 2-year construction schedule, this will equate to 7 to 10 trucks per work day each way. Water will be obtained from a contractor-selected source, most likely in Waimea due to its close proximity to the project. Water will be hauled to the construction area via either the existing west side of Saddle Road or on a temporary construction access road pioneered along the new alignment and connecting to SR 190 at milepost 14. This information has been added to the Final SEIS.

Wildfires
Fire study
The wildfire plan is comprehensive, accurate, relatively recent (2003) and it contains all relevant information.

Risk of wildfire
We do not concur that the risk of wildfire has been underestimated in the Draft SEIS. Although some of your points about Army wildfire risk are valid (however, pyrotechnics, live ammunition, etc. are not relevant to this area), the Army is heavily mitigating for such impact. Some of this infrastructure has been completed, including some firebreaks and dip tanks. Comments regarding the need to modify or make demands of military training are not appropriate to this SEIS because it is outside the scope of this project. The realigned highway provides both a firebreak and a means by which to more quickly reach wildfires.

Traffic and Operations

Distractions due to military training

Saddle Road has passed through/near PTA for decades and we are unaware of any evidence that motorists are distracted by military training activity to the point where it becomes a safety issue. Urban driving tends to offer many more distractions compared to the situation on the proposed realignment.

Traffic-calming features

All approaches to both intersections will include measures to alert drivers and help calm traffic. Both visual and audible measures will be evaluated during final design. For the remainder of the highway, traffic calming features on such as speed humps, which are designed to slow traffic down in urban and residential areas, would not be suitable for this rural, regional highway.

Induced demand

The traffic volumes projections presented in the SEIS and reported in Table 1.4.1 include induced traffic, as well as traffic that will utilize the route as an alternative to SR 11 and 19. We note that the sources you photocopied for your letter relate almost exclusively to mega-cities such as London and Sydney and their exurbs, which have transportation and land use issues that are not analogous to the Big Island.

Bus service

Our discussions to date with Hawai'i County Mass Transit Agency officials indicate that although this is a possibility, current demand and that expected in the foreseeable future would not justify it. If and when necessary, Saddle Road would provide an excellent express mass transit route.

Military convoys

No increase in the number of convoys is expected as a result of building W-7, and the impact of the climbing lane associated with W-7 road will be highly beneficial for other traffic when convoys are present, as pointed out in the Draft SEIS. These questions and requests are relevant to U.S. Army activities at PTA rather than Saddle Road improvements. It is important to recall that the SEIS's charge is to consider realigning the highway from W-3 to W-7. FHWA and HDOT cannot dictate military training and are not privy to detailed planning information beyond that available to the general public. The convoys will use Saddle Road, which will have a climbing lane to accommodate all slow traffic. It is clear that without the proposed realignment and improvements, convoys will induce far more traffic disruption along the existing road.

Firing over road

The Army has informed FHWA that there will be no firing of weapons over the Saddle Road.

Need for highway

We do not anticipate that the economic slowdown, which is likely temporary, nor the overseas deployment of troops will lessen the need (which we believe is an accurate word) for improvements to the highway, as evidenced by the steady growth in traffic through the decades up to now. The long term benefits of an improved and more direct cross island route will help aide the local economy and residents by reducing travel costs and greatly improving safety.

Archaeology

Archaeology study and impacts to historic properties

The archaeological report was submitted to Section 106 consulted parties along with the entire draft SEIS to provide context. It was thus not possible (nor, we believe, in any way necessary or advisable) for the consultation comments to appear in a Draft SEIS.

Funding

FHWA and HDOT are investigating a number of potential funding sources to determine the best means of funding the project.

Multiple impacts

Impacts from tourists

East Hawai‘i's visitor infrastructure is currently underutilized, with low occupancy rates at all hotels except during special events. Visitor expenditures and the taxes paid directly and indirectly (through business and worker expenditures that benefit from tourism) are highly positive sources of government revenue that can be spent on infrastructure shared by residents. For this reason, the County and State expend considerable funding each year to attract more visitors to various parts of the island, including East Hawai‘i. All government agencies we are aware of strongly support the improvements, for this among other reasons. Concerning specifically additional recreational use of Saddle Road, we cannot envision any methodology for determining how much additional use for various categories such as hiking, biking, birding, hunting, etc., would occur, as much of this is done by individuals and families who reside on the Big Island. We would note that these uses would occur within recreational areas that are generally not highly used, including the Volcano to Pu‘u ‘O‘o Trail, Mauna Kea State Park, and most of the hunting areas. Biking advocacy organizations such as PATH have expressed concern not about overuse of the Saddle, but rather how the existing Saddle Road was almost unusable for most bicyclists until the recent improvements were completed, and they are strongly supportive of further improvements that can allow more use. A strong theme heard from the public in hearings in both 1998 and 2008 was the desire to have better access to the numerous recreational areas within the Saddle.

Significant caves

Significant caves would be those with unique biological, cultural, or geological resources.

Non-native vegetation

Once the highway has been turned over to the State of Hawai‘i, DOT maintenance of vegetation in the clear zone areas will begin. DOT will consult with the Department of Land and Natural Resources and the Department of the Army concerning control of noxious weeds.

Overpass/underpass options

It has not yet been determined whether to use an overpass or underpass, but coordination is ongoing. However, there are several reasons that an underpass for military traffic is more likely:

- Building a military overpass would likely require construction of lengthy and possibly paved approaches to/from the bridge that would extend well outside the right of way for the new road.
- Given the weight of some military equipment that may to be brought up to PTA, a military overpass would probably have to be more structurally stout than a bridge designed to handle only legal highway weights, including barriers much stouter than guardrails to prevent

an errant heavy military vehicle from inadvertently running off the overpass onto the roadway below. By going under the new road, the military trail may not need to be asphalt paved.

- HDOT would presumably be responsible for maintaining the military overpass given its location within the State R/W. Given the additional length and structural requirements, this could be more costly for HDOT than the opposite of maintaining a normal (and shorter) highway bridge.
- A military underpass is likely to be less visible to motorists.
- Any future observatory projects that require hauling equipment w/ inordinately high clearance needs would not be restricted.
- A military overpass would have to be considerably longer to cross over the new and wider Saddle Road as compared to taking Saddle Road over a military trail.
- The natural terrain appears to favor an underpass for military traffic.

While there are no perfect locations, one suitable place is shown in Figure 2.2.2d of the Draft SEIS. There will need to be more discussions during design to determine the exact nature, location, size and materials to be used. The volume of military traffic at this time is unknown, but it is not expected to be substantial for any sustained period of times and will easily be accommodated by one-lane crossing. This information has been added to the Final SEIS.

Cumulative Impacts

Saddle Road extension

The Saddle Road Extension was conceived as a connector that could convey traffic from the Mamalahoa Highway, including Saddle Road traffic, towards Waikoloa and along the Queen Ka'ahumanu Highway towards Kona on Kawaihae. As discussed in Section 1.5 of the Draft SEIS, the selection of a western terminus for the Saddle Road project may influence the eastern terminus of the Saddle Road Extension project. In the event that HDOT determines that it is not feasible or prudent to locate the Saddle Road Extension project contiguous with the Saddle Road terminus, another alternative will likely be identified. No other effects on the Saddle Road Extension are foreseen. The cumulative impacts of the Saddle Road with other projects, including the Saddle Road Extension, are discussed in detail in Chapter 6 of the EIS. It should be noted that delivering traffic to its ultimate destination more directly via a route that lacks homes, businesses, schools or parks is a positive impact, as it saves fuel, time, and avoids traffic impacts on such facilities.

Distractions from planes

We do not concur that the occasional landing aircraft provide a substantial distraction warranting evaluation in the context of cumulative impacts, as all motorists on the Big Island are familiar with an airport and what happens there.

Cumulative impacts

Chapter 6 contains an extensive discussion of this issue.

Visual Impacts

Insertion of built element

While there will be a theoretical visual impact, there will be almost no impact to public views, because the affected areas will not be visible or visible only at a great distance except at the highway intersections. Commenters have noted the fact that the highway will open up new vistas in areas where the "scenery" is currently not visible.

Scenic pullouts
We note your support for scenic pullouts and interpretive signage and we will consider including these in the W-7 alignment during the final design if opportunities permit, as has occurred in other parts of the improved Saddle Road.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon, P.E.
Project Manager

2

7:40 pm

December 9, 2009

SADDLE ROAD

Mamalahoa Highway to Milepost 41

Island of Hawaii

Public Hearing

FOR QUESTIONS ONLY

WHY PROVIDE DOFAR WITH THE $150,000 FOR MOWER DRIVER. SINCE STATE ~~HIGHWAYS~~ IS GOING TO TAKE OVER ROADS AND MAINTENANCE GIVE $150,000 TO SDOT-HIWAYS IN LIGHT OF STATE'S BUDGET

My name is: PATRICK L. KAHAWAIOLA'A

(Please return to the information desk.)

U.S. Department
of Transportation
**Federal Highway
Administration**

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Patrick Kahawaiolaʻa
1260 Elama Rd.
Hilo, HI 96720

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawaiʻi

Dear Mr. Kahawaiolaʻa:

Thank you for the comments you provided at the Hilo hearing for the SEIS in the form of oral testimony and a question. The Palila Memorandum of Understanding committed the funds in question ($115,500) to DLNR for mowing of the Kaʻohe mitigation site. Therefore, they cannot be given to HDOT without all signatory agencies agreeing to amend the MOU. It is unlikely that the HDOT would be interested in accepting this responsibility, nor is it likely that MOU signatory agencies would agree to such a change given:

a. the purpose of these mitigation funds is to enhance bird hunting at Kaʻohe, not for performing roadway maintenance;
b. the Kaʻohe mitigation site is within DLNR lands thus HDOT has no jurisdiction;
c. taking on off-site/non-highway related mowing by HDOT would stretch their already limited roadway maintenance resources, thus the HDOT is unlikely to willing to take on this additional responsibility.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon, P.E.
Project Manager

3

SADDLE ROAD

December 9, 2009

Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing

FOR QUESTIONS ONLY

What ~~asha~~ archoeological assessments have been done to identify cultural, burial & wahi pana?

My name is: Kale Gumapac

(Please return to the information desk.)

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Kale Gumapac
HC 2 Box 9607
Keaau, HI 96749

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawaiʻi

Dear Mr. Gumapac:

Thank you for the comments you provided at the Hilo hearing for the SEIS in the form of oral testimony and a question. In response to your question and comments:

Archaeology/cultural concerns
a). The primary archaeological inventory survey is contained in the Draft SEIS; other archaeological surveys were performed in 1996 and 2003 for the area. A cultural impact assessment including the Keʻāmuku area was done for the 1999 SEIS. This analysis was supplemented by ethnohistorical work done as part of subsequent archaeological surveys, as well as Kepa Maly's work for Waikiʻi and Keʻāmuku. These studies are fully referenced in the SEIS.

b) A number of native Hawaiian organizations and individuals have been consulted in the development of the project. In addition, there are many native Hawaiians within the sponsoring agencies, on the consultant teams (including some of the individuals you were addressing in your oral testimony), and in the construction crews. Many native Hawaiians also attended the hearings, including the Hilo one at which you were present.

SEIS process: 1999 EIS is too old
The only substantial change was the request by the U.S. Army to shift the alignment from W-3 to W-7 in order to better separate military and civilian traffic given the acquisition by the Army of the Keʻāmuku parcel for military training.

Traditional Cultural Concerns
The EIS acknowledges the use of the project area for traditional gathering prior to establishments of the ranches there. The forest has disappeared because of ranching and feral goat browsing. No physical traces of these former uses are present in the corridor area, including the area under the

grass, which were examined closely in several archaeological surveys. We acknowledge your position on the sanctity of traditional burials and their *iwi*.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

4

Mr. Ken Tatsuguchi
Hawaii DOT, Hwy Division, Planning Branch
869 Punchbowl Street, Room 301
Honolulu, HI 96813

Re: Saddle Road EIS

Aloha! My name is Pete Lindsey and I am a Field Representative for the Hawaii Construction Laborers' Union Local 368. On behalf of our 500 Big Island members and retirees, I am testifying in STRONG **SUPPORT** of the Saddle Road project.

Our members work all over the Big Island on public and private construction projects. An improved Saddle Road will provide a faster and safer alternative for our members and their construction companies. It will also provide a safer and faster commute for our members.

Also, with so many of our members not working, this project will provide much needed jobs for workers on the Big Island. This project will contribute to getting our Big Island economy going again.

Thank you for this opportunity for us to share our support for this important project.

Very Truly Yours,

Pete Lindsey

Pete Lindsey
Field Representative
Laborers' Union Local 368

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Pete Lindsey
749 Mililani St.
Hilo, HI 96720

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Mr. Lindsey:

We are in receipt of your comment letter submitted at the 12/9/09 Public Meeting. Thank you for your comment of support for the project and your views on how the project will provide jobs as well as a faster and safer alternative for your members and their construction companies.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon, P.E.
Project Manager

5

SADDLE ROAD

Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing

FOR WRITTEN TESTIMONY

I am in favor of the W7 alignment! The sooner the better! Connecting east Hawaii w/ west Hawaii with a safe, efficient roadway will be a positive impact on many residents on the Big Island.

Many work on the west side of the island & live on the east side because housing is more affordable. The economy the way it is right now make it necessary to do business on both sides of the island to survive. A shorter distance to Kona from Hilo saves gas for those that go there for recreation .... it would be such an immense positive impact on many, many lives, & businesses.

My name is: DOREEN FRIBERG

Organization, if any:

My mailing address is: 270 KAILULANI ST
HILO, HI 96720

My email address is: DOEHILO@AOL.COM

Please mail to: State of Hawaii, Department of Transportation, Highways Division, Planning Branch, 869 Punchbowl Street, Room 301, Honolulu, HI 96813

Or, please FAX to: (808) 587-1787

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Doreen Friberg
270 Kaiulani St.
Hilo, HI 96720

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Ms. Friberg:

We are in receipt of your comment submitted at the 12/9/09 Public Meeting. Thank you for your comment of support for the project and your views on how the project will have a positive effect on many residents on the Big Island in terms of commuting, business and recreation.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

6

SADDLE ROAD

Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing

FOR WRITTEN TESTIMONY

I've used the new route on Saddle Road and have found it to be a safe and faster way across the island, ~~for the most part~~, until the last section towards Waimea. In order for the public to truly realize the benefits, the remaining section MUST be upgraded; otherwise, what was the point of undertaking the project?

The benefits of completing the entire project include: (1) Safety, (2) a more direct route across the island, and (3) less wear and tear on equipment.

Please allow the project to realize its fullest benefits.

My name is: David Uhlmann

My mailing address is: 111 E Puainako St. STE 585 PMB 198
Hilo, HI 96720

My email address is: uhlmann_david@yahoo.com

Please mail to: State of Hawaii, Department of Transportation, Highways Division, Planning Branch, 869 Punchbowl Street, Room 301, Honolulu, HI 96813

Or, please FAX to: (808) 587-1787

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

David Uhlmann
111 E. Puainako St.
SPC 585 PMB 198 (?)
Hilo, HI 96720

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Mr. Uhlmann:

We are in receipt of your comment submitted at the 12/9/09 Public Meeting. Thank you for your comment of support for the project and your views on how the final section of the project must be completed to realize the full benefit of the improvements.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon, P.E.
Project Manager

7

SADDLE ROAD

Mamalahoa Highway to Milepost 41

Island of Hawaii

Public Hearing

FOR WRITTEN TESTIMONY

I strongly support this project.
As a professional engineer who works on
both sides of the island, I appreciate all the
work that has been done so far in improving the
Saddle Road. I feel it is very important
for the islands long term economic development
to complete this very important project.

My name is: Peter Boucher, P.E

My mailing address is: 1537 Kalote Place
Hilo, HI 96720

My email address is: pboucher@hawaii.rr.com

Please mail to: State of Hawaii, Department of Transportation, Highways Division, Planning Branch, 869 Punchbowl Street, Room 301, Honolulu, HI 96813

Or, please FAX to: (808) 587-1787

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Peter Boucher, P.E.
1537 Kalote Place
Hilo, HI 96720

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Mr. Boucher:

We are in receipt of your comment letter submitted at the 12/9/09 Public Meeting. Thank you for your comment of support for the project and your views on how the project will benefit long-term economic development.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

8

SADDLE ROAD

Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing

FOR WRITTEN TESTIMONY

I HAVE COMMUTED DAILY OVER SADDLE ROAD FOR OVER 20 YEARS. DURING THAT TIME I HAVE SEEN VIRTUALLY EVERY CLASS + TYPE OF VEHICLE, FROM ~~B~~ MOTORCYLES TO 60,000 + LB GVW TRUCKS INVOLVED IN HORRIFIC ACCIDENTS. AS EVIDENCED BY THE REDUCTION IN ACCIDENTS ~~OF~~ ON THE 23 MILES OF UPGRADED, FEDERAL STANDARD HIGHWAY IT IS CLEAR THAT THE COMPLETION OF THE ROAD FROM MP 42 TO MAMALAHOA HWY IS ESSENTIAL TO PUBLIC SAFETY. AN ADDITIONAL BENEFIT TO COMPLETING THE ROAD TO MAMALAHOA HWY IS A REDUCTION OR POSSIBLE ELIMINATION OF THE TWICE DAILY GRIDLOCK @ THE CROSS ISLAND "CHOKE POINT" OF KAMUELA. SHORTER DISTANCES BETWEEN HILO-KONA WILL ALSO PROVIDE SIGNIFICANT ENVIRONMENTAL BENEFITS THRU REDUCED ~~FUE~~ FUEL CONSUMPTION + EMISSIONS

My name is: S. TROUTE

My mailing address is: 73-4351 HOLOHOLO ST.
KAILUA-KONA HI
96740

My email address is: TROUTEMAN@YAHOO.COM

Please mail to: State of Hawaii, Department of Transportation, Highways Division, Planning Branch, 869 Punchbowl Street, Room 301, Honolulu, HI 96813

Or, please FAX to: (808) 587-1787

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Stephen Troute
73-4351 Holoholo St.
Kailua-Kona, HI 96740

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawaiʻi**

Dear ~~Mr. Troute~~ Steve:

We are in receipt of your comment letter submitted at the 12/9/09 Public Meeting. Thank you for your comment of support for the project and your views on how the project has already reduced accident rates and will alleviate traffic in Waimea and reduce fuel consumption and emissions.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

9

SADDLE ROAD

Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing

FOR WRITTEN TESTIMONY

I have driven Saddle road at least once a week for nearly 20 years. Recent improvements have transformed that experience, saved me $ in gas and wear and tear on my vehicle. The proposed new alignment will transform this important highway into a ~~true~~ connector between East & West Hawaii and save millions of dollars for the movement of people and goods.

I have walked portions of the area as a hunter and know it fairly well. I believe the alignment is a good one and see no reason ~~not~~ to proceed as designed

Thanks for the opportunity to comment

JM

My name is: Jeffrey Melrose

My mailing address is: 1405 Waianuenue Ave
Hilo 96720

My email address is: jmelrosehugo@hawaiiantel.net

Please mail to: State of Hawaii, Department of Transportation, Highways Division, Planning Branch, 869 Punchbowl Street, Room 301, Honolulu, HI 96813

Or, please FAX to: (808) 587-1787

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Jeffrey Melrose
1405 Waianuenue Ave.
Hilo, HI 96720

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Mr. Melrose:

We are in receipt of your comment letter submitted at the 12/9/09 Public Meeting. Thank you for the comments you provided at the Hilo hearing for the SEIS in the form of oral and written testimony. We appreciate your expression of support for the project and your views on how the chosen alignment is appropriate and how the project will save millions of dollars in gasoline and vehicle wear and tear.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

10

SADDLE ROAD

Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing

FOR WRITTEN TESTIMONY

I AM EXTREMELY HAPPY TO SEE SADDLE ROAD PROJECT CONTINUE WITHOUT A LONG INTERRUPTION. IT IS OBVIOUS TO ME FROM A COUNTY WORKER'S PERSPECTIVE THAT THE BELT ROAD AROUND THE ISLAND IS JUST TOO RESTRICTIVE. AFTER THE EARTHQUAKE - WE HAVE SEEN HOW LIMITING ONE ROAD AROUND THE ISLAND CAN BE FROM A ~~PUBLIC~~ PUBLIC HEALTH PERSPECTIVE.

THE PROPOSED ROUTE 7-W IS THE BEST ALIGNMENT IN MY OPINION - OFFERING US A METHOD OF CONNECTING EQUALLY TO WAIMEA, WAIKOLOA, & KONA.

AGAIN I SUPPORT THIS EXTENSION.

My name is: MICHAEL DWORSKY

My mailing address is: 108 RAILROAD AVE
HILO, HI 96720

My email address is: MDWORSKY@CO.HAWAII.HI.US

Please mail to: State of Hawaii, Department of Transportation, Highways Division, Planning Branch, 869 Punchbowl Street, Room 301, Honolulu, HI 96813

Or, please FAX to: (808) 587-1787

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Michael Dworsky
108 Railroad Ave.
Hilo, HI 96720

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai‘i**

Dear Mr. Dworsky:

We are in receipt of your comment letter submitted at the 12/9/09 Public Meeting. Thank you for your comment of support for the project and your views on how the chosen alignment is appropriate and represents a benefit to public health and safety by providing an alternative cross-island route.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

11a

SADDLE ROAD

Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing

FOR WRITTEN TESTIMONY

(1) What is your consultation protocol requirements regarding Federal Undertaking with Na Ohana O Keawe? (2) Hawaiian Cultural Preservation Officers demand compliance of Section 106 requirements of any federal undertaking - Date? Time + location (on Big Island) 1 week in advance notice (Prefer 2 wks public Notice for Na Ohana O Keawe

(3) We have been informed by Naeleni Whittington that no research was done regarding proper title - Allodial / Mahele / Probate Proceedings THEREFORE We request a Cultural Impact Statement Compliance (CIS) with Ordinance #842 (CRC) addressing lineal heirs of Kua Mo'o + Keeaumoku Stretch (~~Keeaumoku~~ Keamuku Battle ground (stretch) is a Historical Site registered w/ NAGPRA... your project plans to alter - this is a direct encroachment of a cultural landscape mandatory testing of heavy metals in the asphalt + cement your project intends to use be contained in your proposal as a requirement

How much Federal money $ spent thus far and the amount of $ more needed to do your project?

My name is: Simbralynn Kanaka'ole

My mailing address is: P.O. Bx 1599
Keeau, Hi, 96749

My email address is: haynsunshine247@hotmail.com

Please mail to: State of Hawaii, Department of Transportation, Highways Division, Planning Branch, 869 Punchbowl Street, Room 301, Honolulu, HI 96813

Or, please FAX to: (808) 587-1787

11b

Road Closures???

I have been informed personelly by mr. Kevin Dayton that there has never been an completed evacuation drill as required by the EPA 2000 Review to determine Responders ability to handle a ~~worse~~ Hurricane/Tsunami evacuation situation, let alone a Worse Case Scenario? ~~How's~~ General Public? Industrial Operators + owners?

Govern Yourselves Accordingly

Cease + Desist.

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Simbralynn Kanaka'ole
P.O. Box 1599
Keaau, HI 96749

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Ms. Kanaka'ole:

Thank you for the comments you provided at the Hilo hearing for the SEIS in the form of oral testimony and a written comment. In response to your written comments:

106 Consultation
The Section 106 consultation process involved a letter to a number of native Hawaiian organizations providing the Draft SEIS and archaeological inventory survey inviting comments on the findings related to historic properties. After the hearing, we provided a letter and Draft SEIS to the address you listed.

Heirs of Keamuku battleground
We have no information regarding a defect in land title. Our research has uncovered no evidence of a Ke'āmuku battleground or any other evidence of a battleground in the area of the W-7 alignment. It is our understanding that the Kuamo'o battleground is located near Keauhou in Kona, not in Ke'āmuku.

Flooding of Waiakea Uka
The work on Saddle Road is distant from Waiakea Uka, and there are no plausible hydrologic connections between the two. The flooding in Waiakea Uka in 2008 (similar to that in 2000) was probably caused by heavy rainfall interacting with land within the local watershed whose permeability had been altered by development, grazing, and agriculture.

Speeding and Accidents
There is indeed a correlation between wider highways and speeds, but the proposed improvements will result in a much safer highway. The Hawai'i County Police Department now regularly patrols the area and has assisted in reducing speeding. The accident rate on the sections of improved road have declined dramatically, whereas the unimproved sections continue to have high accident rates.

Heavy metals in concrete
There are no heavy metals in concrete under normal production methods. If the comment is related to the potential for heavy metals being found in concrete aggregate materials taken from sources within PTA, the field tests that were performed as part of preparation of this SEIS show only natural levels of uranium as would be found in any other quarry on the Big Island.

Cost
The total cost of construction to date is approximately $157 million. The current estimate to complete all remaining construction is $97 million in 2010 dollars ($58 million for the west side and $38 million for the remaining east side).

Evacuation
The information on the EPA and evacuation drills does not appear to be relevant to the action at hand. However, the realigned highway will provide a far superior alternative route to the present route if disasters affect the Hamakua coast.

PTA Training
The Saddle Road project is not related to and is independent of military training at PTA.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

12

SADDLE ROAD

Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing

FOR WRITTEN TESTIMONY

In hearing both sides of the issue; Yes, we need good safe roads, and in that aspect it would be fine, but there is the issue of the DU that concerns me and the air pollution of the impacts, so I am inclined to say that they should go ahead with the road, but only if they quit using the DU!

My name is: Sally Miller

My mailing address is: 282 Kukuau
Unit C
Hilo, HI 96720

My email address is:

Please mail to: State of Hawaii, Department of Transportation, Highways Division, Planning Branch, 869 Punchbowl Street, Room 301, Honolulu, HI 96813

Or, please FAX to: (808) 587-1787

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Sally Miller
282 Kukuau St.
Unit C
Hilo, HI 96720

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Ms. Miller:

We are in receipt of your comment letter submitted at the 12/9/09 Public Meeting. Thank you for your letter of support for the project and your views on how the Army should cease using depleted uranium.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

13

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

December ~~9~~ 10, 2009

Public Hearing

FOR QUESTIONS ONLY

What will the intersection at Māmalahoa Hwy. look like?

Is there an opportunity for a staging area at the intersection of Māmalahoa and Saddle Road for ride share or bus or recreational use (future)

My name is: Laura Dierenfield

5:06

(Please return to the information desk.)

See response of FHWA to Letter No. 41

14

Tammy Harp
maha-oi@hotmail.com
345-6085

10
December ~~9~~, 2009

SADDLE ROAD

Mamalahoa Highway to Milepost 41
Island of Hawaii

⑤ What is the though[illegible] from Waiki'i Homeown[illegible] Association?

Public Hearing

FOR QUESTIONS ONLY

① Why was Thelma Parker Library in Waimea not included in th[illegible] review process?

② Is a one day public notice sufficient enough? ~~Nov 18, 200[illegible]~~ ~~West HI Tod[illegible]~~

③ Where is the stone or rock crushing plant on the map? For perspective purposes.

④ What will happen to the present Saddle Road pass Waiki'i?

My name is: Tammy Harp

Mahalo,

(Please return to the information desk.)

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Tammy Harp
P.O. Box 437347
Kamuela, HI 96743

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Ms. Harp:

Thank you for the comment you provided at the Kona hearing for the SEIS. Regarding your concerns:

SEIS distribution and process
a) Our records show that a copy of the EIS was mailed to the Thelma Parker Library.
b) The public hearing notice for the December 10, 2009 Kona hearing was published in the November 18, 2008 West Hawai'i Today, which provided 21 days of notice.

Rock-crushing plant location
The rock-crushing plant is denoted as the Construction Quarry Site on Figure 3.1.1, and is located on Pohakuloa Training Area about two miles south of Saddle Road near Milepost 39.3.

Waikii stretch
The existing Saddle Road will remain open and under County of Hawai'i jurisdiction. The project has included coordination with the homeowners' association, which did not provide comments on the Draft SEIS.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

P.O. Box 437347
Kamuela, HI 96743

15

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

December ~~9~~ 10, 2009

Public Hearing

FOR QUESTIONS ONLY

Why has project been broken down into several segments rather than considering entire project as a whole? Cumulative impacts being reduced by this approach?
Is documentation on past land ownership transfers, publicly available including documentation on how Parker Ranch acquired the 23,000 acres recently purchase by the military?
Mahalo!

imua-hawaii@hawaii.rr.com

My name is: Isaac Harp - 345-6085

(Please return to the information desk.)

SADDLE ROAD
Mamalahoa Highway to Milepost 41
Island of Hawaii

December ~~9~~ 10, 2009

Public Hearing

FOR QUESTIONS ONLY

Why do the exibit maps show unlegened blue dashe lines going across State controlled lands?

Why not connect Saddle Road to the existing Waikoloa Road to reduce costs and minimizing more paving of undisturbed lands?
Why not upgrade existing alignment?

imua-hawaii@hawaii.rr.com

My name is: Isaac Harp - 345-6085

(Please return to the information desk.)

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 26, 2010

In Reply Refer To:
HFPM-380

Isaac Harp
P.O. Box 437347
Kamuela, HI 96743

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Mr. Harp:

Thank you for the comments you provided at the Kona hearing for the SEIS. Regarding your specific questions:

Reason for Supplemental EIS
The entire Saddle Road project was considered in the 1999 EIS. Section I is the only section that involves a substantial change of route or other circumstances, and thus it is the only section that is being considered in the SEIS. The cumulative impacts analysis included discussion of all aspects of the project, as well as other projects such as the Saddle Road Extension and military training expansion.

Parker Ranch acquisition
We are not aware of any readily available published data on this acquisition, although title information is accessible through government records.

Possible connection to Waikoloa Road
Coordination with Waikoloa residents during the 1999 EIS public involvement process indicated that most did not wish Saddle Road to outlet at Waikoloa Road. Connecting to Waikoloa Road would likely increase through traffic on that road, and in all probability, beyond its original design capacity. It would thus require significant improvements to accommodate the anticipated increased traffic volumes. W-3 would have also have placed the highway close to Waiki'i. Most importantly, the W-3 terminus (which is essentially the same location as the terminus chosen for W-7) was chosen because it shortened the trip between Hilo or Saddle destinations to Kona, the traffic stream for more than half of motorists.

Upgrade of current alignment
As discussed in Section 2.1 of the Draft EIS, the existing alignment, or EX-1, diverts traffic in a northwesterly direction instead of towards Kona or Waikoloa, the traffic stream for more than 75

percent of motorists. The existing west side section of Saddle Road is also about 1.5 miles longer than the proposed W7 alignment, which could add as much as $10 million to the cost of construction. EX-1 has many culverts that would need to be replaced with much larger structures, more than would be necessary along the W7 alignment. There are also many miles of utility lines (electric, telephone, fiber optic) adjacent to the existing road, much of which would likely be impacted by improving the existing road, thus require costly relocation. The existing roadway passes through several miles of private property for which additional and costly right of way would be required if this section were to be improved. Improving the existing section would place the roadway closer to the core population of Palila, thus leading to a greater risk to this endangered species than with the W7 alignment.

SEIS map
The line we believe you were referring to is from the map at the Kona hearing that illustrated the presumed location of the Saddle Road Extension, another highway project from HDOT that may connect these two highways. The Saddle Road Improvements project is independent of that project. The Draft SEIS discussed this and other relevant projects in Section 1.5.

Involvement with State-owned lands
The only segment of Section I of Saddle Road that belongs to the State is a 1-mile section cutting across lands leased by PTA for military training. No loss of public land will occur.

Depleted uranium and Kona cancer
It is our understanding that testing to date has revealed no evidence for effects from DU to land, air or water in Kona or any other location outside the metal fragments themselves. There appears to be no known risk for those building or using Saddle Road.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

16

SADDLE ROAD

Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing

FOR WRITTEN TESTIMONY

we need to have the west end of Saddle Road upgraded!! We drive regularly from Kona to Hilo and Pahoa, both for business and social purposes. We also have friends and work colleagues who drive from Pahoa and Ainaloa to visit us and work with us. We see that the Hilo side has been upgraded several times while the west side is still old & deteriorated. We have had several scary incidents on the existing Saddle Road, Kona side, due to the narrowness, tight curves, bad grades on the curves, and potholes and general deterioration. Just a couple of weeks ago, our friend Laura was run off the road by an oncoming vehicle that was coming around a curve in the center of the highway. We have also driven in the center of the highway, when it is clear + safe, due to the excessive deterioration and potholes at both sides of the existing saddle Road.

My name is: Susan Law

My mailing address is: 73-1093 Mahilani Drive
Kailua Kona, HI 96740

My email address is: naritalaw@yahoo.com

Please mail to: State of Hawaii, Department of Transportation, Highways Division, Planning Branch, 869 Punchbowl Street, Room 301, Honolulu, HI 96813

Or, please FAX to: (808) 587-1787

12/10

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Susan Law
73-1093 Mahilani Drive
Kailua-Kona, HI 96740

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Ms. Law:

We are in receipt of your comment submitted at the 12/10/09 Public Meeting. Thank you for your comment of support for the project and your views on how the western section of the project must be completed to realize the full benefit of the improvements.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

17

SADDLE ROAD

Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing

FOR WRITTEN TESTIMONY

My wife and I want this Road because it is needed and if you do not think so, you have not been here long

My name is: Tim LAW

My mailing address is: 73-1093-Makalani
Kailua Kona 96740

My email address is: ~~[illegible]~~ Naritalaw@yahoo.com

Please mail to: State of Hawaii, Department of Transportation, Highways Division, Planning Branch, 869 Punchbowl Street, Room 301, Honolulu, HI 96813

Or, please FAX to: (808) 587-1787

12/10

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Tim Law
73-1093 Mahilani Drive
Kailua-Kona, HI 96740

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Mr. Law:

We are in receipt of your comment submitted at the 12/10/09 Public Meeting. Thank you for your comment of support for the project.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

18

SADDLE ROAD

Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing

FOR WRITTEN TESTIMONY

Aloha and Mahalo! I have lived on the Big Island on and off for over 30 years. My daughter was born at Hilo Hospital 28 years ago. I have a small house in Puna but I do not live there. I live in Kona now (No jobs in Hilo) I am a long time Union Carpenter Local 745. WE - ALL RESIDENTS NEED NEW ROAD. The old Road is very very dangerous. Driveing to Hilo going North the HamaKua coast is super dagerous when it rains hard! PLEASE GRANT THIS ROAD TO Save Lives Save Gas Create Jobs. NEED I ~~SAVE~~ ~~S~~ SAY MORE ITS ABOUT TIME 20 YEARS IS TO LONG MAHALO

Merry Christmas

My name is: Tim Hershman

My mailing address is: PO BOX 5644
Kona HI 96740

My email address is:

Please mail to: State of Hawaii, Department of Transportation, Highways Division, Planning Branch, 869 Punchbowl Street, Room 301, Honolulu, HI 96813

Or, please FAX to: (808) 587-1787

12/10

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Tim Hershman
P.O. Box 5644
Kailua-Kona, HI 96740

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Mr. Hershman:

We are in receipt of your comment submitted at the 12/10/09 Public Meeting. Thank you for your comment of support for the project and your views on how the project will improve safety, gas consumption and employment.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon, P.E.
Project Manager

19

SADDLE ROAD

Mamalahoa Highway to Milepost 41

Island of Hawaii

Public Hearing

FOR WRITTEN TESTIMONY

Finish this project asap. We've traveled this road so much that it is really a wear and tear for cars and a safety situation with the fog.

My name is: Irene [illegible]

My mailing address is: 87-6236 Hind Dr.
Capt. Cook, HI 96704

My email address is:

Please mail to: State of Hawaii, Department of Transportation, Highways Division, Planning Branch, 869 Punchbowl Street, Room 301, Honolulu, HI 96813

Or, please FAX to: (808) 587-1787

12/10

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Merna Izawa
87-6236 Hind Drive
Captain Cook, HI 96704

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Ms. Izawa:

We are in receipt of your comment submitted at the 12/10/09 Public Meeting. Thank you for your comment of support for the project.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

20

SADDLE ROAD

Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing

FOR WRITTEN TESTIMONY

FOR to PROJECT

My name is: TAKEO IZAWA

My mailing address is: 81-6236 HIND Dr.
Capt. Cook. Hi. 96704

My email address is: ukix7@hotmail.co.JP

Please mail to: State of Hawaii, Department of Transportation, Highways Division, Planning Branch, 869 Punchbowl Street, Room 301, Honolulu, HI 96813

Or, please FAX to: (808) 587-1787

12/10

U.S. Department
of Transportation
Federal Highway
Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Takeo Izawa
87-6236 Hind Drive
Captain Cook, HI 96704

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Mr. Izawa:

We are in receipt of your comment submitted at the 12/10/09 Public Meeting. Thank you for your comment of support for the project.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon, P.E.
Project Manager

21

SADDLE ROAD

Mamalahoa Highway to Milepost 41

Island of Hawaii

Public Hearing

FOR WRITTEN TESTIMONY

I am for the saddle road improvement On the green I Save 1.80 gal's of gas pre trip. Also saving 1/2 hour. per one way trip. The improvement should do more for the good of the envoirment

My name is: ADAM VARDINO

My mailing address is: P.O. BOX 4983
KAILUA, KONA 96745

My email address is:

Please mail to: State of Hawaii, Department of Transportation, Highways Division, Planning Branch, 869 Punchbowl Street, Room 301, Honolulu, HI 96813

Or, please FAX to: (808) 587-1787

12/10

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Adam Jardine
P.O. Box 4983
Kailua-Kona, HI 96745

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawaiʻi

Dear Mr. Jardine:

We are in receipt of your comment submitted at the 12/10/09 Public Meeting. Thank you for your comment of support for the project and your views on how the project will improve gas consumption and the environment.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon, P.E.
Project Manager

22

SADDLE ROAD

Mamalahoa Highway to Milepost 41

Island of Hawaii

Public Hearing

FOR WRITTEN TESTIMONY

Aloha,

I fully support the improved Saddle Road and the preferred western alignment.

It is important to construct the highway as soon as possible to improve safety for motorists and to separate military and civilian traffic. The new western alignment will greatly reduce the travel time between Kona and Hilo - and all other areas of the island.

My name is: Debbie Baker

Organization, if any:

My mailing address is: POB 390051
Keauhou HI 96739

My email address is:

Please mail to: State of Hawaii, Department of Transportation, Highways Division, Planning Branch, 869 Punchbowl Street, Room 301, Honolulu, HI 96813

Or, please FAX to: (808) 587-1787

12/10

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Debbie Baker
P.O. Box 390051
Keauhou, HI 96739

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Debbie
Dear ~~Ms. Baker~~:

We are in receipt of your comment submitted at the 12/10/09 Public Meeting. Thank you for your comment of support for the project and your views on how the project will improve safety, separation of military and civilian traffic, and travel time.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon, P.E.
Project Manager

23

SADDLE ROAD

Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing

FOR WRITTEN TESTIMONY

Good Afternoon,

I am a Lifelong Resident of the State, and a 20 year Big Islander. I have seen the Saddle Road Evolve with what it is today and look Forward to it moving Ahead in the near future. To me this means progress. Thats Right! The "P" word. Please consider my testimony.

Sincerely,

Jon M Kunimura

My name is: JON KUNIMURA

Organization, if any: Local 745

My mailing address is: P.O. Box 311
Holualoa HI 96725

My email address is: JONKUNIMURA@YAHOO.COM

Please mail to: State of Hawaii, Department of Transportation, Highways Division, Planning Branch, 869 Punchbowl Street, Room 301, Honolulu, HI 96813

Or, please FAX to: (808) 587-1787

12/10

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Jon Kunimura
P.O. Box 311
Holualoa, HI 96725

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai‘i**

Dear Mr. Kunimura:

We are in receipt of your comment submitted at the 12/10/09 Public Meeting. Thank you for your comment of support for the project.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

24

Aloha,

My Name is Peggy M. Ciriako and I reside at 77-6494 Maile St., Kailua Kona, Hawaii 96740

I would like to testify for the completion of the Western Section of the Saddle Road.

I have not paid much attention to Saddle Road because I had no interest in using that road because it was so terrible.

Everything changed this year when my Grandson started playing JV football and the games were held in Hilo and Waiakea. Driving to a game, my daughter took the Saddle Road, I could not understand why, the ride was miserable, I was praying all the time for safe journey to our destination. Then, wow, everything changed. The road was smooth and it turned into a nice ride. We hit the new section. Neat! We need an improved road, a nice smooth road from East to West, for the School activities.... for all the sports that are being played on both sides of the Island

The completion of the Western Section will enable parents and grandparents to attend more "away games" without the agony of a long drive on bumpy, curvy roads. This road will benefit the East side and the West side allowing both sides to attend games.

I hope and pray that all the positive testimonies you hear tonight will bring a favorable vote to complete the Western Section of the Saddle Road.

Thank you very much,
Peggy M. Ciriako

12/10

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Peggy M. Ciriako
77-6494 Maile Street
Kailua-Kona, HI 96740

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Ms. Ciriako:

We are in receipt of your comment submitted at the 12/10/09 Public Meeting. Thank you for your comment of support for the project and your views based on personal experience on how the project will improve safety and recreation.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

25

SADDLE ROAD

Mamalahoa Highway to Milepost 41

Island of Hawaii

Public Hearing

FOR WRITTEN TESTIMONY

Many years ago, a well respected Kamaaina attorney named Richard T. Ishida was known as a person who bridged Kona and Hilo communities. When Richard was the Managing Partner at Goodsill Anderson Quinn & Stifel and I was a young lawyer at the firm in the Kona office, we would travel on Saddle Road to go to Court in Hilo. He passed away unexpectedly in 1994.

This year, Sen. Daniel Inouye spoke to the Kona Kohala Chamber of Commerce. He is the force behind funding of Saddle road improvements. He stated the completion of Saddle road is the bridge to East and West Hawaii and emphasized this is ~~the~~ one Island of Hawaii.

I support the alignment (W-7) and would like you to consider naming to highway after Richard Ishida. Thank you.

My name is: MARGARET K. MASUNAGA

My mailing address is: P.O. BOX 345

KEALAKEKUA, HI 96750

My email address is: mkmasunaga@aol.com

Please mail to: State of Hawaii, Department of Transportation, Highways Division, Planning Branch, 869 Punchbowl Street, Room 301, Honolulu, HI 96813

Or, please FAX to: (808) 587-1787

10/10

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Margaret K. Masunaga
P.O. Box 345
Kealakekua, HI 96750

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Ms. Masunaga:

We are in receipt of your comment submitted at the 12/10/09 Public Meeting. Thank you for your comment of support for the project and your suggestion about naming the road. To initiate a change in the name of Saddle Road, a letter may be sent to the Director of the Department of Transportation to request this change. As part of this process other State agencies will research the requested name and other deserving names, and the State legislature will also be consulted before the change is approved by HDOT/Governor. Please note that this suggestion is beyond the scope and authority of this SEIS process.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

26

SADDLE ROAD

Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing

FOR WRITTEN TESTIMONY

I grew up in Kona from age 5 through high school. In 1974 I moved to the mainland with my husband and 2 children, returning in 1999. In the 25 years that I had been away, there have been many, many more homes built and lots of new housing developments but little improvement in our infrastructure and roads until recently. These improvements have been very slow in coming. I rode over the partially improved Saddle Road and was amazed. Saddle Road has always been known as the "short cut" from east to west & vice versa but has always been in such bad condition that even rent-a-cars were not allowed on it. The improvements made to date and future improvements can only benefit the lives of residents on the west and east side of Hawaii and bring them closer. It will be a safer and much shorter distance to travel. And what a beautiful, scenic ride that is. On a clear day, seeing both Mauna Kea and Mauna Loa is truly amazing. I completely support the Saddle Road - West Alignment!!

My name is: MARSHA BOYLE

My mailing address is: 73-4550 MAMALAHOA HWY
KAILUA-KONA, HI 96740

My email address is: mnboyle2@msn.com

Please mail to: State of Hawaii, Department of Transportation, Highways Division, Planning Branch, 869 Punchbowl Street, Room 301, Honolulu, HI 96813

Or, please FAX to: (808) 587-1787

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Marsha Boyle
73-4550 Mamalahoa Hwy.
Kailua-Kona, HI 96740

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Ms. Boyle:

We are in receipt of your comment submitted at the 12/10/09 Public Meeting. Thank you for your comment of support for the project and your views on how the project will benefit the lives of residents on both sides of the island and open up new scenic vistas.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

27

SADDLE ROAD

Mamalahoa Highway to Milepost 41

Island of Hawaii

Public Hearing

FOR WRITTEN TESTIMONY

I am strongly in favor of this realignment. It is much needed for safety reasons. I appreciate that you have covered every area of concern and have done an excellent job of planning! I hope it goes forward quickly!

For county: I hope the existing road is not allowed further deterioration, but eventually sees improvement to full two lane with shoulders.

My name is: Sheryl Henderson

Organization, if any:

My mailing address is: 73-4328 AkaAka Pl.
Kailua Kona, HI 96740

My email address is:

Please mail to: State of Hawaii, Department of Transportation, Highways Division, Planning Branch, 869 Punchbowl Street, Room 301, Honolulu, HI 96813

Or, please FAX to: (808) 587-1787

Jan 7

12/10

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Sheryl Henderson
73-4328 Akaaka Place
Kailua-Kona, HI 96740

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Ms. Henderson:

We are in receipt of your comment submitted at the 12/10/09 Public Meeting. Thank you for your comment of support for the improved Saddle Road and project planning to date. With regard to the existing Saddle Road, it will remain open and under County of Hawai'i jurisdiction. The County has recently been improving the road and its shoulders.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

28

TESTIMONY REGARDING THE SADDLE ROAD EIS ON DECEMBER 10, 2009

Thank you for the opportunity to offer testimony today in support of the rapid completion of improvements to Saddle Road. Although I have been a current resident of the Big Island for only ten years, my first Saddle Road trip was in 1962 and I have traveled this road frequently since moving here.

Let me explain that I do not claim to be an environmental science expert and I admit to not having thoroughly studied the EIS. I think there are experts and an official advisory committee to assist in that area. I am a driver, a consumer and a taxpayer. In my younger years I worked in road construction and I have been driving for 48 years. I have traveled the back roads, local highways and interstate highways of all 50 States. I speak as a frequent traveler of Saddle Road as I travel back and forth in a volunteer capacity between Kona and Hilo. I pay for my own gasoline and vehicle and maintenance costs. No subsidies.

Although I am certain that I will continue to use both the Northern and Southern routes around the island in addition to Saddle Road, I support the continued improvements for my own personal "quality of life" reasons. An improved Saddle Road means a safer, less hazardous trip, less driving time, less gasoline and therefore less pollution and a cleaner environment, less wear and tear on the vehicle, and the ability to view the distinctly different and beautiful vistas of Mauna Loa and Mauna Kea.

I would like to add that I saw comments to the effect that consideration should be given to improving public accommodations along the Saddle Road route. I endorse that suggestion and strongly recommend that Mauna Kea State Park be properly renovated, managed and maintained to serve that purpose. The citizens of Hawaii already have a valuable and underutilized investment in Mauna Kea State Park and now is an excellent time to plan to optimize the benefits of that wonderful resource.

Thank you for the opportunity to testify today.

John Buckstead

77-6356 Halawai Place

Kailua-Kona, Hawaii

12/10

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

John Buckstead
77-6356 Halawai Place
Kailua-Kona, HI 96740

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Mr. Buckstead:

We are in receipt of your comment letter submitted at the 12/10/09 Public Meeting. Thank you for your comment of support for the project and your views on how the project will benefit safety, fuel efficiency, pollution reduction, vehicle wear and tear, and new scenic vistas. With regard to public accommodations on Saddle Road and Mauna Kea State Park, your comments will be provided to the Hawai'i Division of State Parks.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon, P.E.
Project Manager

29

SADDLE ROAD

December 9, 2009

Mamalahoa Highway to Milepost 41
Island of Hawaii

Public Hearing

FOR QUESTIONS ONLY

① The Saddle Road Website mentions that the State intends to provide the area near Puu Mali for bird hunting. Its been 10 years since the ROD was signed. Why ~~not~~ has bird hunting been allowed

② Kaohe lease was supposed to be mowed. Nothing has happened & is a fire hazard.

③ Why has the total 1740 acres not been fenced if it is considered as critical habitat for the palila.

④ Given these discrepancies, why should we think that the provisions of this SEIS will be followed.

My name is:

(Please return to the information desk.)

6:55

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Steve Hurt
17-124 Pala'ai Street
Keaau HI 96745

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Mr. Hurt:

Thank you for the comment you provided for the SEIS. Regarding your concerns:

Hunting areas
a) **Pu'u Mali hunting**: The decision to open up Pu'u Mali to bird hunting rests with the State Division of Forestry and Wildlife (DOFAW), and no aspect of the Saddle Road project hinders this. Your comments will be provided to DOFAW.

b) **Kaohe lease area mowing**: Due to limited available funding in years past, it was necessary to prioritize which mitigation elements to fund first. This has meant that at times there was insufficient funding available to fund several lower priority mitigation elements.

FHWA and DOFAW have recently discussed funding the mower mitigation element and whether this was the best use of such funding. If DOFAW concludes that proceeding with the mower mitigation element is the proper and best course of action, these agencies will enter into an agreement to transfer these funds from the federal government to the State.

Palila fencing
Fencing of the subject habitat area (Ka'ohe mitigation site) was completed in 2006.

SEIS commitments
FHWA has lived up to its commitments in the ROD. The Palila Memorandum of Understanding included mitigation commitments valued at an estimated $15 million; to date, the FHWA has expended approximately $20 million toward the mitigation elements committed to in the Palila MOU. The only outstanding item that has not been funded is the mower and mower operator discussed previously. The funding commitment for this item is $115,500. FHWA is currently working with DOFAW to implement this last mitigation item in the near future.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

30

Phyllis Tarail <ptarail@hawaii.rr.com

Aloha,

I am a member of the So. Kohala Traffic Safety Committee (SKTSC) and the Hawaii Island Traffic Safety Council. I live in Waimea. Steve Troute of Pohakuloa gave a presentation on the proposed realignment of Saddle Road (Highway #200 from Milepost 41 to Mamalohoa Hwy #190) at our recent November SKTSC meeting. This new alignment appears to take care of a number of important concerns--frequent fog near Waikii Ranch, topographic issues on the old route, munitions practice area in Pohakuloa. It also appears that it will shorten the drive time from Hilo to Kailua-Kona. Although it would add a few miles for me and others traveling from Waimea to Hilo, it should shorten our driving time. However, it should serve to relieve some of the traffic that currently goes through Waimea to get to the west side of the Island. Consequently I am a supporter of this realignment.

I will be off Island most of December, so I am unable to attend your public hearings.

Mahalo for the opportunity to provide comments.

Phyllis Tarail
67-1292 Pua'ena St.
Kamuela HI 96743
769-4490

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Phyllis Tarail
67-1292 Pua'ena Street
Kamuela, HI 96743

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Ms. Tarail:

Thank you for your emailed letter of support for the project and your views on how the project will benefit driving time for Waimea residents.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

31

TOM GEBALLE
11/24/09
EMAIL ADDRESS: tgeballe@gemini.edu

Thanks, Ron. Your email has been circulated to the observatory community.

I'll be away on Dec 9, so here are my thoughts. I've always thought it was most natural to put the new intersection close to the Waikoloa Road, perhaps even closer than 3 miles. Clearly it is much better to put it to the south than to the north of the Mamalahoa – Waikoloa intersection. So the plan sounds very good to me. Will anything happen to the old road going toward Waimea? I am sure the astronomy community based in Waimea want it to be improved.

Cheers,

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Tom Geballe
tgeballe@gemini.edu

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Mr. Geballe:

Thank you for the email you provided commenting on the project. Coordination with Waikoloa residents during the 1999 EIS public involvement process indicated that most did not wish Saddle Road to outlet at Waikoloa Road, which also would have drawn the highway close to Waiki'i. Most importantly, the W-3 terminus (which is essentially the same location as the terminus chosen for W-7) was chosen because it shortened the trip between Hilo or Saddle destinations to Kona, the traffic stream for more than half of motorists. The existing Saddle Road will remain open and under County of Hawai'i jurisdiction. The County has recently been improving the road and its shoulders.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

32

RHarris@dtnhawaii.net

To : Mr. Ken Tatsuguchi, State DOT

>From : Roger Harris , Pu'uiwaiwa Ranch

RE: Saddle Road Supplemental EIS

Okahara and Associates sent us the DEIS disk for review.

We own TMKs 6-8-02:07, 012 AND 013 KNOWN AS Pu'uiwaiwa Ranch and fronting on Mamalahoa Hwy near where the Saddle Road is expected to meet Mamalahoa Hwy .

We have reviewed the DEIS and have no objections to it . We are supportive of your efforts to extend the New Saddle Road to Mamalahoa Hwy. Thank you for your work , we appreciate the opportunity to comment .

Aloha,

Roger Harris
for Pu'uiwaiwa Ranch .

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Roger Harris
Pu'uiwaiwa Ranch
rharris@dtnhawaii.net

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Mr. Harris:

Thank you for your emailed letter of support for the project.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

33

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

JAN 06 2010

Mr. David Gedeon
Project Manager
Federal Highway Administration
Central Federal Lands Highway Division
12300 West Dakota Avenue
Lakewood, CO 80228

Subject: Draft Supplemental Environmental Impact Statement (DSEIS) for Saddle Road (State Route 200), Mamalahoa Highway (State Route 190) to Milepost 41, Hawai`i County, Hawai`i (CEQ # 20090392)

Dear Mr. Gedeon:

The U.S. Environmental Protection Agency (EPA) has reviewed the document referenced above. Our comments are provided pursuant to the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations (40 CFR Parts 1500-1508) and our NEPA review authority under Section 309 of the Clean Air Act.

In 1999 the FHWA published a Final Environmental Impact Statement (FEIS) for Saddle Road, from Mamalahoa Highway to Milepost 6. Following our review of the FEIS, EPA had no objections to proposed improvements on Saddle Road between Mamalahoa Highway and Milepost 41. In 2006, The U.S. Army Garrison, Hawai`i, acquired the Keamuku parcel which is traversed by the proposed western section of Saddle Road (W-3). The DSEIS evaluates a new western alignment alternative for Saddle Road to maximize army training opportunities on the parcel and minimize conflict with the traveling public.

EPA rates the new proposed alignment (W-7) as Lack of Objections (LO) (see enclosed *Summary of EPA Rating Definitions*). Implementation of the new alignment, combined with proper mitigation, should not result in significant environmental impacts. Information provided in the DSEIS indicates that Alternative W-7 does not impact any waters of the U.S., including wetlands, lakes or jurisdictional ephemeral streams. Additionally, no surface drainages that connect the W-7 corridor to navigable waterways were identified, and coastal waters are a minimum of nine miles from the project area. As such, EPA does not anticipate any impact to water quality as a result of project implementation. In addition, while the document identifies that there will be no adverse air quality impacts, EPA supports the implementation of stringent dust control and construction equipment emission control measures during construction in order to reduce temporary impacts to air quality.

The DSEIS concludes that there will be little or no growth-related impacts as a result of the proposed project. Residential uses in the area are limited to large (≥ 700 acres) agricultural parcels, and there is very limited opportunity for commercial or industrial development given the zoning and State and County plans. Should there be any changes to current zoning or development plans prior to the release of the Final Supplemental Environmental Impact Statement (FSEIS), EPA recommends that this information, as well as any additional impacts, be discussed in that document.

The Saddle Road project area is already heavily invaded by the alien species that flourish in the region, and thus construction and operation of W-7 is not likely to play a large role in the introduction of new invaders. However, as many of the invasive species found in the project area tend to thrive on disturbance (e.g. *Pennisetum setaceum*), EPA recommends that the FSEIS address the feasibility of implementing active restoration with native species for all graded areas and cut/ fill slopes that result from project construction.

EPA commends the FHWA and the Hawaii Department of Transportation (HDOT) on the involvement with communities in the vicinity of the project area as summarized in the DSEIS. EPA recommends that coordination between government agencies, Native Hawaiian groups, community associations, land owners, and other individuals continue through the remainder of the project planning process. We appreciate the opportunity to review this DSEIS. When the FSEIS is released, please send one hard copy to the address above (Mail Code CED-2). If you have any questions, please contact me (415-947-4161) or Clifton Meek, the lead reviewer for this project. Clifton can be reached at 415-972-3370 or meek.clifton@epa.gov.

Sincerely,

Connell Dunning

Connell Dunning, Transportation Team Supervisor
Environmental Review Office
Communities and Ecosystems Division

Enclosed: Summary of EPA Rating Definitions

CC: Robert Deroche, Army Corps of Engineers
Ken Tatsuguchi, Hawaii Department of Transportation
Melissa Dickard, Federal Highway Administration
Pat Phung, Federal Highway Administration

SUMMARY OF EPA RATING DEFINITIONS*

This rating system was developed as a means to summarize the U.S. Environmental Protection Agency's (EPA) level of concern with a proposed action. The ratings are a combination of alphabetical categories for evaluation of the environmental impacts of the proposal and numerical categories for evaluation of the adequacy of the Environmental Impact Statement (EIS).

ENVIRONMENTAL IMPACT OF THE ACTION

"LO" (Lack of Objections)

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

"EC" (Environmental Concerns)

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

"EO" (Environmental Objections)

The EPA review has identified significant environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

"EU" (Environmentally Unsatisfactory)

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potentially unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ).

ADEQUACY OF THE IMPACT STATEMENT

"Category 1" (Adequate)

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

"Category 2" (Insufficient Information)

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analysed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

"Category 3" (Inadequate)

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analysed in the draft EIS, which should be analysed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

*From EPA Manual 1640, Policy and Procedures for the Review of Federal Actions Impacting the Environment.

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 26, 2010

In Reply Refer To:
HFPM-380

Connell Dunning
Transportation Team Supervisor
Environmental Review Office
Communities and Ecosystems Division
U.S. Environmental Protection Agency
Region IX
75 Hawthorne Street
San Francisco, CA 94105-3901

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Mr. Dunning:

Thank you for your review of the Draft SEIS. In response to your particular comments:

a) FHWA will ensure adherence to dust and equipment emission control measures during construction, as it has throughout the project.

b) There have been no recent changes in zoning plans or development plans related to growth in the area, which remains zoned for conservation or extensive agriculture.

c) We acknowledge your concern regarding the use of native species. However our previous experience in this area has informed us that native plantings are not successful in establishing due to the proliferation of non-native species in the project area. The FHWA commits to using native species where possible, but will use the best options available for the conditions to ensure soil stability. The plan to allow revegetation with the local pasture grasses is consistent with the Record of Decision and Final EIS from 1999, which also evaluated the potential for utilizing native species.

d) Thank you for your commendation for community involvement. FHWA and HDOT will continue their extensive and frequent involvement with the community, who have helped shape the project and have contributed greatly to its success.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3647 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

34

GOODFELLOW BROS., INC. —GENERAL CONTRACTOR—

ABC-7046

December 22, 2009

Mr. Ken Tatsuguchi
Head Planning Engineer HDOT

Subject: Construction of the Saddle Road Mile Marker 41 to the Mamalahoa Highway

Dear Mr. Tatsugchi:

The following letter is to express my support for the construction of the new Saddle Road from mile marker 41 to the Mamalahoa Highway.

I am the Regional Manager for Goodfellow Bros., Inc and have been involved in the construction of the past three phases. I believe that the construction of the Saddle road needs to be completed to provide a safe passage from Hilo to Kona. Now that there is nearly 26 miles of reconstructed roadway the traffic has increased. The public is still faced with driving on substandard roadway when they get to mile marker 41down to the Mamalahoa Highway.

The completion of the roadway will help connect the two sides of the island safely. A majority of my current workforce commutes from Hilo to Kona every day. I have had several of my workers involved in car accidents traveling over the Saddle just to get to work.

I am in full support for the new Saddle Road and to provide a safe access for the public from Hilo to Kona.

Please call if you have any questions –(808) 887-6511

Sincerely,
GOODFELLOW BROS., INC

Edward Brown
Regional Manager

P.O. BOX 383729 ■ WAIKOLOA, HI 96738 ■ PHONE: (808) 887-6511 ■ FAX: (808) 887-6522 ■ WWW.GOODFELLOWBROS.COM

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Edward Brown
Regional Manager
Goodfellow Bros., Inc.
P.O. Box 383729
Waikoloa, HI 96738

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear ~~Mr. Brown~~ Ed:

We are in receipt of your letter dated 12/22/09 regarding the Saddle Road Improvement Project. Thank you for your letter of support for the project and your views on how the project will benefit commuters and workers such as those working for your company.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

35

1/00 PA Diaz

William P. Kenoi
Mayor

Darryl J. Oliveira
Fire Chief

Glen P. I. Honda
Deputy Fire Chief

County of Hawai'i

HAWAI'I FIRE DEPARTMENT

25 Aupuni Street • Suite 2501 • Hilo, Hawai'i 96720
(808) 932-2900 • Fax (808) 932-2928

RECEIVED
STATE DEPARTMENT
OF TRANSPORTATION
'10 JAN -4 P2:34
HIGHWAYS DIVISION
PLANNING BRANCH

December 17, 2009

Mr. Ken Tatsuguchi
State of Hawai'i, Department of Transportation
Highways Division, Planning Branch
869 Punchbowl Street, Room 301
Honolulu, Hawai'i

Dear Mr. Tatsuguchi,

SUBJECT: DRAFT SUPPLEMENT ENVIRONMENTAL IMPACT STATEMENT
SADDLE ROAD, MAMALAHOA HIGHWAY TO MILEPOST 41
ISLAND OF HAWAII

The Hawai'i Fire Department is pleased and encouraged by the consideration of wildfire prevention and mitigation measures identified within the draft Supplemental Environmental Assessment.

As the primary fire response agency for all non-Federal properties such measures will support our efforts in controlling or minimizing fire losses.

Thank you for the opportunity to comment. If additional comments or participation by a Hawai'i Department representative is desired, please feel free to contact my office at your convenience.

Sincerely,

DARRYL OLIVEIRA
Fire Chief

DO:lc

Hawai'i County is an Equal Opportunity Provider and Employer.

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Darryl J. Oliveira, Fire Chief
Hawai'i Fire Department
County of Hawai'i
25 Aupuni Street, Suite 2501
Hilo, HI 96720

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Chief Oliveira:

We are in receipt of your letter dated 12/17/09 regarding the Saddle Road Improvement Project. Thank you for your letter of support for the fire-fighting measures outlined in the Draft SEIS for the project.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

36

ECONOMIC DEVELOPMENT
ISLAND OF OAHU

SENT VIA EMAIL AND FACSIMILE

December 7, 2009

Mr. Ken Tatsuguchi
Hawaii Department of Transportation, Highway Division,
Planning Branch
869 Punchbowl Street, Room 301
Honolulu, HI 96813

REF: *Ala Mauna* - Supplemental Environmental Impact Statement – "Saddle Road"

Aloha Mr. Tatsuguchi!

This letter serves as supporting testimony for the improvements to *Ala Mauna* – the "Saddle Road" project and the supplemental environmental impact statement prepared to address the revised western alignment.

As a point of reference, Hawaii Island Economic Development Board (HIEDB) has been involved since 1994, when the original EIS process commenced and most recently as the Secretariat to the Saddle Road Task Force. In addition, HIEDB formed the *Ala Mauna Advisory Group* to engage, advise and recommend plans to improve and protect the known cultural and archaeological areas of significance. Some of the many stakeholders included; U.S. Department of Transportation -Federal Highway Administration Central Federal Lands Highway Division and the State of Hawaiʻi - Department of Transportation Highways Division and the Saddle Road Task Force. (Personally, I was formerly the Executive Director of HIEDB for nearly four years and have a comprehensive understanding of this important project).

Now, fifteen years since the initial EIS, the final phases are within sight, with the compilation of the SEIS for this most important East-West connector. The improvement to road safety is the greatest benefit to residents and commuters, users of Mauna Kea, contractors, military personnel and visitors alike. The realignments have opened up new view planes and pull outs for the benefits of all who travel, to enjoy the historical elements along Ala Mauna.

One can imagine that this new East-West or West–East connector road, will greatly improve some of the current workforce issues by introducing expeditious connections via public transportation, it is estimated that once completed this may save approximately thirty minutes of travel time each way between Hilo and Kona.

Thank you for allowing me to submit testimony in support of the SEIS and the continued improvements to *Ala Mauna*.

RECEIVED
STATE DEPARTMENT
OF TRANSPORTATION
'09 DEC -7 P4 50
HIGHWAYS DIVISION
PLANNING BRANCH

ʻO wau nō me ka haʻahaʻa,

Mark McGuffie
Managing Director

cc: Katherine P. Kealoha, Director, Office of Environmental Quality Control
Jacqui Hoover, Executive Director, HIEDB

ENTERPRISE
HONOLULU
735 Bishop Street, Suite 412, Honolulu, Hawaii 96813 • 808-521-3611
Fax: 808-536-2281 • www.enterprisehonolulu.com
THE BUSINESS CLIMATE OF PARADISE

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Mark McGuffie
Managing Director
Enterprise Honolulu
735 Bishop Street,Suite 412
Honolulu, HI 96813

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear ~~Mr. McGuffie~~ Mark:

Thank you for your letter of support for the project and your views, based on a long involvement with Saddle Road, on how the project will benefit the many users of Mauna Kea, including visitors, workers, and commuters, through safety and time-savings improvements as well as the amenities the highway will provide.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon, P.E.
Project Manager

— 37

William P. Kenoi
Mayor

Harry S. Kubojiri
Police Chief

Paul K. Ferreira
Deputy Police Chief

County of Hawai'i

POLICE DEPARTMENT
349 Kapi'olani Street • Hilo, Hawai'i 96720-3998
(808) 935-3311 • Fax (808) 961-2389

RECEIVED
STATE DEPARTMENT
OF TRANSPORTATION
'09 DEC 29 A9:13
HIGHWAYS DIVISION
PLANNING BRANCH

December 23, 2009

Mr. Ken Tatsuguchi
State of Hawaii, Department of Transportation
Highways Division, Planning Branch
869 Punchbowl Street, Room 301
Honolulu, HI 96813

Dear Mr. Tatsuguchi:

RE: Draft Supplemental Environmental Impact Statement
Saddle Road, Mamalahoa Highway to Milepost 41, Island of Hawai'i

Staff has reviewed the draft supplemental environmental impact statement for. Saddle Road, Mamalahoa Highway to Milepost 41, and noted the following concerns:

- Consideration be given to creating an intersection similar to the Waikoloa Junction as the Saddle Road abuts Mamalahoa Highway.
- Any rock outcroppings be demolished or moved to provide a distinct line of sight for traffic.
- Measures be implemented that assist in slowing traffic on the approach to this intersection on Mamalahoa Highway from either direction.

Thank you for the opportunity to comment. Should you have any questions, please contact Captain James Sanborn, the South Kohala District Commander, at 887-3080.

Sincerely,

HARRY S. KUBOJIRI
POLICE CHIEF

JOHN E. DAWRS
MAJOR
AREA II OPERATIONS

JS:dmv
RS0901040

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

John E. Dawrs
Major, Area II Operations
Police Department
County of Hawai'i
349 Kapi'olani Street
Hilo, HI 96720-2389

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Mr. Dawrs:

Thank you for the letter you provided on the SEIS. In response to your specific comments:

a) *Intersection with Mamalahoa*: The new Mamalahoa and existing Saddle Road intersections will be fully channelized in all directions will have standards that will be similar or exceed that of the Waikoloa Road intersection. The intersection of W-7 and Mamalahoa Highway will be an at-grade "T" intersection with a stop sign control on the W-7 approach only. It will use auxiliary speed change lanes, left-turn lanes with the appropriate storage lengths, medians, and paved shoulders. The Mamalahoa Highway will undergo significant widening to accommodate these elements. The use of traffic signals will be evaluated according to the AASHTO warrant standards during the design phase. A W-7 overpass will be considered in the Saddle Road Extension EIS. This information has been added to the Final EIS.

b) *Line of sight:* The design will include modification of the terrain to remove any rock outcrops that hinder line of sight for traffic.

c) *Slowing traffic:* All approaches to both intersections will include measures to alert drivers and help calm traffic. Both visual and audible measures will be evaluated during final design.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon, P.E.
Project Manager

38

December 10, 2009

To : Mr. Ken Tatsuguchi, Head Planning Engineer
State of Hawai'i, Department of Transportation
Highways Division, Planning Branch
869 Punchbowl Street, Room 301
Honolulu, Hawai'i 96813

From : Hartwell Aloha Kaeo, East Hawai'i Resident
222 Ho'ohua Street
Hilo, Hawai'i 96720-5229
Phone (808) 987-2259

Subject : Realignment of Saddle Road (State Route 200), from Mamalahoa Highway (State Route 190) to Milepost 41 of Saddle Road, County of Hawai'i, State of Hawai'i, which passes through the Ke'amuku parcel [TMK (3rd): 6-7-001:041] to be relocated to the southern boundary of this parcel. (preferred alignment W-7)

My name is Hartwell A. Kaeo and I am a resident of Hilo. I am in favor of your "completing this Saddle Road Project that connects Hilo to Kona by relocating the realignment of Saddle Road (State Route 200), from Mamalahoa Highway (State Route 190) to Milepost 41 of Saddle Road, County of Hawai'i, State of Hawai'i, to the southern boundary of the Ke'amuku parcel [TMK (3rd): 6-7-001:041], (preferred alignmentW-7).

I am in favor of relocating the realignment of Saddle Road (W-7) because:

a) it will expedite the final completion of this Saddle Road Project;
b) it "minimizes conflict between the traveling public and the PTA military training operations";
c) it now exits on the Kona side of Waikoloa Road, shortening the time and miles to get to Kona;
d) the improved roadways would be safer and the ride more enjoyable for commuters;
e) the savings in fuel and vehicle upkeep from the shorter trip and better roads will be realized in more frequent travels over Saddle Road for shopping, recreation and visiting friends and family;
f) the completed Saddle Road will add another "sightseeing must" for visiting off-island friends/ family.

I would like to thank the Saddle Road Task Force Committee for all of the hard work that they have contributed in moving this project forward.

Further, I would like to thank you for allowing me to enter my testimony via e-mail and have it become a part of the recorded proceedings of this project.

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Hartwell Aloha Kaeo
222 Ho'ohua Street
Hilo, HI 96720-5229

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Mr. Aloha Kaeo:

We are in receipt of your letter dated 12/10/09. Thank you for your letter of support for the project and your views on how the project will benefit the traveling public through minimizing conflicts between civilian and military traffic, making driving shorter, safer and more enjoyable, and making the Saddle a visitor attraction.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

39

January 7, 2010

Department of Transportation, Highways Division
Attn: Ken Tatsuguchi
869 Punchbowl Street, Room 301
Honolulu, HI 96813

Geometrician Associates
Attn: Ron Terry
PO Box 396
Hilo, HI 96721

Office of Environmental Quality Control
Attn: Leiopapa A Kamehameha
235 South Beretania Street, Suite 702
Honolulu, HI 96813

SUBJECT: Saddle Road (State Route 200), Mamalahoa Highway (HRS 343 FEA-EISPN)

Thank you for the opportunity to comment on the Draft Supplemental Environmental Impact statement for the relocation of Saddle Road. I believe that it is necessary to correct the record and to better address the needs of traveling pubic:

1) The shoulders can be used by some bicyclists; however, since almost half the route will exceed a 5-percent gradient, only the most experienced and conditioned cyclists can use it while traveling mauka.

2) Almost half the Big Island population does not or cannot rely on driving a motor vehicle as their primary mode of transportation. Accommodating all users is an essential function of transportation.

3) AASHTO indicates that grades greater than 5-percent are undesirable. Restricting the length of the maximum gradients will accommodate bicyclists within the the broad spectrum of skills and abilities.

4) The shoulders can be utilized by some pedestrians; however, especially considering the higher elevation, grades steeper than 5-percent are not desirable and don't conform to 28CFR Part 36 (ADA).

5) Fog was identified as a potential hazard through this corridor. This could be a problem for vehicles, but, is especially precarious for bicyclists that lack a positive separation from traveling vehicles.

6) Fire is not a threat from bicyclist, pedestrian, or equestrian use and should not be identified as an impediment to accommodating their needs in the design of transportation facilities such as this.

THEREFORE, the right-of-way must be sufficient to accommodate a "switchback" (5-percent maximum) Shared-Use Path on the Kona side. The project must include the design of a 10-foot Shared-Use Path that meets the minimum AASHTO requirements.

Sufficient right-of-way must be included on the Kohala side of the corridor that can eventually accommodate an off-road motorized route to access recreation and hunting facilities. However no design is currently required and only a fence may be required along the right-of-way boundary.

Clearing, grading, and aggregate sub-grade construction of the Shared-Use Path (S-UP) should be included in the base construction bid. An option for paving the S-UP should be included in the bid documents, so paving can be completed if construction funds are sufficient.

It should be noted that widening the transportation corridor by providing a paved Shared-Use Path that could also be accessed by emergency equipment, could reduce the need for paved firebreaks adjacent to the shoulder and could provide better fire control at a lower cost.

Relocating the point of access to Mamalahoa Highway (Route 190) will require some additional access considerations especially for non-motorized users such as bicyclists of all skill levels and pedestrians of all abilities:

7) The intersection with Mamalahoa Highway should be designed with designated bicycle allocation (bike lane markings and signage) for Kohala bound bicyclists including the adjacent auxiliary lanes.

8) Shoulders along Mamalahoa Highway in the vicinity of the proposed intersection are narrow, and consequently should be widened to 8-foot from the intersection to the previously widened area.

9) The Old Kailua-Waimea Road is a valuable historic and transportation resource. It should be restored as a Shared-Use Path as a Priority II project as designated in Bike Plan Hawai`i.

10) The remainder parcel located at the intersection of Mamalahoa Highway should also be acquired, for future development of transit stop, carpool, scenic overlook, recreational parking, and rest area.

Thank you for considering these issues and concerns to better accommodate all modes of travel.

Sincerely,

Robert Ward
77-6526 Ho`olaupa`i Street
Kailua Kona, HI 96740

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Robert Ward
77-6526 Ho'olaupa'i Street
Kailua-Kona, HI 96740

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Mr. Ward:

Thank you for the letter you provided on the SEIS. In response to your specific comments:

1-5) *Use of Saddle Road for all cyclists*. Bicycling on Saddle Road involves mountainous terrain, challenging weather (in some places very hot and dry, in others cold and foggy or rainy), and no services for over 50 miles. The distances between urban areas serviced by Saddle Road are generally not suitable for most recreational bicyclists, and the highway is unlikely to generate much bicycle usage. Most would consider this route appropriate only for experienced and conditioned cyclists, who will find the improvements make for a safer highway. The proposed grades are achievable for serious bicyclists and perhaps even desirable for a challenging ride as well as training. For recreational bicyclists, Mauna Kea State Park is an ideal destination to drive to; from there, bicyclists can ride Saddle Road for miles in either direction without encountering excessively steep or prolonged grades or severe weather. AASHTO guidelines for rural arterials in mountainous terrain are not intended for bicycles; the longer road and greater required right-of-way would add significant cost to construction and would likely reduce the operational efficiency of the new road.

6) *Fire threats from cyclists*. FHWA and HDOT do not consider pedestrians and bicyclists significant sources of ignition concern, but they too may start fires through cigarettes, arson, etc.

7-8) *Mamalahoa intersection*. The Mamalahoa Highway intersection will accommodate bicycles through a signed, shared route with appropriate markings and safety features.

9) *Old Waimea-Kona Road*. The Old Waimea-Kona Road in Ke'āmuku, although slated mostly for preservation, is entirely within an area owed by the U.S. Army that will be used for military training and would not be an appropriate location for pedestrian and bicycle use. Furthermore, it would require considerable modification along most of its 39-mile route to be effective for use as a bike route, which would substantially alter its historic character. Please note that this suggestion is outside the scope of the project and EIS.

10) *Transit stop.* A formal ride-share parking area can be considered during the final design stage. The potential demand for such a facility will need to be taken into consideration in coordination with the Hawai'i County Mass Transit Agency as well as the safety of ingress and egress and the cost of land acquisition. HDOT as probable land owner would have to be agreeable to allowing a parking area to be constructed within their right of way, as well as agree to maintain it. This information has been added to the Final EIS.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

40

United States Department of the Interior

U.S. GEOLOGICAL SURVEY
Pacific Islands Water Science Center
677 Ala Moana Blvd., Suite 415
Honolulu, HI 96813
Phone: (808) 587-2400/Fax: (808) 587-2401

TAKE PRIDE IN AMERICA

January 6, 2010

RECEIVED
STATE DEPARTMENT
OF TRANSPORTATION
'10 JAN -8 P4:40
HIGHWAYS DIVISION
PLANNING BRANCH

Mr. Ken Tatsuguchi
State of Hawaii
Department of Transportation
Highways Division, Planning Branch
869 Punchbowl Street, Room 301
Honolulu, Hawaii 96813

Dear Mr. Tatsuguchi:

Subject: Saddle Road, Mamalahoa Highway to Milepost 41, Island of Hawaii, Draft Supplemental Environmental Impact Statement (DSEIS)

Thank you for forwarding the subject DSEIS for review and comment by the staff of the U.S. Geological Survey Pacific Islands Water Science Center, we regret however, that due to prior commitments and lack of available staff, we are unable to review the report.

We appreciate the opportunity to participate in the review process.

Sincerely,

Stephen S. Anthony
Acting Center Director

cc: Ms. Katherine P. Kealoha, Director
Office of Environmental Quality Control
235 South Beretania St., Suite 702
Honolulu, Hawaii 96813

U.S. Department
of Transportation
**Federal Highway
Administration**

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Stephen S. Anthony
Acting Center Director
Pacific Island Water Science Center
U.S. Geological Survey
U.S. Department of the Interior
677 Ala Moana Blvd., Suite 415
Honolulu, HI 96813

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Mr. Anthony:

We are in receipt of your letter dated 1/6/10. Thank you for your response on the Draft SEIS.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

41

PATH ~ PEOPLES ADVOCACY FOR TRAILS HAWAI`I

Share the road with aloha!

PO BOX 62 ◆ KAILUA-KONA, HAWAI`I 96745 ◆ 808-936-4653◆ sharetheroad@pathhawaii.org

January 7, 2010

To: Department of Transportation, Highways Division. Attn: Ken Tatsuguchi, P.E.
869 Punchbowl Street, Room 301 Honolulu, HI 96813

Geometrician Associates. Attn: Ron Terry, Principal
PO Box 396 Hilo, HI 96721

Office of Environmental Quality Control, Attn: Katherine Puana Kealoha, Esq. Director
235 South Beretania Street, Suite 702 Honolulu, HI 96813

SUBJECT: Saddle Road (State Route 200), Mamalahoa Highway (HRS 343 FEA-EISPN)

We applaud the efforts by FHWA's Central Federal Lands Division, State of Hawaii Department of Transportation, County of Hawaii and citizen leaders for working to complete the Supplemental EIS for the relocation of Saddle Road, State Route 200.

This road provides a critical connector for local families, businesses and visitors to our island. As such, it's important to clarify and correct the SEIS document so that the project best meets the needs for all public roadway users, including motorists, pedestrians and bicyclists. We ask that the following recommendations based on the existing topography, safety concerns, weather patterns, surrounding land uses and using appropriate design guidelines provided by AASHTO, be included in the design and construction of the project.

- CREATE A WORLD-CLASS SCENIC CORRIDOR - The SEIS references the outstanding vistas and scenic byways this new road offers. One of the safest and best ways to enjoy these vistas is by a bicycle where one can go at a slower, more contemplative pace. States such as Colorado and Wyoming have successfully built outstanding Shared-Use Pathways (SUP) of considerable length through sparsely populated, scenic areas for resident and visitor enjoyment. Bicycle tourists, Olympic athletes in training and families use these facilities on a regular basis and they are a source of pride and critical revenues for these state budgets. Saddle Road has the opportunity to become this same kind of world-class recreational and bicycle transportation facility that attracts visitors from around the world. This facility should be a minimum 5% switch back design with 10' clear width according to AASHTO guidelines. The facility can be phased in over time but it is critical to consider this facility now and set aside the Right-Of-Way in the SEIS stage. To do this, a 25-30' minimum corridor should be set aside. The base construction bid should include incremental bids for grading, grubbing and applying a base-course of compact aggregate as funding permits. An option for paving the SUP should be included in the bid documents, so paving can be completed if construction funds are sufficient. In addition, the SEIS references the steep topography (48% of the road is over 5% grade) and tendency for fog, rain and wind in this area, making use of the shoulder by bicyclists very dangerous. Climbing cyclists typically need more room to maneuver and fog and rain can make visibility difficult. These factors make it critical to provide a separated SUP facility for cyclists so that the road is available 24-7 for all roadway users.

- MAMALAHOA HIGHWAY SAFETY IMPROVEMENTS - The new Saddle road will serve commuters from the East side going to the Kohala Coast resorts, causing increased traffic on Mamalahoa Highway from the new Saddle Road intersection northbound to the Waikoloa Road. It's important to maintain a safe path of travel along this section of Mamalahoa Highway by providing bicycle accommodation at the intersection (bike lanes, signage) as well as minimum six-foot (eight-foot preferred) shoulders from the intersection to Waimea. This shoulder facility will serve to provide bicyclists with safe travel as well as emergency pull off for motorists.

- HISTORIC MAMALAHOA ROAD - The historic Mamalahoa Highway is identified in Bike Plan Hawaii as a Priority II project, Shared-Use Pathway. The roadway corridor should be protected at all costs and preserved as a trail or pathway for public use.

- FIRE HAZARD MITIGATION - Fire is identified as a significant threat for this corridor but this threat comes primarily from motor vehicles. Therefore, fire should not be identified as an impediment to accommodating the needs of bicyclists, pedestrians or equestrians when designing transportation facilities. These roadway users are actually pose the least fire risk when compared with that of a motor vehicle. It should be noted that widening the transportation corridor by providing a paved Shared-Use Path, that could also be accessed by emergency equipment, could **reduce** the need for paved firebreaks adjacent to the shoulder and could **provide better fire control** at a lower cost.

Thank you for the opportunity to comment.

Laura Dierenfield

Executive Director

PATH Peoples Advocacy for Trails Hawaii

808-936-4653

sharetheroad@pathhawaii.org

www.pathhawaii.org

CC: The Office of Senator Daniel K. Inouye, Attn: Van Luong, Esq.

Jiro A. Sumada, Deputy Director, State Highways

Dave Gedeon, Central Federal Lands

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Laura Dierenfield
Executive Director
Peoples Advocacy for Trails Hawai'i (PATH)
P.O. Box 62
Kailua-Kona, HI 96745

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Ms. Dierenfield:

Thank you for your letter of support for the project, and your comments at the 12/10/09 public meeting. In response to your specific comments:

Highway 190 intersection
The intersection of W-7 and Mamalahoa Highway will be an at-grade "T" intersection with a stop sign control on the W-7 approach only. It will use auxiliary speed change lanes, left-turn lanes with the appropriate storage lengths, medians, and paved shoulders. The Mamalahoa Highway will undergo significant widening to accommodate these elements. The use of traffic signals will be evaluated according to the AASHTO warrant standards during the design phase. A W-7 overpass will be considered in the Saddle Road Extension EIS. This information has been added to the Final EIS.

As far as bicycling at this intersection, the Mamalahoa Highway intersection will accommodate bicycles through a signed, shared route with appropriate markings and safety features.

Ride-share area
A formal ride-share parking area can be considered during the final design stage. The potential demand for such a facility will need to be taken into consideration in coordination with the Hawai'i County Mass Transit Agency as well as the safety of ingress and egress and the cost of land acquisition. HDOT as probable land owner would have to be agreeable to allowing a parking area to be constructed within their right of way, as well as agree to maintain it. This information has been added to the Final EIS.

Shared-use pathways
Bicycling on Saddle Road involves mountainous terrain, challenging weather (in places very hot and dry, in others cold and foggy or rainy), and no services for over 50 miles. The distances between urban areas serviced by Saddle Road are generally not suitable for most recreational bicyclists, and the highway is unlikely to generate much bicycle usage. Most would consider this route appropriate only for experienced and conditioned cyclists, who will find the improvements make for a safer highway. The proposed grades are achievable for serious bicyclists and perhaps even desirable for a challenging ride as well as training. For recreational bicyclists, Mauna Kea State Park is an ideal destination to drive to; from there, bicyclists can ride Saddle Road for miles in either direction without encountering excessively steep or prolonged grades or severe weather. AASHTO guidelines for rural arterials in mountainous terrain are not intended for bicycles; the longer road and greater required right-of-way would add significant cost to construction and would likely reduce the operational efficiency of the new road.

Old Waimea-Kona Road
The Old Waimea-Kona Road in Ke'āmuku, although slated mostly for preservation, is entirely within an area owed by the U.S. Army that will be used for military training and would not be an appropriate location for pedestrian and bicycle use. Furthermore, it would require considerable modification along most of its 39-mile route to be effective for use as a bike route, which would substantially alter its historic character. Please note that this suggestion is outside the scope of the EIS.

Fire hazard
FHWA and HDOT do not consider pedestrians and bicyclists significant sources of ignition concern, but they too may start fires through cigarettes, arson, etc.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

42

Japanese Chamber of Commerce & Industry of Hawaii

RECEIVED
STATE DEPARTMENT
OF TRANSPORTATION

'10 JAN -8 P4:41

HIGHWAYS DIVISION
PLANNING BRANCH

January 6, 2010

Mr. Ken Tatsuguchi
STATE OF HAWAII, DEPARTMENT OF TRANSPORTATION
Highways Division, Planning Branch
869 Punchbowl Street, Room 301
Honolulu, Hawaii 96813

Dear Mr. Tatsuguchi:

RE: Comments to: The Draft SEIS of the Saddle Road Realignment Project

The Japanese Chamber of Commerce and Industry of Hawaii ("JCCIH") is an organization representing the interests of businesses operating in East Hawaii. The JCCIH presently represents over 200 member companies who employ thousands of East Hawaii residents. On behalf of the Japanese Chamber of Commerce and Industry of Hawaii, I wish to respectfully express our comments to the Draft Supplemental Environmental Impact Statement on the Saddle Road Realignment Project covering the proposed W-7 alignment.

Following reviews and discussions of the subject Draft SEIS, we have found that there should not be significant increased adverse impacts on the environment from the proposed W-7 alignment over the previously planned W-3 alignment. Additionally, we continue to support the overall Saddle Road Improvement Project. It is expected to provide a safe and efficient cross-island route between East and West Hawaii. In turn, this improvement in access will help to unify Hawaii Island's communities to foster social and economic development for our island.

Sincerely,

JAPANESE CHAMBER OF COMMERCE AND INDUSTRY OF HAWAII

Eugene H. Nishimura
Chair, Government Affairs Committee

714 Kanoelehua Avenue • Hilo, Hawaii 96720-4565
P.O. Box 7436 • Hilo, Hawaii 96720-8981
Phone: (808) 934-0177 • Fax: (808) 934-0178 • E-mail: jccih@jccih.org

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Eugene H. Nishimura
Chair, Government Affairs Committee
Japanese Chamber of Commerce and Industry of Hawai'i
714 Kanoelehua Avenue
Hilo, HI 96720-4565

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Mr. Nishimura:

We are in receipt of your letter dated 01/06/10 regarding the Saddle Road Improvement Project. Thank you for your letter of support for the project and your views on how it will benefit provide a safe and efficient route and will help unify the island's communities.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

43

RECEIVED
STATE DEPARTM
OF TRANSPORTA

'10 JAN -8 P4 :40

HIGHWAYS DIVIS
PLANNING BRAN

Stephanie Nagata
P.O. Box 1172
Volcano, HI 96785

January 6, 2010

Mr. Ken Tatsuguchi
State of Hawaii, Department of Transportation
Highways Division, Planning Branch
869 Punchbowl Street, Room 301
Honolulu, HI 96813

Subject: Supplemental Environmental Impact Statement for the Saddle Road (State Route 200), Mamalahoa Highway (State Route 190) to Milepost 41

Dear Mr. Tatsuguchi:

Thank you for the opportunity to comment on the Supplemental Environmental Impact Statement (SEIS) for the Saddle Road, Mamalahoa Highway to Milepost 41, hereinafter referred to as SEIS.

I find this SESI contains a thorough review and analysis of the affected environment, including existing land uses, resources, including natural and cultural, as well a review of air, water and noise quality. The mitigation measures are well thought, reasonable, and addresses impacts, potential and real, of this project. It appears that the SEIS also evaluated and complied with existing state and county land use policies, statutes and regulations, as well as relevant federal statutes.

Improvements to the Saddle Road, whether it is the W-3 or the subject alignment will, as noted in the discussion on social and economic factors, provide a much needed improved thoroughfare for the island and for keeping abreast with changing societal needs. An added benefit of the Mamalahoa-Milepost 41 alignment is that it is a safer route and will avoid traversing through the middle of PTA's lands which poses a health and safety concern during military training exercises.

I would like to state my support of the FEIS, its findings and mitigation measures.

Respectfully submitted,

Stephanie Nagata

Stephanie Nagata

c: Office of Environmental Quality Control

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Stephanie Nagata
P.O. Box 1172
Volcano, HI 96785

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Ms. Nagata:

We are in receipt of your letter dated 01/06/10 regarding the Saddle Road Improvement Project. Thank you for your letter of support for the project and for the adequacy of the SEIS, and for your views on how it will provide a safe route that will separate military from civilian traffic.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

44a

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

January 6, 2010

David Gedeon, P.E., Project Manager
US Department of Transportation, FHA
Central Federal Lands Highway Division
12300 West Dakota Avenue
Lakewood, Colorado 80228

LOG NO: 2009.4195
DOC NO: 1001MD05
Archaeology

Dear Mr. Gedeon:

SUBJECT: National Historic Preservation Act (NHPA) Section 106 Review –
West Saddle Road Highway Improvement Project
Ke`amuku & Waikoloa Ahupua`a, South Kohala District, Island of Hawaii
TMK: (3) 6-7-001:009

Thank you for the opportunity to comment on the aforementioned undertaking, which we received on December 4, 2009. We have reviewed and accepted the archaeological inventory survey (AIS) for this undertaking (*Escott and Keris 2009*). No further work is required and the report has been accepted as final (*Log No. 2010.0025, Doc No. 1001MD04*).

We do have one issue to raise. In your letter to us you cited the proposed mitigation to site 20855 (the Waimea-Kona Belt Road) which was determined to be eligible under criterion "d" during the assessment of the W-3 alternative; you also note that the W-3 would present an adverse affect to site 20855 and mitigation would include a pullout and sign along the new road. However, the AIS was prepared for alternative W-7, which according to the report would bypass site 20855 and not have an adverse or other affect; in this case, should you choose W-7 then no adverse affect will be caused by this undertaking. We understand that the proposed mitigation to 20855 was part of an MOA between FHWA and the Office of Hawaiian Affairs; we are not suggesting a change to agreed-upon commitments but are simply raising the issue that it appears choosing alternative W-7 would avoid the adverse impact. Please contact Morgan Davis at (808) 896-0514 or morgan.c.davis@hawaii.gov if you have any questions or concerns regarding this letter.

Aloha,

Nancy A. McMahon

Nancy McMahon, Deputy SHPO/State Archaeologist
and Historic Preservation Manager
State Historic Preservation Division

Cc: Office of Hawaiian Affairs, 711 Kapiolani Blvd., Honolulu Hawaii 96813-5278

44b

LINDA LINGLE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

January 19, 2010

David Gedeon, P.E., Project Manager
US Department of Transportation, FHA
Central Federal Lands Highway Division
12300 West Dakota Avenue
Lakewood, Colorado 80228

LOG NO: 2009.4195
DOC NO: 1001MD19
Archaeology

Dear Mr. Gedeon:

SUBJECT: National Historic Preservation Act (NHPA) Section 106 Review – REVISED West Saddle Road Highway Improvement Project Ke`amuku & Waikoloa Ahupua`a, South Kohala District, Island of Hawaii TMK: (3) 6-7-001:009

This letter is a correction to our earlier comments (Doc No. 1001MD05). We previously reviewed and accepted the archaeological inventory survey (AIS) for this undertaking (*Escott and Keris 2009*). No further work is required and the report has been accepted as final (*Log No. 2010.0025, Doc No. 1001MD04*).

One site, SIHP 20855 (the Waimea-Kona Belt Road) was previously determined to be eligible under criterion "d" during the assessment of the W-3 alternative; the W-3 would present an adverse affect to site 20855 and mitigation would include a pullout and sign along the new road. We concur that the new proposed alternative W-7 will have the same adverse affect to this historic property as the previously reviewed W-3 alternative. We concur that this **adverse affect will be mitigated** as detailed in the MOA.

Please contact Morgan Davis at (808) 896-0514 or morgan.c.davis@hawaii.gov if you have any questions or concerns regarding this letter.

Aloha,

Nancy A. McMahon

Nancy McMahon, Deputy SHPO/State Archaeologist
and Historic Preservation Manager
State Historic Preservation Division

Cc: Office of Hawaiian Affairs, 711 Kapiolani Blvd., Honolulu Hawaii 96813-5278

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Nancy McMahon
Deputy SHPO/State Archaeologist and Historic Preservation Manager
State Historic Preservation Div.
Department of Land and Natural Resources
P.O. Box 621
Honolulu, HI 96809

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Ms McMahon:

Thank you for the letters you provided dated 01/06/10 and 1/19/10 on the SEIS. Thank you for your review of the Archaeological Inventory Survey and the Draft SEIS. The documents you requested will be made available to the Kapolei Library.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon, P.E.
Project Manager

45

South Kohala Traffic Safety Committee
P.O. Box 383375
Waikoloa, HI 96738

January 2, 2009

Mr. Ken Tatsuguchi
State of Hawaii Department of Transportation
Highways Division, Planning Branch
869 Punchbowl Street, Room 301
Honolulu, HI 96813

RE: Saddle Road, Mamalahoa to Milepost 41 to Queen Ka'ahumanu Highway Project HI200(00) Draft SEIS Comments

Dear Mr. Tatsuguchi;

At the January 8, 2008 Meeting of South Kohala Traffic Safety Committee safety and other concerns related to the Saddle Road MP 41 to Mamalahoa MP 14 were discussed by the membership. A major concern is that this new road will be a heavily used connector between East and West Hawai`i. As the Island population grows, future traffic on this road will increase substantially. Many of these past comments made by the membership for review and consideration appear to be incorporated in the Draft SEIS.

The Committee supports this project as an improved major connector between East and West Hawai`i designed to provide a safe route to users. The following items are requested as additions to the final design and SEIS document;

1. We want to emphasize the need for design of an interchange for connecting the existing Saddle Road to the new proposed Saddle Road alignment. The existing Saddle Road alignment will become the connecting spur to the proposed State Kawaihae Bypass Project via Mamalahoa Highway (190).

2. Design of a Park & Ride/Ride Share parking area needs to be incorporated in the design. This parking area should be located at the intersection of Saddle Road and Mamalahoa Highway near MP 14. The parking area needs to be designed for access by County buses (HELON) and a future bus shelter.

3. Funding and construction of the alignment from Mamalahoa Highway (190) to Queen Ka'ahumanu Highway (19) under the Department of Defense funding program. Originally the SEIS included this segment. Military convoy traffic use of the current County Waikoloa Road accelerates surface deterioration historically due to heavy loads. Lack of

State funding is going to delay this segment of the East West connector otherwise. Use of the out dated current Mamalahoa Highway to connect from MP 14 to the Kona Area will increase congestion and accident risk as cross island traffic increases. The same safety concerns exist for the County Waikoloa Road to Highway 19.

We appreciate the opportunity to comment on this long awaited project and hope you will keep South Kohala Traffic Safety Committee informed as the project progresses. Again, the Committee strongly supports this project. Hopefully the end result will be a well designed, safe roadway that serves present and future needs. We also appreciate the 15 years of continued dedicated effort of the Saddle Road Task Force. Mahalo for your consideration of these comments.

Sincerely,

Mike Price

Mike Price-Chair South Kohala Traffic Safety Committee

CC: State Representative Cindy Evans
William Kenoi-Hawaii County Mayor
Pete Hoffmann-Hawaii County District 9 Councilman
Stanley Tamura-District Engineer DOT Highways Division
Warren Lee-Director County Department of Public Works

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Mike Price, Chair
South Kohala Traffic Safety Committee
P.O. Box 383375
Waikoloa, HI 96738

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Mr. Price:

Thank you for your letter of support for the project. In response to your specific comments:
a) The intersection of W-7 and Mamalahoa Highway will be an at-grade "T" intersection with a stop sign control on the W-7 approach only. It will use auxiliary speed change lanes, left-turn lanes with the appropriate storage lengths, medians, and paved shoulders. The Mamalahoa Highway will undergo significant widening to accommodate these elements. The use of traffic signals will be evaluated according to the AASHTO warrant standards during the design phase. A W-7 overpass will be considered in the Saddle Road Extension EIS. This information has been added to the Final EIS.

b) A formal ride-share parking area can be considered during the final design stage. The potential demand for such a facility will need to be taken into consideration in coordination with the Hawai'i County Mass Transit Agency as well as the safety of ingress and egress and the cost of land acquisition. HDOT as probable land owner would have to be agreeable to allowing a parking area to be constructed within their right of way, as well as agree to maintain it. This information has been added to the Final EIS.

c) HDOT is currently planning the Saddle Road Extension, a new highway to link Mamalahoa Highway and to Queen Ka'ahumanu Highway, which could accommodate military and commercial traffic among other vehicles. We encourage your organization to stay involved in this planning.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon, P.E.
Project Manager

46

DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

LINDA LINGLE
GOVERNOR
THEODORE E. LIU
DIRECTOR
MARK K. ANDERSON
DEPUTY DIRECTOR

STRATEGIC INDUSTRIES DIVISION
235 South Beretania Street, Leiopapa A Kamehameha Bldg., 5th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

Telephone: (808) 587-3807
Fax: (808) 586-2536
Web site: www.hawaii.gov/dbedt

RECEIVED
STATE DEPARTMENT OF TRANSPORTATION
'09 DEC 10 A7:53
HIGHWAYS DIVISION
PLANNING BRANCH

November 30, 2009

Mr. Ken Tatsuguchi
State of Hawaii, Department of Transportation
Highways Division, Planning Branch
869 Punchbowl Street, Room 301
Honolulu, HI 96813

Dear Mr. Tatsuguchi:

Subject: Saddle Road, Mamalahoa Highway to Milepost 41, Island of Hawaii, Draft Supplemental Environmental Impact Statement

In response to your recent notice, thank you for the opportunity to provide comments on the Saddle Road, Mamalahoa Highway to Milepost 41, Island of Hawaii, Draft Supplemental Environmental Impact Statement. We have no comments on this project relating to energy efficiency and renewable energy. In regard to resource efficiency, we recommend using recycled concrete aggregate as fill material and recycled asphalt pavement for surfacing.

For additional information or clarification, please contact Carilyn O. Shon at telephone number 808-587-3810.

Sincerely,

Theodore A. Peck
Administrator

c: OEQC
J.Strickler, SID
E. Raman, SID

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Theodore A. Peck, Administrator
Strategic Industries Division
Department of Business, Economic Development & Tourism
State of Hawai'i
235 S. Beretania Street
Leiopapa A Kamehameha Building, 5th Floor
Honolulu, HI 96804

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Mr. Peck:

We are in receipt of your letter dated 11/30/09 regarding the Saddle Road Improvement Project. Thank you for your review of the Draft SEIS.

Regarding your question about recycled materials, FHWA/CFLHD's standard specifications allow for the use of recycled materials. Such materials are normally generated on site with the removal of existing pavements. As the W-7 alignment will result in the removal of only a small amount of existing roadway, it is unlikely that there will be much existing asphalt or concrete pavement materials generated as a result of the W-7 construction.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

47

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RECEIVED
STATE DEPARTMENT
OF TRANSPORTATION

'10 JAN -8 A10:29

HIGHWAYS DIVISION
PLANNING BRANCH

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

January 4, 2010

Department of Transportation
Highways Division, Planning Branch
869 Punchbowl Street Room 301
Honolulu, Hawaii 96813

Attention: Mr. Ken Tatsuguchi

Ladies and Gentlemen:

Subject: Draft Supplemental Environmental Impact Statement for Saddle Road, Mamalahoa Highway to Milepost 41

Thank you for the opportunity to review and comment on the subject matter. The Department of Land and Natural Resources' (DLNR), Land Division distributed or made available a copy of your report pertaining to the subject matter to DLNR Divisions for their review and comment.

Other than the comments from Division of Aquatic Resources, Engineering Division, Division of State Parks, Commission on Water Resource Management, Land Division-Hawaii District, the Department of Land and Natural Resources has no other comments to offer on the subject matter. Should you have any questions, please feel free to call our office at 587-0433. Thank you.

Sincerely,

Charlene E. Unoki

for Morris M. Atta
Administrator

Cc: OEQC

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

November 23, 2009

RECEIVED
LAND DIVISION
2010 JAN -4 A 7:46
DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

'09 NOV 25 AM 10:26 ENGINEERING

MEMORANDUM

TO: **DLNR Agencies:**

x Div. of Aquatic Resources
~~Div. of Boating & Ocean~~ Recreation
x Engineering Division
x ~~Div. of Forestry~~ & Wildlife
x Div. of State Parks
x Commission on Water Resource Management
x Office of Conservation & Coastal Lands
x Land Division –Hawaii District
x Historic Preservation

FROM: Morris M. Atta
SUBJECT: Draft Supplemental Environmental Impact Statement for Saddle Road, Mamalahoa Highway to Milepost 41
LOCATION: Island of Hawaii
APPLICANT: Department of Transportation, Highways Division

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by January 4, 2010.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact my office at 587-0433. Thank you.

Attachments

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed:
Date: 12-29-09

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LM/MorrisAtta
REF.: DSEIS for Saddle Road, Mamalahoa Highway to Milepost 41
Hawaii.006

COMMENTS

(X) **We confirm that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Zone X. The Flood Insurance Program does not have any regulations for developments within Zone X.**

( ) Please take note that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Zone.

( ) Please note that the correct Flood Zone Designation for the project site according to the Flood Insurance Rate Map (FIRM) is ___.

( ) Please note that the project must comply with the rules and regulations of the National Flood Insurance Program (NFIP) presented in Title 44 of the Code of Federal Regulations (44CFR), whenever development within a Special Flood Hazard Area is undertaken. If there are any questions, please contact the State NFIP Coordinator, Ms. Carol Tyau-Beam, of the Department of Land and Natural Resources, Engineering Division at (808) 587-0267.

Please be advised that 44CFR indicates the minimum standards set forth by the NFIP. Your Community's local flood ordinance may prove to be more restrictive and thus take precedence over the minimum NFIP standards. If there are questions regarding the local flood ordinances, please contact the applicable County NFIP Coordinators below:

( ) Mr. Robert Sumitomo at (808) 768-8097 or Mr. Mario Siu Li at (808) 768-8098 of the City and County of Honolulu, Department of Planning and Permitting.
( ) Mr. Frank DeMarco at (808) 961-8042 of the County of Hawaii, Department of Public Works.
( ) Mr. Francis Cerizo at (808) 270-7771 of the County of Maui, Department of Planning.
( ) Mr. Mario Antonio at (808) 241-6620 of the County of Kauai, Department of Public Works.

( ) The applicant should include water demands and infrastructure required to meet project needs. Please note that projects within State lands requiring water service from the Department of Water Supply system will be required to pay a resource development charge, in addition to Water Facilities Charges for transmission and daily storage.

( ) The applicant should provide the water demands and calculations to the Engineering Division so it can be included in the State Water Projects Plan Update.

( ) Additional Comments: ______________________

( ) Other: ______________________

Should you have any questions, please call Mr. Dennis Imada of the Planning Branch at 587-0257.

Signed: ______________________
CARTY CHANG, ACTING CHIEF ENGINEER

Date: 12-29-09

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

AQUATIC RESOURCES: 2725

DIRECTOR	
COMM. FISH	
AQ RES ENV	
AQ REC	
PLANNER	
STAFF SVCS	
RCUH/UH	
STATISTICS	
AFRC/FED AID	
EDUCATION	
SECRETARY	
OFFICE SVCS	
TECH ASST	X
Return to:	
No. Copies	
Copies to:	
Due Date:	

RN

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

November 23, 2009

MEMORANDUM

RECEIVED NOV 30 2009 AQUATIC RESOURCES

TO: ~~**DLNR Agencies:**~~
x Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
x Engineering Division
x Div. of Forestry & Wildlife
x Div. of State Parks
x Commission on Water Resource Management
x Office of Conservation & Coastal Lands
x Land Division –Hawaii District
x Historic Preservation

FROM: Morris M. Atta Charlene
SUBJECT: Draft Supplemental Environmental Impact Statement for Saddle Road, Mamalahoa Highway to Milepost 41
LOCATION: Island of Hawaii
APPLICANT: Department of Transportation, Highways Division

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by January 4, 2010.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact my office at 587-0433. Thank you.

Attachments

(✓) We have no objections.
( ) We have no comments.
( ) Comments are attached.

Signed: [signature]
Date: 02 Dec 2009

DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII
2009 DEC -4 A 10:18
RECEIVED LAND DIVISION

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

November 23, 2009

RECEIVED
LAND DIVISION
2009 NOV 31 P 1:32
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

MEMORANDUM

~~TO:~~ **DLNR Agencies:**
x Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
x Engineering Division
~~x~~ Div. of Forestry & Wildlife
x Div. of State Parks
x Commission on Water Resource Management
x Office of Conservation & Coastal Lands
x Land Division –Hawaii District
x Historic Preservation

FR:

to:

~~FROM~~: Morris M. Atta Darlene
SUBJECT: Draft Supplemental Environmental Impact Statement for Saddle Road, Mamalahoa Highway to Milepost 41
LOCATION: Island of Hawaii
APPLICANT: Department of Transportation, Highways Division

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by January 4, 2010.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact my office at 587-0433. Thank you.

Attachments

( ) We have no objections.
(✓) We have no comments.
( ) Comments are attached.

Signed: Edwin T. Sakoda
Date: 12/1/09

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
SERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
HOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

DIVISION OF STATE PARKS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

December 2, 2009

MEMORANDUM

To: Morris Atta, Administrator
Land Division

From: Daniel S. Quinn, Administrator

Subject: Draft Supplemental EIS for the Saddle Road Improvements from Mamalahoa Highway to Milepost 41, Mauna Kea, Hawai'i

Thank you for the opportunity to review the draft supplemental EIS for the Saddle Road Improvements from Mamalahoa Highway to Milepost 41. As the project is implemented, work will occur within the vicinity of Mauna Kea State Recreation Area which may impact the visitors to the park. We would appreciate being notified in advance of such work and ask that Dean Takebayashi, Hawai'i Island Parks District Superintendent be contacted at 974-6206.

RECEIVED
LAND DIVISION
2009 DEC -3 P 12:54
DEPT. OF LAND &
NATURAL RESOURCES
STATE OF HAWAII

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

2009 NOV 30 A 11:04

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

November 23, 2009

MEMORANDUM

RECEIVED
LAND DIVISION
2009 DEC -7 A 9:33
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

TO: **DLNR Agencies:**
x Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
x Engineering Division
x Div. of Forestry & Wildlife
x Div. of State Parks
x Commission on Water Resource Management
x Office of Conservation & Coastal Lands
x Land Division –Hawaii District
~~x Historic~~ Preservation

FROM: for Morris M. Atta Charlene
SUBJECT: Draft Supplemental Environmental Impact Statement for Saddle Road, Mamalahoa Highway to Milepost 41
LOCATION: Island of Hawaii
APPLICANT: Department of Transportation, Highways Division

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by January 4, 2010.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact my office at 587-0433. Thank you.

Attachments

( ) We have no objections.
( ) We have no comments.
(X) Comments are attached.

Signed: [signature]
Date: 12.4.09

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

75 Aupuni Street, Room 204
Hilo, Hawaii 96720
PHONE: (808) 974-6203
FAX: (808) 974-6222

December 4, 2009

MEMORANDUM

TO: Morris M. Atta, Administrator

FROM: Kevin E. Moore, Hawaii District Land Agent

SUBJECT: Supplemental Environmental Impact Statement for Saddle Road, Mamalahoa Highway to Milepost 41

LOCATION: Keaumuku, South Kohala, Kaohe, Hamakua, Island of Hawaii, TMK: (3) 6-7-001:041 por. 4-4-015:008 por. and 4-4-015:014 por.

APPLICANT: Department of Transportation, Highways Division

Pursuant to your request for comments on the above matter, we offer the following:

The proposed Saddle Road realignment crosses two State parcels: TMK (3) 4-4-015:008 (Parcel 8) and 4-4-015:014 (Parcel 14). Parcel 8 is leased to the United States of America as part of the Pohakuloa Training Area (PTA) pursuant to General Lease No. S-3849. Parcel 14 is part of the existing Saddle Road right-of-way (ROW).

The Supplemental Environmental Impact Statement (SEIS) states on the Errata Sheet inserted at the beginning of Volume I that Parcel 14 is leased to the United States Army. This is incorrect because General Lease No. S-3849, as originally drafted, excluded the existing Saddle Road from the lease premises.

The SEIS maps indicate that the new Saddle Road alignment will overlap the existing Saddle Road for a distance near the 42-mile marker, before diverging south across a portion of Parcel 8 toward Kona. To the extent the new road alignment within PTA is outside the existing Saddle Road alignment, a withdrawal of lands from General Lease No. S-3849 with the concurrence of the United States will be necessary. Additionally, the realignment of Saddle Road through Parcels 8 and 14 will require the approval of the Board of Land and Natural Resources for the withdrawal of the new ROW from the lease and the disposition of the ROW to the State Department of Transportation. Consolidation and resubdivision of affected parcels may be necessary through a Department Permit or Land Board Permit since the lands are in a conservation district

Please contact me should you have any questions.

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RECEIVED
STATE DEPARTMENT
OF TRANSPORTATION

'10 JAN -8 A10 :29

HIGHWAYS DIVISION
PLANNING BRANCH

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

January 5, 2010

Department of Transportation
Highways Division, Planning Branch
869 Punchbowl Street Room 301
Honolulu, Hawaii 96813

Attention: Mr. Ken Tatsuguchi

Ladies and Gentlemen:

Subject: Draft Supplemental Environmental Impact Statement for Saddle Road, Mamalahoa Highway to Milepost 41

Thank you for the opportunity to review and comment on the subject matter. The Department of Land and Natural Resources' (DLNR), Land Division distributed or made available a copy of your report pertaining to the subject matter to Office of Conservation & Coastal Lands for their review and comment.

The Department of Land and Natural Resources has no other comments to offer on the subject matter. Should you have any questions, please feel free to call our office at 587-0433. Thank you.

Sincerely,

Charlene E. Unoki

for Morris M. Atta
Administrator

Cc: OEQC

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

1A-10-119

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

November 23, 2009

RECEIVED
OFFICE OF CONSERVATION AND COASTAL LANDS
2009 NOV 25 A 10:08
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

RECEIVED
LAND DIVISION
2010 JAN -5 P 3:15
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

MEMORANDUM

TO: **DLNR Agencies:**
x Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
x Engineering Division
x Div. of Forestry & Wildlife
x Div. of State Parks
x Commission on Water Resource Management
x Office of Conservation & Coastal Lands
x ~~Land Division – Hawaii District~~
x Historic Preservation

FROM: Morris M. Atta Darlene
SUBJECT: Draft Supplemental Environmental Impact Statement for Saddle Road, Mamalahoa Highway to Milepost 41
LOCATION: Island of Hawaii
APPLICANT: Department of Transportation, Highways Division

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by January 4, 2010.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact my office at 587-0433. Thank you.

Attachments

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed:
Date: 1-5-2009

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

REF:OCCL:TM

Correspondence: HA 10-119

MEMORANDUM

JAN 5 2010

TO: Morris M. Atta, Administrator
Land Division

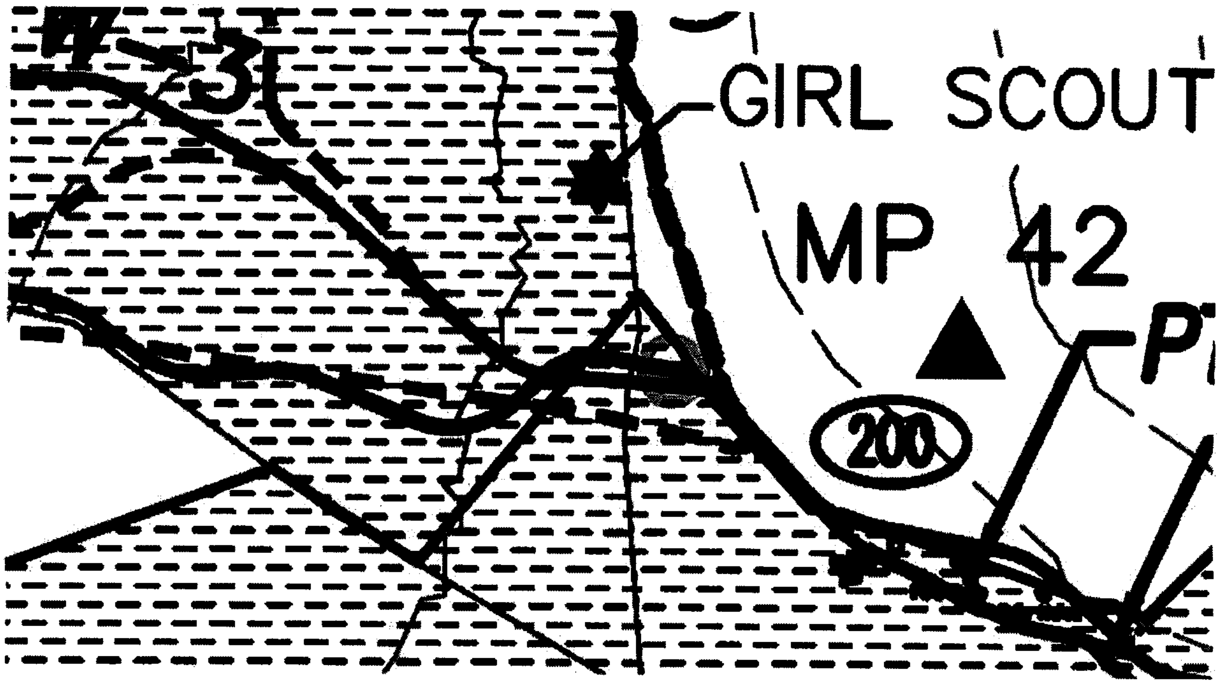
FROM: Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

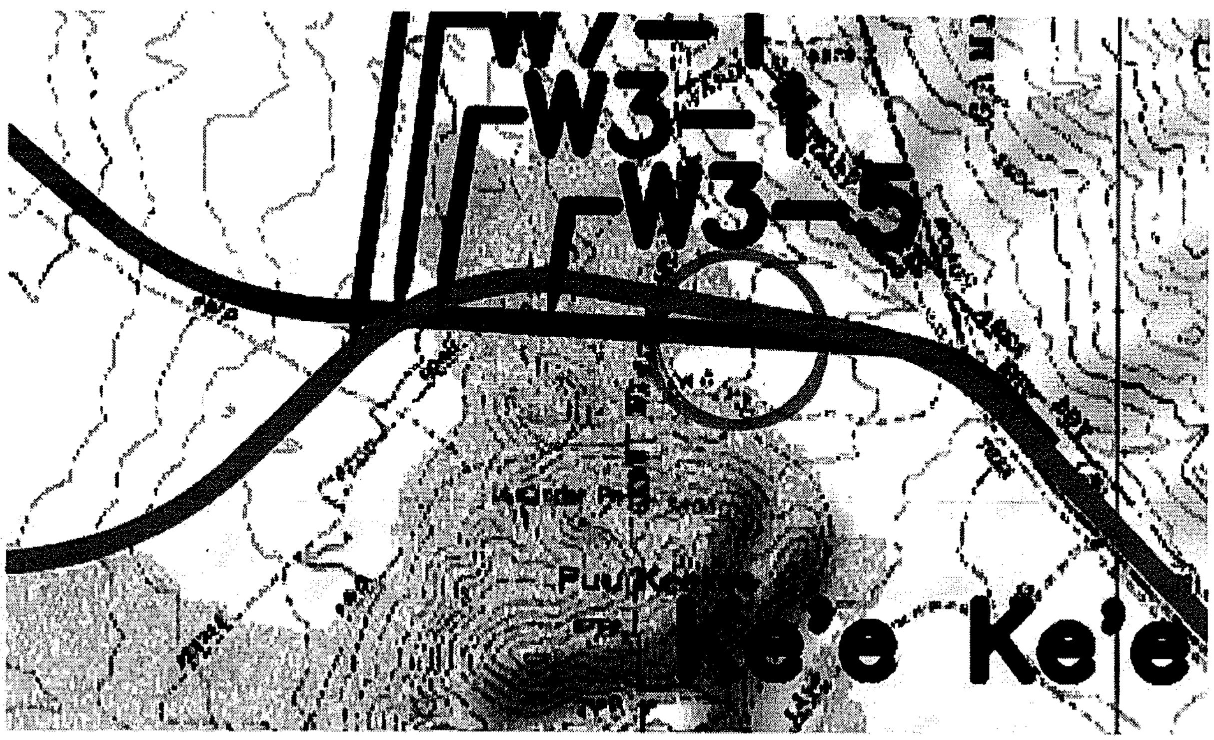
SUBJECT: Draft Supplemental Environmental Impact Statement for Saddle Road

The Office of Conservation and Coastal Lands (OCCL) has reviewed the subject information and note that the applicant believes a Conservation District Use Permit has been approved for the new proposed alignment. However, within the vicinity of Puu Ke'e Ke'e, a portion of the new proposed W-7 alignment within the Conservation District appears to deviate from the permitted W-3 alignment (**Exhibit 1**-area in highlighted pink circle). It appears that the new alignment may not be within the permitted W-3 alignment and may require further review.

As such, pursuant to the Hawaii Administrative Rules, §13-5-22, Operations, repair, maintenance, or renovation of existing structures facilities, equipment, or topographical features which are different from the original permit or which are different from the department-approved construction plans, a departmental permit may be required for this deviation.

Should you have any questions regarding this memorandum, contact Tiger Mills of our Office at (808) 587-0382.





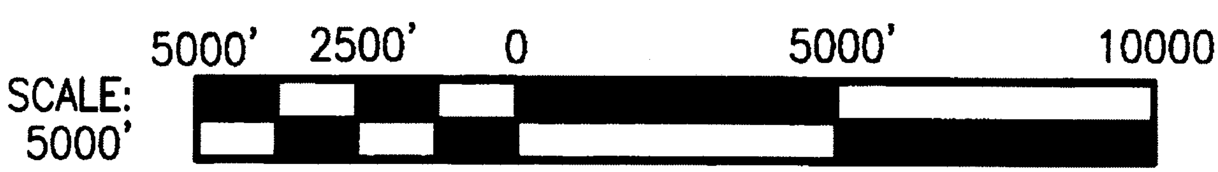


Figure 3:
USGS Map
12/10/08

EXHIBIT 1

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Charlene O. Unoki, Assistant Administrator
Land Division
Department of Land and Natural Resources
State of Hawai'i
P.O. Box 621
Honolulu, HI 96809

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Ms. Unoki:

Thank you for coordinating the DLNR review of the Draft SEIS. In response to the specific comments.

• *Engineering Division:* Thank you for confirming that the project is within FIRM Zone X.

• *Division of Aquatic Resources*: We acknowledge the no objections comment.

• *Commission on Water Resource Management*: We acknowledge the statement of no comments.

• *Division of State Parks*: Work in the vicinity of Mauka Kea State Recreation Area is essentially done, but FHWA will notify State Parks in advance of any remaining work. The section of new Saddle Road that passes by Mauna Kea State Park (MKSP) was completed several years ago. These improvements included constructing a new and much safer access to MKSP, including left and right turn lanes from and onto Saddle Road. The former 90-degree bend in existing Saddle Road was removed, thereby providing a much safer access to the park.

• *Land Division-Hawai'i District*:
a) Thank you for this correction, which will be added to the Final SEIS. Our understanding is that Saddle Road is owned by the State but is being maintained by the County of Hawai'i under an agreement executed in the 1960s. It is also under the County's jurisdiction for law enforcement.
b) We acknowledge your statement that the portion of new road alignment outside of the existing Saddle Road alignment will require withdrawal of lands from Lease S-3849, and the realignment of Saddle Road through parcels 8 and 14 will require BLNR approval for withdrawal of the new ROW from lease and assignment to HDOT. This information will be added to the Final SEIS. We

understand that consolidation and resubdivision may require Department or Land Board permit since they are in Conservation District. This information has been added to the Final EIS.

• *Office of Conservation & Coastal Lands*: Thank you for your determination on this matter. The information that the CDUP granted in 2003 for the proposed realignment may not cover the portion of the W-7 alignment near Puu Ke'e Ke'e and that realignment may require a departmental permit will be added to the Final SEIS. FHWA now intends to apply for a CDUP.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3647 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

48

David A. Tarnas
M. Carolyn Stewart
P.O. Box 6882
Kamuela, Hawaii 96743

24 December 2009

Mr. Ken Tatsuguchi
Head Planning Engineer
Hawaii Department of Transportation
869 Punchbowl Street, #301
Honolulu, HI 96813

Aloha Mr. Tatsuguchi:

We live in Waimea and use the Saddle Road (State Route 200) to go back and forth to Hilo on a regular basis. We support the proposed re-alignment of Saddle Road on the western end to the south of the U.S. Army's newly-acquired Keamuku parcel. It will help separate military training and civilian transportation, and provide a wider, straighter roadway which will be safer to drive and improve traffic flow. This will complete the overall improvements to Saddle Road, which will make the cross-island commute that many people make shorter, easier, safer, and less expensive because of the decreased fuel consumption.

The new portions of Saddle Road are a pleasure to drive, and we look forward to the completion of the full project.

Sincerely,

David Tarnas

David A. Tarnas

MCStewart

M. Carolyn Stewart

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

David Tarnas and M. Carolyn Stewart
P.O. Box 6882
Kamuela, HI 96743

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Mr. Tarnas and Ms. Stewart:

We are in receipt of your letter dated 12/24/09 regarding the Saddle Road Improvement Project. Thank you for your letter of support for the project and your views on how it will provide a safe and efficient route by separating civilian from military traffic, and make the cross-island commute shorter, safer and less expensive.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

49

WATERWORKS

Pools Watertanks Hot-Tubs

TO: Department of Transportation.

RE: Saddle Road Re-alignment.

January 7th 2010

To whom it may concern,

I would like to submit my input in regard to the proposed realignment of the Saddle Road.

As a business owner with retail locations in both Hilo and Kona I have trucks and crews crossing the Island several times a week.

The improved safety and convenience that would be provided by the proposed re-alignment provokes me to express my support for this project.

Thank you for your consideration,

With regards,

Verne Wood
President, CEO
Puna Water Services. Inc
dba: WaterWorks.

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Verne Wood
President and CEO
Puna Water Services, Inc.
dba Water Works
741 Kanoelehua Avenue
Hilo, HI 96720

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Mr. Wood:

We are in receipt of your letter dated 01/07/10 regarding the Saddle Road Improvement Project. Thank you for your letter of support for the project and your views on how the improved safety and convenience will help businesses such as yours and their workers.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

50

FAX TRANSMITTAL SHEET

ENVIRONMENTAL CENTER
University of Hawaii
2500 Dole Street, Krauss Annex 19, Honolulu, HI 96822
Telephone (808) 96-7361 Fax: (808) 956-3980

DATE: 1/12/10

FROM: Peter Rappa
Environmental Review Coordinator

TO: Dina U. Lau (808 587-2340)
Department of Transportation, Highways Division

Ron Terry (866 316-6988)
Geometrician

OEQC (808 586-4186)

SUBJECT: **REVIEW OF DRAFT SUPPLEMETNAL EIS FOR THE SADDLE ROAD, MAMALAHOA HIGHWAY TO MILEPOST 41**

No. of Pages including cover sheet: 6

Due to circumstances beyond our control we were not able to send you our reviews comments until today, January 12, 210. We realize that you will receive them after the deadline for the 45 day review period and that you are not obligated to respond. However, many of our comments are editorial in nature and would enhance the readability of the document. The rest, we feel, merit your attention.

We hope you will include our comments with your response in the final SEIS.

Thank you for your consideration.

Peter Rappa
Environmental Review Coordinator

Water Resources Research Center
Environmental Center

UNIVERSITY of HAWAI'I® MĀNOA

January 12, 2010
RE: 0797

Ms. Dina U. Lau
Department of Transportation, Highways Division
869 Punchbowl Street
Honolulu, HI 96813

Dear Ms. Lau:

Draft Supplemental Environmental Impact Statement
Saddle Road, Mamalahoa Highway to Milepost 41
South Kohala, Hawaii

The Draft Supplemental Environmental Impact Statement (DSEIS) for the Saddle Road Mamalahoa Highway to Milepost 41 project evaluates a new preferred route (W-7) for the alignment and improvement of Saddle Road at and near its western terminus (Section I of the Saddle Road Improvement project). Alignment W-7 was developed as a result of the United States Army's 2006 purchase of Keamuku lands and the desire to provide a safe separation between military training and civilian transportation. The alignment discussed in the 1999 Record of Decision for the project identified a different preferred alignment (W-3) - an alignment that would bisect the Army's training lands. This document compares the environmental, historical, and social impacts of the current W-7 preferred alignment and the 1999 W-3 alignment.

This review was conducted with the assistance of Ryan Riddle, Environmental Center.

General Comments

This DSEIS frequently references the text of the 1999 final EIS in order to avoid repeating the analysis of the effects of the completion of the road as a whole and issues that were previously covered in the 1999 text. While these references typically include section number references, it would be more helpful to the reader if the section and page numbers being referred to were *consistently* included.

In addition to our general comments we also have several specific comments.

2500 Dole Street, Krauss Annex 19 Honolulu, Hawai'i 96822
Telephone: (808) 956-7361 Fax: (808) 956-3980
An Equal Opportunity/Affirmative Action Institution

Capacity (pp. 1-14 – 1-16)

In the first paragraph of this section there is an estimate that traffic volumes are expected to increase by ten-fold by 2014. The expected increase in volume to 14,000 ADT is nearly a fifteen-fold increase in volume over the average daily traffic of 900 vehicles reported in 1994.

The paragraph at the top of page 1-16 points out the existing Saddle Road's severely limited passing opportunities. The paragraph concludes with the sentence "Construction of the road will provide a safe modern highway with sufficient capacity for expected growth." Will it do anything to address the problem of severely limited passing opportunities which will be made worse by an increase in traffic that the improvements will bring? How will it address this problem?

W-3 Alignment Alternative (p. 2-2)

Figure 1.1.2 does not show MP 41 nor does it show where the slopes of Pu`u Ke`eke`e are located, although both of these are used for directional purpose in the text both here and elsewhere. We can assume that MP 41 lies close to MP 42 on Figure 1.1.2 but we have little idea where the slopes of Pu`u Ke`eke`e are. We recommend that these land marks be included on Figure 1.1.2 in the final SEIS.

Transportation System Management (TSM) Alternatives and Mass Transit (p. 2-7)

At the top of page 2-7 the DSEIS states, "Regardless of improvements to Saddle Road, the buses would continue using the Hamakua coast route, as this is where a large portion of the major users, the resort workers, reside." Is it possible that future increases in the resident population of Hilo and Kailua-Kona and/or Waikoloa would support a direct/express bus route between the destinations – an express route that would travel the Saddle Road?

Design Criteria (p. 2-21)

This section briefly mentions the intersection of military traffic traveling between Keamuku and the main section of Pohakuloa Training Area with the highway route, stating "This would occur at one point, the location of which is not yet specified which would be a grade-separated crossing. It is likely that military traffic would pass *under* Saddle Road." What factors will be considered in this decision? At what point in time is the decision expected?

Social (pp. 3-16 – 3-17)

The last sentence in this section is unclear. Are there pedestrian and bicycle pathways within the Waiki`i Ranch that are open to use by the public or are they only available for recreational use on the ranch?

Affected Environment (p. 3-39)

The DSEIS mentions that Pohakuloa Training Area (PTA) allows hunting when and where it does not conflict with training and that PTA expects to open Keamuku to hunting under the same State regulations as other areas within the training area. What are these regulations and do they vary monthly or seasonally? How does PTA communicate notices of closure? Will hunting access points be located off of W-7? How would hunting access vary between the two routes (W-3 and W-7)?

Tourism (p. 3-51)

Table 3.3.9 referenced in the second sentence of the first paragraph in this section as being "above" is actually found on page 3-25, 26 pages previously. The table should either be reproduced here or the page number on which it can be found.

Environmental Consequences (pp. 3-52 – 3-53)

How accurate is the Average Daily Traffic increase predicted at the top of page 53? It is predicted that it will increase from the 1992 level of between 5000 and 9000 to between 14,000 and 20,000 by the year 2020. In light of earlier estimates being so far off in the section on Capacity reported on page 1-14 should the range be reconsidered? There should be data available on the ADT measured recently. Does it look like that ADT will increase to the predicted levels by 2020?

Affected Environment (p. 3-121)

In this section the DSEIS discusses the general location of management units for endangered species within and around PTA and Keamuku. It would help to have a map included of these locations and the nearby boundary of palila critical habitat. This visual representation would allow the reader to obtain a better understanding of the proximity of important land units with regard to potential sources of fire associated with alignment W-3 and W-7.

Environmental Consequences (pp. 3-57 – 3-58)

There is a reference to developing the Saddle Road as a "complete street" in the paragraph in the middle of the page. The state legislature passed a "complete streets" bill in the past legislative session (Act 54, 2009). Perhaps this section may be updated to reflect what the legislators passed.

Wildfire Threat at Ke`amuku (pp. 3-73 – 3-74)

On the next to the last paragraph on page 3-74 there is a mention of six classes mapped by Castillo et al. of wildland fire fuel types found at PTA. The next sentence says that "Two of the three types are common on the W-7 alignment." What happened to the other three types or are types and classes somehow different?

Environmental Consequences (p. 3-123)

In the first paragraph on page 3-123 the DSEIS mentions that the Army is constructing three firefighting dip tanks within the Keamuku parcel to provide onsite water to be used to fight wildfires that may ignite in the general region. What would be the capacity of these tanks?

Thank you for the opportunity to review this DSEIS.

Sincerely,

Peter Rappa
Environmental Review Coordinator

cc: OEQC
Ron Terry, Geometrician Associates
Chittaranjan Ray, WRRC
Ryan Riddle

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Peter Rappa
Environmental Review Coordinator
Environmental Center
University of Hawai'i
2500 Dole Street
Kraus Annex 19
Honolulu, HI 96822

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Mr. Rappa:

Thank you for your review of the Draft SEIS, and the late date of your comments has not prevented us from being able to consider them. Regarding your specific comments:

General comments
Readers who require the page number of a particular section may refer to the Table of Contents in the 1999 Final EIS. Section numbers are better guides to general discussions.

Traffic
The word "existing" in this context meant 2008-2009, and therefore the tenfold increase is accurate. The wording in the Final SEIS has been clarified.

Passing opportunities
To gain an idea of the project, the Environmental Center may be interested in reviewing not only the purpose and need section of the document that you cite, which outlines problems in the existing road, but also the project description, contained in Chapter 2, which explains how the project addresses these deficiencies. The new W-7 alignment will replace the two-lane, narrow, and winding conditions on the existing Section I of Saddle Road with a wide, safe modern highway with climbing lanes and a posted speed of 55 MPH most of its length, as discussed in Section 2.2 (p. 2-11). The Level of Service, which reflects passing opportunities among other factors, will increase dramatically, even with more traffic.

Figure 1.1.2
Your deduction about MP 41 being a mile away from MP 42 was correct, but to meet your concerns, labels for this mile marker and the summit of Pu'u Ke'eke'e have been added to this figure.

Transit alternatives
Our discussions to date with Hawai'i County Mass Transit Agency officials indicate that although this is a possibility, current demand and that expected in the foreseeable future would not justify it. If and when necessary, Saddle Road would provide an excellent express mass transit route.

Overpass/underpass options
It has not yet been determined whether to use an overpass or underpass, but coordination is ongoing. However, there are several reasons that an underpass for military traffic is more likely:

- Building a military overpass would likely require construction of lengthy and possibly paved approaches to/from the bridge that would extend well outside the right of way for the new road.
- Given the weight of some military equipment that may to be brought up to PTA, a military overpass would probably have to be more structurally stout than a bridge designed to handle only legal highway weights, including barriers much stouter than guardrails to prevent an errant heavy military vehicle from inadvertently running off the overpass onto the roadway below. By going under the new road, the military trail may not need to be asphalt paved.
- HDOT would presumably be responsible for maintaining the military overpass given its location within the State R/W. Given the additional length and structural requirements, this could be more costly for HDOT than the opposite of maintaining a normal (and shorter) highway bridge.
- A military underpass is likely to be less visible to motorists.
- Any future observatory projects that require hauling equipment w/ inordinately high clearance needs would not be restricted.
- A military overpass would have to be considerably longer to cross over the new and wider Saddle Road as compared to taking Saddle Road over a military trail.
- The natural terrain appears to favor an underpass for military traffic.

While there are no perfect locations, one suitable place is shown in Figure 2.2.2d of the Draft SEIS. There will need to be more discussions during design to determine the exact nature, location, size and materials to be used. The volume of military traffic at this time is unknown, but it is not expected to be substantial for any sustained period of times and will easily be accommodated by one-lane crossing. This information has been added to the Final SEIS.

Waiki'i pathways
The pathways within Waiki'i are only available to residents and are only useful for travel within the subdivision or for exercise.

Hunting at PTA
Hunting regulations at PTA are currently undergoing changes and the Final SEIS will not be able to report on any details. FHWA will coordinate with PTA if PTA requests access at one or more points for hunting. In any case, the proposed realignment of the western section of Saddle Road from W-3 to W-7 has no effect on hunting access.

Palila critical habitat
A new figure with a map of the Endangered Species Habitats and Palila Critical Habitat Area, Figure 3.18.1, has been added to the Final EIS.

Table 3.3.9 reference
The Final SEIS now provides a page number for this reference.

Hamakua traffic counts
HDOT's traffic counts in the non-urban portions of Highway 19 between Hilo and Waimea show ADT in the range of 7,100 to 11,400 for 2009, depending on location. This is slightly less than what would have been expected based on the factors that were operative at the time of the 1999 Saddle Road EIS (source: unpublished HDOT traffic counts). This is probably due to the worldwide economic slowdown that has reduced visitor counts, which has noticeably decreased traffic in most locations in Hawai'i. Preliminary forecasts that we obtained from HDOT for this same portion of Highway 19 account for the full construction of Saddle Road, along with economic trends (some level of tourism rebound) and land use trends, namely development of a portion of existing entitled properties in the region along with steady growth in DHHL and other affordable government housing projects. ADT is currently forecasted to be between 8,200 to 14,700 by 2019, a substantial increase over current levels, but less than the 14,000 to 20,000 that the 1999 EIS foresaw for this same stretch of highway for 2020. Forecasts of this nature are general, but the steady rise in ADT on all of the Big Island's highways over the last 50 years is undisputed and does not seem likely to reverse. It is clear that drive-by traffic in Hamakua and Waimea will continue to grow. Some of this information has been added to the Final EIS.

Act 54
As foreseen in Act 54, the Complete Streets Act, certain highways are not suited for the complete street concept when the costs would be excessively disproportionate to the need or probable use of the particular highway, or when the sparseness of population indicates an absence of a future need. For these reasons, Saddle Road is not suitable. The Final SEIS contains a discussion of Act 54.

Dip tank capacity
The specifications call for 80,000 gallons dip tanks. This information has been added to the Final SEIS.

Typo
The wording has been changed in the Final EIS to "two of the six types". Thank you for catching this error.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

51

1/08/10-PK, Pi

RECEIVED
STATE DEPARTMENT
OF TRANSPORTATION

'10 JAN -8 A10:28

HIGHWAYS DIVISION
PLANNING BRANCH

UNIVERSITY OF HAWAI'I HILO

January 5, 2010

Mr. Ken Tatsuguchi
Hawaii DOT, Hwy Division, Planning Branch
869 Punchbowl Street, Room 301
Honolulu, HI 96813

Aloha Mr. Tatsuguchi,

Happy New Year wishes to you and yours. I am writing to voice my strong support for the project to finish paving Saddle Road for many reasons – personal and professional.

I live and work in Hilo and have been here since 1983. As you are well aware many of us, especially residents, drive quite often to/from the west side of the Big Island for meetings, social engagements and travel purposes (since many mainland flights land there). In the past, I only used the Hamakua Coast route to travel to the west side because of the unpaved Saddle Road which made it unsafe and uncomfortable to drive on. Since the partial paving of Saddle Road, I have taken that route a little more and am pleased to say that my ride to the west side is made slightly more delightful, safer and has saved me time and gas money. However, I still dread driving on the last portion of the Saddle Road that has not been paved mainly because the unpaved portion is narrow and rough and still poses great danger when reckless and inconsiderate drivers decide to speed.

It is critical to complete the improvements on Saddle Road to further enhance safety and ensure time efficiency and cost-savings for all, especially those of us who are working hard to sustain the economy and having to do more with less in today's weakened economy. This new alignment of the Saddle Road will also reap great benefits for those who are in need of urgent health care or those who have to drive to/from either side of the island to seek regular medical care. I once overheard a complaint from a patient while waiting for my doctor whereby the complainer commented on the traffic encountered in Waimea while enroute to Hilo for her child's doctor appointment. When this next improvement project for Saddle Road is complete, many drivers to/from the west side will be more enticed to utilize the Saddle Road and this will definitely lessen the bottleneck traffic jam in Waimea...and perhaps save more lives.

In conclusion, I want to reinforce my strong support for the new alignment of Saddle Road. If you should have any questions, please do not hesitate to contact me.

Mahalo,

Yu Yok Pearring
Director, Marketing and Alumni

University Relations

200 W. KĀWILI STREET
HILO, HAWAI'I 96720-4091
PHONE: (808) 974-7567
FAX: (808) 974-7622

www.uhh.hawaii.edu

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Yu Yok Pearring, Director
Marketing and Alumni
University of Hawai'i at Hilo
200 Kawili Street
Hilo, HI 06720-4091

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Ms. Pearring:

We are in receipt of your letter dated 01/05/10 regarding the Saddle Road Improvement Project. Thank you for your letter of support for the project and your views on how it will provide benefits for both emergency medical care and regular doctor visits, and will reduce traffic bottleneck in Waimea.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

52

LAWFUL NOTICE

Dated: **December 07, 2009**

Attention: **DEPARTMENT OF DEFENSE, et al**
Robert Gates and its "public citizens"

UNITED STATES ARMY GARRISON - HAWAII, et al
Colonel Matthew T. Margotta and its "public citizens"
Mark Katkow, Laurie Lucking

UNITED STATES DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION, et al
David Gedeon and its "public citizens"
Stephen Hallisy

STATE OF HAWAII, et al
Linda Lingle and its "public citizens"
Laura Thielen, Pua Aiu, Brennon T. Morioka, Michael D. Formby, Francis Paul Keeno, Brian H. Sekiguchi, Jiro A. Sumada, Ken Tatsuguchi, Katherine P. Kealoha, Paul K. Neves, Hawaii Maoli, Council on Native Hawaiian Advancement, Association of Hawaiian Civic Clubs, Hawaii Island Burial Council, Haunani Apoliona, OHA Board of Trustees, Clyde Namu'o, Ruby McDonald, Lukella Ruddle

HFHD-16

Regarding: **HFPD-16 and HWY-PA 2.3866**
<u>NOTICE TO CEASE AND DESIST</u> unlawful conduct, harm, intentional impacts and damages to our Hawaiian National Treasures at Pohakuloa, Ke'amuku... and other related historic traditional cultural properties on Hawaii Island and throughout Ko Hawaii Pae Aina by the DEPARTMENT OF DEFENSE, UNITED STATES ARMY GARRISON - HAWAII undertaking.

Lawful Notice: **Said "public citizens" violating the law shall be held accountable to the law by we "Private National Citizens" who possess the land, and for and damages incurred. There is no statute of limitations on "intentional fraud"... and continued action shall incur personal liabilities to those "public citizens" acting without law.**

'ano'ai kakou

We, Hawaiian Nationals of Ke Aupuni O Hawaii Nei, Ko Hawaiia Pae Aina , hereby, issue LAWFUL NOTICE to the DEPARTMENT OF DEFENSE, UNITED STATES ARMY GARRISON - HAWAII, UNITED STATES DEPARTMENT OF TRANSPORTATION, STATE OF HAWAII and its "public citizens" of the following:

1. The lawful ownership of the land, i.e., *"exclusive territorial jurisdiction"* is still that of Ke Aupuni O Hawaii Nei and we National Citizens of the Kingdom, as confirmed by the United States Court for the Hawaii District. The land has never transferred to the United States nor any other sovereign entity.

2. The STATE OF HAWAII is "de facto" in standing as openly admitted to by President Grover Cleveland and other United States government entities.

3. The "de facto" STATE OF HAWAII Constitution reveals that the STATE OF HAWAII does not have jurisdictional holdings to the lands of the Hawaiian Kingdom.

4. Section 19 of the "de facto" STATE OF HAWAII Constitution reveals that the "national" citizenship of Hawaiians was not changed when Hawaii became a "Fake State" within a non-existent Union.

5. The "de facto" STATE OF HAWAII cannot prove jurisdiction over the land in question in this issue.

6. The title to Pohakuloa, Ke'amuku... and all contained within, are the soul possession of Ke Aupuni O Hawaii Nei, and the "common-law" rights that belong to Hawaiian Nationals domiciled on their own Aina.

7. The "de facto" STATE OF HAWAII has as its primary, basic law, the Common Law of the Hawaiian Kingdom, which under Hawaii Court Rules must honor.

8. The UNITED STATES ARMY GARRISON - HAWAII and its failure to comply with Field Manual (FM) 27-10 *"The Law of the Land Warfare"* and the National Historic Preservation Act (NHPA) Section 106 *"Traditional Cultural Property (TCP)"* study and assessment for and by the lineal descendants whom are directly affected by the DEPARTMENT OF DEFENSE, UNITED STATES ARMY GARRISON - HAWAII undertaking throughout Ko Hawaii Pae Aina.

LAWFUL NOTICE TO CEASE AND DESIST

Let it be known that ***this is an immediate and lawful notice to the DEPARTMENT OF DEFENSE, UNITED STATES ARMY GARRISON - HAWAII, et al*** **and its "public citizens" Robert Gates, Matthew T. Margotta, Mark Katkow, Laurie Lucking; *UNITED STATES DEPARTMENT OF TRASNPORTATION, et al* and its "public citizens" David Gedeon, Stephen Hallisy; *STATE OF HAWAII, et al* and its "public citizens" Linda Lingle, Laura Thielen, Pua Aiu, Brennon T. Morioka, Michael D. Formby, Francis Paul Keeno, Brian H. Sekiguchi, Jiro A. Sumada, Ken Tatsuguchi, Katherine P. Kealoha, Paul K. Neves, Hawaii Maoli, Council on Native Hawaiian Advancement, Association of Hawaiian Civic Clubs, Hawaii Island Burial Council, Haunani Apoliona, OHA Board of Trustees, Clyde Namu'o, Ruby McDonald, Lukella Ruddle** to cease and desist their unlawful conduct, harm to our cultural sites, desecration of our grave sites and cultural indifference to our Hawaiian culture and traditions, while damaging and eradicating our Hawaiian National Treasures at Pohakuloa, Ke'amuku... and other related historic traditional cultural properties on Hawaii Island and throughout Ko Hawaii Pae Aina.

'owau no me ka ha'aha'a

Thomas J Lenchanko 12/01/09

Tom Lenchanko, Hawaiian National
kahuaka'i ola ko laila waha olelo 'Aha Kukaniloko/Koa Mana mea ola kanaka mauli
808-349-9949

Alika Poe Silva, Hawaiian National
Kahu Kulaiwi, Koa Mana, Kupukaaina O Wai'anae Wahipana, Oahu

cc:
Office of the Attorney General
Aran Alton Ardaiz, Attorney Gemeral
Ke Aupuni O Hawaii Nei
Ko Hawaii Pae Aina

'aina

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Tom Lenchanko and Alika Poe Silva
P.O. Box 4192
Honolulu HI 96812

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Mr. Lenchanko and Ms. Silva:

Thank you for the letter on the SEIS. In response to your specific comments:

Sovereignty
We have no information regarding a defect in land title, and we believe that we are following the appropriate laws of the appropriate jurisdictional authorities, the County of Hawai'i, State of Hawai'i and the United States of America.

Section 106
We believe that the Section 106 consultation process, which involved a letter to a number of native Hawaiian organizations providing the SEIS and archaeological inventory survey inviting comments on the findings related to historic properties, was correctly conducted.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

53

DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

LINDA LINGLE
GOVERNOR
THEODORE E. LIU
DIRECTOR
MARK K. ANDERSON
DEPUTY DIRECTOR
ABBEY SETH MAYER
DIRECTOR
OFFICE OF PLANNING

OFFICE OF PLANNING
235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

Telephone: (808) 587-2846
Fax: (808) 587-2824

Ref. No. P-12889

January 12, 2010

Ron Terry, Ph.D., Principal
Geometrician Associates, LLC
P.O. Box 396
Hilo, Hawaii 96721

Dear Dr. Terry:

Subject: Hawaii Coastal Zone Management (CZM) Program Federal Consistency Review for Saddle Road (State Route 200), Mamalahoa Highway (State Route 190) to Milepost 41, South Kohala, Hawaii

The proposal by the Federal Highway Administration (FHWA) to construct a new alternative alignment for the improvement of Section I of Saddle Road, has been reviewed for consistency with the Hawaii CZM Program. We concur with the FHWA determination that the activity is consistent to the maximum extent practicable with the enforceable policies of the Hawaii CZM Program, based on the following conditions:

The mitigation measures proposed in the Supplemental EIS (SEIS) shall be fully implemented. In particular, the following mitigation measures, as proposed in the SEIS and identified below by section number, are required for CZM consistency.

1. Outdoor Recreation Access, Section 3.3.4.3 (p. 3-40)
2. Native Hawaiian Culture and Values, Section 3.3.7.3 (p. 3-46)
3. Fire Hazard, Section 3.9.3 (p. 3-81)
4. Stormwater Pollution Prevention Plan, Section 3.10.3 (p. 3-85)
5. Soil Erosion, and Cave and Lava Tube Mitigation, Section 3.12.3 (p. 3-97)
6. Botanical Resources, Section 3.13.3 (p. 3-105)
7. Threatened and Endangered Species, Section 3.18.3 (pp. 3-123 - 3-125)
8. Archaeological, Historic, and Traditional Cultural Resources, Section 3.19.2.3 (p. 3-130)
9. Traditional Hawaiian Cultural Sites, Section 3.19.3.4 (p. 3-135)
10. Hazardous Materials and Toxic Substances, Section 3.20.1.3 (p. 3-137)
11. Unexploded Ordnance, Section 3.20.2.3 (p. 3-139)
12. Visual, Section 3.21.3 (pp. 3-144 - 3-145)
13. Construction Impacts, Section 3.23.2 (pp. 3-146 - 3-148)

CZM consistency concurrence is not an endorsement of the project nor does it convey approval with any other regulations administered by any State or County agency. Thank you for your cooperation in complying with the Hawaii CZM Program. If you have any questions, please call John Nakagawa of our CZM Program at (808) 587-2878.

Sincerely,

Abbey Seth Mayer
Director

c: Mr. Pat Phung, FHWA
Planning Department, County of Hawaii

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Abbey Seth Mayer, Director
Office of Planning
Department of Business, Economic Development and Tourism
P.O. Box 2359
Honolulu HI 96804-2359

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Mr. Mayer:

We are in receipt of your letter regarding the Saddle Road Improvement Project. Thank you for your review of the project's consistency with the policies of the Hawai'i CZM program. The mitigation measures specified in your letter will be refined and formalized as a part of the Record of Decision (ROD), which will be made available on the Saddle Road website.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

54

Ken Tatsuguchi/HWY/HIDOT@HIDOT

12/13/2009 08:49 PM

To "Dina Lau" <Dina.Lau@hawaii.gov>

cc

bcc

Subject Fw: Saddle Road Draft EIS Comments

----- Original Message -----
From: Aaron Stene [aaron@hawaiiantel.net]
Sent: 12/12/2009 03:21 PM HST
To: oeqc@doh.hawaii.gov; Ken Tatsuguchi
Cc: Ron Terry <rterry@hawaii.rr.com>; Dave <dave.gedeon@fhwa.dot.gov>; Brennon Morioka; "Bruce K. Meyers" <bmeyers@okahara.com>
Subject: Saddle Road Draft EIS Comments

I want to express my support of the re-alignment of Kona side of Saddle Road. The existing roadway is woefully inadequate. There is numerous safety issues with this roadway segment due to design deficiencies. However, the new W-7 alignment would address these issues along with complementing the rest of Saddle Road improvements.

Nonetheless, I hope a better job is done regarding the introduction of invasive plants during the construction of this new phase (along with the current phase under construction on the Hilo side). The shoulders of the newly realigned Saddle Road between m.m 19- m.m 28 are being taken over by these plants. This is very concerning due to the potential impact on native plants and an increased fire hazard.

I hope the funding can be secured for this phase in a timely manner. It will help improve roadway safety on this important cross island link, along with bridging the deep political divide separating both East and West Hawaii.

Aaron Stene
Kailua-Kona

--
****
Aaron Stene
Kailua-Kona, HI
http://thekonablog.wordpress.com/
Twitter @konablog
****

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Aaron Stene
aaron@hawaiiantel.net

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear ~~Mr. Stene~~ Aaron:

We are in receipt of your letter regarding the Saddle Road Improvement Project. Thank you for your letter of support for the project and your views on how it will improve safety. In regard to weeds, once the highway has been turned over to the State of Hawai'i (which has not yet occurred with the existing sections), DOT maintenance of vegetation in the clear zone areas will begin. DOT will consult with the Department of Land and Natural Resources and the Department of the Army concerning control of noxious weeds.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

55

Michael Reimer
75-6081 Ali'i Drive RR-103
Kailua-Kona, HI
December 30, 2009

Ms. Katherine P. Kealoha
Office of Environmental Quality Control
235 Beretania St. Suite 702
Honolulu, HI 96813

Mr. Ken Tasuguchi
Highway Division Planning Branch
Room 301
869 Punchbowl St.
Honolulu, HI 96813

Dear Ms Kealoha and Mr. Tasuguchi:

Thank you for the opportunity to review and report on the SEIS for the saddle road realignment project.

My review is limited to the Section 3.7.1.3 (pp. 3-60, 3-69) of the main report and Appendix E of the addendum; these are the sections dealing with interpretation and conclusions from the additional analysis of soil samples collected for depleted uranium (DU). Unfortunately, the additional study did nothing to improve the uncertainty already at hand regarding the presence of depleted uranium (DU). In effect, the amount of DU present in the PTA area is still unknown and therefore, it is speculative at best.

However, this shortcoming should not prevent progress on the Saddle Road Planning and development. It is possible to take adequate precautions at minimal cost during construction to reduce the possible risk of exposure to DU. Some suggestions are made in the Summary of the report.

Unlike previous studies conducted by Cabrera at PTA for 10 soil samples, this study did reflect some attempt at improvement in that there were two types of analytical procedures used and the report contains information regarding blank and replicate analyses. ICP-MS and alpha spectrometry were used in an attempt on 5 soil samples to determine the uranium isotopic composition of the collected samples. However, the knowledge gained from the previous sampling regarding the need for higher precision in analyses was not applied to the Saddle Road Bypass study and the results remain inconclusive.

The most unfortunate part of the issue is that there exists the technology and methodology to obtain results that would answer the issue of the amount of DU present or carried by air transport along the proposed bypass route for the Saddle Road. These have been available since 2002 and have been used in other reports on DU. As it stands, what is being reported is an analysis of uranium and not DU, if present. One could plausibly argue from the data provided that significant amounts of DU are present. But this would be as questionable as attempting to argue the contrary. It is not necessary to present a simulated projection when analytical methods are available to answer the question whether or not DU is part of the measurement.

In addition, in the last few years, recent studies have become available to indicate that natural uranium and DU present significantly different health effects. The basis is the form of the element and includes the presence of oxides of uranium that have a very different residence time in the human body compared to the element uranium. Further, risk to humans involving DU is an evolving field of study with such indications now that DU is transported through the nervous system and that the DU alloy may participate in tumor growth and metastasis.

In summary, the DU studies for the PTA area conducted for the Hawaii Department of Transportation provide no substantive information that clarifies the concerns previously posed and certainly add no value to any computed risk analysis. This conclusion is supported by the U.S. Army Installation Management Command, Environmental from Depleted Uranium M-101 Spotting Round For Pohakaloa Training. In that document they state, "A Baseline Human Risk Assessment (BHHRA) has not been performed for Pohakuloa Training Area. Only a few fragments were found as discussed above, and presented little evidence of oxidation. The only measurements above natural background were in the immediate vicinity of these fragments."

One can reasonably conclude that in the subsequent 40 years since the M-101 DU Spotting Rounds were used, continual disturbance to the site through live fire exercises has dispersed the DU into small fragments over a large area and probably partially buried those fragments. This contributes to the oxidation of the DU, a form that is readily mobile as an aerosol.

In view of this information as presented in the SEIS, it would be prudent as the relocation road is being constructed, that the workers should be appropriately protected and at a minimum should be wearing dust masks or even respirators. One should consider that even the clothing could be disposable and on-site showers made available so no dust is carried to the workers' residences. Continued and adequate air particulate monitoring should occur throughout the construction.

Keeping in mind that the precautionary steps are not only for any DU that may have been transported to the relocation sites but from any DU that may become airborne from the PTA firing range sites, full precautionary measures would require that no live fire training exercises take place in the Pohakuloa area during the construction of the Saddle Road bypass.

Sincerely yours,

Michael Reimer

Michael Reimer, Ph.D. retired geologist

SUPPORT COMMENTARY

Uranium is a naturally occurring element; its chemical symbol is U. It has the largest nucleus of naturally occurring elements. It is also radioactive, meaning it releases energy as changes to its atomic structure occur, mostly in the nucleus. In the classical sense, the nucleus is composed of protons and neutrons. It is the number of protons in an atom that define it as an element. Uranium has 92 protons. For most elements, the number of neutrons in the nucleus can vary. When an element has a different number of neutrons, those forms are called isotopes. Natural uranium has 3 isotopic configurations; these three have the same number of protons but different numbers of neutrons. Adding the number of protons and neutrons gives the atomic mass. For uranium, these masses are usually written 234-U, 235-U, and 238-U.

Each of these isotopes decays radioactively. They decay at different rates and the rate at which they decay is referred to as the half life, meaning half of the amount present will decay in a certain time. Energy is given off as the element decays and, again, the classical decay energy is represented by three forms of energy release, the alpha particle, the beta particle, and the gamma ray. For the most part, the element when found has all isotopes occurring together. Isotopes do not equally make up an element but occur in different proportions. There are some physical processes that can separate the isotopes into different proportional fractions. This does occur to a minor extent with U in the natural environment, particularly between 234-U and 238-U.

The table below shows the different percent of natural occurrence, half lives and the primary energy release of the U isotopes.

ISOTOPE	PERCENT OF OCCURRENCE	HALF LIFE	RADIATION
234-U	0.0054	240,000 years	alpha
235-U	0.72	704 million years	alpha
238-U	99.27	4.5 billion years	alpha

TABLE 1

These half lives are very long, measured in hundreds of thousands to billions of years. All decay with the release of an alpha particle. An alpha particle consists of 2 neutrons and 2 protons and is essentially the nucleus of a helium atom. An alpha particle is very energetic and massive as far as ionizing radiation is concerned. Alpha particles emitted from natural isotopes have about 5 million electron volts energy it can transfer to atoms along is ejection pathway. It does not travel very far, around 5 centimeters in air and only 5-10 micrometers in cellular tissue, about the size human lung cells, and in the range of the 7 micrometer human red blood cell. Its energy transfer is very efficient and it ionizes atoms along its path and can beak chemical DNA and RNA bonds in cells.

When an atom decays with the loss or gain of protons, it becomes a different element. For the uranium isotopes, all the following elements are also radioactive emitting energy and nuclear particles until they become lead, chemically abbreviated Pb (after the Latin name for lead, plumbum). Lead has 82 protons and also has isotopes, that is, differing numbers of neutrons in its nucleus. It is a stable element.

Uranium exists everywhere in minor and trace amounts. The crust of the earth has an average concentration of 1 part U per a million parts of other elements. It is higher in continental rocks and lower in oceanic rocks. For example, it is about 4 parts per million in the California granites but only one-half part per million in Hawaiian basalts that make up the island chain. Uranium also exists in food we eat, the water we drink, and to a minimal extent, as particle in the air we breathe. It occurs in our own bodies, averaging about 90 micrograms, mostly in the bone and liver. A 160 pound person weighs 73 billion micrograms so you can see the human concentration of uranium is much less than the crustal abundance, by nearly a factor of 1,000. When an element is concentrated in an area much greater than its average occurrence and can be collected and separated economically, it is called an ore deposit.

One isotope of uranium, 235-U has certain physical properties that make it particularly applicable to uses in nuclear physics. Its nucleus can capture a neutron at a higher rate than either of the other two naturally occurring U isotopes. When this happens, 235-U goes through a different radioactive decay process called fission. That is, it splits into two or more fragments containing all the neutrons and protons and emits a great amount of energy, including some unattached neutrons that could be captured by other 235-U atoms if nearby. If the released neutron energy is controlled to a high degree, the nuclear reaction is controlled so that a nuclear reactor can be constructed. If it is controlled to a lesser degree, nuclear weapons can be constructed.

In order to construct those devices, the amount of 235-U must be concentrated to a level higher than its natural occurring percentage. In order to do this, uranium ore is processed in special factories to extract 235-U. What remains is very pure U that is depleted in 235-U and on a percentage basis, concentrated in 238-U. That remainder after processing is called depleted uranium. During the cold war, literally hundreds of thousands of tons were produced. It found both civilian and military applications. The military application most commonly used was to manufacture munitions, typically alloyed with other metals because pure uranium, if fine enough, can burn spontaneously in contact with air. As a bullet or artillery shell, it is denser and harder than lead (Pb) and could penetrate the armor of battlefield vehicles easier than the lighter, softer lead.

Some of those munitions were used at Pohakuloa Training Area in the 1960s. What wa used was a spotting round or marker round for a larger nuclear weapon that went out about 2 miles and landed on the surface giving off a puff of smoke. The exact amount of DU used is not known but could exceed 700 or pounds of depleted uranium. Now seven hundred pounds does not seem like a lot; an average sized pickup truck can hold more than that. But in the basaltic rocks at Pohakuloa, with its average uranium concentration of only 0.5 ppm uranium, it is an enormous addition. It is as much uranium that exists naturally over 3 square miles to a half-foot depth. In other words, your cancer risk from exposure on those three square miles are doubled according to the U.S. EPA's approach of defining risk to radiation on a linear no-threshold basis.

Uranium is considered to present two types of health concerns. It is both a toxic metal and it emits radiation. As a toxic metal, it is highly unlikely to be ingested in quantities sufficient to be a heavy metal poison as the common concern of ingestion of lead by children. As a radioactive substance, the half life is very long and alpha particle emission is quite slow. It takes a lot, on the order of pounds, of uranium alloy metal to present a radiation hazard if it is sitting a few feet from you. But there is a means in which a uranium hazard can be brought to you from those few contaminated areas at PTA. If the remnants of the spotting rounds oxidize or are blasted into finer fragments either by live fire or vehicles running over them, those particles can become aerosols and be carried in the air. Although the larger particles (10 micrometers) will settle more quickly than finer ones (less than 1 micrometers), they can again become aerosolized by mechanical action and carried to a new location by movement of the air. The finer particle can be carried for miles and reports have been made of finding those up to 26 miles from the source.

The inhalation of uranium as aerosols into the lungs provides a radiation hazard as the uranium is sitting among lung cells and is irradiating them with the very energetic alpha particle. Depending on the size of the aerosol (nanoparticle), it could contain millions or billions of uranium atoms. This is very unlike inhaling the same size particle with only 1 part per million U embedded in some crystalline rock matrix made mostly of silicon and oxygen. Aerosols are very small particles that can become airborne and remain airborne for quite some time. They typically range in size from 0.001 to 10 micrometers. Ten micrometers is 4 ten thousands of an inch. As is typically used in comparison, the diameter of a human hair is about one thousandths of an inch. So ten micrometers is about half the diameter of a human hair.

Without getting into the health physics aspect, such as what size particle gets deposited where in the respiratory tract, it is reasonable to say that it is inhalation that presents the greatest health risk. In addition, it is likely that both radiation and metal toxicity are probable risk factors.

What this means is that if a particle of depleted uranium becomes airborne, it can be carried quite some distance from where the depleted uranium is located. Although there are some arguments that the particles cannot move very far, on the order of a few hundred feet, this applies only to certain aerodynamic conditions such as with the largest particles. You have probably heard that massive amounts of dust particles (larger than aerosols) are carried by strong winds from Asia to Hawaii. From your own personal experience, think of the sea salt and some minuscule sea organisms (algae) that deposit themselves on your car windshield even though you may have been far from the sea. It is therefore highly likely that the smaller aerosols are carried from the PTA source across any land mass presented by the Big Island, again dependent on the aerodynamic conditions.

This leads to the question of whether or not depleted uranium can become airborne. Depleted uranium has been detected in aerosol samples collected at other sites where depleted uranium has been used on the mainland and certainly in Kosovo and Iraq. On Hawaii Island, spotter rounds weighing about 6 ounces of DU were used. Upon impact, these were supposed to explode and release a cloud of some material in order to determine where the spotter round had landed. This type of explosion is very different from the anti-armor rounds fired by the military. The military rounds were designed to burn upon impact that would immediately create aerosols. In contrast, the spotter rounds would release very little aerosol upon impact and explosion. Certainly the large metal fragments are not going to be blown about in the wind but as the fragments remain in the open, they do oxidize as has been seen by a yellow coating on the fragments. They oxidize more quickly in Oahu than Hawaii because of the higher moisture concentration where they were used. Oxidization is like rust. Run your hand over a rusty car fender and look at your hand. It is covered in fine particles of iron oxide rust.

One major unknown is how many times the area where the spotting rounds were used was engaged in live fire exercises. Airborne bombing, artillery shells, vehicular traffic all would contribute to making the spotting round fragments smaller and burying them under rock or soil where they would oxidize faster. More live fire and these fragments and oxides are churned again and again with the potential of releasing the oxides to the atmosphere.

SAMPLING AND ANALYTICAL PROCESS

Five soil samples were collected from the proposed realignment route of the Saddle Road. The collection methodology was developed by AMEC and reported as a protocol in the SEIS report. This document was not included in the SEIS and I contacted AMEC by telephone to determine the salient points of the protocol.

To the best knowledge of AMEC, the sample was sieved so no particles larger than 2 millimeters were included and they do not know if any organic material was excluded (grasses, etc.). Two analytical methods were used, the ICP-MS and alpha spectrometry. That is a good selection but did not provide analysis of all uranium isotopes. The amount of sample is unknown as is any dilution process for the ICP and procedures for the alpha spectrometry.

"Fingerprinting" is a term used in this study for seeking clues that may indicate if depleted uranium is present in a sample. Analyzing for uranium will not reveal the difference between natural and depleted uranium unless there is an inordinate amount of uranium found that is not associated with some ore forming process. Complete isotopic analysis will reveal the difference.

As a brief review, all isotopes of uranium are radioactive and primarily decay with the emission of an alpha particle. Natural uranium contains three isotopes that are the same chemically but have a different number of neutrons in the nucleus that gives them different nuclear characteristics. The isotopes are written as 234-U, 235-U and 238-U. The nuclei contain 142, 143, and 146 neutrons respectively. There are different concentrations of these isotopes in nature, as well. The previous Table 1 shows these differences. The simplified Table 2 below shows the symbols, primary radiation energy release, half life and the decay product (modified from NY Department of Health).

Symbol	Element	Radiation	Half-Life	Decay Product
U-238	Uranium-238	alpha	4.5 billion years	Th-234
Th-234	Thorium-234	beta	24.1 days	Pa-234
Pa-234	Protactinium-234	beta	1.17 minutes	U-234
U-234	Uranium-234	alpha	247,000 years	Th-230
Th-230	Thorium-230	alpha	80,000 years	Ra-226
Ra-226	Radium-226	alpha	1,602 years	Rn-222
Rn-222	Radon-222	alpha	3.82 days	Po-218
Po-218	Polonium-218	alpha	3.05 minutes	Pb-214

Pb-214	Lead-214	beta	27 minutes	Bi-214
Bi-214	Bismuth-214	beta	19.7 minutes	Po-214
Po-214	Polonium-214	alpha	1 microsecond	Pb-210
Pb-210	Lead-210	beta	22.3 years	Bi-210
Bi-210	Bismuth-210	beta	5.01 days	Po-210
Po-210	Polonium-210	alpha	138.4 days	Pb-206
Pb-206	Lead-206	none	stable	(none)

TABLE 2.

An alpha particle decay results in a different element with a lower atomic number and atomic mass, while a beta decay results in an isotope of the same atomic mass but a different atomic number. Interestingly, 234-U is part of the decay chain of 238-U.

235-U is an isotope with nuclear characteristics that are of interest in building reactors or bombs. It has the affinity to easily capture a neutron and then fission. Fission is a decay process where the nucleus splits into two or more large pieces and releases energy and neutrons, and other radiation in the process. When the rate of the released neutron capture is slowed for the amount of fissionable isotope present as controlled in a reactor, it generates heat. When the rate of capture is less moderated and more fissionable isotope is present, it can react explosively and is the basis of an atomic bomb.

The amount of 235-U in natural uranium today is insufficient to generate these fission reactions*. Therefore, 235-U is concentrated so it can be used in nuclear reactions. When it is separated from natural uranium, the remainder is called depleted uranium.

Interestingly, there is a documented case in geologic history when the 235-U isotope was in greater concentration where there was a natural atomic reactor. For those interested, more information about this unique natural phenomenon can be found at* http://en.wikipedia.org/wiki/Oklo**

That isotopic manipulation gives an opportunity to determine whether the uranium is natural or depleted. By analyzing the isotopes, if the percentage of 235-U is lower than its naturally occurring counterpart, it is likely depleted uranium. The separation process gives another fingerprint clue. In separating out 235-U, some 234-U is removed as well. Ideally then, if the ratio of 234-U to 238-U is lower than its natural counterpart; it too may be a clue to determining whether the uranium is natural or depleted.

That is typical of separation from purified uranium ore but that isn't all the possibilities. Depleted uranium can also be separated from reactor fuel rods. The once enriched rods have burned up most of the 235-U. In effect, the fuel rods are now depleted uranium plus a lot of other isotopes created when the nucleus of those other atoms capture a neutron. For example, in the uranium family, the fuel rod can contain 236-U and even after separation of uranium, some traces of other radioactive isotopes are found, such as 237-neptunium and even 239-plutonium, both man-made isotopes as they do not occur naturally.

It is not known whether the DU projectiles used at PTA are from the first purification of uranium ore or reprocessed fuel rods but it is a relatively straight forward process to determine that unknown. Pieces of the spotting rounds have been found; simply analyze the found rounds to answer this question.

Still another means is possible. The spotting rounds are reported to be an alloy of uranium and molybdenum. Analyses of materials looking for DU should include molybdenum and any other material that might have been used in alloy process, again determined from analyzing the spotting rounds.

The current air monitoring program is not capable of finding DU or any surrogate simply because it is not looking for any. This is true for soil analysis as well. Depleted uranium is defined as uranium from which 235-U has been selectively removed, often about half or two-thirds removal. As previously mentioned, the 234-U isotope during the process of concentrating 235-U is often depleted as well. The analytical methods employed often do not analyze specifically for 235-U (it is below the detection limit). Quite often then 234-U is used as a surrogate for interpreting whether a sample is DU or natural uranium. If 234-U is not lower than its natural abundance concentration, it is often and erroneously concluded that the uranium is natural uranium. This is wrong because even in the natural environment, 234-U is quite variable due to several physical and chemical factors. For a time, 238-U decays by alpha emission into 234-Th. Thorium has different chemical affinities than uranium and the two elements may not move together. Eventually, 234-Th decays by beta emission to 234-U. Thus, there is a range of ratios of 234-Th to 238-U. This range is 0.5 to 1.2 as determined by Sansone and others, 2001 and quoted in an incomplete reference in the SEIS, Appendix II.

This is an important point as it is being improperly applied in interpreting the results of soil analysis for depleted uranium.

Table 3 below compares percentages of uranium isotopes by weight and activity in natural and depleted uranium.

Isotope	Relative isotopic abundance			
	Natural Uranium		Depleted Uranium	
	By weight	By activity	By weight	By activity
U-238	99.28%	48.8%	99.8%	83.7%
U-235	0.72%	2.4%	0.2%	1.1%
U-234	0.0057%	48.8%	0.001%	15.2%

TABLE 3

In Table 3, the activity ratio of natural 234-U to 238-U is 1. They have the same activity as would be expected from an undisturbed physical process. In reality, the range in soils is variable because some natural processes can separate 234-U from 238-U.

Soils are derived from rocks by physical and chemical processes that break down the rock into finer particles. The primary processes are largely dependent on the local climate zone. If it rains a lot, the water can interact with the elements in the rock, dissolving some and carrying away some. You are familiar with how acid rains can rapidly dissolve some rocks or even leach elements from building roof materials and create problems with impurities in catchment systems. In colder climate zones, such as found in Hawaii on the higher regions of Mauna Kea and Mauna Loa, freezing and thawing help break up rocks. Wind can take finer grains and they can impact larger particles and mechanically break them just as sand blasting can erode away the paint on buildings or the unsightly weathering of stone buildings to expose a fresh surface. Moving water can do the same thing as it carries sediment along erosion pathways, including streams, rivers, and even intermittent flows in gullies or surface swales. Plant growth with the root systems can help create soils and leaves organic materials behind that can also interact with rocks to generate soils.

Soil generation takes time. You can see this on Hawaii as there is more soil on older lava flows and more in regions with greater rainfall. As mentioned before, thorium can separate chemically from uranium or be more easily leached from the mineral grains in which it is contained. Most commonly, the activity ratio can be less than one, because it has been removed. Therefore the 234-Th to 238-U ratio in soils is disturbed and is not the equilibrium perfect one to one ratio. 234-thorium is also removed during a uranium isotope extraction process and the ratio would also be less than one. Here is where the misinterpretation of soil analyses come into being.

Much of the PTA area is barren of soils. The lava flows are recent. The soil samples at PTA were collected from gullies or swales where water had moved some soil. The soil at these locations is a mix or combination of all soils from different areas over which water carrying it had flowed. The 234/238 isotopic uranium activity ratios vary within the natural range found in soils with an occasional lower value or two. The question arises is how do you know the lower value is not reflecting a mixture of depleted uranium with lower 234-U and natural uranium also with lower 234-U. The answer is, you can't. So to interpret the low 234-U ratios as not being from depleted uranium is incorrect. If the ratio were that freshly processed 234/238 (0.18 from table 1), then it would be clear that it is from depleted uranium. But the sample may contain a fraction of DU and Natural uranium because it is a mix of sediment or soil brought together by flowing water from vast drainage areas.

You will notice from the report that the ratios are averaged to diminish the impact of the lower samples. An average is an improper application as it tends to hide the anomalies that can be outliers from the normal data range.

Here is an example to demonstrate the problem with averaging. Suppose the playgrounds of 5 schools were tested for arsenic. In Hawaii, arsenic in soils ranges from about 1 to 5 parts per million. EPA would generally say any contaminated area should be cleaned up to the normal background. The results of the school yard analysis are: 1.1, 0.9, 1.2, 1.1, 10.2 parts per million. Yes, one analysis is 10.2 ppm, over 2 times the highest natural background found in Hawaii. Why might it be so high? Let's presume the school site was a former lumber treatment yard for applying termite resistant materials to lumber that contained arsenic. Is it a problem? Simply average the 5 analyses and you get 2.9, well within the normal range of arsenic on the island. So, it is easy for some authority to claim the average is within normal limits and there is no need for concern; yet children are exposed nearly daily to twice the arsenic limit normally found in Hawaii. Clearly, the individual children at all schools do not have the same risk.

This is the same result that can occur when you mix soils, one or more that can come from an area contaminated with depleted uranium and the others from areas with only natural uranium. The 234/238 ratio of one sample taken along the saddle road proposed bypass was 0.74 that individually is quite lower than the average of 1.16. It could easily be a mix of DU at 0.18 and the average provided by natural variability. The situation with the Saddle Road Bypass sampling is further complicated by the fact that DU is probably not transported in by water movement but by air transport. The DU contaminated aerosols would then have to drop and realistically the likelihood of it being in one of the sites from which the 5 samples collected is miniscule but probable. From the analyses that were performed, it cannot be discounted. Aerosols can be remobilized with mechanical disturbance.

This discussion would not be complete without stating that the isotopic analysis of uranium at these concentration levels is very difficult. Techniques to accomplish this have been available since 2002 but do not appear to have been used here.

It is unfortunate in that the refinement to risk analysis could be greatly improved but that is not possible here. The risk determination is based on too many assumptions and presumptions to have any meaningful application. If one selects to err on the side of caution, it must be assumed that DU is present.

SUMMARY RECOMMENDATIONS

The State of Hawaii is to be commended in attempting to resolve the DU risk to workers participating in the realignment of the Saddle Road. The results unfortunately do nothing to assist in that risk determination.

The information provided by the additional DU studies addressed in the SEIS should not be used to provide a false impression that there is no potential hazard from DU. However, that issue should not prevent the planning and construction from going forward.

In view of this information as presented in the SEIS, it would be prudent as the relocation road is being constructed, that the workers should be appropriately protected and at a minimum should be wearing dust masks or even respirators. One should consider that even the clothing could be disposable and on-site showers made available so no dust is carried to the workers' residences. Continued and adequate air particulate monitoring should occur through out the construction.

Keeping in mind that the precautionary steps are not only for any DU that may have been transported to the relocation sites but from any DU that may become airborne from the PTA firing range sites, full precautionary measures would require that no live fire training exercises take place in the Pohakuloa area during the construction of the Saddle Road bypass.

REFERENCES

Pertinent references will be provided upon request

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Michael Reimer
75-6081 Alii Drive RR-103
Kailua-Kona, HI 96739

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Mr. Reimer:

Thank you for the letter on the SEIS. In response to your specific comments:

Report shortcomings
FHWA and HDOT disagree that there are shortcomings regarding the human health risk assessment report prepared by AMEC. However, we appreciate that your evaluation has led you to the conclusion that the project should not be delayed. We surmise that you do not feel that a significant health risk from DU exists from either road construction or use of the road.

Need for higher precision in analysis
We disagree with this statement. Precision is defined by the U.S. Environmental Protection Agency as "a measure of mutual agreement among individual measurements of the same property usually under prescribed similar conditions." AMEC utilized HDOH and ASTM guidance documents and accepted scientific principles and practices in designing its sampling protocol. Soil samples were collected at five distinct locations along the proposed W7 alignment. These samples were collected using multi-increment sampling methods, which significantly reduces the probability of obtaining false negative results and provide a better measurement of the true concentration. Each multi-increment sample was comprised of approximately 50 individual soil "increments" collected across a 10,000 sq ft area (defined as decision units) using a systematic random sampling approach. The relatively large multi-increment samples were thoroughly homogenized and subsampled in the laboratory in accordance with ASTM Standard C999-05, *Standard Practice for Soil Sample Preparation for the Determination of Radionuclides*. Implementation of the described sampling procedure minimizes the effects of soil heterogeneity and provides a more accurate representation of average concentration within a decision unit.

Additionally, one of five decision units evaluated (Decision Unit 2) was sampled in triplicate. Sampling and analyzing replicate samples allows for the specific evaluation of precision, which indicates sampling representativeness. It is a measure of reproducibility and can be completed without comparison to an assumed or known value and is traditionally expressed as a relative standard deviation (RSD) for field triplicate samples. The three replicate samples collected from Decision Unit 2 contained ^{238}U at 130 μg/kg, 100 μg/kg, and 110 μg/kg and lead at 2.8 mg/kg, 2.0 mg/kg, and 2.4 mg/kg. The calculated RSD for this sample set is 13.5% for ^{238}U and 16.7% for lead, which is well below the data quality objective goal of 30%. According to Section 4.2.5.3 (Evaluation of Replicates and Data Representativeness) of the *Technical Guidance Manual for the Implementation of the Hawaii State Contingency Plan*, "...an RSD% of approximately 35% or less indicates the amount of estimated total error is within a reasonable range for decision-making." Therefore, we are confident that the sampling program carried out by AMEC resulted in analytical results with a high degree of precision.

There exists the technology and methodology to obtain results that would answer the issue of the amount of DU present or carried by air transport along the proposed bypass route for Saddle Road. These have been available since 2002 and have been used in other reports on DU. As it stands, what is being reported is an analysis of uranium and not DU.
Unfortunately, you did not provide reference to the technologies and methodologies you are referring to. AMEC has provided significant backup to its sampling and analytical procedures. Uranium isotope analysis was conducted by Test America, St. Louis, which has the reputation as being the best in the industry in radionuclide testing. As you have indicated, AMEC utilized multiple laboratory techniques to measure uranium isotopes. The first method utilized Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), which is theoretically more sensitive and provides lower detection limits for ^{235}U and ^{238}U. The second analytical method utilized was alpha spectrometry. Alpha spectrometry results were expected to provide greater precision and lower detection limits for the ^{234}U isotope in comparison to the ICP-MS method.

Your statement that what was being reported was an analysis of uranium and not DU is erroneous. The analysis for DU must originate from the analysis of individual isotopes of uranium, specifically from the analysis of the three predominant and relatively stable isotopes, ^{234}U, ^{235}U, and ^{238}U. Determination of DU presence is generally made from the relative abundance of the three isotopes in relation to each other. Generally, $^{234}U/^{238}U$ and $^{235}U/^{238}U$ activity ratios are significantly reduced in DU relative to natural U. Conversely, $^{234}U/^{238}U$ and $^{235}U/^{238}U$ activity ratios are substantially elevated in enriched uranium (EU) relative to natural U. According to the reference document cited in AMEC's report (Sansone et. al., 2001), $^{234}U/^{238}U$ activity ratios for natural U in soil typically range from 0.5 to 1.2. The range of $^{234}U/^{238}U$ activity ratios measured in soil samples collected by AMEC ranged from 0.74 to 1.79. Consequently, we conclude that negligible amounts of DU (if any) are present in surface soil at the Site. Furthermore, the absolute concentration of total U in surface soil at the Site is well within the accepted range of background (or naturally occurring) concentrations.

Recent studies indicate that natural uranium and DU present significantly different health effects.
We cannot respond to this comment as you do not provide these studies or references to these studies. In any case, there is no evidence of DU in the study area.

Support commentary on pages 3-5 of letter.
We will not respond to these comments as they are informative or speculative in nature.

Potential sample problems because of organic material, and use of ICP-MS and alpha spectrometry methods.
The samples were sieved in the laboratory through a 2 mm sieve. This is standard procedure for any chemical analyses in the soil matrix and especially relevant when analyzing for metals. The reason samples are sieved to 2 mm is multifactoral:

1) Provides a more homogenous soil matrix
2) Provide a more conservative estimate of metal concentrations as the sieved matrix has a higher surface area to mass ratio than an unsieved sample. This is highly relevant to the analysis of uranium and other metals as it is well known that metals are generally particulate bound.
3) Removes unwanted debris, like grasses, rocks, etc.

You do not provide reference to any other technique or laboratory method that would be more effective at uranium isotope analysis other than that provided by AMEC. Therefore, we cannot respond to the portion of the comment regarding technique or method.

Specific laboratory standard operating procedures for the ICP-MS and Alpha Spectrometry methods are provided in AMEC's *Sampling and Analysis Plan, Depleted Uranium Risk Assessment*, dated March 2008. Additionally, dilution factors are provided in the laboratory analytical reports provided in Appendix A (Analytical Sampling Results) of the *Saddle Road Uranium Soils Investigation and Baseline Human Health Risk Assessment Report* (AMEC, October 2009).

AMEC provided the laboratory with approximately one kilogram of soil for each sample. The samples were provided in resealable plastic Ziplock bags (double-bagged) and maintained at 0-6 degrees Centigrade from the time of sample collection until analysis.

The laboratory dilution process is defined in the laboratory SOPs provided in the AMEC Sampling and Analysis Plan. According to the laboratory reports included in Appendix A of the Risk Assessment Report, soil sample extracts were not diluted for any of the alpha spectrometry analyses or any of the isotopic uranium analyses via ICP-MS. Soil sample extracts were diluted 2.5 times for lead analyses via ICP-MS.

Range of activity ratios of ^{234}Th to ^{238}U is being improperly applied in interpreting the results of soil analysis for depleted uranium.
We do not agree with your evaluation. The reference document cited by you (and AMEC) specifically states:

"The natural composition of uranium is characterized by $^{234}U/^{238}U$ and $^{235}U/^{238}U$ activity ratios of about 1 and 0.046 respectively. In particular, $^{234}U/^{238}U$ activity ratios in soil typically range from 0.5 to 1.2. Depleted uranium has lower $^{234}U/^{238}U$ and $^{235}U/^{238}U$ activity ratios; considering an isotopic abundance of 0.2% for ^{235}U, these ratios become 0.18 and 0.013 respectively."

Contrary to your comment, ^{234}Th is not discussed anywhere in this reference document. Instead, the author is referring to ^{234}U. AMEC has used this reference document to identify the typical range of $^{234}U/^{238}U$ activity ratios in soil that are representative of natural uranium. DU is typically characterized by $^{234}U/^{238}U$ activity ratios of approximately 0.18, which is well below the ratios measured from soil samples collected at the Site.

234-thorium is also removed during a uranium isotope extraction process and the ratio would also be less than one....leading to misinterpretation of soil analyses.
We do does not agree with this comment. Activity ratios presented in AMEC's risk assessment report are calculated by dividing the alpha radiation activity in ^{234}U by the alpha radiation activity in ^{238}U. ^{234}Th activity is not considered in this calculation and does not have any bearing in differentiating natural and depleted uranium sources.

Soil samples collected from gullies or swales where water had moved some soil.
This is an inaccurate and unfounded statement. None of the five soil sampling locations were situated in areas that appeared to be surface water drainage pathways.

AMEC identified soil sampling locations based on the proposed alignment of the new roadway. Five separate sample locations were evenly distributed (spatially) along the proposed roadway alignment, which is in a predominantly downwind direction from PTA. The primary mode of DU contamination (if any) is assumed to result from aerial deposition of wind-blown dust particles. Consequently, AMEC restricted soil sample collection from only the top two inches of surface soil, in accordance with ASTM Method C998-05 (Surface Soil Sampling for Radionuclides).

AMEC risk assessment using an average of the $^{234}U/^{238}U$ activity ratios is an improper application as it tends to hide the anomalies that can be outliers from the normal data range.
This comment is invalid for the application of the sample results to evaluate human health risk at the site. The risk to humans is evaluated based on contaminant concentrations and assumed exposure to the contamination. Construction workers and recreational users of the future roadway will not be exposed to a single sample area for any significant period of time. Instead, it is reasonable to assume that receptors will be exposed to the contaminants along the entire roadway for approximately even durations. Therefore, when evaluating human health risk, it is a valid assumption that receptors will be exposed to the average contaminant concentrations along the entire roadway.

Furthermore, the example you provided is not relevant. The maximum concentration presented in your example is nearly 10 times greater than the rest of the sample set, which is not at all representative of the of the actual data set obtained by AMEC.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

56

HOUSE OF REPRESENTATIVES

STATE OF HAWAII
STATE CAPITOL
HONOLULU, HAWAII 96813

January 6, 2010

Mr. Ken Tatsuguchi
State of Hawaii, Dept. of Transportation
Highways Div., Planning Branch
869 Punchbowl St. #301
Honolulu, HI 96813

Re: Saddle Road, Mamalahoa Highway to Milepost 41
Island of Hawaii, Draft Supplement Environmental Impact Statement

Dear Mr. Tatsuguchi,

Mahalo for allowing me to provide comments on the Draft SEIS. At this time, I have no comment to provide.

Sincerely,

Faye Hanohano

Representative Faye P. Hanohano
House Representative, District 4

U.S. Department
of Transportation
Federal Highway
Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Representative Faye Hanohano, District 4
State Capitol
Honolulu HI 96813

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Representative Hanohano:

We are in receipt of your letter regarding the Saddle Road Improvement Project. Thank you for your review of the Draft SEIS and the statement that you have no comments at this time.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

57

LINDA LINGLE
GOVERNOR

RUSS K. SAITO
COMPTROLLER

SANDRA L. YAHIRO
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P.O. BOX 119, HONOLULU, HAWAII 96810-0119

(P1000.0)

HIGHWAYS DIVISION
PLANNING BRANCH

'10 JAN -8 A10 :30

RECEIVED
STATE DEPARTMENT
OF TRANSPORTATION

JAN - 5 2010

MEMORANDUM

TO: Mr. Ken Tatsuguchi
Department of Transportation, Highways Division

FROM: Ernest Y.W. Lau
Public Works Administrator

Subject: Draft Supplemental Environmental Impact Statement
Saddle Road, Mamalahoa Highway to Milepost 41
Island of Hawaii

Thank you for the opportunity to provide comments for the subject project. The proposed project does not impact any of the Department of Accounting and General Services' projects or existing facilities, and we have no comments to offer at this time.

If you have any questions regarding the above, please have your staff call Mr. David DePonte of the Planning Branch at 586-0492.

DD: lnn
c: Ms.Katherine Kealoha, DOH OEQC
DAGS-HDO

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Ernest Lau
Public Works Administrator
State of Hawaii
Department of Accounting and General Services
PO Box 119
Honolulu HI 96810-0119

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Mr. Lau:

We are in receipt of your letter regarding the Saddle Road Improvement Project. Thank you for your review of the Draft SEIS and the statement that you have no comments at this time.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Joel Tuck
Hawaiian Beaches

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Mr. Tuck:

Thank you for the comments you provided at the Hilo hearing in support of construction of the project. Regarding your comments on the rental agencies, some rental agencies have already lifted restrictions and it is expected that most will after completion of Section I.

Please note that although we could not locate a mailing address for you, this letter will be reproduced in the Final EIS. If this letter comes to your attention, , please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov if you have any any questions regarding this project.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Hugh Ono
hono@ssfm.com

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear ~~Mr. Ono~~ Hugh:

Thank you for the comments you provided at the Hilo hearing in support of construction of the project.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Claudia Wilcox Boucher, Instructor
Hawai'i Community College
200 W. Kawili Street
Hilo HI 96720

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Ms. Boucher:

Thank you for the comments you provided at the Hilo hearing in support of construction of the project.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Kaulana H.R. Park
Chairman, Hawaiian Homes Commission
Dept. of Hawaiian Home Lands
P.O. Box 1879
Honolulu, HI 96805

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Mr. Park:

Thank you for the comments you provided at the Hilo hearing, read by Mr. Bill Davis, in support of construction of the project, and also for the information regarding the potential of the improved Saddle Road to assist in the DHHL's Aina Mauka Legacy Program at Humu'ula and Pi'ihonua Mauka.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon, P.E.
Project Manager

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Emily Naeole-Beason
Vice-chairwoman, Hawai'I County Council
15-2237 Kaohuwalu Street
Pahoa, HI 96778

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Ms. Naeole-Beason:

Thank you for the comments you provided at the Hilo hearing in support of construction of the project, including the information on how the project will save time and wear and tear on your car during your professional travel.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Shalan Crysdale
The Nature Conservancy
P.O. Box 11
Naalehu, HI 96772

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Ms. Crysdale:

Thank you for the comments you provided at the Hilo hearing in which you stated that the W-7 avoids the deepest gulches in the area. Concerning the travel of feral animals across Ke'āmuku and their potential impact on highway safety, FHWA and HDOT are working with the Army and DLNR to determine potential solutions to help minimize this, in the location, type and funding for potential fencing of the area for training and environmental remediation.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Sharon Hettema
360 Kauila St., Apt. 110
Hilo, HI 96720

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Ms. Hettema:

Thank you for the comments you provided at the Hilo hearing. Regarding your specific question on depleted uranium :
(DU), testing of the air has been conducted by both the Army and DOH. For the Army testing, monthly reports on air quality monitoring that began in February 2009 at Pohakuloa Training Area (PTA) (see http://www.imcom.pac.army.mil/du/Reports.htm) have consistently shown that the total uranium mass found on most filters in above the laboratory's latest determined instrument detection level (IDL) but below the practical reporting level (PRL) of 0.00025 microgram (µg). The fact that most total uranium values continue to be less than the PRL remains significant from a public health perspective. At a nominal sampler flow rate of 5 lpm, the laboratory's PRL of 0.00025 microgram (µg) corresponds to an airborne uranium concentration of 0.000035 µg/m3, a value several orders of magnitude below health effects guidelines. Uranium isotopes 234-U and 235-U have been undetectable.

If DU were present in the air in the W-7 area, it would likely be deposited over time and would almost certainly be detected in soil samples. This information has been added to the Final SEIS.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon, P.E.
Project Manager

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Galen Kelly
P.O. Box 6121
Hilo, HI 96720

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Ms. Kelly:

Thank you for the comments you provided at the Hilo hearing. Regarding your specific questions:

High readings from Geiger counters
Our experts on radiation do not concur that handheld Geiger counters are usually reliable monitors of the presence or absence of DU without considerable training and rigorous methods.

DU on returning Strykers
PTA officials have informed us that all vehicles are steam cleaned prior to departing the overseas deployment areas and are then shipped to Ft. Lewis in Washington where they are stripped of all running gear (engine, transmission, wheels, suspension, etc.) and weapons systems, sandblasted and repainted in and out, then reassembled. During that process they are "frisked" with radiac meters to make sure no radiation is being transported. They are essentially new when they return to Hawai'i. Also, please note that since W-7 better separates civilian traffic from military training, this alignment will minimize any potential conflicts with military vehicles.

Too few Native Hawiians in attendance
We acknowledge your concern.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Jim Albertini
P.O. Box AB
Kurtistown, HI 96760

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Mr. Albertini:

Thank you for the comments you provided at the Hilo hearing. FHWA and HDOT agree that a multimodal transportation approach is important. In the case of cross-island transportation in Hawai'i County, highways will continue to provide the best service to the most people at the lowest prices for the foreseeable future, even with rising energy prices. We would note that motor vehicles do not necessarily require fossil fuels, and that advances in hydrogen, biomass, electric cars and as-yet unknown technologies may completely transform the energy source for motor vehicles in the future. Construction of the new Saddle Road will not prevent the implementation of other modes of transportation in the future, and may in fact assist toward that end by setting aside a cross-island transportation corridor now rather than trying to do so at a future point in time when it might be more difficult for political, social, environmental or economic reasons.

Regarding handheld Geiger counters, our experts on radiation do not concur that handheld Geiger counters are usually reliable monitors of the presence or absence of DU without considerable training and rigorous methods. Systematic tests of air and soil have not shown the contamination you indicate.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Dean Au
Hawai'i Carpenters Union
Local 745
525 Kilauea Ave., Room 205
Hilo, HI 96720

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Mr. Au:

Thank you for the comments you provided at the Hilo hearing in support of construction of the project, including the information on how the project will allow carpenters and construction companies to better access work around the island, as well as spend more time with their families.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon, P.E.
Project Manager

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Mary Begier
Hawai'i Island Chamber of Commerce
101 Aupuni St., Suite 315
Hilo, HI 96720

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Ms. Begier:

Thank you for the comments you provided at the Hilo hearing in support of construction of the project, including the information that it will assist in both reducing accidents and increasing safety when citizens assist other motorists.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Michael Cadaoas
P.O. Box 908
Kurtistown, HI 96760

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Mr. Cadaoas:

Thank you for the comments you provided at the Hilo hearing in support of construction of the project, including the assessment that the project is long overdue.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon, P.E.
Project Manager

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Deborah Ward
P.O. Box 918
Kurtistown, HI 96760

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Ms. Ward:

Thank you for the comments you provided at the Hilo hearing. The clearing of broad areas is necessary to provide clear zones for safety when errant vehicles leave the roadway during accidents. We acknowledge the weed problem and share your concerns. Once the highway has been turned over to the State of Hawai'i, DOT maintenance of vegetation in the clear zone areas will begin. DOT will consult with the Department of Land and Natural Resources and the Department of the Army concerning control of noxious weeds.

We acknowledge your statement about potential health risks for some PTA workers and contractors possibly exposed to DU. It is our understanding that the Army is working to determine whether there is a current or future risk of exposure and to minimize or eliminate this risk. We do not currently see any radiation risk from traveling or working on Saddle Road.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon, P.E.
Project Manager

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Joseph Kuali'i Camara
192 Kualua Place
Hilo, HI 96720

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Mr. Camara:

Thank you for the comments you provided at the Hilo hearing stating that the project will be good for working people who need to travel from one side of the island to the other.

Regarding your concerns:

Wide road and large embankments inundated with weeds.
The clearing of broad areas is necessary to provide to provide adequate clear zones for safety when errant vehicles leave the roadway during accidents. We would note that there are various military, hunting, and ranching roads that traverse the general area and already contain most of the weeds that have become a problem on the side of the road. However, we acknowledge the weed problem and share your concerns. Once the highway has been turned over to the State of Hawai'i, DOT maintenance of vegetation in the clear zone areas will begin. DOT will consult with the Department of Land and Natural Resources and the Department of the Army concerning control of noxious weeds.

Returning Stryker vehicles
Regarding the Stryker vehicles, the Army reports that they along with all other equipment are thoroughly cleaned before returning to the United States. PTA officials have informed us that all vehicles are steam cleaned prior to departing the overseas deployment areas and are then shipped to Ft. Lewis in Washington where they are stripped of all running gear (engine, transmission, wheels, suspension, etc.) and weapons systems, sandblasted and repainted in and out, then reassembled. They are essentially new when they return to Hawai'i, and there is very little chance for them to be vectors for new weeds.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3647 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Christian Rygh
P.O. Box 10922
Hilo HI 96721

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Mr. Rygh:

Thank you for the comments you provided at the Hilo hearing, including your views on the relative risk of DU exposure.

Regarding your concerns about invasive species, the clearing of broad areas is necessary to provide adequate clear zones for safety when errant vehicles leave the roadway during accidents. We acknowledge the weed problem and share your concerns. Once the highway has been turned over to the State of Hawai'i, DOT maintenance of vegetation in the clear zone areas will begin. DOT will consult with the Department of Land and Natural Resources and the Department of the Army concerning control of noxious weeds. With regard to the concerns you later shared with one of our consultants about the spread into more pristine areas such as Kipuka Kalawamauna, Pu'u Anahulu, and Pu'u Wa'awa'a, we would note that there are various military, hunting, and ranching roads that traverse these areas and already contain most of the weeds that have become a problem on the side of the road. Nevertheless, we take the problem seriously and are working to address it.

Regarding wildfires, the highway will indeed present an additional area for potential ignition of wildfires. The project has involved coordination among highway agencies and firefighters at PTA and DOFAW to determine the best design and mitigation measures for preventing and fighting fire. This coordination will continue as the road becomes operational. Thank you for your assessment based on personal experience on the lands that the road will be a great new firefighting tool.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3647 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Rodney Watanabe
13-5611 Olowalu Street
Kailua-Kona, HI 06740

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Mr. Watanabe:

Thank you for the comments you provided at the Kona hearing in support of the project stating that the project will benefit the economy and will provide a safe route for people to visit family on the other side of the island.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Mel Ventura
P.O. Box 2045
Kailua-Kona, HI 96745

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Mr. Ventura:

Thank you for the comments you provided at the Kona hearing in support of the project stating that the road in its current state is not utilized fully and that the project will help integrate the island community.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Arnold Kanai
73-5611 Olowalu Street
Kailua-Kona, HI 96740

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Mr. Kanai:

Thank you for the comments you provided at the Kona hearing in support of the project stating from personal experience that the road in its current state is difficult to travel for the elderly and sickly from Kona who need to seek medical attention in Hilo.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon, P.E.
Project Manager

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Ken Melrose
P.O. Box 109
Kealakekua, HI 96750

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Mr. Melrose:

Thank you for the comments you provided at the Kona hearing in support of the project stating that the project has made the road safe and scenic, along with your hope that all rental cars may soon be allowed on Saddle Road.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

John Parazette
P.O. Box 9021
Kailua-Kona, HI 96745

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Mr. Parazette:

Thank you for the comments you provided at the Kona hearing in support of the project. Regarding your concern about the double-yellow line, centerline striping is based on national guidelines contained in the AASHTO green book which sets standards and guidelines for highway design, including pass and no pass zones. While it may appear to the motoring public that double yellow lines (i.e., no pass zones) are excessive in some locations, they are determined on the basis of an engineering analysis that takes into account the roadway design speed, horizontal and vertical alignments, roadside obstacles, and stopping sight distances.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Diane Quitiquit
75-5591 Hienalali Road #11
Kailua-Kona, HI 96740

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Ms. Quitiquit:

Thank you for the comments you provided at the Kona hearing in support of the project stating that the project will improve the economy, increase safety, and help build the island community.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon, P.E.
Project Manager

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Representative Denny Coffman
Hawai'i House of Representatives
77-258 Ho'oka'ana Street
Kailua-Kona, HI 96740

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Representative Coffman:

Thank you for the comments you provided at the Kona hearing in support of the project stating that you and your constituents see the road as a great benefit to safety and the economy.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

U.S. Department
of Transportation
**Federal Highway
Administration**

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Michael Matsukawa
75-5751 Kuakini Highway
Kailua-Kona, HI 96740

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Mr. Matsukawa:

Thank you for the comments you provided at the Kona hearing expressing your support for the project and referencing a decision by Judge King on the State of Hawai'i versus The Nature Conservancy, Yee Hop, Limited, The United States of America; et al., Defendants, and Steve's Ag Services, Ltd., et al., Defendants-Intervenors case (Civil No. 07-00516 SPK-LEK) **2009 Westlaw 3415303 (D.Hawai'i)**. We reviewed the decision in the case, and after having determined that it applies to title involving certain historic land awards in the State of Hawai'i, we have forwarded the decision to the Army for their information.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Walter Kunitake
Saddle Road Task Force
76-5861A Mamalahoa Hwy.
Holualoa, HI 96725

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Walter
Dear Mr. ~~Kunitake~~:

Thank you for the comments you provided at the Kona hearing in support of the project and providing information for the record on the Saddle Road Task Force involvement with the project.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Norman Kaimuloa
Hawai'i Carpenters Union
78-7108B Kamehameha III Rd.
Kailua-Kona, HI 96740

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Mr. Kaimuloa:

Thank you for the comments you provided at the Kona hearing in support of the project recalling the condition of the road thirty years ago and stating that the project will be a benefit to the carpenters union and its members.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Vivian Landrum
Kona-Kohala Chamber of Commerce
75-5737 Kuakini Highway
Suite 208
Kailua-Kona, HI 96740

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Ms. Landrum:

Thank you for the comments you provided at the Kona hearing in support of the project stating that the project will benefit tourism and other businesses and expand the opportunities to buy local and take advantage of educational opportunities on both sides of the island. Thank you also for illustrating the need for increased safety based on your personal experience of the road in its present condition.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

U.S. Department
of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Robert Meierdiercks
Hawai'i Carpenters Union
75-126 Lunapule Road
Kailua-Kona, HI 96740

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Mr. Meierdiercks:

Thank you for the comments you provided at the Kona hearing in support of the project stating that the project will be a benefit to union carpenters by allowing more opportunities to safely travel for work on both sides of the island.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

U.S. Department
of Transportation
**Federal Highway
Administration**

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

James Boyle
73-4550 Mamalahoa Hwy.
Kailua-Kona, HI 96740

Subject: Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i

Dear Mr. Boyle:

Thank you for the comments you provided at the Kona hearing in support of the project and comparing the benefits of the improved portions to the unimproved portions.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawaii 96850

TAKE PRIDE IN AMERICA

In Reply Refer To:
2010-F-0040

JAN 29 2010

Rick Suarez, P.E.
Division Engineer
Federal Highway Administration
Central Federal Lands Highway Division
12300 West Dakota Avenue, Suite 340
Lakewood, Colorado 80228

Subject: Reinitiation of Section 7 Consultation for the West Side W-7 Alignment, Saddle Road (State Route 200) Improvement Project between Mamalahoa Highway (State Route 190) to Milepost 6, Hawaii

Dear Mr. Suarez:

This Biological Opinion responds to your request for reinitiation of the 1998 Biological Opinion for the Saddle Road Realignment and Improvement Project (1-2-98-F-0l (kwr)) (1998 Saddle Road Biological Opinion) with the U.S. Fish and Wildlife Service (Service) pursuant to the Endangered Species Act of 1973, as amended (Act). Consultation was reinitiated with the Federal Highway Administration (FHWA) on January 8, 2010, to address modifications to the 1998 Saddle Road Biological Opinion. In this Biological Opinion, we address impacts from this project that may adversely affect the endangered plant *Haplostachys haplostachya* (honohono). The 1998 Biological Opinion addressed impacts of realigning and improving Saddle Road on the endangered bird palila (*Loxioides bailleui*), palila critical habitat, and the threatened plant species *Silene hawaiiensis,* in accordance with section 7(a)(2) of the Act.

Reinitiation of the 1998 Biological Opinion is necessary, pursuant to 50 CFR §402.16, as new information reveals modifications of the project may affect listed species in a manner or to an extent not considered in the original opinion. A Final Environmental Impact Statement (EIS) and Record of Decision (ROD) for the Saddle Road improvements were completed in 1999. As part of the EIS process, twelve action alternatives incorporating use of the existing alignment and potential new alignments were considered. The project was divided into four different sections (Sections I, II, III, and IV) for purposes of alternative development and selection, as well as project scheduling (Figure 1). In the intervening years since the release of the EIS, the Department of the Army has purchased a large section of land in the Keamuku area from Parker Ranch. The W-3 alignment (Section I) roughly passes though the middle of the Keamuku Parcel.

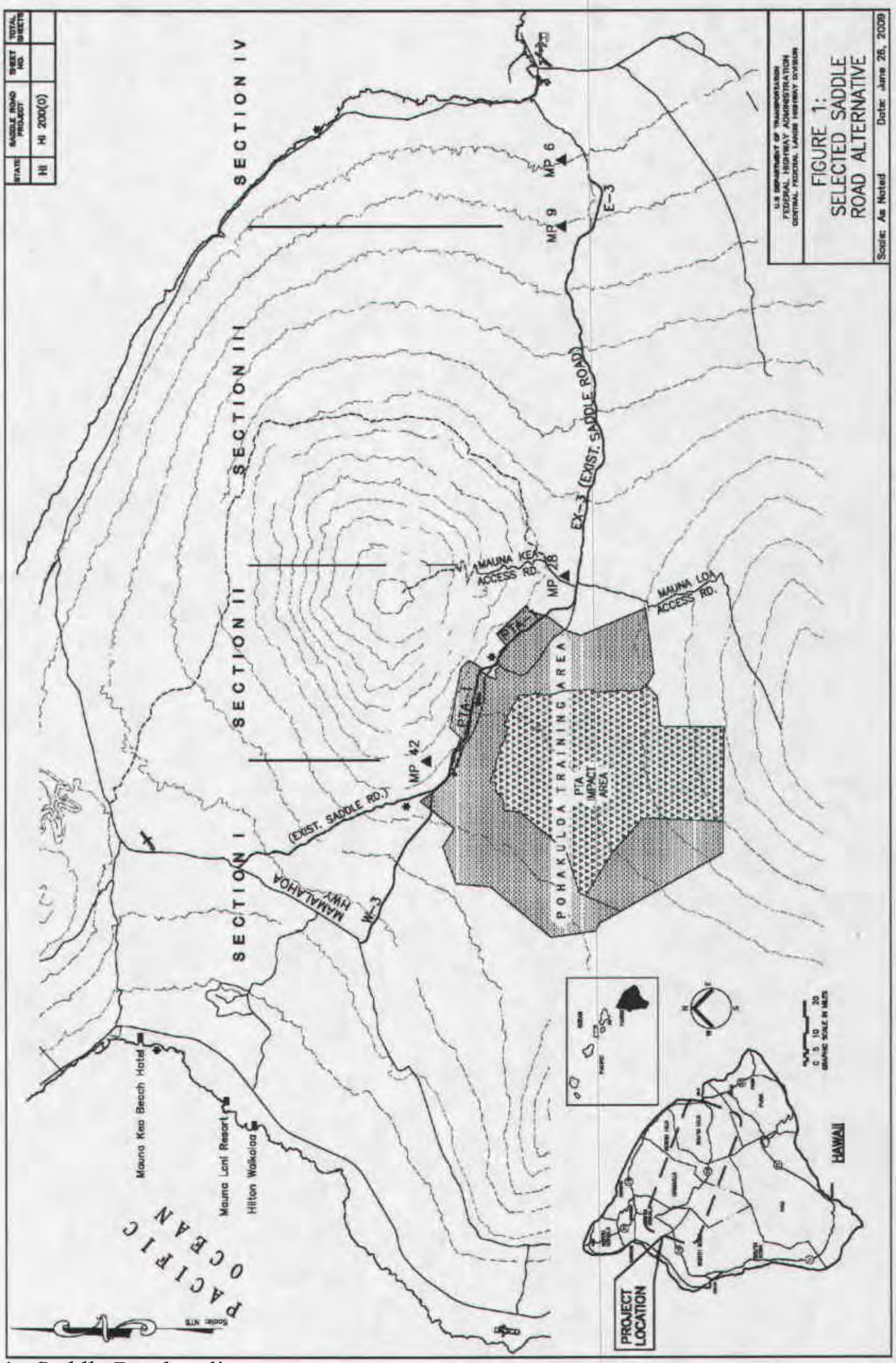


Figure 1. Saddle Road realignment.

This alignment does not fulfill one of the key purposes and needs of the proposed improvement project, namely separation of military training activity from the general driving public using the Saddle Road. Another alignment, W-7, has been proposed and studied to fulfill the need to separate civilian traffic from military training activities (Figure 2). A Supplemental Environmental Impact Statement (SEIS) was prepared to address this new alignment. This reinitiation covers FHWA actions associated with the construction of the realigned and improved Saddle Road between Mamalahoa Highway (State Route 190) to Milepost (MP) 6.

All other information within the 1998 Biological Opinion and the 2009 Reinitiation (Service file 2009-F-0314) remains in effect, except for the new actions described above. The findings and recommendations in this reinitiation are based on the following:

1. The above referenced 1998 Biological Opinion;
2. Final Environmental Impact Statement, Saddle Road (State Road 200) Mamalahoa Highway (State Route 190) to MP 6, County of Hawaii, State of Hawaii, FHWA Project No. A-AD-6(1) (1999);
3. U. S. Department of Transportation, Federal Highway Administration, Record of Decision, Saddle Road (State Road 200) Mamalahoa Highway (State Route 190) to MP 6, County of Hawaii, State of Hawaii (1999);
4. The FHWA request for reinitiation of section 7 consultation for the West Side W-7 Alignment (2009);
5. Meetings, a site visit, reports, electronic mail (email), phone calls (see Consultation History); and
6. Other information in our files.

A complete administrative record of this consultation is on file at the Service's Pacific Islands Fish and Wildlife Office.

The overall Saddle Road Realignment and Improvement Project extends from Mamalahoa Highway (State Route 190) to MP 6 (see Figure 1). The limits of the W-7 alignment extend from MP 42 located just to the east of the Department of the Army's Pohakuloa Training Area's (PTA) Keamuku Parcel eastern boundary to the project's western terminus along Mamalahoa Highway (State Route 190) (see Figure 1). The alignment is roughly 10.3 miles (mi) (16.6 kilometers (km) long, with approximately 8.9 mi (14.3 km) of the route located within TMK: 6-7-001:041(the Keamuku Parcel) and the remaining 1.4 miles of the alignment going through a portion of the main PTA training area (see Figure 2).

CONSULTATION HISTORY

August 27, 2009: Steve Hallisy (FHWA), Dave Gedeon (FHWA), Melissa Dickard (FHWA), Reginald David (FHWA consultant), Patrice Ashfield (Service) and Jeff Zimpfer (Service) met to discuss the new W-7 alignment, view maps, and discuss the findings of the biological surveys that were completed as part of the National Environmental Policy Act (NEPA) process for this new alignment.

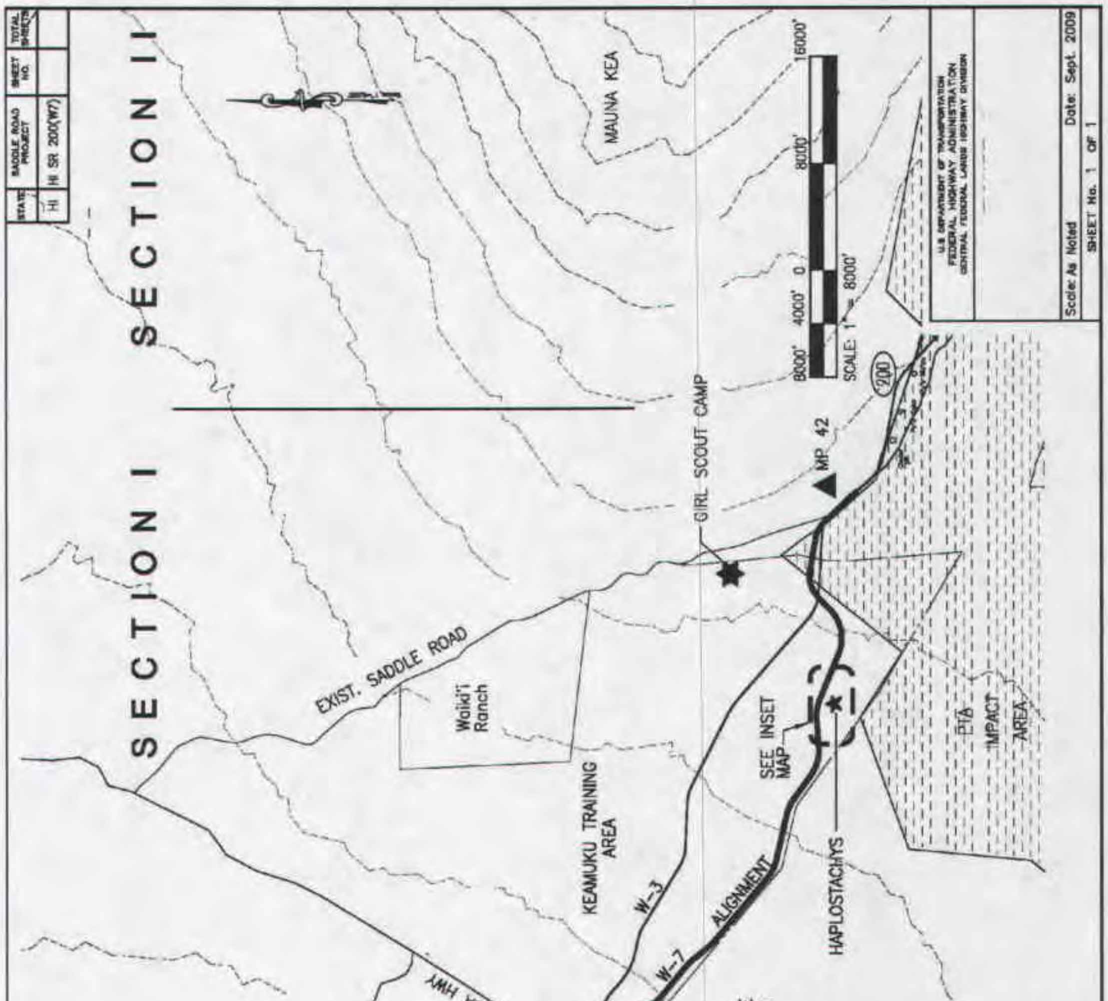


Figure 2. W-7 alignment.

September 11, 2009: The Service completed our consultation titled Reinitiation Saddle Road Realignment and Improvement Project Section 7 Consultation for Saddle Road (State Route 200) Improvement Project: the East Side, MP 6-42, Hawaii.

October 15, 2009: Melissa Dickard (FHWA), Reginald David (FHWA consultant) and Jeff Zimpfer (Service) met again to discuss the section 7 consultation. The FHWA informed the Service that based on the conservation measures in this document, they had determined that the proposed action is not likely to adversely affect Blackburn's sphinx's moth (*Manduca blackburni*), Hawaiian goose (*Branta sandvicensis*), Hawaiian hawk (*Buteo solitarius*), Hawaiian petrel (*Pterodroma sandwichensis*), Newell's shearwater (*Puffinus auricularis newelli*), Hawaiian hoary bat (*Lasiurus cinereus semotus*), and *Haplostachys haplostachya*. FHWA informed the Service they would be requesting our concurrence with their determination.

November 4, 2009: The Service received a request from FHWA for concurrence on their determination that the proposed West side W-7 alignment was not likely to adversely affect listed species.

November 13, 2009: Jeff Zimpfer (Service) and Lena Schnell (Natural Resource Coordinator for Pohakuloa Training Area), participated in a site visit to the *Haplostachys haplostachya* population in the Army's Keamuku Parcel that occurs near the proposed W-7 alignment. The site visit resulted in finding seven plants along a 300-foot (ft) (100-meter (m)) transect through a portion of the *H. haplostachya* population. The site is heavily dominated by fountain grass (*Pennisetum setaceum*). Based on the findings during the site visit, the Service recommended FHWA enter into formal consultation for potential adverse affects to the plant from wildfire.

January 8, 2010: FHWA requested formal consultation on the West Side Saddle Road Improvement Project for potential impacts to *Haplostachys haplostachya*.

SPECIES CONCURRENCE STATEMENT

As described in the above consultation history, FHWA has determined that the above proposed project is not likely to adversely affect Blackburn's sphinx's moth, Hawaiian goose, Hawaiian hawk, Hawaiian petrel, Newell's shearwater, and Hawaiian hoary bat. Biological surveys for the host plants of the Blackburn's sphinx moth were not detected in the proposed right-of-way for the project. Based on the lack of available habitat or the presence of Blackburn's sphinx moth in the action area, we concur with your determination that the proposed project may affect, but is not likely to adversely affect, the Blackburn's sphinx moth.

Although not detected during the course of the biological surveys for this project, a few Hawaiian geese have been recorded within the Keamuku Parcel in the recent past (David 1996, Lena Schnell, personal communication 2009). Hawaiian geese nest at the Big Island Country Club and at Puuwaawaa, which are located 7 and 10 mi (11 and 16 km) respectively south of the southwestern terminus of the W-7 alignment. Since Hawaiian geese are not known to occur within the action area, we concur with your determination that the proposed project may affect, but is not likely to adversely affect, the Hawaiian goose.

Hawaiian hawks are not known to occur in the Keamuku area and no suitable nest trees are within, or close to, the W-7 alignment. Based on the lack of suitable nesting trees for Hawaiian hawks, the Service concurs with your determination this proposed project may affect, but is not likely to adversely affect the Hawaiian hawk.

Because the known distribution of nesting colonies of listed Hawaiian petrels on the island of Hawaii is on the southwest flanks of Mauna Loa, and known breeding colonies of Newell's shearwaters occur in East Hawaii, it is unlikely large numbers of listed seabirds will transit the project area. This, combined with the implementation of the conservation measures listed below, we concur with your determination that this proposed project may affect, but is not likely to adversely affect the Hawaiian petrel or Newell's shearwater.

As described in the Action Area Description above, habitat within the right-of-way consists of low-statured vegetation and is not suitable Hawaiian hoary bat roosting habitat. Based on the lack of suitable habitat, the Service concurs with your determination this proposed project may affect, but is not likely to adversely affect the Hawaiian hoary bat.

Biological Opinion

Summary of the 1998 Project Description

Saddle Road, which was built in 1942, is a narrow, winding, two-lane road with steep grades, sharp curves, poor pavement, and substandard drainage. This is the only paved road serving PTA, the Mauna Kea telescope complex, Waikii Ranch, upper Kaumana, Mauna Kea State Recreation Area, Kilohana Girl Scout Camp and several major hunting areas. It is also an important cross-island link for business travel, the transport of goods and services, tourism, recreation, shopping, and commuting. Military traffic on Saddle Road going to and from PTA involves transportation of ammunition, water, training equipment and troops.

The FHWA Saddle Road improvements include upgrading and modernizing approximately 48 mi (78 km) of the road, from the Mamalahoa Highway (State Road 190) to MP 6, near Hilo, Hawaii (see Figure 1). The purpose of the Saddle Road Improvement Project is to provide a safe and efficient route for travel between east and west Hawaii. The proposed improvements will address five general types of needs: roadway deficiencies, conflicts with and hazards of military training operations, capacity, safety, social demand and economic development. Upon completion, the improved 48-mile long Saddle Road will meet the American Association of State Highway and Transportation Officials design standards for rural arterials and provide adequate capacity to handle anticipated traffic volumes for the next 20 years. The FHWA estimates that the Average Daily Traffic (ADT) on Saddle Road in 1994 was 900 vehicles. By the year 2014, in its present condition, Saddle Road is expected to accommodate an ADT of 4,400 vehicles. Projected figures, based on increased usage associated with commuter traffic, residential development at both ends of the road, tourism and recreation, agriculture, military operations, the Mauna Kea telescope complex, and increasing congestion along alternative cross-island routes, estimate that Saddle Road will need to accommodate an ADT of 14,000 vehicles in the year 2014.

An EIS and ROD for the Saddle Road improvements were completed in 1999. Construction of the entire 48 mi (77 km) project is being phased; the first phase from MP 19 to 42 (Section II plus a portion of Section III (see Figure 1)) is nearing completion. The next construction project will improve Saddle Road between MP 11 and 19. The scheduling of the remaining construction phases is dependent on the future appropriation of Federal funding. A full description of the project's background, purpose and need, and specific design characteristics is contained in the Executive Summary of the Final EIS (FHWA 1999). The Service's 1998 Biological Opinion also contains a complete description of the project and evaluation of impacts to listed species and critical habitat. For the portion of the project addressed in this consultation, we evaluate the impacts to listed species that will result from the proposed changes from the original alignment. The proposed roadway engineering and construction activities remain the same as do the conservation measures developed in our 1998 Biological Opinion. In addition to direct actions related to the actual construction of the road, FHWA committed to conservation measures as part of their project description in the 1998 Saddle Road Biological Opinion. These measures include lighting restrictions, minimization of increased fire threat, enhancement activities for endangered and threatened plants, minimizing the spread of invasive alien species, offsetting loss of palila critical habitat and avoiding impacts to the Hawaiian hawk.

2009 Project Description

Since the Service issued its original Biological Opinion for the Saddle Road project in 1998, the Department of the Army has purchased a large section of land in the Keamuku area from Parker Ranch. The originally selected alignment (W-3, in Section I) bisected this parcel and thus no longer met one of the key needs of the proposed improvement project, namely the separation of military training activity from the general driving public using the Saddle Road. The W-7 alignment has been proposed as the preferred alignment (see Figure 2).

Site Description

FHWA Proposed Road Improvements
The W-7 alignment gently slopes from east to west, from an elevation of approximately 5,800 ft (1,800 m) above mean sea level (MSL) along the existing Saddle Road down slope to where it will intersect the existing Mamalahoa Highway at approximately 2,500 ft (750 m) MSL. The alignment is roughly 10.3 mi (16.6 km) long, with approximately 8.9 mi (14.3 km) of the route located within TMK 6-7-001:041, and the remaining 1.4 mi (2.25 km) of the alignment going through a portion of the main PTA training area (see Figure 2).

FHWA is proposing to build a two-lane hot asphalt concrete paved roadbed, two 12-ft (3.66-m) travel lanes with two 8-ft (2.4-m) paved shoulders, and a 6-ft (1.8-m) wide ditch in locations where the new roadway will be cut. Because of the grades, an uphill passing lane will be provided for most of the length of W-7, as it passes through the Keamuku Parcel and is illustrated as Typical Section A (Figure 3). The road will be designed to accommodate 60 MPH (96.5 KPH) traffic speeds with a minimum curve radius of 230-m (754 ft), an 8 percent maximum super elevation, simple curves with 67 percent of runoff on tangent, and an 8 percent maximum grade.

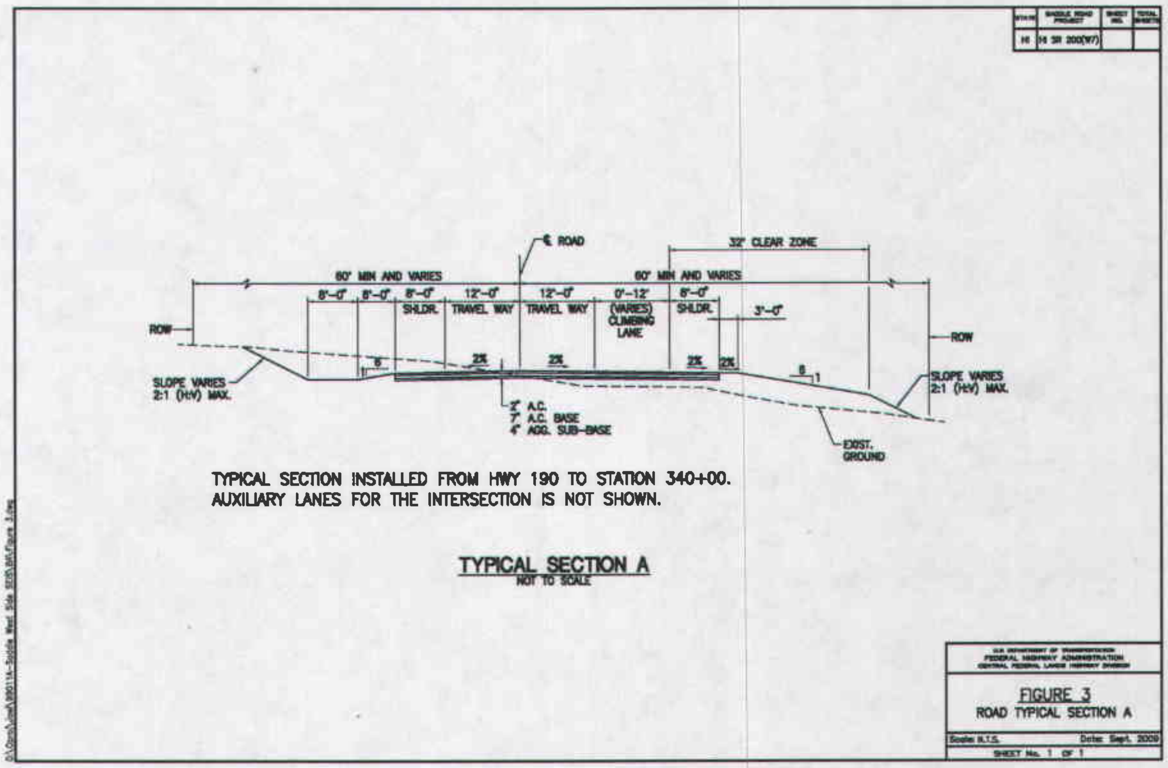


Figure 3. Typical section.

The project area is on the west-facing slope of Mauna Kea, on the leeward side of the island. Annual rainfall is approximately 20 inches (in) (50 centimeters (cm)) a year, with the upper reaches somewhat drier. The terrain along the alignment is composed of a mix of aa and pahoehoe lava flows disgorged from Mauna Kea between 14,000 and 65,000 years ago during the Pleistocene Age. Additionally there are surficial alluvial deposits in many areas, which were washed down from Mauna Kea at the end of the last ice age. Along the southern boundary of the area several small fingers of aa from the Keamuku flow, deposited by Mauna Loa between 200 and 750 years ago overlay portions of the older Mauna Kea flows (Sherrod et al. 2007).
The vast majority of the site has been extensively altered by decades of cattle grazing and is now largely a pasture of introduced grasses with scattered shrubs and very few trees. The vegetation between the eastern terminus of the project and approximately the 4,200-ft (1,300-m) elevation is dominated by fountain grass, with sparse amounts of *Dodenea viscosa* (aalili), and numerous other alien grasses and *Senecio madagascariensis* (Madagascar ragwort). At the lower elevations in this section there are also pockets of *Cenchrus ciliaris* (buffelgrasss), *Panicum maximum* (Guinea grass), and *Pennisetum clandestinum* (Kikuyu grass). Between the 4300-ft (1,300-m) and 4,600-ft (1,400-m) elevation, the makeup of the vegetation is similar to that found in the lower section, except that in this zone the native species dominate, with large dense stands of aalili making up to 50 percent of the ground cover. Between the 4,300-ft (1,300-m) elevation and the boundary of the Keamuku Parcel and PTA proper the habitat is similar to those previously described, but with varying densities of the component species, as is to be expected in pastureland that is grazed on a rotational basis. Between approximately the 5,200-ft (1,600-m)

elevation and the eastern terminus of the project, the substrate is markedly different than that found lower on the alignment; this area is made up of alluvial and colluvial sand and gravel deposited by the erosion of Mauna Kea by the melting of the last ice cap. On this substrate the dominate plant is the endemic shrub *Chenopodium oahuense* (aheahea).

The population of *Haplostachys haplostachya* tht occurs within the project site is in an area dominated by fountain grass and other alien vegetation.

Fire Minimization
The proposed W-7 alignment will be entirely located within the U.S. Army training facilities. These training facilities have an extensive fire minimization and mitigation program in place in accordance with the Service's 2003 (2003-F-002) and 2008 (2008-F-278) Biological Opinions for Army actions at PTA and the Keamuku Parcel. The proposed W-7 alignment will create an additional firebreak within the Army's Keamuku Parcel, which will be between 40 and 52 ft (12 and 16 m) wide. This road will also allow very rapid response by PTA and County of Hawaii firefighting personnel in the event that a fire does occur within the general project area. The center of the W-7 alignment is approximately 10 mi (16 km) from the PTA fire station, and approximately the same distance from the County of Hawaii Waikoloa fire station. As the new road will be designed to accommodate 60 MPH (100 KPH) traffic, both fire stations could respond in a very short period of time to any wildfire that might occur within the general project area. These areas would otherwise be extremely difficult to access from the existing Saddle Road, thus result in extremely long response times. Additionally, the Army is currently constructing five firefighting dip tanks within the Keamuku Parcel to provide onsite water to be used to fight any wildfires that may ignite within the general area.

Conservation Measures

The following conservation measures are designed to avoid and minimize effects to Blackburn's sphinx's moth, Hawaiian goose, Hawaiian hawk, Hawaiian petrel, Newell's shearwater, Hawaiian hoary bat and *Haplostachys haplostachya* and are considered part of the project descritption. When used in the context of the Act, "conservation measures" represent actions proposed by the Federal action agency that are intended to further the recovery of and/or minimize or compensate for project effects on the species under review. Because conservation measures are pledged in the Project Description by the action agency, their implementation is required under the terms of the consultation. The project proposes to implement the following measures to ensure that the construction and operation of the proposed W-7 alignment does not result in adverse impacts to listed species.

To reduce the construction related project footprint, FHWA has agreed to measures and or prohibitions that will be included as part of special contract requirements that will be incorporated in the construction contract documents:

1. To minimize damage to natural resources in areas outside of the right of way (ROW), special contract requirements will mandate that all construction activity shall be restricted to within the clearly delineated ROW and that entry and exit into the ROW by all

construction personnel and equipment shall be at previously identified and marked non-sensitive areas.

2. Special contract requirements will be incorporated into the construction documents directing the contractor's work to be consistent with specific minimization commitments that are outlined here and in the 1998 Biological Opinion for the project. The Contract Officer will have the authority to shut down construction should violations of special contract requirements be detected; furthermore, the project engineer will be responsible for ensuring compliance with all environmental restrictions and minimization measures.

3. A comprehensive manual outlining and discussing the environmental commitments contained in the original ROD, 1998 Biological Opinion and special contract requirements will be prepared. This document will be prepared by the FHWA in accordance with their environmental team policy, which ensures that the environmental team closely follows the entire project to its completion.

To avoid impacts to Hawaiian petrels and Newell's shearwater (listed seabirds), FHWA has agreed to the following:

1. If nighttime work is required, all lights will be shielded or directed at the ground to reduce the potential for interactions of nocturnally-flying listed seabirds with lights and man-made structures.

2. No nighttime construction will occur during the peak seabird fallout period, namely between September 15 and December 15, annually.

3. Any streetlights that may be installed as part of this action will be shielded. This minimization measure would serve the dual purpose of minimizing the threat of disorientation and downing of listed seabirds, while at the same time complying with the Hawaii County Code §14 – 50 *et seq,* which requires the shielding of exterior lights so as to lower the ambient glare caused by unshielded lighting to the astronomical observatories located on Mauna Kea.

To reduce the threat of wildfires FHWA has agreed to the following:

1. No smoking will be permitted during construction within the construction site, nor will any fires be permitted within the project corridor.

2. To reduce the potential threat of wildfires being started by careless smokers or drivers driving or parking on grassy verges on the north side of the roadway between mile marker 41 and the eastern boundary of the Keamuku Parcel, an expanded and modified typical section for the roadway will both reduce the likelihood of accidental ignition from unintentional road sources (car fires, catalytic converters, cigarettes, etc.) and assist in creating a firebreak and fuelbreak on the north side of the roadway. This section is illustrated as Typical Section B (Figure 4). This expanded Typical Section will consist of:

a. Two 12-ft (4-m) travel lanes with 8-ft (2.5 m) paved shoulders.
b. An 8-ft (2.5 m) strip of pavement on the north side of the highway with a 4-in (10-cm) high curb on the outside, which will serve as a firebreak.
c. At the outside edge of the firebreak a wire fence with metal posts will be constructed to a height of 4 ft (1.3 m) on the edge of the pavement to discourage off pavement travel by motorists.

3. As the W-7 alignment enters Keamuku and descends towards Mamalahoa Highway, the primary wildfire concern shifts towards preventing fires from Saddle Road spreading southwards, towards the western boundary of the *Haplostachys haplostachya* exclosure. The Typical Section between the Keamuku Parcel boundary towards Mamalahoa Highway is illustrated in Figure 5 as Typical Section C, and would consist of the three 12-ft (3.66 m) travel lanes with a paved 8-ft (2.4 m) shoulder, and a 4-in (10-cm) high-extruded asphalt curb at the outside of the shoulder on the south side of the road. This will create a 52-ft (16 m) wide paved surface that would serve as a firebreak, as well as a curb to protect against thrown cigarette butts or other thrown material and will prevent motorists from driving off of the roadway onto grassy areas.

There are no known or anticipated conflicts between Hawaiian geese and the proposed W-7 alignment. If a conflict arises between vehicles and Hawaiian geese, FHWA has agreed to reinitiate consultation with the Service.

To offset the potential loss of *Haplostachys haplostachya* individuals, FHWA has agreed to contribute $50,000 to Hawaii Volcanoes National Park's (Park) Natural Resources Management Program to sponsor the establishment of three populations *H. haplostachya* in protected areas within the Kahuku portion of the Park and within the estimated ecological range of this species.

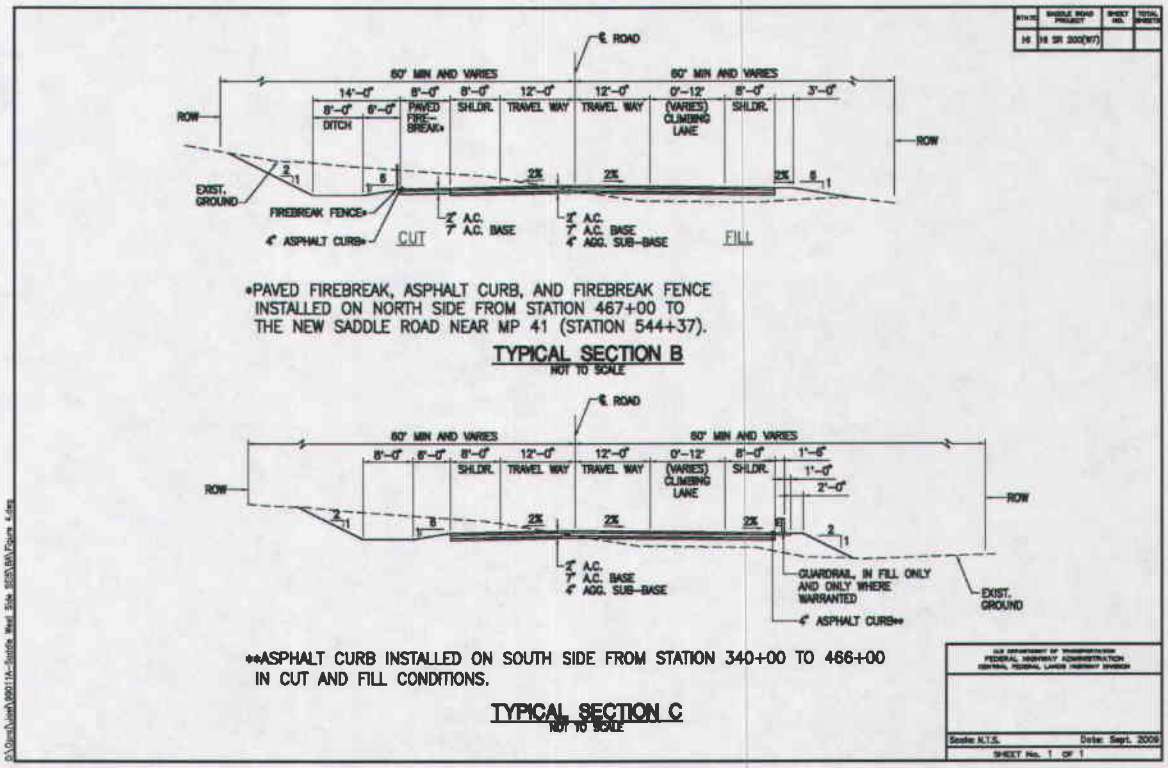


Figure 4. Typical section with fire minimization measures.

SPECIES AFFECTED

As described above in the consultation history of this opinion, the FHWA has determined that the proposed project may adversely affect *Haplostachys haplostachya* due to indirect effects from wildfire.

STATUS OF THE SPECIES

Honohono (*Haplostachys haplostachya*)

Haplostachys haplostachya is in the Lamiaceae, or mint family. It is an erect short-lived subshrub and grows from 12 to 24 in (30 to 60 cm) tall. The leaves are fleshy, narrowly cordate and the upper surface is green, rugose, and densely puberlent. Leaf lower surfaces are densely white tomentose. The inflorescence is a raceme with white and tubular flowers. Reproduction is by seed and basal sprouts. The taxon is distinguished by its densely white tomentose stems (Wagner 1999, p. 799).

Haplostachys haplostachya was federally and State-listed as an endangered species on October 30, 1979 (44 FR 62468). A recovery plan was drafted for this species in 1993 (Service 1993). *Haplostachys haplostachya* was once present on the islands of Kauai (mountains), Maui (sands of the low isthmus and at Kaula), and Hawaii (slopes of Mauna Kea, Nohonaohae cinder cone, and the plains of Waimea) (Wagner 1999, p. 799). Currently, the species is only known from 12 occurrences totaling approximately 17,000 individuals on the island of Hawaii (U.S. Army 2009, p. 11). All known, naturally-occurring populations of this species, occur on Army training areas (PTA and the Keamuku Parcel). The vast majority of individuals of this species (approximately 97 percent) are in ungulate-free fenced units the Army has constructed and maintains. Approximately 30 percent of the individuals of this species are in areas where the Army controls weeds. The Army has also outplanted 26 individuals of this species at Puuwaawaa in 2009 (U. S. Army 2009, p. 15).

Haplostachys haplostachya grows in dry exposed areas on ash-veneered lava, very stony, shallow soils, and lava outcrops. It often establishes in large cracks on rocky ridges and on cinder cones. On Hawaii island, *H. haplostachya* is found in *Chamaesyce* treeland, open *Metrosideros* treeland with dense shrub understory, open *Dodonaea* Shrubland, *Dodonaea* Mixed Shrubland, *Myoporum* Shrubland, and *Myoporum-Dodonaea* Shrubland vegetation types. The taxon occurs almost exclusively on old Mauna Kea flows, with one population on Mauna Loa pahoehoe lava.

Haplostachys haplostachya may be sensitive to drought. Plants can survive low and moderate intensity fires (*i.e.*, the plants appear to be fire resistant). The success of the species following fire is presumed to be due to its ability to resprout and its frequent location on rocky slopes. Fire in rocky areas tends to occur at low intensities because of low fuel load. However, fire coupled with drought appears to affect the species annual abundance. From year to year, there is considerable variability in the number of individuals in the populations of this species that are actively monitored.

The primary threats to *Haplostachys haplostachya* are browsing by feral sheep and goats; rooting by feral pigs; competition for light, space, and nutrients by fountain grass and other nonnative plants; and invasion by and conversion of habitat to a fire-based vegetation community. In addition, some populations that occur at PTA are impacted by Army training. Aphids and the introduction of mildew have been noted on the plants in the Keamuku Parcel and on plants in greenhouse conditions.

Environmental Baseline

Status of the Species in the Action Area

There is one *Haplostachys haplostachya* population within the action area for this project. This population is approximately 700 ft (200 m) from the proposed W-7 alignment and could be indirectly impacted by a wildfire originating from the realigned Saddle Road. The area is heavily invaded by fountain grass (Figures 5, 6 and 7). Based on personal observations, Army Natural Resource staff believe as fountain grass moves into an area, the fountain grass outcompetes *H. haplostachya* for moisture and nutrients. Based on personal observations, Army Natural Resource staff believe the abundance of *H. haplostachya* in the action area of this project has been reduced by more than 80 percent (Peter Peshut 2010, pers. comm.).

There have been no recent surveys of this population and no specific counts of individuals in the population were provided by FHWA. We estimate the size of the population that may be affected is approximately 10 ac (4 ha). Based on our biologist's observation of seven plants in a

300 ft (100 m) transect and the fact that the entire area has been completely invaded by fountain grass, we estimate the population that may be impacted by wildfire to be approximately 100 to 200 plants.

Effects of the Action

The W-7 alignment will bring Saddle Road within 700 ft (200 m) of the *Haplostachys haplostachya* population (see Figure 2), whereas the current alignment of Saddle Road is approximately 3 mi (5 km) away from the *H. haplostachya* population. The road will not directly affect *H. haplostachya* because no plants occur within the road alignment. To reduce the risk of wildfires to *H. haplostachya*, FHWA has agreed to the following conservation measures in the vicinity of *H. haplostachya* (eastern boundary of the Keamuku Parcel to Mamalohoa Highway):

- A 52-ft (16-m) wide paved surface that will serve as a firebreak.
- A four-inch (10-cm) high-extruded asphalt curb at the outside of the shoulder on the south side of the road will prevent thrown cigarette butts from coming in contact with dry grass and other vegetation material. The curb will also prevent motorists from driving off of the roadway onto grassy areas.

The entire proposed W-7 alignment will be located within Army training facilities, which has an extensive fire minimization and mitigation program. This road will also allow very rapid response by PTA and County of Hawaii firefighting personnel in the event that a fire does occur within the general project area. The *Haplostachys haplostachya* population that will be in close proximity to the W-7 alignment is located approximately 6 mi (10 km) by road from the PTA fire station. The new road will be designed to accommodate 60 MPH (100 KPH) traffic, both fire stations could respond in a short period of time to wildfire that might occur within the general project area. This area would otherwise be extremely difficult to access from the existing Saddle Road, and thus result in extremely long response times. Additionally, the Army is currently constructing five firefighting dip tanks within the Keamuku Parcel to provide onsite water to be used to fight wildfires that may ignite within the general area.

In addition, FHWA has agreed to contribute $50,000 to Hawaii Volcanoes National Park's (Park), Division of Resources Management. The Park will use these funds to establish three populations of *H. haplostachya* in areas of the Park which are believed to be within the ecological range of the species and within suitable habitat (Price and Jacobi, unpublished).

Figure 5. Monotypic stand of fountain grass between the proposed W-7 alignment and the nearby *Haplostachys haplostachya* population.

Figure 6. Monotypic stand of fountain grass within and surrounding the *Haplostachys haplostachya* population.

Figure 7. A typical *Haplostachys haplostachya* individual surrounded by dense fountain grass.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, local or private actions that are reasonably certain to occur within the area of action subject to consultation. Future Federal actions will be subject to the consultation requirements established in section 7 of the Act and, therefore, are not considered cumulative to the proposed action. The Service is unaware of any other future State, local, or private actions that are reasonably certain to occur within the action area covered in this Biological Opinion and that would not be subject to consultation under section 7 of the Act.

CONCLUSION

After reviewing the current status, the environmental baseline, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that implementation of the proposed action discussed herein will not jeopardize the continued existence of *Haplostachys haplostachya*. This conclusion is based on the following factors:

1. The population of *H. haplostachya* that may potentially be impacted by this project, represents less than one percent of the known total number of *H. haplostachya*. No plants occur within the road alignment itself.

2. While the road increases access and proximity to the listed plants which may increase the threat of fire, it also provides a more rapid response by firefighting personnel.

3. The proposed project will be located within Army training facilities which also have an extensive fire minimization and mitigation program which includes constructing fire fighting dip tanks that will provide onsite water.

4. The 52-ft (16-m) wide paved surface will serve as a firebreak and the 4-in (10-cm) curb will provide a barrier against cigarette butts.

All of these actions will reduce and minimize the impacts from wildfires. In addition, FHWA will sponsor an outplanting program of *H. haplostachya* at Hawaii Volcanoes National Park. Presently, this species has a very limited range, only occurring within the Saddle area of Hawaii island. Outplanting this species in an area where it does not presently occur, but within the predicted former range of the species, increases the likelihood this species will persist in the event the populations in the Saddle area of Hawaii island are decimated by a catastrophic event.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. Fountain grass has become a threat to this population of *Haplostachys haplostachya* that occurs within the action area. FHWA should fund the long-term eradication and management of alien grass to the benefit of *H. haplostachya.*

2. Fountain grass is a threat to native ecosystems across vast areas of West Hawaii. FHWA should fund research focusing on developing bio-control agents for controlling fountain grass.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION-CLOSING STATEMENT

This concludes formal consultation on the action outlined in the re-initiation request. As provided in 50 CFR § 402.16, reinitiation of consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if:

(1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operation causing such take must cease pending reinitiation. If you have any questions regarding this reinitiated Biological Opinion, please contact Dr. Jeff Zimpfer at (808) 792-9400.

Sincerely,

Gina M Shultz

for Loyal Mehrhoff
Field Supervisor

REFERENCES

44 FR 62468 U.S. Fish and Wildlife Service. 1979. Endangered and Threatened Wildlife and Plants; Determination that Three Hawaiian Plants are Endangered Species. Department of the Interior, Fish and Wildlife Service, 50 CFR part 17, October 30, 1979. Federal Register 44 (211):62468.

David, R. 2009. Phone conversation concerning observing Hawaiian geese in the Keamuku Parcel. (August 25, 2009).

Federal Highway Administration, C.F.L.H.D. 1999. Final Environmental Impact Statement, Saddle Road (State Road 200) Mamalahoa Highway (State Route 190) to Milepost 6, County of Hawaii, State of Hawaii, FHWA Project No. A-AD-6(1) (1999).

Peter Peshut. Email communication concerning the status of *Haplostachys haplostachya* (January 28, 2010).

Sherrod, D. R., J. M. Sinton, S E. Watkins, and K. M. Brunt. 2007. Geologic Map of the State of Hawaii. http://pubs.usgs.gov/of/2007/1089/.

Schnell, l. Conversation concerning Hawaiian geese in the Keamuku Parcel. November 13, 2009

U.S. Army. 2009. Natural Resource Program, Annual Report, Pohakuloa Training Area, Island of Hawaii, January 2009 to September 2009. Prepared by the Department of Public Works, Environmental Division, In Cooperation with Center for the Environmental Management of Military Lands, Colorado State University.

U.S. Fish and Wildlife Service. 1993. Draft Recovery Plan for *Haplostachys haplostachya* and *Stenogyne angustifolia*. U.S. Fish and Wildlife Service, Portland, OR. 65 pp.

Wagner, W.L., D.R. Herbst, and S.H. Sohmer. 1999. Manual of the Flowering Plants of Hawaii. University of Hawaii Press and Bishop Museum Press, Honolulu. Bishop Museum Special Publication. 97:1-1919.

U.S. Department
of Transportation
**Federal Highway
Administration**

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, Colorado 80228

January 29, 2010

In Reply Refer To:
HFPM-380

Loyal Mehrhoff, PhD.
Field Supervisor
U.S. Fish and Wildlife Service
300 Ala Moana Blvd, Room 3-122
Honolulu HI 96813

Subject: **Response to Comments on Saddle Road Improvement Project Draft Supplemental Environmental Impact Statement, Island of Hawai'i**

Dear Mr. Mehrhoff:

Thank you for providing a Biological Opinion for the Saddle Road Improvement Project. We appreciate the opportunity to coordinate with your office, and we appreciate your response to our tight timeframes.

If you have any questions regarding this project, please contact Melissa Dickard at 720-963-3691 or Melissa.Dickard@dot.gov, or myself at 720-963-3723 or Dave.Gedeon@dot.gov.

Sincerely,

David Gedeon

David Gedeon, P.E.
Project Manager

SADDLE ROAD (STATE ROUTE 200)
Mamalahoa Highway (State Route 190) to Milepost 41
County of Hawai‘i, State of Hawai‘i
FHWA Project No. 200(00)

SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

Submitted Pursuant to Section 42 U.S.C. 4332(2)(c)
and Chapter 343, Hawai‘i Revised Statutes by the

U.S. DEPARTMENT OF TRANSPORTATION
Federal Highway Administration (FHWA)
Central Federal Lands Highway Division
and
STATE OF HAWAI‘I
Department of Transportation (HDOT)
Highways Division

Cooperating Agencies
U.S. Army Garrison, Hawai‘i

Appendix B
Waters of U.S. Report and Correspondence

[This page intentionally left blank]

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

September 10, 2009

Regulatory Branch

File No. POH-2008-00021

Mr. Glenn M. Yasui
Administrator, Highways Division
State of Hawaii
Department of Transportation
869 Punchbowl Street
Honolulu, HI 96813-5097

Dear Mr. Yasui:

This is in response to your March 18, 2009 letter requesting a Department of the Army (DA) Jurisdictional Determination (JD) for the Saddle Road realignment and improvement project. Your request is specifically for Section I of the project between Mileposts (MP) 42 to MP 53, the westernmost portion of Saddle Road, ending at the Mamalahoa Highway (SR 190).

Based on our review of the information you furnished, our staff visit to the site, and other resources available to our office, we have determined that your proposed project would not involve the discharge of fill material into waters of the U.S. under our regulatory jurisdiction. Therefore, a DA permit is not required.

Your proposed project was reviewed pursuant to Section 10 of the Rivers and Harbors Act of 1899 (Section 10) and Section 404 of the Clean Water Act (Section 404). Section 10 requires that a DA permit be obtained for certain structures or work in or affecting navigable waters of the United States (U.S.), prior to conducting the work (33 U.S.C. 403). Navigable waters of the U.S. are those waters subject to the ebb and flow of the tide shoreward to the mean high water mark in waters determined to be navigable by the Honolulu District. Your project is not within Section 10 jurisdiction. Section 404 requires that a DA permit be obtained for the placement or discharge of dredged and/or fill material into waters of the U.S., including wetlands, prior to conducting the work (33 U.S.C. 1344). The three crossings proposed between MP 42 and MP 53 do not impact any water of the U.S. (see attached JD). This determination is valid for a period of five (5) years from the date of this letter.

You have the opportunity to submit a formal Administrative Appeal of this Approved JD. Your Request for Appeal (RFA) must be submitted within 60 days of this letter. Should you wish to submit a RFA, please contact this office and we will provide you with the appropriate form detailing the Appeal process.

Thank you for your cooperation with our regulatory program. Please be advised you can provide comments on your experience with the Honolulu District Regulatory Branch by accessing our web-based customer survey form at http://per2.nwp.usace.army.mil/survey.html.

If you have questions, please contact Mr. Robert Deroche of my staff at 808-348-2039 (FAX: 808-438-4060) or by email at robert.d.deroche2@usace.army.mil. Please refer to File No. POH-2008-21 in all future correspondence with this office regarding this project.

Sincerely,

George P. Young, P.E.
Chief, Regulatory Branch

Enclosure

Copy Furnished (w/encl):

Mr. Ron Terry, Ph.D., Geometrician Associates, LLC., P.O. Box 396, Hilo, HI 96721
Mr. Donald K. Okahara, P.E., Okahara & Associates, Inc., 677 Ala Moana Blvd., Suite 703, Honolulu, HI 96813-5419
Mr. Dave Gedeon, U.S. Department of Transportation, 12300 West Dakota Avenue, Suite 280, Lakewood, CO 80228-2583

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): September 9, 2009

B. DISTRICT OFFICE, FILE NAME, AND NUMBER: CEPOH-EC-R SADDLE ROAD REALIGNMENT 2008-21

C. PROJECT LOCATION AND BACKGROUND INFORMATION: Mile Posts 42 thru 53
State: Hawaii County/parish/borough: Hawaii City:
Center coordinates of site (lat/long in degree decimal format): Lat. 19.8020 ° N, Long. -155.6894 ° W.
Universal Transverse Mercator: 5
Name of nearest waterbody: None
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Pacific Ocean
Name of watershed or Hydrologic Unit Code (HUC): 20010000
☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc...) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):
☒ Office (Desk) Determination. Date: September 9, 2009
☒ Field Determination. Date(s): August 10, 2009

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There Are no "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]
☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There Are no "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
      ☐ TNWs, including territorial seas
      ☐ Wetlands adjacent to TNWs
      ☐ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
      ☐ Non-RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
      ☐ Impoundments of jurisdictional waters
      ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
      Non-wetland waters: linear feet: width (ft) and/or acres.
      Wetlands: 6.0 acres.

   c. **Limits (boundaries) of jurisdiction** based on: Pick List
      Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   ☐ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: .

---

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. **TNW**
   Identify TNW: .

   Summarize rationale supporting determination: .

2. **Wetland adjacent to TNW**
   Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. **Characteristics of non-TNWs that flow directly or indirectly into TNW**

   (i) General Area Conditions:
   Watershed size: Pick List
   Drainage area: Pick List
   Average annual rainfall: inches
   Average annual snowfall: inches

   (ii) Physical Characteristics:
   (a) Relationship with TNW:
   ☐ Tributary flows directly into TNW.
   ☐ Tributary flows through Pick List tributaries before entering TNW.

   Project waters are Pick List river miles from TNW.
   Project waters are Pick List river miles from RPW.
   Project waters are Pick List aerial (straight) miles from TNW.
   Project waters are Pick List aerial (straight) miles from RPW.
   Project waters cross or serve as state boundaries. Explain: .

   Identify flow route to TNW[5]: .
   Tributary stream order, if known: .

---

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: Pick List.

Primary tributary substrate composition (check all that apply):
☐ Silts ☐ Sands ☐ Concrete
☐ Cobbles ☐ Gravel ☐ Muck
☐ Bedrock ☐ Vegetation. Type/% cover:
☐ Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: Pick List
Tributary gradient (approximate average slope): %

(c) Flow:
Tributary provides for: Pick List
Estimate average number of flow events in review area/year: Pick List
Describe flow regime: .
Other information on duration and volume: .

Surface flow is: Pick List. Characteristics: .

Subsurface flow: Pick List. Explain findings: .
☐ Dye (or other) test performed: .

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):
☐ clear, natural line impressed on the bank ☐ the presence of litter and debris
☐ changes in the character of soil ☐ destruction of terrestrial vegetation
☐ shelving ☐ the presence of wrack line
☐ vegetation matted down, bent, or absent ☐ sediment sorting
☐ leaf litter disturbed or washed away ☐ scour
☐ sediment deposition ☐ multiple observed or predicted flow events
☐ water staining ☐ abrupt change in plant community
☐ other (list):
☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):
■ High Tide Line indicated by: ■ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects ☐ survey to available datum;
☐ fine shell or debris deposits (foreshore) ☐ physical markings;
☐ physical markings/characteristics ☐ vegetation lines/changes in vegetation types.
☒ tidal gauges
☐ other (list):

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

---

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) **Biological Characteristics. Channel supports (check all that apply):**
- ☐ Riparian corridor. Characteristics (type, average width): .
- ☐ Wetland fringe. Characteristics: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) **Physical Characteristics:**

(a) General Wetland Characteristics:

Properties:

Wetland size: acres

Wetland type. Explain: .

Wetland quality. Explain: .

Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:

Flow is: Pick List. Explain: .

Surface flow is: Pick List

Characteristics: .

Subsurface flow: Pick List. Explain findings: .

- ☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:
- ☐ Directly abutting
- ☐ Not directly abutting
  - ☐ Discrete wetland hydrologic connection. Explain: .
  - ☐ Ecological connection. Explain: .
  - ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW

Project wetlands are Pick List river miles from TNW.

Project waters are Pick List aerial (straight) miles from TNW.

Flow is from: Pick List.

Estimate approximate location of wetland as within the Pick List floodplain.

(ii) **Chemical Characteristics:**

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .

Identify specific pollutants, if known: .

(iii) **Biological Characteristics. Wetland supports (check all that apply):**
- ☐ Riparian buffer. Characteristics (type, average width): .
- ☐ Vegetation type/percent cover. Explain: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: Pick List

Approximately ( ) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed: .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   ☐ TNWs: linear feet width (ft), Or, acres.
   ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   ☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: .
   ☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
- Tributary waters: linear feet width (ft).
- Other non-wetland waters: acres.
  Identify type(s) of waters: .

3. **Non-RPWs[8] that flow directly or indirectly into TNWs.**
   - Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

   Provide estimates for jurisdictional waters within the review area (check all that apply):
   - Tributary waters: linear feet width (ft).
   - Other non-wetland waters: acres.
     Identify type(s) of waters: .

4. **Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.**
   - Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
     - Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .
     - Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

   Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. **Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.**
   - Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

   Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. **Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.**
   - Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

   Provide estimates for jurisdictional wetlands in the review area: acres.

7. **Impoundments of jurisdictional waters.[9]**
   As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
   - Demonstrate that impoundment was created from "waters of the U.S.," or
   - Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
   - Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]
- which are or could be used by interstate or foreign travelers for recreational or other purposes.
- from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
- which are or could be used for industrial purposes by industries in interstate commerce.
- Interstate isolated waters. Explain: .
- Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

---

[8] See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] **Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.***

Provide estimates for jurisdictional waters in the review area (check all that apply):
- ☐ Tributary waters: linear feet width (ft).
- ☐ Other non-wetland waters: acres.
  Identify type(s) of waters: .
- ☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
- ☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
- ☐ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
  - ☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
- ☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: .
- ☐ Other: (explain, if not covered above): .

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
- ☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
- ☐ Lakes/ponds: acres.
- ☐ Other non-wetland waters: acres. List type of aquatic resource: .
- ☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
- ☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
- ☐ Lakes/ponds: acres.
- ☐ Other non-wetland waters: acres. List type of aquatic resource: .
- ☒ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
- ☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: Geometrician Associates LLC.
- ☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
  - ☒ Office concurs with data sheets/delineation report.
  - ☐ Office does not concur with data sheets/delineation report.
- ☐ Data sheets prepared by the Corps: .
- ☐ Corps navigable waters' study: .
- ☒ U.S. Geological Survey Hydrologic Atlas: .
  - ☐ USGS NHD data.
  - ☒ USGS 8 and 12 digit HUC maps.
- ☒ U.S. Geological Survey map(s). Cite scale & quad name: .
- ☒ USDA Natural Resources Conservation Service Soil Survey. Citation: NRCS, Web Soil Survey.
- ☒ National wetlands inventory map(s). Cite name: U.S. Fish & Wildlife Service, Wetlands Online Mapper (Scale: 1:36,710).
- ☐ State/Local wetland inventory map(s): .
- ☐ FEMA/FIRM maps: .
- ☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
- ☒ Photographs: ☒ Aerial (Name & Date): Google Earth Copy 2007; USACE GIS DOQQ 1977.
  or ☒ Other (Name & Date): Site photographs contained in "Report on Waters of the U.S. Within Proposed Saddle Road Corridor, Section I (MP 42-53) Island of Hawai'i", State of Hawai'i, submitted by Geometrician Associates, Hilo, Hawai'i dated February 2009.
- ☐ Previous determination(s). File no. and date of response letter: .
- ☐ Applicable/supporting case law: .
- ☐ Applicable/supporting scientific literature: .
- ☒ Other information (please specify):

-USACE personnel site visit of 10 August, 2009
-Atlas of Hawaii, 2nd Edition, Department of Geography, University of Hawaii, 1983.

[This page intentionally left blank]

Report on Waters of the U.S.
Within Proposed Saddle Road Corridor, Section I (MP 42-53)
Island of Hawai‘i, State of Hawai‘i

Geometrician Associates, Hilo, Hawai‘i
February 2009

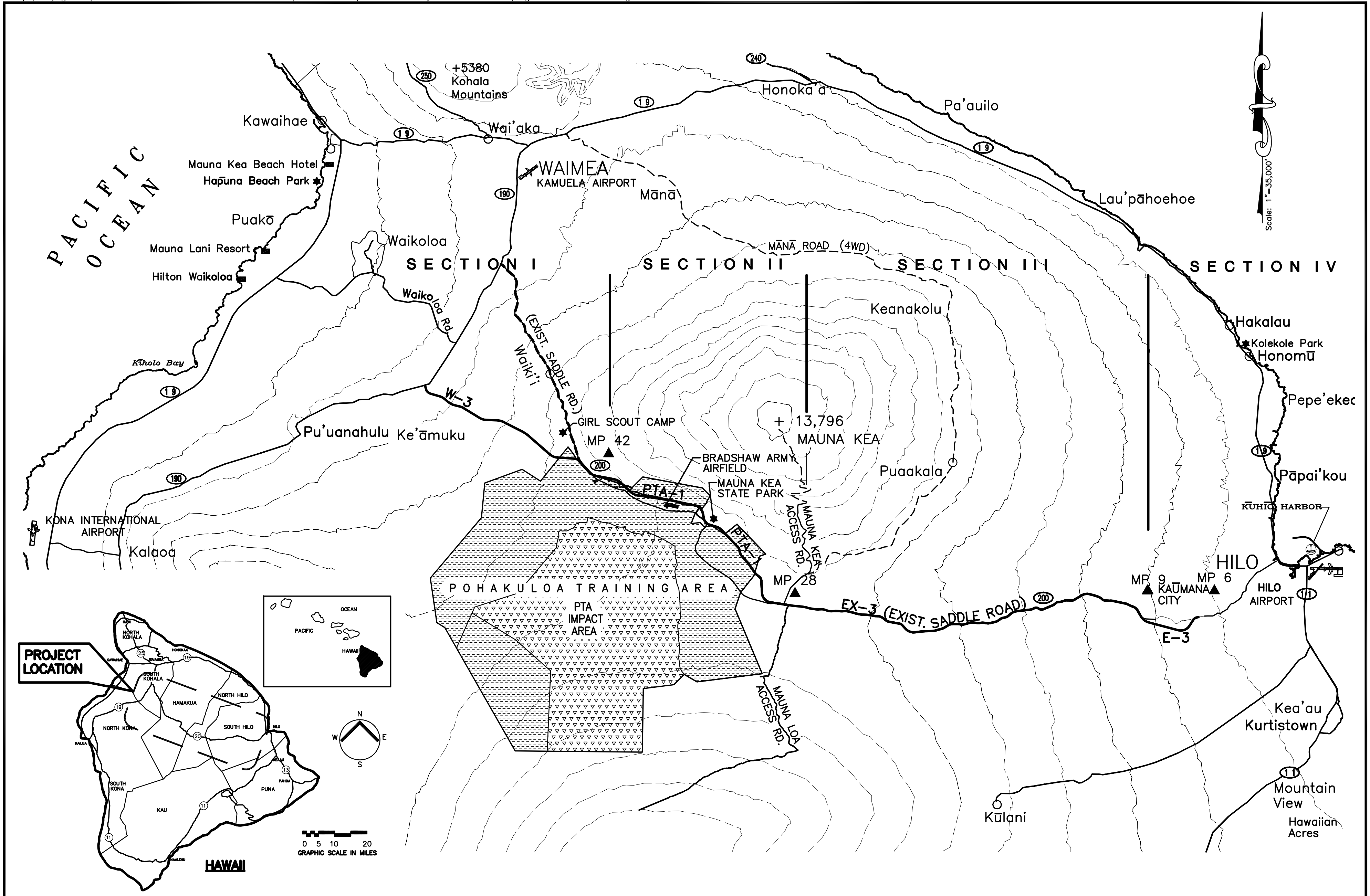
This report summarizes an evaluation by Geometrician Associates of Waters of the U.S. potentially present on a highway improvement project on the island of Hawai'i. The project title is *Saddle Road (State Route 200), Mamalahoa Highway (State Route 190) to Milepost 6 Project (FHWA Project No. A-AD-6(1)*. The work was conducted under a 2008 contract amendment with DMT Consultant Engineers and on behalf of the Hawai'i Department of Transportation (HDOT).

Project Overview

A Final Environmental Impact Statement for the proposed Saddle Road Improvements project (as it is commonly known) was released in September 1999, followed by the issuance of a Record of Decision (ROD) for the Saddle Road improvements on October 30, 1999. The EIS process included consideration of twelve action alternatives incorporating use of the existing alignment and potential new alignments between Mamalahoa Highway (SR 190) to Milepost (MP) 6. The project was divided into four different sections (Sections I, II, III and IV, from west to east) to consider and select various alternative routes and to assist in project scheduling. These sections and the Selected Alternative are illustrated in **Figure 1**. Construction of the entire 48 miles is being done in phases. After receiving appropriate permits and approvals, including a jurisdictional determination finding no Waters of the U.S. in the portions between Milepost 14 and 53 as part of the EIS process in 1999, construction began in 2004 on a 6.5-mile part of Section II from Milepost 28 to 35. This segment was opened to public traffic in May 2007. The remainder of Section II between MP 35 and 42 is expected to be finished by fall 2009. A subsequent project that opened to public traffic in October 2008 is the section in Section III from Milepost 19 to 28. The western portion of the project, Section I, from the “Seven Steps” near MP 42 to Mamalahoa Highway, has not yet been scheduled for final design or construction.

HDOT is working with the Federal Highway Administration, Central Federal Lands Highway Division (FHWA-CFLHD) to prepare a Supplemental Environmental Impact Statement (SEIS) for Section I, the western section of the Saddle Road Improvements Project. The SEIS is necessary because the U.S. Department of the Army Garrison Hawai‘i purchased property from Parker Ranch known as the Keamuku parcel (State of Hawai‘i TMK (3rd.) 6-7-001:041) through which the Section I Saddle Road Improvements is proposed to pass (**Figure 2**). The U.S. Army has incorporated this property into the Pohakuloa Training Area and use it for military training.

O:\oproj\joel\99011A–Saddle West Side SEIS\JD Letter\to ron terry 12–10–08\Fig.1–select.alt.dwg



Report of Waters of the U.S.
Saddle Road, MP 42-53
Island of Hawai'i, State of Hawai'i

Figure 1:
Selected Saddle Road Alternative
12/10/08

This property included the area in which the western section of the Saddle Road was planned to pass, along the alignment termed W-3, which was selected in the Record of Decision. In 2006, the U.S. Army requested that HDOT and FHWA-CFLHD relocate the road as close as practical to the southern boundary of the Keamuku property. In response to that request, HDOT has developed a new alternative called W-7, the location of which is approximate until further design is completed (see **Figure 2**). Both alternatives, the 9.7-mile long W-3 and the 10.3-mile W-7, are under consideration in the SEIS for Section I. Note that the common connection point of both W-3 and W-7 to existing the Saddle Road near MP 42 is outside the Keamuku property; both alignments include approximately 0.6 mile within the Keʻekeʻe area.

This report is intended for use as background for a letter requesting jurisdictional determination (JD) for potential Waters of the U.S. from the U.S. Army Corps of Engineers (USACE), Honolulu District, for Section I of the Saddle Road.
It is understood that as more than five years have passed since the original jurisdictional determinations were made as part of the 1999 EIS, a new JD will be required for this section of the Saddle Road between milepost 42 and SR 190. The JD is requested to cover both of the SEIS alternatives under consideration, W-3 and W-7.

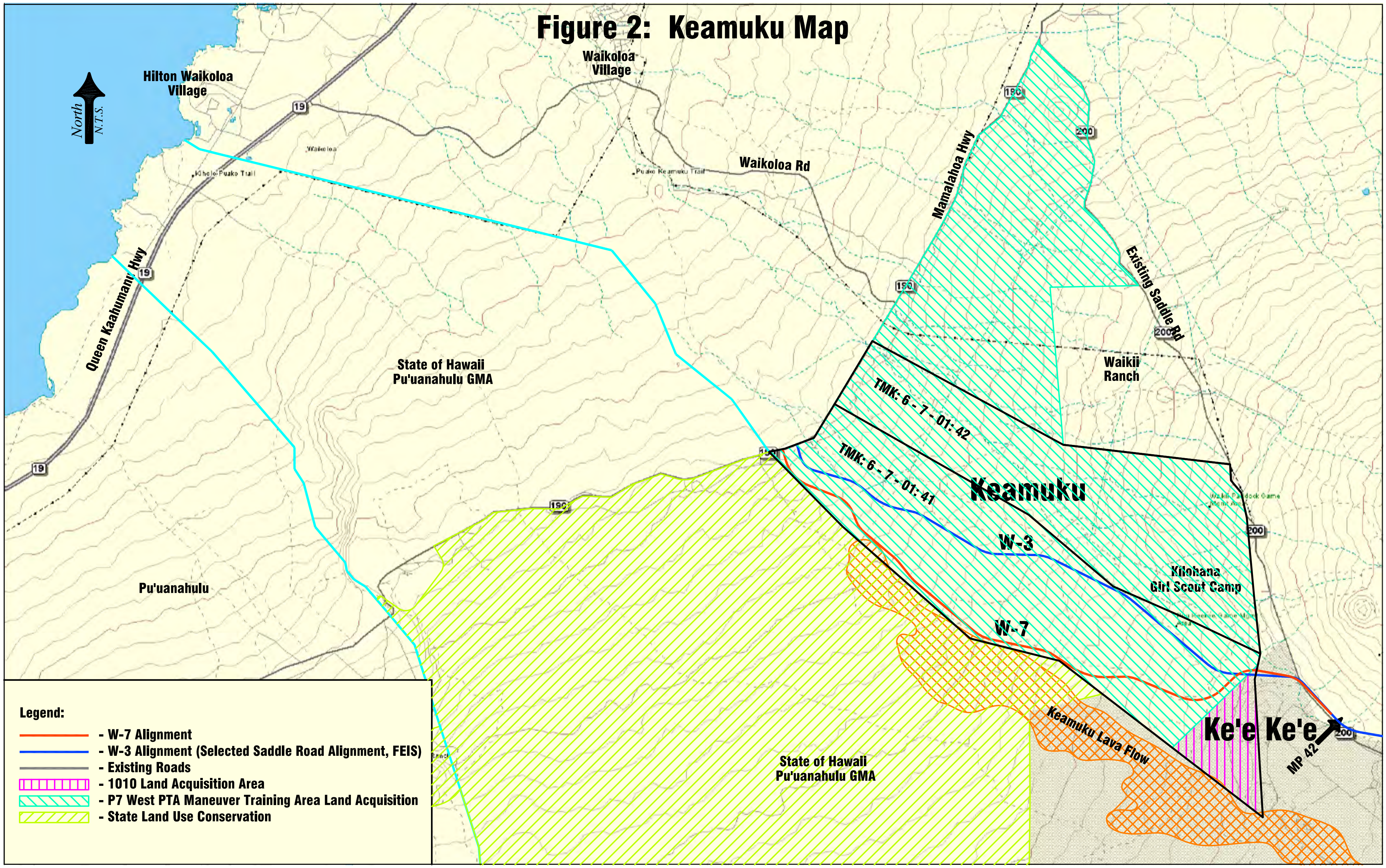
Regulatory Background

Waters of the United States (U.S.) is a regulatory term referring to surface waters that are under the jurisdiction of the USACE. Surface waters may include streams, streambeds, rivers, lakes, reservoirs, arroyos, washes, other ephemeral watercourses and wetlands. Any actions that result in effects on Waters of the U.S. require compliance with the Section 404 of the Clean Water Act

The U.S. Army Corps of Engineers (USACE) made jurisdictional determinations for the original study routes in Section I (W-2 and W-3, the latter of which was selected in the Record of Decision for the proposed Saddle Road project in the 1990s. No Waters of the U.S. were identified within this section of the study corridor (USACE letter dated August 22, 1997, reproduced in FEIS - Part II, 1.4.4, and EPA letter dated August 12, 1998, FEIS - Part II, 1.4.5) (**Exhibit A**). The EIS reported that although the proposed road corridor crossed several major intermittent drainages, many of which were formed by glacial meltwater at the end of the Pleistocene Era 10,000 years ago, it contained no Waters of the U.S.

Since 1999, when the original Saddle Road EIS was being developed, the USACE has substantially revised its practical definition of Waters of the U.S. and also its methods for assessing them. The latest guidance is contained in *JD Form Instructional Guidebook* and the *Approved Jurisdictional Determination Form*; these digital files are available on the Honolulu District website (http://www.poh.usace.army.mil/EC-R/EC-R.htm). This report utilizes the methodology and forms referenced above.

O:\oproj\joel\99011A-Saddle West Side SEIS\JD Letter\to ron terry 12-10-08\Fig.2-keamuku.dwg



Report of Waters of the U.S.
Saddle Road, MP 42-53
Island of Hawai'i, State of Hawai'i

Figure 2:
Keamuku Map
12/10/08

In particular, the methodology utilized in this analysis has been consistent with the latest guidance, the *U.S. Army Corps of Engineers Jurisdictional Determination Form Instructional Guidebook* (Rev. 5/23/07). In this guidance, which is available on USACE websites, the USACE has reaffirmed that all traditional navigable waters (TNW) are jurisdictional, and that any stream that generally flowed three continuous months of the year or more – called a relatively permanent water (RPW) – is also jurisdictional. It is understood that any wetlands adjacent to RPW, as well as non-RPW streams and wetlands adjacent to them, need to be evaluated to see if they have a significant nexus to a TNW. The USACE, interpreting a ruling by the U.S. Supreme Court, defines this as follows:

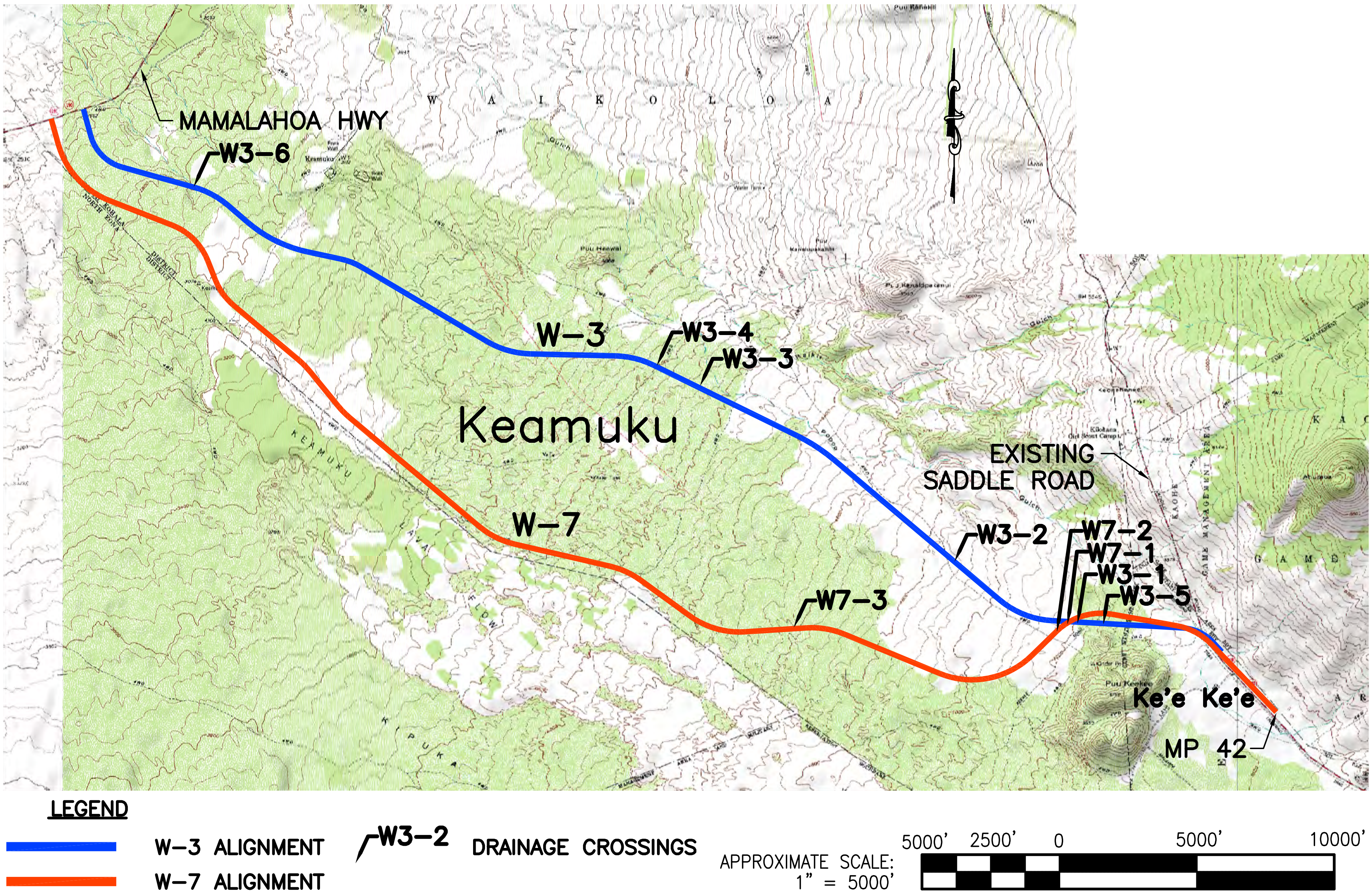
> "A significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or an insubstantial effect on the chemical, physical, and/or biological, integrity of a TNW. Principal considerations when evaluating significant nexus include the volume, duration, and frequency of the flow of water in the tributary and the proximity of the tributary to a TNW, plus the hydrologic, ecologic, and other functions performed by the tributary and all of its adjacent wetlands."

Therefore, the first task of our work in Section I of the Saddle Road has been to identify within the affected W-3 and W-7 corridors all TNWs, tributary RPWs, and tributary non-RPW streams, along with any wetlands or other special aquatic sites. After these are identified and mapped, certain waters will be by definition jurisdictional, and for others, the issue of a significant nexus must then be examined, and then a jurisdictional determination should be made.

Geological Setting

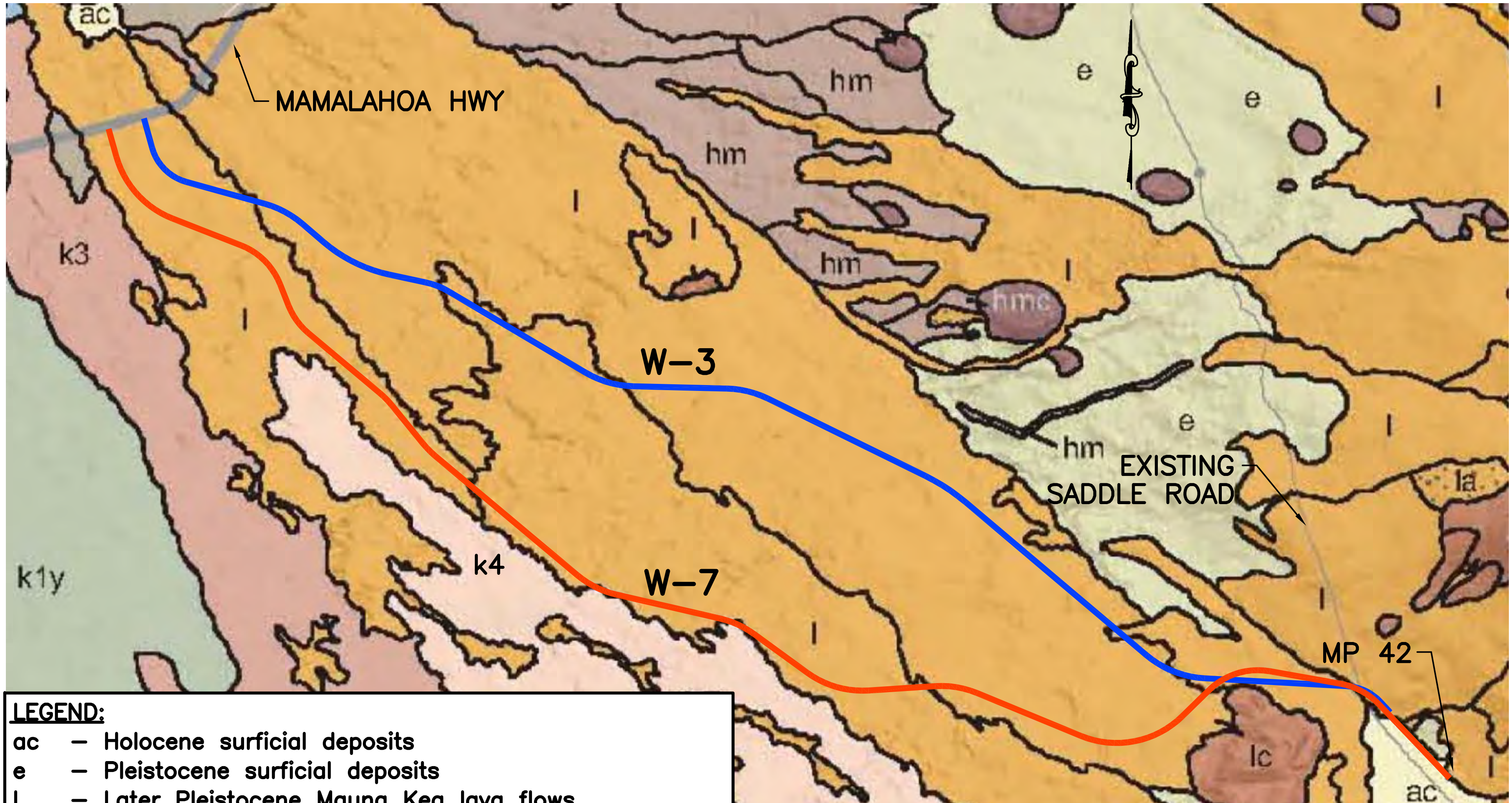
As shown on the attached USGS maps (**Figure 3**), no blue-line streams are crossed by either the W-3 or W-7 corridors within the Keamuku property or the Ke‘eke‘e section There is a distinct geomorphological difference between the central and northern parts of the Keamuku parcel that contain deep, blue-line gulches and the southern part that lacks them. This roughly corresponds to a geological difference between older and younger Mauna Kea flows, as shown in the attached geologic map (**Figure 4**). The very youngest flows – where there are no blue-line streams whatsoever – are found on the southern margin of the Keamuku property, where W-7 and a portion of W-3 pass. The Ke‘eke‘e section consists of rough lava flows as well as cinder cone and Holocene surficial deposits.

The topography of the area strongly reflects the geology. The Saddle Road area near Pu‘u Ke‘eke‘e at the base of Mauna Kea is fairly flat, reflecting alluvial Pleistocene and later deposits over old lava flow and ash deposits from cones such as Puu Ke‘eke‘e, which exhibits typical cinder cone topography. The far southern portion of the Keamuku property, which contains most of W-7 and the western (makai) segment of W-3, has a surface in which the lobes of the lava flows that flowed downslope are clearly visible, with little erosion or sediment build-up. Soil is not strongly developed and few erosional or alluvial features are evident.



Report of Waters of the U.S.
Saddle Road, MP 42-53
Island of Hawai'i, State of Hawai'i

Figure 3:
USGS Map
12/10/08



LEGEND:

ac – Holocene surficial deposits
e – Pleistocene surficial deposits
l – Later Pleistocene Mauna Kea lava flows
lc – Later Pleistocene Mauna Kea cinder cones
hm – Earlier Pleistocene Mauna Kea lava flows
hmc – Earlier Pleistocene Mauna Kea cinder cones
k2 – 1500–3000 year old Mauna Loa lava flows
k3 – 750–1500 year old Mauna Loa lava flows
k4 – (Keamuku) 400–750 year old Mauna Loa lava flows

LEGEND

W-3 ALIGNMENT
W-7 ALIGNMENT

APPROXIMATE SCALE: 1" = 5000'
5000' 2500' 0 5000' 10000'

Report of Waters of the U.S.
Saddle Road, MP 42-53
Island of Hawai'i, State of Hawai'i

Figure 4:
Geology Map
12/10/08

In the middle southern part of Keamuku, which contains the eastern (mauka) portion of W-7 and most of W-3, the topography generally has a smoother appearance, reflecting a cover of ash, cinders and sand of variable thickness on top of the bedrock lava flows.

A satellite-based aerial image of the eastern portion of the study area draped over a digital terrain model and rotated to provide an oblique view reveals these differences in the topography (**Figure 5**). Note the complete lack of apparent drainages in the southern portion (where the main portion of W-7 lies), the hummocky terrain with small, discontinuous drainages between some of the hummocks in the southern part of the central area, and the true intermittent gulch in the northernmost part (neither the W-3 nor W-7 alignment crosses such a gulch).

Soil patterns are highly complex, but some generalizations can be made. Soil in the southern parts of Keamuku varies from non-existent, on rough lava land, to minimal, on rough stony land, to thin organic soils over ʻaʻa (Kaimu Series), to stony soils about 20-30 inches deep formed in ash (Puʻu Pa Series). Some inclusions of deeper soils formed in ash are also present (Waikaloa Series). Minimal erosion and deposition is evident on most of the areas covered by these soils. Soils on the middle and northern parts of Keamuku include both the Kaimu and Puʻu Pa Series, but are dominated by soils of the Waikaloa and Waimea Series, the latter of which is the thickest (and possibly oldest) of all these soils and is heavily dissected by intermittent or ephemeral streams in places. In the Keʻekeʻe area near Saddle Road there are a number of soil types, but in general the soil is thin and highly stony. Where W-7 and W-3 diverge as they proceed east, W-7 lies well south of W-3 and lies atop the rockiest soils with little erosion or deposition evident. Where W-3 is farthest from W-7, in the middle section of Keamuku, the thickest and least stony soils occur.

FIELD METHODOLOGY

On five separate days during August and September of 2008, a team of two to four scientists and technicians led by Ron Terry, Ph.D., systematically walked and closely examined both the W-3 and W-7 corridors from their common terminus with the Saddle Road near MP 42 to the Mamalahoa Highway, a distance of about 11 miles. The width of the W-3 corridor was 200 feet (the study corridor for the 1999 EIS), and the width of the W-7 corridor was 500 feet, which is the refined corridor width for all environmental studies being conducted for the current SEIS.

For all sites within the right-of-way of a drainage that appeared to have any potential to be considered as a Water of the U.S., the site was first located using a handheld global positioning system (GPS) device, then photographed and evaluated using the criteria in the USACE data sheets referenced above.

FINDINGS

We encountered nine crossings of drainage features during the field surveys described in the previous section that merited measurement and study, six on W-3 and three on W-7. They are detailed in **Table 1**, mapped on **Figure 6**, illustrated by representative photos in **Figures 7a-f**, and discussed below. The full records for each site are contained in the data sheets and photographs attached as **Exhibit B** to this report.

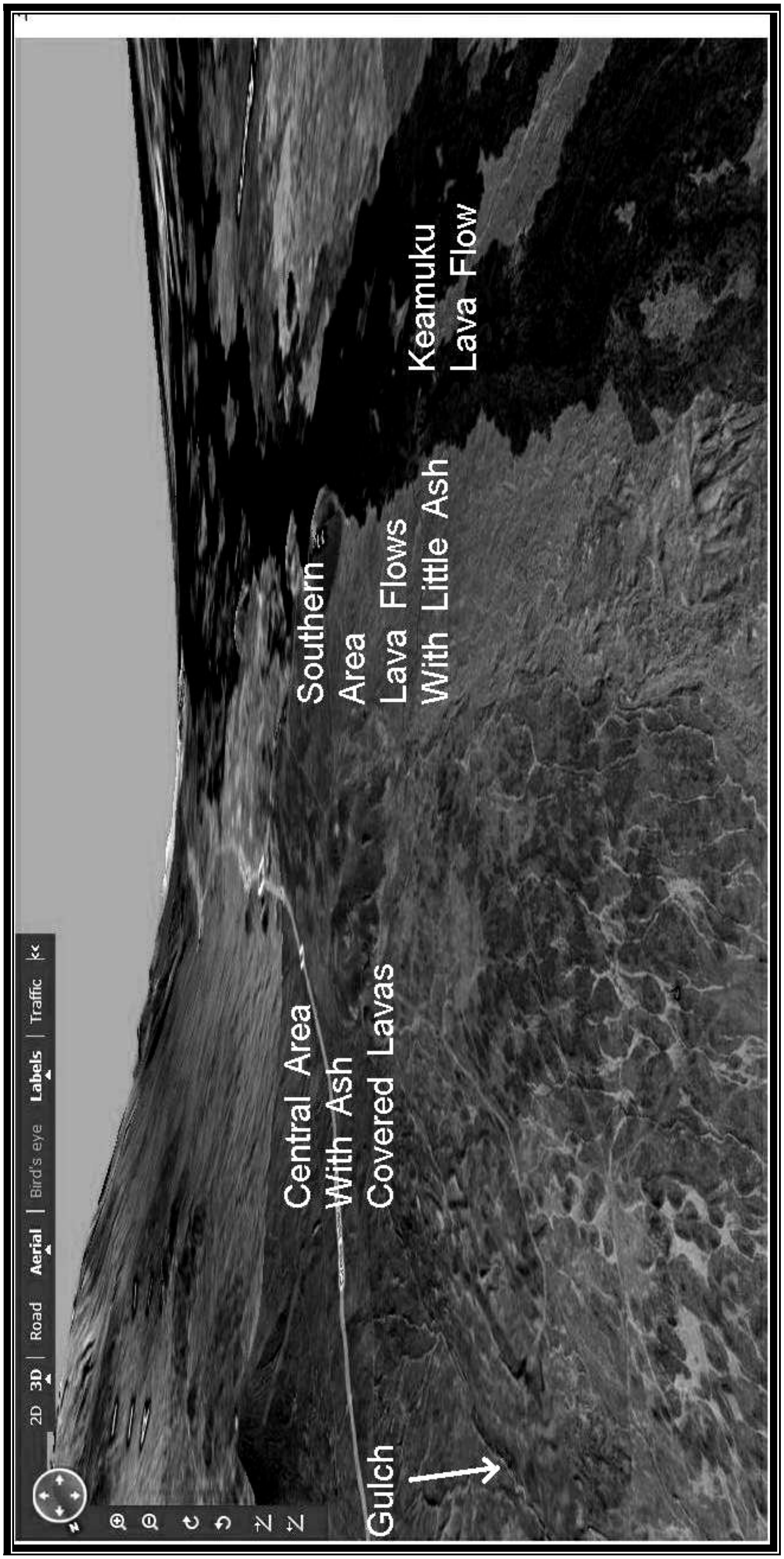


Figure 5 *Aerial Imagery of Eastern Part of Study Area from Microsoft Virtual Earth ©*

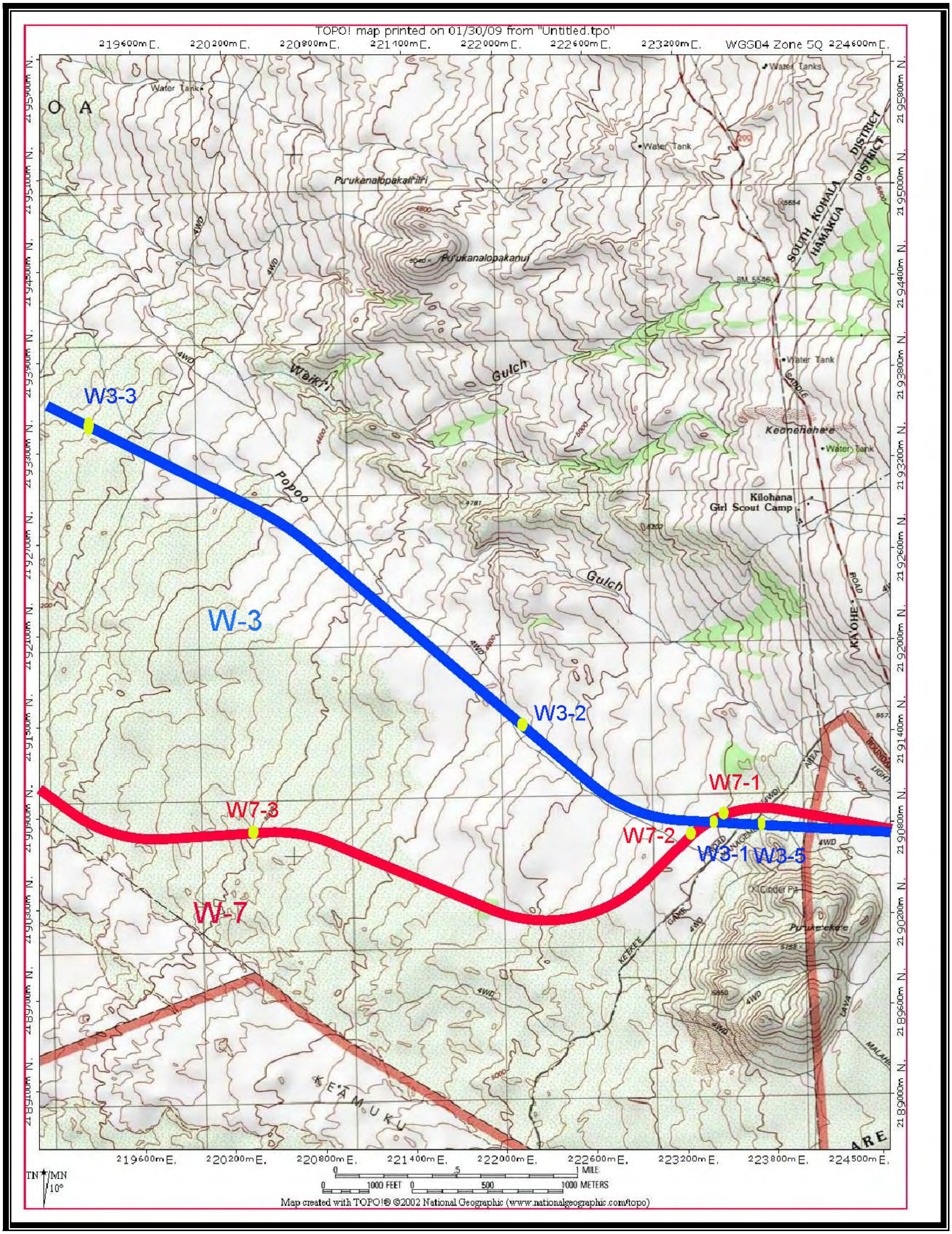


Figure 6a *Drainage Crossings on W-3 and W-7, Mauka Section*

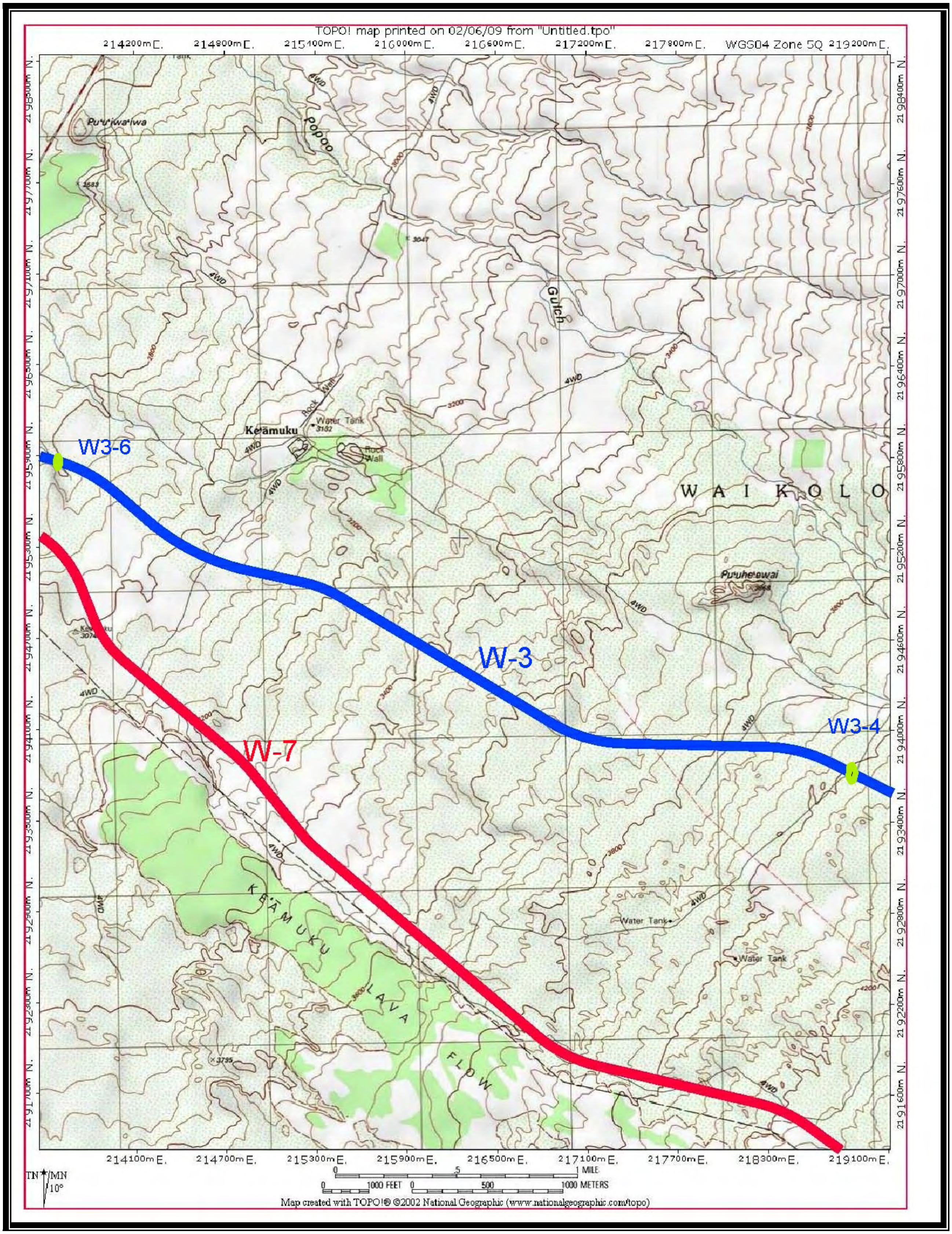


Figure 6b *Drainage Crossings on W-3 and W-7, Makai Section*

Table 1
Drainage Crossing Details

Name of crossing	Lat/Long (Decimal Degrees)*		Average width/depth (feet)	Substrate/Geometry
W3-1	19.7941	155.6393	15/3	Grass, shrubs and bedrock, meandering
W3-2	19.7996	155.6522	30/3	Grass, meandering
W3-3	19.8172	155.6798	27/6	Grass and bedrock, straight
W3-4	19.8195	155.6843	11/2	Grass, meandering
W3-5	19.7938	155.6366	20/3	Grass, meandering
W3-6	19.8372	155.7335	10/2	Grass, meandering
W7-1	19.7940	155.6401	28/6	Veg, meandering
W7-2	19.7935	155.6413	20/3	Grass, meandering
W7-3	19.7935	155.6691	20/4	Grass and bedrock, meandering

*Derived by handheld GPS. No high water indicators present at any sites, and all drainages were highly ephemeral. Channel slopes were the same as regional slopes.

Individual drainage crossings are described below:

- Crossing W3-1 is typical of most of the other drainages, in that it has a bed that is a combination of bedrock and kikuyu grass (*Pennisetum clandestinum*) exhibiting no obvious signs of systematic erosion or deposition or high-water marks, although water clearly flows through on rare occasions. The sideslopes have kikuyu grass, fountain grass (*Pennisetum setaceum*), the common native shrub aʻaliʻi (*Dodonea viscosa*), and the herb fireweed (*Senecio madagascarensis*). Although only one of these plants is listed in the *National List of Plant Species That Occur in Wetlands (Region H),* (kikuyu grass, listed as FACU – a plant species that are likely to occur in uplands, but may occasionally be found in wetlands), none of the plants are associated with wetlands. All but aʻaliʻi are alien introductions. The drainage outlets in a flat area dominated by kikuyu grass and disappears.
- Crossings W3-2, W3-3, and W3-4 are very similar to Crossing W3-1.
- Crossing W3-5 is similar to Crossing W3-1 in most respects but is on the footslope of the steep cinder cone Puʻu Keʻekeʻe and has slightly higher sideslopes. This drainage outlets into the same channel crossed at W3-1 and W7-1.
- Crossing W3-6 is in the drier, lower, western half of Keamuku and has only kikuyu grass and fountain grass. In other respects it is similar to the other crossings. This small swale drains into a small flat depression that outlets into an ephemeral gulch that has a number of tributaries and is mapped as a blue-line (but unnamed) stream on USGS maps. This gulch eventually disappears about two miles downhill, approximately eight miles from the Pacific Ocean and any other TNW or RPW. W3-6 is the only crossing over a swale that is tributary to another drainage.
- Crossing W7-1 is almost identical to W3-1 and in fact is in a different location on this same short channel.
- Crossing W7-2 is similar to W7-1 but in an adjacent crease between lava flow hummocks.

Figure 7a *"Channel" in V-shaped contact between linear lava flow hummocks at Crossing W3-03*.

Figure 7b *Typical "bed' of drainage shows no evidence of flow at Crossing W3-03.*

Figure 7c *As hummock contrast varies, "channels" may disappear and any ephemeral flows widen out and percolate, as here at W3-02.*

Figure 7d *Downslope view of basin at Crossing W3-02, below drainage shown in Figure 7c. No channel is present in this basin, which contains alluvial, colluvial and aeolian deposits.*

Figure 7e *Typical meandering swale in minor hummock contact zone.*

Figure 7f *Relatively deep incising has occurred in spots on a V-shaped contact zone between a prominent younger' a'a flow type on the south and the ash-covered surface of the central area, at Crossing W7-03. Cattle and goats erode banks with trails and utilize caves seeking shade. Despite apparent prominence, this "drainage" disappears shortly downhill.*

- Crossing W7-3 crosses the one drainage that had a length of more than about 600 feet (see Figure 7f). This drainage runs approximately a mile along the clear contact between a young, rocky lava flow (the most northern lobe of the younger flows on the southern end of Keamuku) that runs parallel to and about ten to twenty feet higher than an adjacent older lava flow mantled with ash. As the slope tilts slightly sideways towards the younger lava flow, runoff from occasional storms is channeled down and along this contact zone, where it has eroded some areas as deep as 15 feet. When the cross-slope topography no longer favors sheet flow in extreme rainfall events in the direction of the contact zone, the drainage disappears.

None of the nine crossings appear to meet the definition of a Water of the U.S. All are extremely ephemeral, and the channels of all but one (W3-6) essentially disappear into basins between hills after running for distances of dozens to hundreds of feet. Thus, eight of the drainages are not tributary in any way to any relatively permanent waters (RPWs), such as an intermittent stream, and thereby to potential traditional navigable waters (TNWs). The only exception, the swale crossed in W3-6, drains into a small flat depression that outlets into an ephemeral gulch that has a number of tributaries and is mapped as a blue-line (but unnamed) stream on USGS maps, but which eventually disappears approximately eight miles from the Pacific Ocean and any other TNW or RPW.

Rather than intermittent streams, these drainage features are essentially the V-shaped contacts between hummocky lava flows. Figures 7a-f illustrate essential elements of these drainage features. Almost all rainwater immediately sinks in youthful lava flows, but where ash has mantled the lava flows, a soil forms that is a little less permeable and some runoff occurs in heavy rains. This naturally gets funneled into these Vs, slightly eroding out the soil and ash and in places exposing the bedrock that lies one to four feet beneath the surface. Where the Vs are naturally steep, the erosion is more intense, and where the Vs are gentle, deposition occurs rather than erosion, and the V tends to fill in. At some point along the contact the V will flatten out and disappear, and finally no channel at all is evident, as this runoff simply spreads and percolates. Typically, in between the sets of hummocky lava flows are plains or basins with minor quantities of alluvium, colluvium, and aeolian deposits. The basins generally have no real outlet channel.

Even if these drainages were tributary to RPWS, which all but one is not, it would be doubtful that they would have a significant nexus to a TNW. The amount and frequency of flows in such features is minor, and it is doubtful that sediment or water generated in these areas makes its way overland for any significant distance. The ground surface is highly permeable, and where overland runoff is generated, it percolates in natural basins. No habitat for native reptiles or amphibians (none of which exist in Hawai‘i), aquatic birds, fish, or invertebrates is present. No wetlands or riparian plants or vegetation are present. In sum, there would appear to be insubstantial effect on the chemical, physical, and/or biological, integrity of the Pacific Ocean, the nearest TNW, which lies a minimum of ten miles from this area. The reasoning for this lack of a significant nexus is also true for W3-6, the one drainage that is tributary to any other drainage, as it does not connect directly or indirectly to a TNW.

It is important to note that there are drainages to the north of the area traversed by W-3 and W-7 that vary between highly ephemeral, with flows occurring during a few hours a year, to intermittent, flowing for several days a year. Even there, however, no RPW is present, as no drainage with a flow more than three months per year (or in fact, more than a few days per year) exists in that area. The largest such drainage is Auwaikeakua Gulch, which may have short-duration but impressive flows during heavy rains and has caused floods downstream in Waikoloa Village. None of the tiny drainages intersected by W-3 or W-7 flow into Auwaikeakua Stream or similar gulches.

No springs, wetlands or special aquatic sites were observed within the entire study area covered during these field investigations, and none are known to exist in the general area.

SUMMARY

In summary, no jurisdictional Waters of the U.S. appear to be present, as no wetlands or special aquatic sites are present, and none of the highly ephemeral and poorly developed drainage features meets the criteria of a Water of the U.S. for streams. Specifically, there are no traditional navigable waters (TNWs), relatively permanent waters (RPWs), or non-RPW streams that are tributary to RPWs and/or have a significant nexus to a TNW.

[This page intentionally left blank]

SADDLE ROAD (STATE ROUTE 200)
Mamalahoa Highway (State Route 190) to Milepost 41
County of Hawai‘i, State of Hawai‘i
FHWA Project No. 200(00)

SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

Submitted Pursuant to Section 42 U.S.C. 4332(2)(c)
and Chapter 343, Hawai‘i Revised Statutes by the

U.S. DEPARTMENT OF TRANSPORTATION
Federal Highway Administration (FHWA)
Central Federal Lands Highway Division
and
STATE OF HAWAI‘I
Department of Transportation (HDOT)
Highways Division

Cooperating Agencies
U.S. Army Garrison, Hawai‘i

Appendix C
Botanical Report

[This page intentionally left blank]

Botanical Study for Proposed Alignment W-7 for the Realignment of Saddle Road (State Route 200)

May 28, 2009

Prepared for:

Hawai'i Department of Transportation
Highways Division

and

U.S. Department of Transportation
Federal Highway Administration
Central Federal Lands Highway Division

Prepared by:

Grant Gerrish, Ph.D
Laupahoehoe, HI

and

DMT Associates
Honolulu, HI

Botanical Study for Proposed Alignment W-7 for the Realignment of Saddle Road (State Route 200)

Executive Summary

This botanical study covers a proposed alternative alignment, identified as Alignment W7, of the portion of the Saddle Road 7 that extends from Mamalahoa Highway eastward to a point on the existing Saddle Road, within the Pohakuloa Training Area (PTA).

The project area is on the leeward (dry) slope of Mauna Kea on open land between about 2600 and 5800 feet above sea level. The annual rainfall is around 20 inches. Approximately 8.9 miles is within Keʻamuku and 1.4 miles is within PTA. After years of military training activities, many of the plant communities of PTA are still dominated by native plants and numerous endangered plants are known from various parts of PTA. In contrast, decades of cattle-grazing in Keʻamuku have profoundly changed the composition and appearance of the vegetation.

Three endangered plant species (*Haplostachys haplostachya, Stenogyne angustifolia*, and *Vigna o-wahuensis*) were discovered in near the southern border of the Keʻamuku property. The proposed W-7 alignment was carefully positioned to avoid all of the known locations of these endangered species. No endangered plants were found within the proposed project area during the current botanical survey. No other plants or plant communities with significant value for conservation were found within the study area.

The vegetation within the Keʻamuku parcel has been extensively altered by years of cattle-grazing and is now largely pasture land The general appearance is of rolling grasslands on the rugged slope of Mauna Kea with some extensive stands of the indigenous shrub *ʻaʻaliʻi* . The dominant pasture grasses are two widely-spread introduced species, fountaingrass and kikuyugrass. A small number of mostly common, native shrubs and trees are scattered within these grasslands. The vegetation within PTA is only somewhat more intact. Human activity has altered the vegetation, introducing numerous weedy introduced plants but leaving a couple of native species as still dominant plants.

Three Endangered Plants Habitats protecting endangered species are near the proposed W-7 Alignment. It is recommended that, if selected, the roadway should be built and managed to reduce the risk of fire spreading from the roadway to these protected areas.

Botanical Study for Proposed Alignment W-7 for the Realignment of Saddle Road (State Route 200)

Introduction

This botanical study has been conducted in conjunction with a Supplemental Environmental Impact Statement for the proposed realignment of a portion of Saddle Road (State Route 200). Specifically, this botanical study covers a proposed alternative, identified as Alignment W-7, that extends from Mamalahoa Highway (State Route 190) eastward to a point between mileposts 41 and 42 of the existing Saddle Road (State Route 200), within the Pohakuloa Training Area (PTA). Approximately 8.9 miles of this 10.3 mile-long route traverses TMK parcel 6-7-001:041, within the 23,977 acre land known as Keʻamuku, within the ahupuaʻa of Waikoloa, South Kohala, Hawaii County. The remaining 1.4 miles is within the Pohakuloa Training Area.

The purposes of this botanical study are to provide a baseline description of the plants and vegetation of the study area and to locate and identify endangered plant species (if any), other rare species, and other valuable botanical resources within the study area.

Numerous endangered and rare plants are known from PTA (USACH 1977; Shaw 1997, and many others). After many years of military training activities, many of the plant communities of PTA are still dominated by native plants and largely native in character. The Keʻamuku parcel has a significantly different land-use history than PTA. Within Keʻamuku, decades of cattle-grazing have profoundly changed the composition and appearance of the vegetation.

A recent survey of the Keʻamuku parcel (Arnett 2002) found three endangered species near the southern border of the Keʻamuku property. These are *Haplostachys haplostachya*, (common name: *honohono*) a perennial mint with showy white flowers; *Stenogyne angustifolia* (no common name) a twining mint, and *Vigna o-wahuensis* (no common name) a very rare legume vine. Prior to 2002, *Haplostachys* and *Stenogyne* were only known to exist within PTA and nowhere else. Arnett (2002) recorded and mapped the location of over 8,000 *Haplostachys*, 11 *Stenogyne*, and 74 *Vigna* within Keʻamuku. The proposed W-7 alignment was carefully positioned to avoid all of the known locations of these endangered species.

Methods

General Description of the Project Area

The project area is on the west-facing slope of Mauna Kea. This is the leeward and, therefore, dry slope. This proposed road project traverses open land between about 2600 feet and 5800 feet above sea level. The annual rainfall is around 20 inches, perhaps somewhat dryer at the upper elevation and wetter at the lower. The great majority of the site is on lava flows erupted from Mauna Kea more than 10,000 years ago. A few slivers are on the Keʻamuku flow which came from Mauna Loa 200 to 750 years ago (Wolfe and Morris 1996).

The indigenous vegetation would probably have been classified as montane dry shrublands, montane dry grasslands and subalpine dry shrublands. However, the vegetation within the Keʻamuku parcel has been extensively altered by years of cattle-grazing and is now largely a pasture of introduced grasses with scattered shrubs and a very few trees. The indigenous vegetation within PTA is only somewhat more intact.

Study Corridor

The study corridor follows the proposed W-7 Alignment a distance of 54,400 feet from its origin at Mamalahoa Highway to a terminus on the existing Saddle Road within PTA. The study corridor traverses 46,800 linear feet through Keʻamuku and another 7500 linear feet through PTA. The centerline of the proposed right-of-way and the outer limits of the 500 foot-wide study corridor were surveyed and staked by land surveyors before the commencement of this botanical survey. Numbered stakes were placed every 300 feet along the centerline and limits.

Field Survey

All vascular plant species observed within the study corridor were identified and recorded. Taxonomy of flowering plants follows Wagner et al. (1990), for the most part, and ferns are named according to Palmer (2003). Estimates of the abundance of each species and vegetation descriptions were also recorded allowing the study corridor to be subdivided into a number of vegetation zones. The abundance estimates integrated observations within each zone. Abundance was recorded as “common,” meaning dominant in all or most of the zone; “frequent,” meaning occurring in most parts of the zone but usually with relatively little biomass; “infrequent,” meaning individuals were seen in only a few parts of the zone or were sparsely scattered within the zone; and “rare,” meaning only one or a few individual plants were seen in only one location.

An “index of importance” was calculated by arbitrarily assigning the value of 5 to each common species, 3 to frequent species, 1 to infrequent species, and 0 to rare species. These values were totaled and partitioned between native and introduced species in order to give an index of the relative importance, based on abundance. These values are used as a general indicator of the importance of native species in each zone, but cannot be used as quantitative measures of abundance or biomass.

Level of Effort

The initial botanical survey of the entire alignment was conducted on the 5th, 6th, 10th, and 12th of September, 2008. The field team was led by botanist, Grant Gerrish, who accompanied the technicians on the alignment at all times during the survey. The technicians for the September, 2008, survey were J. Johansen, J. Schulten, and E. Hansen, all graduates or students of the Biology Department, University of Hawaii at Hilo. All have had previous field experience with Hawaiian vegetation. Prior to beginning the survey, all the technicians examined living specimen of the rare plants in the greenhouse at PTA.

The botanical survey consisted of a 100% visual, walking survey. This means that the botanists walked along the entire alignment in an orderly manner that ensured visual observation of all parts of the study corridor. Surveys were conducted with three or four team members evenly spaced within one-half the width of the study corridor. That is, the team members were spaced between the staked centerline and the staked outer limit, walking roughly in parallel along the alignment. The team then covered the rest of the corridor by reversing direction and spacing themselves between the centerline and the other outer limit. With a team of three, spacing was approximately 83 feet between workers, requiring each to survey a swath 42 feet wide on either side of him/herself. With a four-member team, spacing was 62 feet between workers and each responsible for 31 foot-wide swaths on either side. The four member team was used on September 6 when surveying vegetation similar to nearby habitat known to support the endangered plants, *Haplostachys* and *Stenogyne*.

The leader and technicians spent a total of 88 hours in the study corridor. Total area of the study area is calculated as 54,400 linear feet multiplied by 500 foot width or 624.4 acres. This area was surveyed at the rate of 56.8 acres per person day (624.4 acres/88 person hours X 8 person hours per person day = 56.8 acres/person day.)

This level of effort and intensity of coverage provided a good probability that a shrub or tree extending above the prevailing grasses would be seen and identified. The probability that a small, solitary plant would be seen if it were lower in height than the prevailing grasses is lower.

An additional survey was conducted on May 9, 2009. This survey was timed to follow the seasonal winter and spring rains to increase the probability that any rare plants that might be in the study corridor would be actively growing and more readily found. This survey was conducted along the proposed alignment within the “Native Shrubs Amidst Fountaingrass” vegetation zone (Table 1). Two endangered plants, *Haplostachys* and *Stenogyne*, occur within this vegetation type not far from the study corridor. For this survey, the team consisted of Grant Gerrish and four technicians who are employed with the Natural Resources Division at Pohakuloa Training Area. All four technicians have field experience searching for and working with *Haplostachys* and other endangered plants at PTA. This survey covered approximately 6,000 feet of the study corridor with team members spaced 50 feet apart.

Results

Rare and Endangered Plants

No plants listed as endangered or threatened by the State of Hawaii or the U.S. Fish and Wildlife Service were found within the study area.

A small population that appears to be *Chamaesyce olowaluana* was found in the study corridor at 3600 feet above sea level (24,900 feet from the origin). This is a species that the U.S. Fish and Wildlife Service has unofficially named as a "species of concern," meaning that it may be declining. The population consisted of four small individuals that have been grazed and one large, near-dead specimen. The large individual was 6 feet high and approximately 5 inches in diameter at the base, with only a few living leaves present. These plants are tentatively identified as *C. olowaluana* based on leaf form and the large size of the near-dead, mature specimen. However, the poor condition of all the plants precludes positive identification; the plants could possibly be *C. multiformis*, a native species that is somewhat more common and not a species of concern.

Plant Species of the Proposed W-7 Alignment Study Area

A total of 91 species of vascular plants were recorded within the study corridor during the field survey (Appendix). Of these, 15 are endemic to the Hawaiian Islands and 15 are indigenous, meaning they are native to Hawaii and they occur naturally in other places, too. Sixty-one species are introduced, meaning they were brought to Hawaii by people, including one of Polynesian introduction, *'ihi'ai* (*Oxalis corniculata*).

Only two of the endemic species, *'aweoweo* (*Chenopodium* oahuense) and hard-stemmed lovegrass (*Eragrostis atropiodes*), are common or dominant anywhere in the study area. These two are dominant only where the study corridor leaves Ke'amuku and enters PTA as it approaches the existing Saddle Road. Seven of the fifteen endemic species were recorded as rare within the study area, meaning only one or very few individuals were observed. These findings show that endemic plants have been nearly extirpated from Ke'amuku during years of cattle-grazing.

Vegetation of the Proposed W-7 Alignment Study Area

Overview of the Vegetation

Nearly all of the Ke'amuku parcel has been used for cattle production for many years. Thus, the vegetation of most of the area is pasture, made up of introduced grasses with varying numbers of scattered native shrubs, many introduced forbs (weeds) and a few introduced shrubs and trees. The general appearance is of rolling grasslands on the rugged slope of Mauna Kea with some extensive stands of the indigenous shrub *'a'ali'i* (*Dodonaea viscosa*). From Mamalahoa Highway up to about 4600 feet above sea level, fountaingrass (*Pennisetum* *setaceum*) is the single dominant pasture grass. Above this elevation, kikuyugrass (*P. clandestinum*) becomes the dominant pasture species.

Seven different vegetation zones were recognized (Table 1, Figure1). These are similar to the vegetation zones reported by Arnett (2002). The zones generally correspond primarily to differences in human land-use patterns and secondarily to differences in the substrate. Four of the five zones within Keʻamuku (Fountaingrass with *ʻAʻaliʻi,* Native Shrubs Amidst Fountaingrass, Rangeland and *ʻAʻaliʻi,* and Moderate to Dense *ʻAʻaliʻi*) differ mainly in the balance between the two introduced pasture grasses (fountaingrass and kikuyugrass) and the abundance of native shrubs. In general, native shrubs are more numerous and diverse where grazing has been less intense. Often, these areas are those with very rocky surface and rugged terrain that may impede access by cattle. The fifth vegetation zone within Keʻamuku is the Keʻamuku Lava Flow, a young, near-barren *ʻaʻa* flow.

ʻAʻaliʻi, an indigenous shrub, is common in much of the study area and is a dominant species in several vegetation zones in Keʻamuku. It is probable that this abundance is in response to disturbance of the natural vegetation by human actions and does not represent the foundation of a healthy native plant community. *ʻAʻaliʻi* is tolerant of the wildfires that are frequent in this environment and it is relatively unpalatable to cattle. Overgrazing may increase the abundance of this native shrub. In contrast, nearly all other native plants in this region decline in response to wildfire and cattle grazing.

The two vegetation zones outside of the Keʻamuku parcel near Saddle Road (*Eragrostis* Grassland and *ʻAheahea* Shrubland) are somewhat different having a native grass and native shrubs among the dominant plants. Even here, however, introduced plan species outnumber the natives.

Description of the Vegetation Along the Proposed W7 Alignment

2600-4200 Ft. Elevation: Fountaingrass with *ʻAʻaliʻi* and Sparse Native Shrubs

This vegetation type prevails over the lower half of the proposed alignment, extending from the origin at Mamalahoa Highway for 27,400 feet. The overall appearance is of a vast grassland with a small and inconspicuous component of shrubs and small trees. This area is now used for cattle pasture and has been for many decades. The vegetation is introduced grasses and forbs, with widely scattered native shrubs and a few introduced shrubs and trees. This vegetation type is underlain by very stony land partially covered by shallow, fine textured soil. In the lower elevation portion, this covering soil is a fine sandy, mineral soil (Puu Pa soil series) but at higher elevation it is derived mostly from organic matter (Kaimu soil series) (Sato et al. 1973).

Table 1. Plant Communities recognized along the W7 Alignment; their location and extent beginning at Mamalahoa Highway; elevation, percentage of total community species that are endemic or indigenous (native), and an index weighted by plant abundance of the importance of native species within the community.

Community	**Location**	**Extent (linear feet)**	**Elevation (feet above sea level)**	**% Native Species**	**% Native Importance Index**
Fountaingrass with *Aàli'i*	Ke'amuku	0-27,400 (27,400)	2,600-4,200	34	22
Ke'amuku Flow	Ke'amuku	27,400-28,700 (1,300)	4,200-4,300	70	62
Native Shrubs Amidst Fountaingrass	Ke'amuku	28,700– 34,600 (5,900)	4,300-4,600	28	25
Rangeland and *'a'ali'i*	Ke'amuku	34,600– 44,700 (10,100)	4,600-5,100	39	26
Moderate to Dense *'a'ali'i*	Ke'amuku	44,700– 46,800 (2,100)	5,100-5,200	37	30
Eragrostis Grassland	PTA	46,800 – 51,000 (4,200)	5,200-5,600	37	38
'Aheahea Shrubland	PTA	51,000– 54,400 (3,300)	5,600-5,800	21	27

Throughout this zone, fountaingrass is the ever-present dominant plant, usually covering 90% or more of the surface. In swales where the surface has been covered by silt, other grasses dominate. At lower elevations, these swales are marked by buffelgrass (*Cenchrus ciliaris*) and guinea grass (*Panicum maximum*), at higher elevations within this zone, kikuyugrass dominates these small areas. Natal redtop (*Rhynchelytrum repens*) and barbwire grass (*Cymbopogon refractus*) are two other introduced grasses that are relatively wide spread. The most common of the introduced forbs are the ubiquitous and toxic yellow-flowered fire weed (*Senecio madagascarensis*), Tinaroo glycine (*Neonotonia wightii*), and black medick (*Medicago lupulina*) the latter two of which were probably intentionally seeded to improve the quality of the pasture.

The most common shrubs are the indigenous *'a'ali'i* and, somewhat less common, *'ilima*. *'A'ali'i* is variable in cover, ranging from widely scattered to approaching 50% cover in a few places at higher elevation in this zone. Other native shrubs or trees include *pukiawe* (*Leptecophylla tameiameiae*), *naio* (*Myoporum sandwicense*),*'ulei* (*Osteomeles anthyllidifolia*) , and *na'ena'e* (*Dubautia cilliolata*), all of which are very widely scattered. One individual, or one small population, was found of *'akia* (*Wikstroemia pulcherrima*) and *'akoko* (*Chamaesyce olowaluana*), both endemic large shrubs.

The introduced European olive (*Olea europaea*) is frequently seen in the middle reaches of this zone. It is conspicuous amidst the sea of fountaingrass because its foliage is dense and dark in

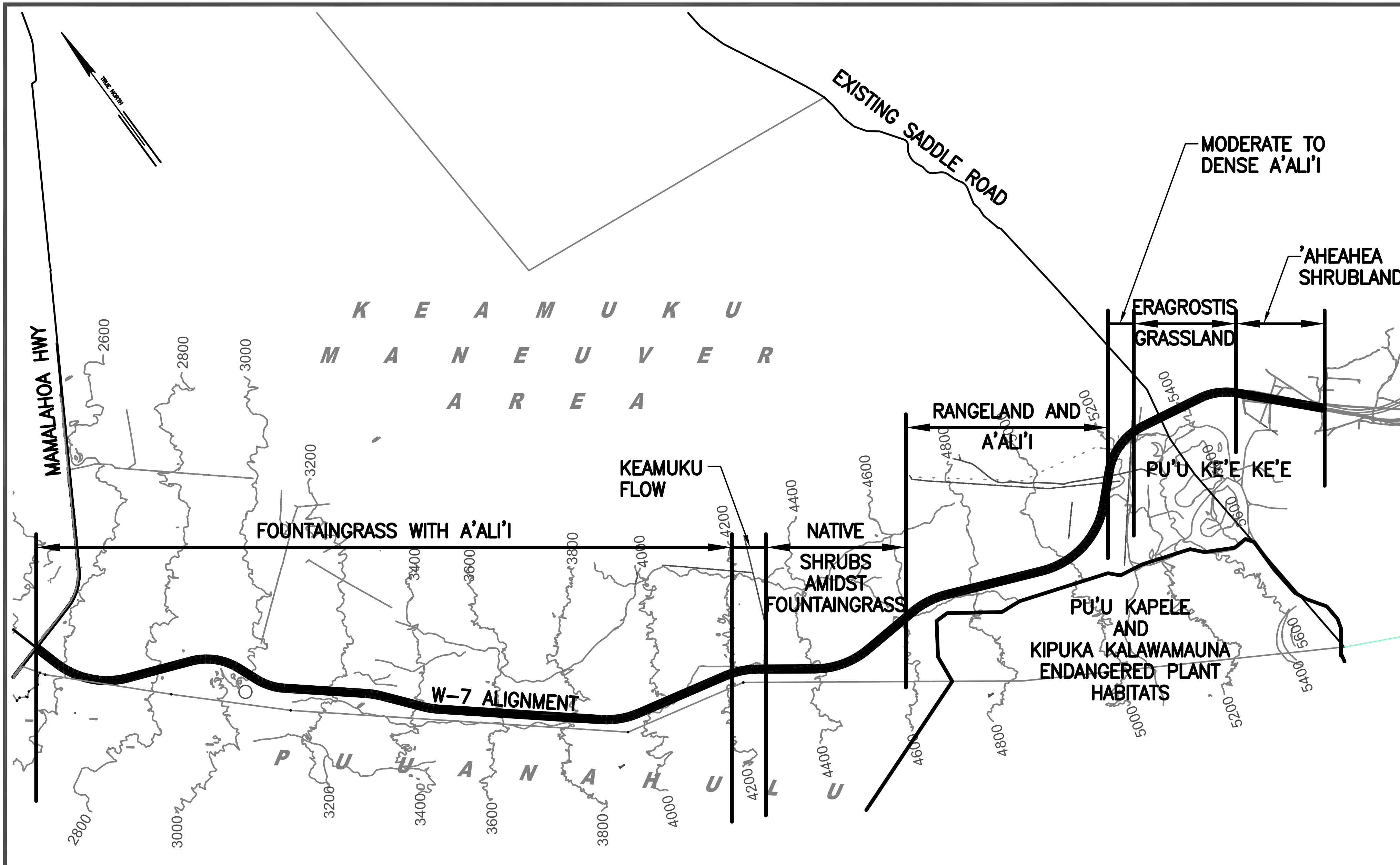


FIGURE 1. VEGETATION ZONES ALONG THE PROPOSED W7 ALIGNMENT

color. Introduced *haole koa* (*Leucaena leucocephala*), although less visible, is frequent at least in some areas, as is indigo (*Indigofera suffruticosa*) a much smaller shrub.

Nineteen of the fifty-six plant species (34%) recorded in this zone are native species; the rest are introduced, including one of Polynesian introduction. However, the "index of importance," calculated using the estimated frequency values, is only 22% for native species (Table 1). This indicates that the nineteen native species have disproportionately low cover and play a minor roll in the ecology of the vegetation of this zone.

4200-4300 Ft. Elevation: Keʻamuku Lava Flow

A 1300-foot section of the centerline of the study area traverses the sparsely vegetated Keʻamuku Lava Flow. Somewhat more of the southern edge of the study area is also on this flow. This is the only part of the study corridor that is situated on lava from Mauna Loa. The Keʻamuku Flow is very rugged *ʻa*ʻa lava dated to between 200 and 750 years before the present time (Wolfe and Morris 1996). The Keʻamuku Flow is very visible because the nearly-barren, brown lava contrasts with the surrounding pastures and grasslands.

The most conspicuous plant species on the Keʻamuku Flow is *ʻohiʻa lehua* (*Metrosideros polymorpha*), however only one individual of this native tree actually falls within the study corridor. Other native trees and shrubs include, *naio* (*Myoporum sandwicense*) and *pukiawe* (*Leptecophylla tameiameiae)*, both of which are common. Many of the introduced plants that are dominant in the surroundings, especially fountaingrass, fireweed and barbwire grass, are also found on the Keʻamuku Flow, however, in much lower densities.

Seven of the ten plant species (70%) within the study corridor on the Keʻamuku Flow are native species. This is the highest percent native species of all the vegetation zones along the proposed alignment. Similarly, the index of importance for native species is the highest here, at 62% (Table 1). These high values for native plants point out that this young lava flow is not easily invaded by introduced plants and the native plants may be more tolerant of the harsh conditions of the barren lava.

4300-4600 Ft. Elevation: Native Shrubs Amidst Fountaingrass

The vegetation of this zone differs from the fountaingrass pastures below the Keʻamuku Flow in that the native shrubs and trees are more dominant and conspicuous here. In places, the *ʻaʻaliʻi* forms about 50% cover and is up to 5 feet high. The other native shrubs, especially *ʻilima*, *pukiawe*, and *naʻenaʻe*, are much more common than at the lower elevation. In certain locations, especially silt-laden swales, the ground cover of fountaingrass is replaced by kikuyugrass, fireweed, black medick, and scarlet sage (*Salvia coccinea*), all introduced plants.

The surface in this zone is much more rocky and rugged than in the fountaingrass grasslands at lower elevation and is mapped in the soil survey as Very Stony Land (Sato et al. 1973). This ruggedness probably accounts for the presence of more species of native plants here. This is the habitat type that supports two endangered native species, *Haplostachys haplostachya* and

Stenogyne angustifolia, a short distance south of the proposed alignment. About 5900 feet of the proposed alignment is within this vegetation type.

Although native shrubs are an important component of the vegetation in this zone, there is a large number of introduced plants, including fountaingrass, kikuyugrass and fireweed that rank among the dominants. Thirteen of the 46 (28%) plant species in this zone are native. The index of importance of native species is even lower at 25%.

Thirteen of the twenty-nine (45%) plant species found in this vegetation zone are native. The index of importance of native species is somewhat lower at 33% (Table 1). The difference between these two indices reflects the findings that even though there are a substantial number of native species, more introduced plants are among the dominants. These

4600-5100 Ft. Elevation: Rangeland and *ʻAaʻaliʻi*

An extent of 10,100 feet of the study corridor passes through this heavily degraded rangeland. This zone has the potential for good pasture because the soil here, mapped as Kilohana Loamy Fine Sand (Sato et al. 1973) is much less stony than at lower elevations along the study corridor. This zone includes two subtypes with very different appearances: heavily grazed kikuyugrass pasture and dense stands of *ʻaʻaliʻi*, that is four to five feet high and difficult to pass through. These two subtypes are included together because it appears that they both are the product of heavy cattle grazing over a period of time. *ʻAʻaliʻi* is one of the few native plant species that is relatively tolerant of both cattle grazing and fire. In this zone, the grass is currently cropped very short and appears overgrazed. Even in the grassy areas, shrubs of *ʻaʻaliʻi* are present, indicating that it is at least as tolerant as the introduced grasses of heavy grazing and the fires that occur in this zone. In fact, it appears that the dense stands of *ʻaʻaliʻi* are the product of years of overgrazing and probably frequent fire. These extensive areas are no longer of any value for grazing. If intensive grazing continues in the grassy areas, they may be converted to dense *ʻaʻaliʻi* stands. In these areas, the indigenous *ʻaʻaliʻi* behaves as a successional species and this vegetation type should not be considered a remnant of the original vegetation.

Seven of the eighteen (39%) plant species found in this zone are native. However, only one of these, *ʻaʻaliʻi* has a high importance value. The trend noted above of native plant species having disproportionately low cover, and therefore importance values, is strongest in this vegetation zone, resulting in an index of importance for native plants of just 26% (Table 1).

5100-5200 Ft. Elevation: Moderate to Dense *ʻAʻaliʻi*

At this elevation, the vegetation is somewhat less degraded in that a few other species of native trees and shrubs are sparsely represented. These appear to be remnants of the original vegetation rather that reinvasion following degradation, as in the previous vegetation type. These native plants include *mamane* (*Sophora chrysophylla*), *ilima* (*Sida fallax*), *naio* and a single specimen of *pilo* (*Coprosma montana*) seen during the survey.

ʻAʻaliʻi is the dominant species in much of this zone; however, it also includes extensive areas of heavily gazed kikuyugrass with many introduced weeds, including fireweed, black mustard (*Brassica nigra*) , stinkweed (*Tagetes minuta*) and crown-beard (*Verbesina encelioides*). Thirty-seven percent of the plant species recorded are native species; the index of importance for native species is somewhat lower at thirty percent (Table 1). An extent of 2100 linear feet of the study corridor passes through this vegetation type. The underlying soil is mapped as Kilohana Loamy Fine Sand (Sato et al. 1973).

5200-5600 Ft. Elevation: *Eragrostis* Grassland

At 46,800 linear feet from the origin on Mamalahoa Highway, the study corridor crosses *Keʻekeʻe* Road and leaves the Keʻamuku parcel. This zone east of *Keʻekeʻe* Road has not been grazed, at least in recent years. Here, the dominant grass is the endemic hard-stemmed lovegrass (*Eragrostis atropioides*) which forms a near-complete cover in most areas. The terrain is very rugged in the lower half of this zone and native shrubs are common, as are some introduced weedy species. *ʻAʻaliʻi* is common and *mamane*, *naio*, and *ʻilima* are frequent. Kikuyugrass is the most common of the introduced plants, but orchardgrass (*Dactylis glomerata)*, stinkweed and fireweed are also abundant. The upper part of the zone, nearing the existing Saddle Road, is a leveler and smoother surface and also more disturbed and degraded by human activities. Here, the native shrubs are less frequent and the weedy introduced species become more prevalent.

In this zone, thirty-seven percent of the 38 species recorded are native, and the index of importance for native species is 38% (Table 1). The soil in this zone is mapped as Keekee Loamy Sand, derived from cinder material erupted from nearby Puu Keʻekeʻe and other nearby cinder cones (Sato et al. 1973).

5600-5800 Ft. Elevation: *ʻAheahea* Shrublands

At this elevation, the study corridor rejoins the existing Saddle Road and is superimposed over it for an extent of 3300 linear feet before terminating. This zone has an unusual substrate and a unique set of forces of disturbance that support a unique combination of native and introduced plant species. The surface is mapped as a deposit of alluvial and colluvial sand and gravel deposited by gravity and running water (Wolfe and Morris 1996).

The dominant plant is the endemic shrub *ʻaweoweo* forming a stand about five feet high. The native hard-stemmed lovegrass is also common. Research shows that both of these endemic species are tolerant of disturbance and resprout after fire (Lamb 1981, Sherry et al. 1999). It is probable that this community does not represent the original indigenous plant community but is itself a product of disturbance. Other than those two hardy native species, the vegetation contains a large collection of introduced grasses and weeds, probably associated with continuing human disturbance near Saddle Road. One of the more conspicuous is Russian thistle (or tumbleweed) (*Salsola kali*). Between the shrubs and other plants, much of the surface is barren and dusty and there is much evidence of human activity. Twenty-one percent of the twenty-four species present are native and the index of importance for native species is only slightly higher at twenty-seven percent (Table 1).

Discussion of Potential Adverse Impacts of Proposed Action and Recommendations

No endangered plant species or unique, sensitive native plant communities were found within the study corridor.

Endangered Plant Habitats have been established within PTA at Kipuka Kalawamauna and Puu Ka Pele. These are the primary sites where h*onohono* (*Haplostachys*) survives within the Hawaiian Islands (and on Earth) today. Puu Kapele is about 6770 feet southeast and Kipuka Kalawamauna is about 4700 feet south of the proposed W-7 alignment. A third Endangered Plants Habitat has been designated within Ke‘amuku to protect and manage *Haplostachys* and *Stenogyne angustifolia*. This site is approximately 500 feet west of the proposed W-7 alignment. These sites are managed by the U.S. Army to protect and recover endangered plant species. All three sites have been fenced to exclude feral ungulates.

<u>Recommendation</u>

These three Endangered Plants Habitats should be protected from any increased risk of wildfire that may originate from the proposed road. Protection should include constructing features in the roadway that minimize the probability that fire will spread from the road, management of roadside vegetation to reduce available fuel, if needed, and a well-designed and well-supported fire suppression plan specifically for the Endangered Plants Habitats. Specific fire protection plans are discussed in the Supplemental EIS.

References

Arnett, M. 2002. Report of survey for rare plants on the Ke‘amuku parcel, Island of Hawaii. Prep. for U.S. Army Corps of Engineers by Center for Environmental Management of Military Lands, Colorado State University. Fort Collins, Colorado.

Lamb, S. H. 1981. Native trees and shrubs of the Hawaiian Islands. The Sunstone Press, Santa Fe, New Mexico. 158 p.

Palmer, D. D. 2003 Hawai‘i’s Ferns and Fern Allies. University of Hawaii Press. Honolulu, HI. 324 p.

Sato, H. H., W. Ideda, R. Paeth, R. Smythe, and M. Takehiro, Jr. 1973. Soil Survey of the Island of Hawaii, State of Hawaii. U.S. Government Printing Office, Washington, D.C

Shaw, Robert. 1997. Rare Plants of Pohakuloa Training Area. Technical Publication Series 97-24, CEMML, Colorado State University. Fort Collins, CO.

Sherry, K., J. M. Castillo, R. B. Shaw. 1999. Effects of wildfire on vegetation and rare plants in arid montane shrublands. Pohakuloa Training Area, Hawaii. 1999 Hawaii Conservation Conference, Honolulu, HI.

Wagner W. L., D. R. Herbst and S. H. Sohmer. 1990. Manual of the Flowering Plants of Hawai'i. University of Hawai'i Press/Bishop Museum Press. Honolulu, HI.

Wolfe, E. W., and J. Morris. 1996. Geologic Map of the Island of Hawaii. U.S. Geological Survey. 3 sheets + booklet.

USACH 1977. Environmental Impact Statement for Pohakuloa Training Area.

APPENDIX

Vascular plant species found within the Proposed W7 Alignment, Saddle Road. Estimated abundance given for each Vegetation Zone traversed by the study corridor.

ORGN = Origin (E = endemic, I = indigenous, P= Polynesian introduction, A = introduced); LF = Life Form (T = tree, S = shrub, H = herb, G = grass or grass-like, F = fern, L = liana or vine).

VEGETATION ZONES
1 - Fountaingrass with *Aàli'i*
2 - Ke'amuku Flow
3 - Native Shrubs Amidst Fountaingrass
4 - Rangeland and *A'ali'i*
5 - Moderate to Dense *A'ali'i*
6 - *Eragrostis* Grassland
7 - *'Aheahea* Shrubland

ABUNDANCE WITHIN ZONES
C - Common
F - Frequent
I - Infrequent
R - Rare

ORGN	LF	BOTANICAL NAME / COMMON NAME	1	2	3	4	5	6	7
A	F	*Adiantum hispidulum* Sw. rough maidenhair fern	I		I				
A	S	*Ageratina riparia* (Regel) R. King & H. Robinson *Hamakua pamakani*	R						
A	H	*Anagalis arvensis* L. pimpernel	I		I				
I	F	*Asplenium adiantum-nigrum* L. *'iwa'iwa*	I	F	I			I	
E	F	*Asplenium trichomanes* L. subsp. *densum* maidenhair spleenwort	R		R			I	
E	H	*Argemone glauca* Pope *pua-kala*			R	R		I	
A	G	*Avena fatua* L. wild oat						I	F

Vascular plant species found within the Proposed W7 Alignment. (Continued)

ORGN	LF	BOTANICAL NAME COMMON NAME	VEGETATION ZONES 1	2	3	4	5	6	7
A	H	*Bidens alba* (L.) DC beggar's tick			I				
E	S	*Bidens menziesii* (Gray) Sherff subsp. *filiformis* *ko'oko'olau*				R			
A	H	*Bidens pilosa* L. *ki nehe*, Spanish needle	R				I	I	I
A	H	*Brassica nigra* (L.) W.Koch black mustard			I	I	F	F	F
A	G	*Bromus rigidus* Roth ripgut grass			I				I
A	G	*Bromus willdenowii* Kunth rescue grass					I	I	I
E	G	*Carex wahuensis* C. A. Mey. no common name	R		R			R	
A	G	*Cenchrus ciliaris* L. buffelgrass	C						
A	H	*Centaurea melitensis* L. yellow star thistle			I				
A	H	*Centaureum erythraea* Rafn. bitter herb	I		F	I	I	I	
A	H	*Chamaecrista nicitans* (L.) Moench partridge pea	F						
E	T	*Chamaesyce olowaluana* (Sherff) Croizat & Degener *'akoko*	R						
A	H	*Chenopodium ambrosioides* L. Mexican tea						I	I
E	S	*Chenopodium oahuense* (Meyen) Aellen '*aheahea*					I	F	C

Vascular plant species found within the Proposed W7 Alignment. (Continued)

ORGN	LF	BOTANICAL NAME COMMON NAME	VEGETATION ZONES 1	2	3	4	5	6	7
A	H	*Cirsium vulgare* (Savi) Ten. bull thistle	I						
I	L	*Coculus trilobus* (Thunb.) DC *huehu*	I						
A	H	*Conyza bonariensis* (L.) Cronq. hairy horseweed	I				I	I	F
A	H	*Conyza canadensis* (L.) Cronq. horseweed	I				I	I	F
E	T	*Coprosma montana* Hbd. *pilo*						R	
A	H	*Crotolaria pallida* Aiton smooth rattlepod	R						
A	G	*Cymbopogon refractus* (R. Br.) A. Camus barbwire grass	F	F	I				
A	G	*Dactylis glomerata* L. orchardgrass	I			F	F	I	F
A	H	*Desmodium sandwicense* E. Mey. Spanish clover	R						
I	S	*Dodonaea viscosa* Jacq. *‘a‘ali‘i*	C	C	C	C	C	C	I
E	S	*Dubautia cilliolata* (DC) Keck *na'ena'e*	R		F	R			
E	G	*Eragrostis atropioides* Hillebr. hard-stemmed lovegrass				I	I	C	C
A	T	*Eucalyptus* cf. *citridora* Hook. lemon-scented gum				R			
A	H	*Galium divaricatum* Pourr. ex Lam. bedstraw			I	I			
A	H	*Geranium homeanum* Turcz. cranesbill	I		I				

Vascular plant species found within the Proposed W7 Alignment. (Continued)

ORGN	LF	BOTANICAL NAME COMMON NAME	VEGETATION ZONES 1	2	3	4	5	6	7
A	H	*Helichrysum foetidum* (L.) Cass. stinking everlasting						I	I
A	H	*Heterotheca grandiflora* Nutt. telegraph plant			I			F	F
A	G	*Holcus lanatus* L. velvetgrass						I	I
A	S	*Indigofera suffruticosa* Mill. indigo	F						
I	V	*Ipomoea indica* (J. Burm.) Merr. morning glory	I						
A	H	*Lepidium virginicum* L. pepperwort	I		I	C	C	F	I
I	S	*Leptecophylla tameiameiae* (Cham. & Schltdl.) C.M. Weiller *pukiawe*	I	C	I				
A	S	*Leucaena leucocephala* (Lam.) de Wit *koa haole*	F						
I	H	*Lythrum maritimum* Kunth *pukamole*	R		I				
A	H	*Marrubium vulgare* L. common horehound			I				
A	H	*Medicago lupulina* L. black medick	I		F	I			I
A	H	*Medicago polymorpha* bur clover			F	F			
A	H	*Melilotus alba* Medik. white sweet clover	R						
A	G	*Melinis minutiflora* Beauv. molassesgrass	I		I				

Vascular plant species found within the Proposed W7 Alignment. (Continued)

ORGN	LF	BOTANICAL NAME COMMON NAME	VEGETATION ZONES 1	2	3	4	5	6	7
E	T	*Metrosideros polymorpha* Gaud. var. *incana* *'ohi'a-lehua*		I					
I	T	*Myoporum sandwicense* A. Gray *naio*	I	F	R		I	I	
A	H	*Neonotonia wightii* (Am.) Lackey Tinaroo glycine	C						
A	T	*Olea europaea* L. *'oliw*, olive	I		R				
I	S	*Osteomeles anthyllidifolia (Sm.)* Lindl. ‘ulei	I		I		I		
A	T	*Oppuntia ficus-indica*(L.) Mill. *panini*	I		R			I	
P	H	*Oxalis corniculata* L. *'ihi'ai*, yellow wood sorrel	I		I	I			
A	G	*Panicum maximum* Jacq. Guinea grass	C						
A	L	*Passiflora suberosa* L. *huehue haole*	R						
I	F	*Pellaea ternifolia* (Cav.) Link cliffbrake	R	F	I		I		
A	G	*Pennisetum clandestinum* Hochst. ex Chiov. kikuyugrass	F		C	C	C	C	I
A	G	*Pennisetum setaceum* (Forsk.) Chiov. fountaingrass	C	C	C	F	F	I	I
I	H	*Peperomia leptostachya* Hook & Arnott *‘ala‘ala wai nui*	R						
A	H	*Petrorhagia velutina* (Gaus.) Ball&Heyw. childing pink					I	I	

Vascular plant species found within the Proposed W7 Alignment. (Continued)

ORGN	LF	BOTANICAL NAME COMMON NAME	1	2	3	4	5	6	7
A	H	*Picris hieracioides* L. hawkweed			I				
I	F	*Psilotum nudum* (L.) Griseb. *moa*	R						
A	H	*Plantago lanceolata* L. narrow-leaved plantain	I		I	I		I	
I	F	*Pleopeltis thunbergiana* Kaulf. *pakahakaha*	F				I	F	I
E	F	*Pteridium aquilinum* (L.) Kuhn var. *decompositum* (Gaud.) Tryon bracken	I				I		
A	G	*Rhynchelytrum repens* (Willd.) Hubb. Natal redtop	F		F		F	F	I
A	H	*Rumex acetosella* L. sheep sorrel						I	
E	S	*Rumex giganteus* W. T. Aiton *pawale*						I	
A	H	*Salsola kali* L. Russian thistle					I	I	C
A	H	*Salvia coccinea* B.Juss *ex* Murray scarlet sage			F				
E	T	*Santalum paniculatum* Hook. & Arnott *'iliahi*	R						
A	H	*Senecio madagascariensis* Poiret Madagascar ragwort, fireweed	F	C	C	C	C	F	F
I	S	*Sida fallax* Walp. *'ilima*	I	I	C	I	I	F	I
A	H	*Silene gallica* L. small-flowered catchfly			I				

Vascular plant species found within the Proposed W7 Alignment. (Continued)

ORGN	LF	BOTANICAL NAME COMMON NAME	VEGETATION ZONES						
			1	2	3	4	5	6	7
I	H	*Solanum americanum* Mill. *popolo*, nightshade			R		I	I	
A	H	*Sonchus oleraceus* L. *pualele*			I				
E	T	*Sophora chrysophylla* (Salisb.) Seem *mamane*				I	I	I	
A	G	*Sporobolus indicus* (L.) R. Br. West Indian dropseed	I						
A	H	*Tagetes minuta* L. stinkweed			I	I	F	F	F
A	H	*Verbascum thapsus* L. common mullein						I	I
A	H	*Verbena litoralis* Kunth vervain	I		F			I	
A	H	*Verbesina encelioides* (Cav.) Benth.&Hook crown-beard	I				F	F	F
A	H	*Vicia villosa* Roth hairy vetch	I		F		F	I	
A	G	*Vulpia bromoides* (L.) S.F. Gray brome fescue			I				
A	H	*Wahlenbergia gracillis* no common name			I				
I	S	*Waltheria indica* L. *uhaloa*	I						
E	S	*Wikstroemia pulcherrima* Skottsb. *'akia*	R						

[This page intentionally left blank]

SADDLE ROAD (STATE ROUTE 200)
Mamalahoa Highway (State Route 190) to Milepost 41
County of Hawai‘i, State of Hawai‘i
FHWA Project No. 200(00)

SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

Submitted Pursuant to Section 42 U.S.C. 4332(2)(c)
and Chapter 343, Hawai‘i Revised Statutes by the

U.S. DEPARTMENT OF TRANSPORTATION
Federal Highway Administration (FHWA)
Central Federal Lands Highway Division
and
STATE OF HAWAI‘I
Department of Transportation (HDOT)
Highways Division

Cooperating Agencies
U.S. Army Garrison, Hawai‘i

Appendix D
Vertebrate Fauna Report

Avian and Terrestrial Mammalian Species Surveys Conducted on the W-7 Alignment of the Hawai‘i State Route 200 - Māmalahoa Highway to Milepost 6 Saddle Road Realignment Project North Kona District, Island Of Hawai‘i.

-

U.S. Department of Transportation
Federal Highway Administration
Central Federal Lands Highway Division
Project No. A-AD-6 (1)

Prepared by:

Reginald E. David
Rana Biological Consulting, Inc.
P.O. Box 1371
Kailua-Kona, Hawai‘i 96745

Prepared for:

DMT Associates
677 Ala Moana Blvd, Suite 703
Honolulu, Hawai‘i 96813

September 22, 2009

Table of Contents

Figures & Tables

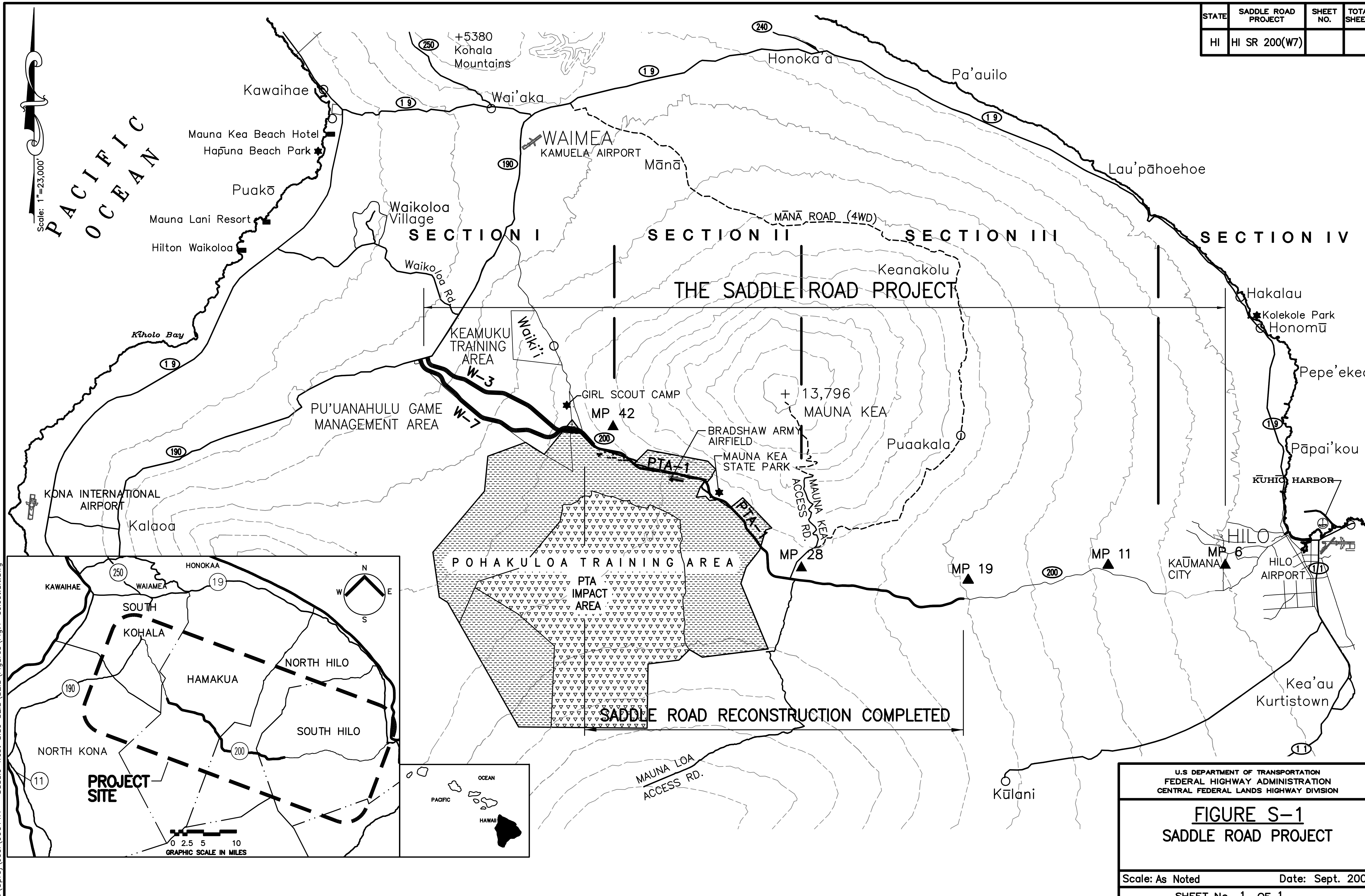
Introduction

The State of Hawaii, Department of Transportation, Highways Division (HDOT), in consultation with the Federal Highways Administration (FHWA), Central Federal Lands Highway Division is proposing to realign and improve the Saddle Road (State Route 200), from Māmalahoa Highway (State Route 190) to Milepost 6 on the Hilo side of the island, (hereinafter Saddle Road Improvement Project) (Figure S-1). A Final Environmental Impact Statement (EIS) and Record of Decision for the Saddle Road improvements were completed in 1999 (FHWA, *et al.* 1999). As part of the EIS process, twelve action alternatives incorporating use of the existing alignment and potential new alignments were considered. The project was divided into four different sections (Sections I, II, III, and IV) for purposes of alternative development and selection, as well as project scheduling (Figure 1). In the intervening years since the release of the EIS, the Department of the Army has purchased a large section of land in the Ke‘āmuku area from Parker Ranch. This development has rendered the selected alignment, W-3, in Section I to no longer fulfill one of the key purposes and needs of the proposed improvement project, namely the separation of military training activity from the general driving public using the Saddle Road. Another alignment, W-7, has been proposed and studied to fulfill the need to separate civilian traffic from military training activities. This report documents the avian and mammalian studies that were conducted as part of the revised project and will be included in the supplemental EIS that is currently being prepared.

The primary purpose of the survey that I report on in this document was to determine if there were any avian or mammalian species currently listed as endangered, threatened, or proposed for listing under either the federal or the State of Hawai‘i's endangered species programs on, or within the immediate vicinity of the proposed W-7 alignment. Federal and State of Hawai‘i listed species status follows species identified in the following referenced documents (Division of Land and Natural Resources (DLNR) 1998, Federal Register 2005, U. S. Fish & Wildlife Service (USFWS) 2005, 2009). Fieldwork was conducted in June 2009.

Avian phylogenetic order and nomenclature follows *The American Ornithologists' Union Check-list of North American Birds 7th Edition* (American Ornithologists' Union 1998), and the 42nd through the 49th supplements to *Check-list of North American Birds* (American Ornithologists' Union 2000; Banks et al. 2002, 2003, 2004, 2005, 2006, 2007, 2008). Mammal scientific names follow *Mammals in Hawaii* (Tomich 1986). Place names follow *Place Names of Hawaii* (Pukui et al. 1974).

Hawaiian and scientific names are italicized in the text. A glossary of technical terms and acronyms used in the document, which may be unfamiliar to the reader, are included at the end of the narrative text on Page 16.

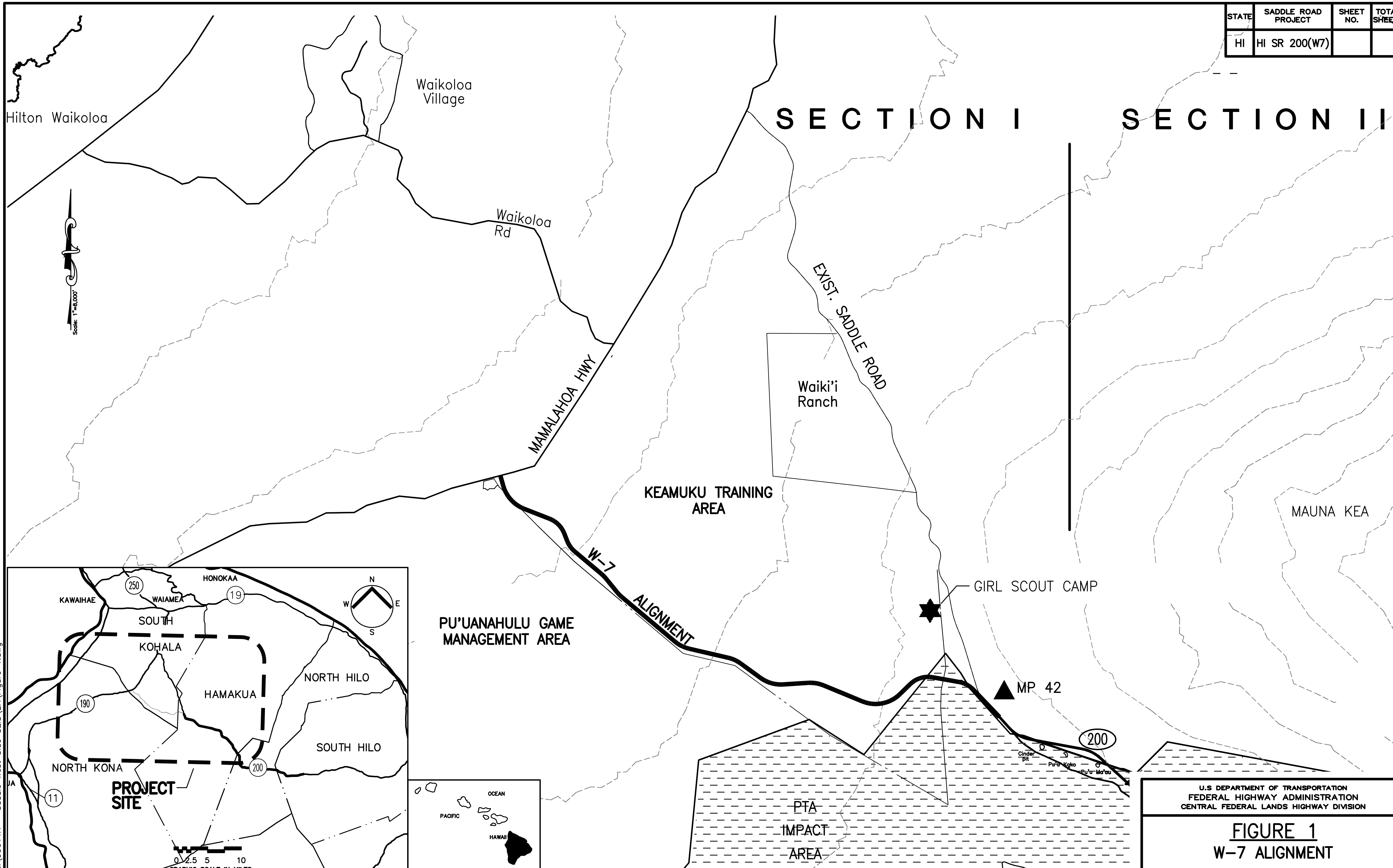


U.S DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

FIGURE S-1
SADDLE ROAD PROJECT

Scale: As Noted | Date: Sept. 2009

SHEET No. 1 OF 1



U.S DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

FIGURE 1
W-7 ALIGNMENT

Scale: As Noted — Date: Sept. 2009

SHEET No. 1 OF 1

O:\Oproj\Joel\99011A – Saddle West Side SEIS\BA\Figure 1.dwg

General Site and Project Description

The W-7 alignment gently slopes from east to west, from an elevation of ~ 1765 meters (5800-feet), above mean sea level (ASL), along the existing Saddle Road, down slope to where it will intersect the existing Māmalahoa Highway at ~ 760 meters (2493-feet) ASL. The alignment is roughly 10.3 miles long, with approximately 8.9 miles within TMK: 6-7-001:041: the remaining 1.4 miles of the alignment goes through a portion of the main Pōhakuloa Training Area (PTA) (Figure 1).

The project area is on the west-facing slope of Mauna Kea, on the leeward side of the island. Annual rainfall is in the neighborhood of 50 centimeters (20-inches) a year, with the upper reaches somewhat drier. The terrain present along the alignment is composed of a mix of *ʻaʻā* and *pāhoehoe* lava flows disgorged from Mauna Kea more than 14,000 and 65,000 years ago during the Pleistocene Age. Additionally there are surficial alluvial deposits in many areas, which were washed down from Mauna Kea at the end of the last ice age. Along the southern boundary of the area several small fingers of *ʻaʻā* from the Keʻāmuku flow, deposited by Mauna Loa between 200 and 750 years ago overlay portions of the older Mauna Kea flows (Wolfe and Morris 1996).

The vast majority of the site has been extensively altered by decades of cattle grazing and is now largely a pasture of introduced grasses with scattered shrubs and very few trees. The vegetation between the eastern terminus of the project and approximately the 4200 foot level is dominated by fountain grass (*Pennisetum setaceum*), with sparse amounts of *ʻaʻalilʻi* (*Dodenea viscose*), and numerous other alien grasses and Madagascar ragwort (*Senecio madagascariensis*) (Figure 2). At the lower elevations in this section there are also pockets buffelgrasss (*Cenchrus ciliaris*), Guinea grass (*Panicum maximum*), and Kikuyu grass (*Pennisetum clandestinum*). Between the 4300 foot and 4600 foot elevation the makeup of the vegetation is similar to that found in the lower section, except that in this zone the native species are dominate, with large dense stands of *ʻaʻaliʻi* making up to 50% of the ground cover (Figure 3). Between the 4300-foot elevation and the boundary of the Keʻāmuku parcel and PTA proper the habitat is similar to the previously described ones, but with varying densities of the component species, as is to be expected in pastureland that is grazed on a rotational basis (Figure 4). Between approximately 5200-feet ASL and the eastern terminus of the project the substrate is markedly different than that found lower on the alignment, in this area is made up of alluvial and colluvial sand and gravel deposited by the erosion of Mauna Kea by the melting of the last ice cap. On this substrate the dominate plant is the endemic shrub *ʻaheahea* (*Chenopodium oahuense*).

Mammalian Survey Methods

With the exception of the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), or *ʻōpeʻapeʻa* as it is known locally, all terrestrial mammals currently found on the Island of Hawaiʻi are alien species. Most are ubiquitous. The survey of mammals was limited to visual and auditory detection, coupled with visual observation of scat, tracks, and other animal sign. A running tally was kept of all vertebrate species observed and heard within the project area.

Figure – 3 Fountain grass dominated western end of W-7

Figure – 4 *‘A‘ali‘i* and grass shrubland W-7

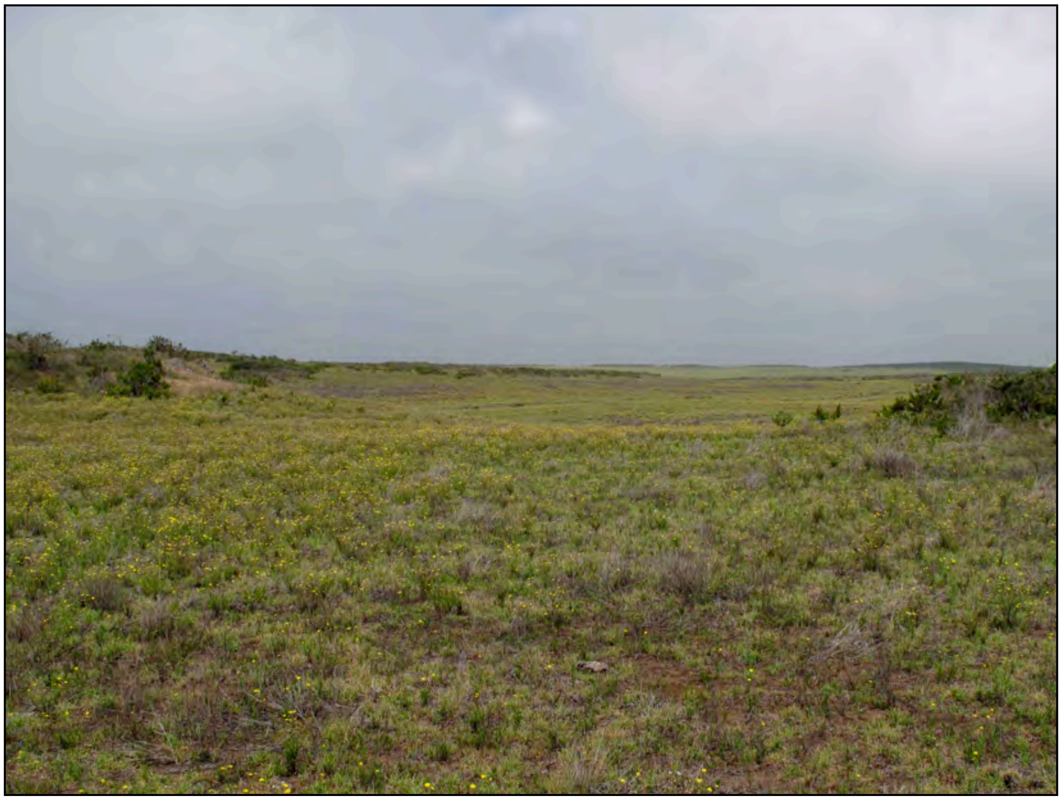


Figure - 5 Heavily grazed grass land with Madagascar ragwort upper third of W-7

Mammalian Survey Results

A total of nine mammalian species were detected during the course of this survey (Table 1). Several European house mice (*Mus musculus domesticus*) were seen at various locations within the site. Small Indian mongooses (*Herpestes a. auropunctatus*) were seen at several locations, predominantly on the western third of the alignment. Several horses (*Equus c. caballus*) were seen within the Ke‘āmuku parcel. Pigs (*Sus s. scrofa*), domestic cattle (*Bos taurus*), and feral goats (*Capra h. hirca*), and feral sheep (*Ovis aries*) were seen in numbers along the whole length of the Ke‘āmuku parcel. Additionally, tracks, scat and sign of dog (*Canis f. familiaris*), small Indian mongoose, cat (*Felis c. catus*), horse, pig, cattle, goat and sheep were encountered throughout the Ke‘āmuku parcel. Of particular note were the numerous very large flocks of goats seen in the mid-to-upper elevation areas of the alignment; over 400 animals were seen a day (Figure 6).

All nine of the mammals recorded are considered to be alien to the Hawaiian Islands. Hawai‘i‘s sole endemic terrestrial mammalian species, the endangered Hawaiian hoary bat, was not detected during the course of this survey.

Table 1 - Mammalian Species Detected Saddle Road W-7 Alignment

Common name	***Scientific name***	***Det/Type***
	RODENTIA - Gnawers	
	Muridae - Old World Rats & Mice	
European house mouse	*Mus musculus domesticus*	V
	CARNIVORA- Flesh Eaters	
	Canidae - Wolves, Jackals & Allies	
Domestic dog	*Canis f. familiaris*	Si
	Viverridae - Civets & Allies	
Small Indian mongoose	*Herpestes a. auropunctatus*	V, Si, Skel
	Felidae- Cats	
House cat	*Felis catus*	Si
	PERISSODACTYLA - Odd-Toed Ungulates	
	Equidae - Horses, Asses & Zebras	
Domestic horse	*Equus c. caballus*	V, Si
	ATRIODACTYLA - Even-Toed Ungulates	
	Suicidae - Old World Swine	
Pig	*Sus s. scrofa*	V, Si
	Bovidae- Hollow-horned Ruminants	
Domestic cattle	*Bos taurus*	V, Si, Skel
Goat	*Capra h. hircus*	V, Si, Skel
Domestic sheep	*Ovis aries*	V, Si,

Key To Table 1

Det/Type	Detection type
V	Visual – animals that were seen
Skel	Skeleton – animals that were detected through observation of skeletal remains
A	Audio – animals that were detected by sound
Si	Sign – animals that were detected by seeing tracks, scat and other sign

Figure – 6 Goats (*Capra h. hirca*) Mid level W-7

Avian Survey Methods

Forty-five avian count stations were sited along the W-7 alignment. Count stations were placed at approximately 350-meter intervals equally spaced along the proposed right-of-way. Six-minute point counts were made at each of the 45-count stations. Each station was counted once. Field observations were made with the aid of Leitz 10 X 42 binoculars and by listening for vocalizations. Counts were concentrated between 06:30 a.m. and 10:00 a.m., the peak of daily bird activity.

Avian Survey Results

A total of 749 individual birds of 27 different species, representing 18 separate families, were recorded during station counts (Table 2). Three of the species recorded, Pacific Golden-Plover (*Pluvialis fulva*), Ruddy Turnstone (*Arenaria interpres*), and Short-eared Owl (*Asio flammeus sandwichensis*) are native species. The Pacific Golden-Plover, and Ruddy Turnstone are indigenous migratory shorebird species that nests in the high Arctic during the late spring and summer months, returning to Hawai‘i and the Tropical Pacific to spend the fall and winter months each year. They usually leave Hawai‘i for their trip back to the Arctic in late April or the very early part of May each year, though as evidenced by this surveys results small numbers of both of these species over-summer in Hawai‘i. The Hawaiian endemic sub-species of the Short-eared Owl, or *Pueo* is a diurnal bird of prey, regularly seen within the grassland areas in North and

South Kohala. The remaining 24 avian species detected are all considered to be alien to the Hawaiian Islands.

Avian diversity and densities were low, though in keeping with the habitat present within the project area. I recorded no birds at one of the 45-count station. Two species, Sky Lark (*Alauda arvensis*), and House Finch (*Carpodacus mexicanus*), accounted for slightly less than 54% of the total number of birds recorded during station counts. The most common avian species recorded was Sky Lark, which accounted for slightly less than 40% of the total number of individual birds recorded. An average of 17 individual birds were recorded per station count.

Table 2 - Avian Species Detected Saddle Road W-7 Alignment

Common Name	Scientific Name	ST	RA
	GALLIFORMES		
	PHASIANIDAE - Pheasants & Partridges		
	Phasianinae - Pheasants & Allies		
Gray Francolin	*Francolinus pondicerianus*	A	0.31
Black Francolin	*Francolinus francolinus*	A	0.51
Erckel's Francolin	*Francolinus erckelii*	A	1.20
Japanese Quail	*Coturnix japonica*	A	0.11
Ring-necked Pheasant	*Phasianus colchicus*	A	0.20
	Meleagridinae - Turkeys		
Wild Turkey	*Meleagris gallopavo*	A	0.42
	ODONTOPHORIDAE - New World Quail		
California Quail	*Callipepla californica*	A	0.22
	CHARADRIIFORMES		
	CHARADRIIDAE - Lapwings & Plovers		
	Charadriinae - Plovers		
Pacific Golden-Plover	*Pluvialis fulva*	IM	0.11
	SCOLOPACIDAE - Sandpipers, Phalaropes & Allies		
	Scolopacinae - Sandpipers & Allies		
Ruddy Turnstone	*Arenaria interpres*	IM	0.24
	PTEROCLIDIDAE - Sandgrouse		
Chestnut-bellied Sandgrouse	*Pterocles exustus*	A	0.31
	COLUMBIFORMES		
	COLUMBIDAE - Pigeons & Doves		
Rock Pigeon	*Columba livia*	A	0.71
Spotted Dove	*Streptopelia chinensis*	A	0.11
Zebra Dove	*Geopelia striata*	A	0.38
	STRIGIFORMES		
	TYTONIDAE - Barn Owls		
Barn Owl	*Tyto alba*	A	0.04

Table 2 continued

Common Name	Scientific Name	ST	RA
	STRIGIDAE - Typical Owls		
Short-eared Owl	*Asio flammeus sandwichensis*	ES	0.09
	PASSERIFORMES		
	ALAUDIDAE - Larks		
Sky Lark	*Alauda arvensis*	A	6.58
	ZOSTEROPIDAE - White-Eyes		
Japanese White-eye	*Zosterops japonicus*	A	0.16
	MIMIDAE -Mockingbirds & Thrushes		
Northern Mockingbird	*Mimus polyglottos*	A	0.18
	STURNIDAE - Starlings		
Common Myna	*Acridotheres tristis*	A	0.29
	EMBERIZIDAE - Emberizids		
Saffron Finch	*Sicalis flaveola*	A	0.27
	CARDINALIDAE - Cardinals Saltators & Allies		
Northern Cardinal	*Cardinalis cardinalis*	A	0.20
	FRINGILLIDAE - Fringilline And Cardueline Finches & Allies		
	Carduelinae - Carduline Finches		
House Finch	*Carpodacus mexicanus*	A	2.36
Yellow-fronted Canary	*Serinus mozambicus*	A	0.27
	PASSERIDAE - Old World Sparrows		
House Sparrow	*Passer domesticus*	A	0.04
	ESTRILDIDAE - Estrildid Finches		
	Estrildinae - Estrildine Finches		
Red Avadavat	*Amandava amandava*	A	0.16
African Silverbill	*Lonchura cantans*	A	0.87
Nutmeg Mannikin	*Lonchura punctulata*	A	0.31

KEY TO TABLE 1

ST Status
A Alien Species
IM Indigenous Migratory Species
ES Endemic Sub-species
RA Relative Abundance – number of individual birds detected divided by the number of stations (45)

Discussion

Mammalian Resources

The findings of the mammalian survey are consistent with at least one other faunal survey conducted on portions of the W-7 alignment (David 1996a), as well as with several other surveys conducted within similar habitat in the South Kohala District, or on lands that are adjacent to portions of the project alignments within the recent past (David 1999b, 2002, 2004, David and Guinther 2006).

Although not detected during the course of this survey, it is likely that Hawaiian hoary bats over-fly portions of the proposed right-of-way on a seasonal basis, as bats have been documented within *mauka* portions of the PTA facility, and south of the western terminus in Waikoloa Village on a seasonal basis (Jacobs 1994, Cooper *et al.*, 1992, David 2009). There is no suitable Hawaiian hoary bat roosting habitat present within, or close to the W-7 alignment.

Several European house mice were detected at several locations along the corridors surveyed. Additionally, it is likely that roof rats (*Rattus r. rattus*), Norway rats (*Rattus norvegicus*), and possibly Polynesian rats (*Rattus exulans hawaiiensis*) utilize resources within the general project site on a seasonal basis within the project area.

All of the other mammalian species recorded during the course of this survey are commonly occurring species present on farmland, pasturage and the grasslands present in the general project area. All of these mammals are considered alien to the Hawaiian Islands, and none are protected under either state or the federal endangered species statutes.

Avian Resources

The findings of this survey are consistent with at least one other avian surveys conducted on portions of the W-7 alignment (David 1996a), as well as with several other surveys conducted within similar habitat in the South Kohala District, or on lands that are adjacent to portions of the project alignments within the recent past (David 1999b, 2002, 2004, David and Guinther 2006). During the course of this survey I recorded a slightly higher number of avian species and numbers than I did during the 1996 survey of the same general area. These findings are not surprising as the habitat present on the site during 1996 was even more depauperate than encountered during this survey; many areas within the Ke‘āmuku parcel were bare ground in 1996, due to a multi-year drought. The vegetation present on the site during the course of this survey was verdant when compared to that found in 1996. The Ke‘āmuku parcel is as green as I have seen it in the 35 years that I have lived on the island.

A total of 27-different avian species were recorded during the time spend within the project area (Table 2). Three of the species recorded, Pacific Golden-Plover, Ruddy Turnstone, and the Hawaiian endemic sub-species of the Short-eared Owl are considered to be native to the Hawaiian Islands. As previously stated Pacific Golden-Plover and Rudy Turnstone are regularly seen throughout Hawai‘i between the months of July and early May, though as evidenced by this surveys results small numbers of both of these species over-summer in Hawai‘i. Short-eared Owls are an uncommon, irruptive diurnal owl species that are still found in goodly numbers on the Big Island, where it is most frequently encountered in open grassland areas, though usually in somewhat less xeric conditions that present within most of this project area. The remaining 24 avian species detected are all considered to be alien to the Hawaiian Islands. No species currently listed, or proposed for listing under either the US Federal or the State of Hawai‘i endangered species programs was detected during the course of this survey.

Although not detected during the course of this survey the endangered Nēnē (*Branta sandwichensis*) has been recorded in low numbers within the Ke‘āmuku parcel. During the 1996 survey of two alignments (W-3 and W-4) that were located parallel to the W-7 alignment, one to the north and the other to the south, I saw one Nēnē in an area close to the current alignment. Since the Army purchased the Ke'āmoku parcel their biologists have reported seeing ≤ 2 Nēnē on several occasions close to the western terminus of this alignment, including one apparent nesting attempt north of the W-7 alignment in 2008. The repeated sightings of Nēnē within the general area have apparently involved three separate individual birds (Lena Schnell 2009, personnel communication).

Although not detected during this survey, it is possible that small numbers of the endangered endemic Hawaiian Petrel (*Pterodroma sandwichensis*), and the threatened Newell's Shearwater (*Puffinus auricularis newelli*), over-fly the project area between the months of May and November (Banko 1980a, 1980b, Harrison 1990, Cooper et al., 1992, Day *et al.*, 2003a).

Hawaiian Petrels were formerly common on the Island of Hawaiʻi (Wilson and Evans 1890–1899). This pelagic seabird reportedly nested in large numbers on the slopes of Mauna Loa and in the saddle area between Mauna Loa and Mauna Kea (Henshaw 1902), as well as at the mid-to-high elevations of Mount Hualālai. It has, within recent historic times, been reduced to relict breeding colonies located at high elevations on Mauna Loa and, possibly, Mount Hualālai (Banko 1980a, Banko et al. 2001, Cooper and David 1995, Cooper et al. 1995, Day et al. 2003a, Harrison 1990, Simons and Hodges 1998). Hawaiian Petrels were first listed as an endangered species by the USFWS) in 1967 and by the State of Hawaiʻi in 1973 (Federal Register 1967, DLNR 1998)

Newell's Shearwaters were formerly common on the Island of Hawaiʻi (Wilson and Evans 1890–1899). This species breeds on Kauaʻi, Hawaiʻi, and Molokaʻi. Newell's Shearwater populations have dropped precipitously since the 1880s (Banko 1980b, Day et al., 2003b). This pelagic species nests high in the mountains in burrows excavated under thick vegetation, especially *uluhe* (*Dicranopteris linearis*) fern. Newell's Shearwater was listed as a threatened species by the USFWS in 1975 and by the State of Hawaiʻi in 1973 (Federal Register 1975, DLNR 1998).

The primary cause of mortality in both Hawaiian Petrels and Newell's Shearwaters is thought to be predation by alien mammalian species at the nesting colonies (U.S. Fish & Wildlife Service 1983, Simons and Hodges 1998, Ainley et al. 2001, Hue et al., 2001). Collision with man-made structures is considered to be the second most significant cause of mortality of these seabird species in Hawaiʻi. Nocturnally flying seabirds, especially fledglings on their way to sea in the summer and fall, can become disoriented by exterior lighting. When disoriented, seabirds often collide with manmade structures, and if they are not killed outright, the dazed or injured birds are easy targets of opportunity for feral mammals (Hadley 1961, Telfer 1979, Sincock 1981, Reed et al. 1985, Telfer et al. 1987, Cooper and Day 1998, Podolsky et al. 1998, Ainley et al. 2001). There is no suitable nesting habitat within or close to the proposed project site for either of these pelagic seabird species.

Potential Impacts to Protected Vertebrate Species

Hawaiian Hoary Bat

As previously discussed, it is likely that Hawaiian hoary bats overfly portions of the alignment on a seasonal basis. They may also forage for volant insects over portions of the project area on a seasonal basis, though the xeric nature of the habitat present and the lack of dense vegetation within the site likely means that there is little in the way of food resources that might attract a bat to the area.

Currently there is no suitable bat roosting habitat along the entire length of the project corridor, so it is unlikely that the clearing, grubbing construction and operation of a roadway through the area will result in deleterious impacts to this listed species.

Nēnē

The principal potential risk that the operation of the proposed roadway poses to Nēnē is that birds may be attracted to the roadway following build out in search of water, heat and gravel along the roadbed. Motorists on several of the Big Islands roadways have hit Nēnē over the past few years.

Hawaiian Petrel and Newell's Shearwater

The principal potential impact that construction and operation of the proposed alignment poses to Hawaiian Petrels and Newell's Shearwaters is the increased threat that birds will be downed after becoming disoriented by lights associated with the project.

The two main project specific actions that pose a potential threat to these nocturnally flying seabirds are: 1) during construction if it is deemed expedient, or necessary to conduct nighttime construction activities, 2) if streetlights are required for traffic safety reasons following build-out of the roadway.

Recommendations

If nighttime construction activity, be it actual construction activity or equipment maintenance is proposed during the construction phase of the project, all associated lights should be shielded, and when large flood/work lights are used they should be placed on poles that are high enough to allow the lights to be pointed directly at the ground.

If streetlights are installed in conjunction with the new road, it is recommended that lights be shielded to reduce the potential for interactions of nocturnally flying Hawaiian Petrels and Newell's Shearwaters with external lights and man-made structures (Reed et al. 1985, Telfer et al. 1987). This minimization measure would serve the dual purpose of minimizing the threat of disorientation and downing of Hawaiian Petrels and Newell's Shearwaters, while at the same time complying with the Hawaii County Code § 14 – 50 *et seq.* which requires the shielding of exterior lights so as to lower the ambient glare caused by unshielded lighting to the astronomical observatories located on Mauna Kea.

Since there are potential issues associated with Nene, Hawaiian Petrel and Newell's Shearwaters it is recommend that the project consult with the USFWS under Section 7 of the endangered species act, to ensure compliance with that statute.

Glossary:

ʻAʻā – Clinker lava formed by slow moving lava flows
Alien – Introduced to Hawaiʻi by humans
Commensal - Animals that share humans' food and shelter, such as rats and mice
Crepuscular – Twilight hours
Diurnal – Daytime
Endangered – Listed and protected under the Endangered Species Act of 1973, as amended as an endangered species.
Endemic – Native and unique to the Hawaiian Islands
Indigenous – Native to the Hawaiian Islands, but also found elsewhere naturally
Mauka – Upslope, towards the mountains
*Maka*i – Down-slope, towards the ocean
Nocturnal – Night-time, after dark
Pāhoehoe – Sheet lava formed by relatively fast moving lava flows
ʻŌpeʻapeʻa – Hawaiian hoary bat
Pelagic – An animal that spends its life at sea – in this case seabirds that only return to land to nest and rear their young
Phylogenetic – The evolutionary order that organisms are arranged by
Pueo – Hawaiian endemic sub-species of the Short-eared Owl
Sign – Biological term referring tracks, scat, rubbing, odor, marks, nests, and other signs created by animals by which their presence may be detected
Threatened – Listed and protected under the ESA as a threatened species
Volant – Flying, capable of flight, as in flying insect
Xeric - Extremely dry conditions or habitat

ASL – Above mean sea level
DLNR – Hawaii State Department of Land & Natural Resources
TMK – Tax Map Key
USFWS – United State Fish & Wildlife Service

Literature Cited:

Ainley, D. G, R. Podolsky, L. Deforest, G. Spencer, and N. Nur. 2001. The Status and Population Trends of the Newell's Shearwater on Kaua'i: Insights from Modeling, *In*: Scott, J. M, S. Conant, and C. Van Riper III (editors) *Evolution, Ecology, Conservation, and Management of Hawaiian Birds: A Vanishing Avifauna.* Studies in Avian Biology No. 22:. Cooper's Ornithological Society, Allen Press, Lawrence, Kansas. (Pg. 108-123)

American Ornithologist's Union. 1998. *Check-list of North American Birds*. 7th edition. AOU. Washington D.C. 829pp.

_______. 2000. Forty-second supplement to the American Ornithologist's Union *Check-list of North American Birds*. Auk 117:847-858.

Banks, R. C., C. Cicero, J. L. Dunn, A. W. Kratter, P. C. Rasmussen, J. V. Remsen, Jr., J. D. Rising, and D. F. Stotz. 2002. Forty-third supplement to the American Ornithologist's Union *Check-list of North American Birds*. Auk 119:897-906.

_______. 2003 Forty-fourth supplement to the American Ornithologist's Union *Check-list of North American Birds*. Auk 120:923-931.

_______. 2004 Forty-fifth supplement to the American Ornithologist's Union *Check-list of North American Birds*. Auk 121:985-995.

_______. 2005 Forty-sixth supplement to the American Ornithologist's Union *Check-list of North American Birds*. Auk 122:1031-1031.

_______. 2006 Forty-seventh supplement to the American Ornithologist's Union *Check-list of North American Birds*. Auk 123:926-936.

Banks, R. C., C. R. Terry Chesser, C. Cicero, J. L. Dunn, A. W. Kratter, I. J. Lovette, P. C. Rasmussen, J. V. Remsen, Jr., J. D. Rising, and D. F. Stotz. 2007 Forty-eighth supplement to the American Ornithologist Union *Check-list of North American Birds*. Auk 124:1109-1115.

Banks, R. C., C. R. Terry Chesser, C. Cicero, J. L. Dunn, A. W. Kratter, I. J. Lovette, P. C. Rasmussen, J. V. Remsen, Jr., J. D. Rising, and D. F. Stotz, and K. Winker. 2008 Forty-ninth supplement to the American Ornithologist Union *Check-list of North American Birds*. Auk 125:758-768.

Banko, W. E. 1980a. Population Histories- Species Accounts Seabirds: Hawaiian Dark-rumped Petrel (‘Ua‘u). Cooperative National Park Resources Studies Unit, University of Hawaii at Manoa, Department of Botany, Technical Report #5B.

_______. 1980b. Population Histories- Species Accounts Seabirds: Newell's Shearwater (‘A‘o). Cooperative National Park Resources Studies Unit, University of Hawaii at Manoa, Department of Botany, Technical Report #5A.

Banko, P. C., R. E. David, J. D. Jacobi, and W. E. Banko. 2001. Conservation Status and Recovery Strategies for Endemic Hawaiian Birds, *In:* : Scott, J. M, S. Conant, and C. Van Riper III (editors) *Evolution, Ecology, Conservation, and Management of Hawaiian Birds: A Vanishing Avifauna*. Studies in Avian Biology No. 22. Cooper's Ornithological Society, Allen Press, Lawrence, Kansas (Pg. 359-376).

Cooper, B.A., R.E. David, and R.J. Blaha. 1995. Radar and Visual Surveys of Endangered Seabirds and Bats in the Pohakuloa Training Area, Hawai'i, During Summer 1995. Prepared for R.M. Towill Corporation and the U.S. Army Corps of Engineers, Pacific Division (POD).

Cooper, B. A and R. H. Day. 1998. Summer Behavior and Mortality of Dark-rumped Petrels and Newells' Shearwaters at Power Lines on Kauai. Colonial Waterbirds, 21 (1): 11-19.

David, R. E. 1990. Ornithological and Mammalian Survey of the Proposed Extension of the Multi-Purpose Range Complex, Pohakuloa Training Area, Hamakua, Hawaii. Prepared for: Wilson Okamoto & Associates & U.S. Army Corps of Engineers, Pacific Ocean Division (POD).

David, R. E. 1996. Ornithological and Mammalian Surveys of the Proposed Improvement and Realignment Corridors of the Saddle Road (State of Hawaii Route 200), Island of Hawai'i, Hawaii. Prepared for: Rust E&I & The Federal Highways Administration, Central Federal Lands Highway Division. 99pp.

_______. 1999. A Survey of Terrestrial Vertebrate Species Associated with the Waikoloa Maneuver Area, Phase II: Waikoloa Village and Surrounding Areas, Island of Hawai'i, Hawai'i. Prepared for: Edward K. Noda & Associates and the U.S. Army Corps of Engineers, Pacific Ocean Division.

_______. 2002. A Survey of Avian and Terrestrial Mammalian Species for the Saddle Road Extension Project : Queen Ka'ahumanu Highway to Mamalahoa Highway South Kohala & North Kona Districts, Hawai'i. Prepared for: Okahara & Associates, and Hawai'i Department of Transportation, Highways Division.

________. 2004. A Survey of Terrestrial Vertebrate Species Associated with the Ordnance Avoidance and Environmental Survey of Sector 15 of the former Waikoloa Maneuver Area, Phase III. South Kohala and Hamakua Districts, Island of Hawai'i. Prepared for: Donaldson Enterprises Inc. & the U.S. Army Corps of Engineers, Pacific Ocean Division.

_______. 2009b. Unpublished Field Notes – Island of Hawai'i: 1985-2009.

David, R., and E. B. Guinther 2006a. A Survey of Botanical, Avian and Terrestrial Mammalian Species for the Waikoloa Highlands Subdivision, South Kohala District, Island of Hawai'i. Prepared for: R. M. Towill Corporation, and the Vitoil Corporation.

Day, R. H., B. Cooper, and R. J. Blaha. 2003a. Movement Patterns of Hawaiian Petrels and Newell's Shearwaters on the Island of Hawai'i. Pacific Science, 57, 2:147-159.

Day, R. H., B. Cooper, and T. C. Telfer. 2003b. Decline of Townsend's (Newell's Shearwaters

(*Puffinus auricularis newelli*) on Kauai, Hawaii. The Auk 120: 669-679.

Department of Land and Natural Resources. (DLNR). 1998. Indigenous Wildlife, Endangered and Threatened Wildlife and Plants, and Introduced Wild Birds. Department of Land and Natural Resources. State of Hawaii. Administrative Rule §13-134-1 through §13-134-10, dated March 02, 1998.

Federal Register. 1967. Department of the Interior, Fish and Wildlife Service, Endangered and Threatened Wildlife and Plants. Appendix D – United States List of Endangered Native Fish and Wildlife; *Federal Register*, 32 (March 11, 1967) : 4001.

______. 1975. Department of the Interior, Fish and Wildlife Service, List of Endangered and Threatened Fauna. *Federal Register*, 40 No. 205 (September 25, 1975): 44149-44151.

_______. 2005. Department of the Interior, Fish and Wildlife Service, 50 CFR 17. Endangered and Threatened Wildlife and Plants. Review of Species That Are Candidates or Proposed for Listing as Endangered or Threatened; Annual Notice of Findings on Resubmitted Petition; Annual Description of Progress on Listing Actions. Federal Register, 70 No. 90 (Wednesday, May 11, 2005): 24870-24934.

Hadley, T. H. 1961. Shearwater calamity on Kauai. Elepaio 21:60.

Harrison, C. S. 1990. *Seabirds of Hawaii: Natural History and Conservation*. Cornell University Press, Ithica, N.Y. 249 pp.

Henshaw, H.W. 1902. *Complete list of birds of the Hawaiian Possessions with notes on their habits*. Thrum, Honolulu. 146 pp.

Hue, D., C. Glidden, J. Lippert, L. Schnell, J. MacIvor and J. Meisler. 2001. Habitat Use and Limiting Factors in a Population of Hawaiian Dark-rumped Petrels on Mauna Loa, Hawai‘i. , *in:* : Scott, J. M, S. Conant, and C. Van Riper III (editors) *Evolution, Ecology, Conservation, and Management of Hawaiian Birds: A Vanishing Avifauna*. Studies in Avian Biology No. 22. Cooper’s Ornithological Society, Allen Press, Lawrence, Kansas (Pg. 234-242).

Jacobs, D. S. 1994. Distribution and Abundance of the Endangered Hawaiian Hoary Bat, *Lasiurus cinereus semotus*, on the Island of Hawai‘i. Pacific Science, Vol. 48, No. 2: 193-200.

Podolsky, R., D.G. Ainley, G. Spencer, L. de Forest, and N. Nur. 1998. “Mortality of Newell’s Shearwaters Caused by Collisions with Urban Structures on Kaua‘i”. Colonial Waterbirds 21:20-34.

Pukui , M. K., S. H. Elbert, and E. T. Mookini. 1976. *Place Names of Hawaii*. University of Hawaii Press. Honolulu, Hawai‘i. 289 pp.

Reed, J. R., J. L Sincock, and J. P. Hailman 1985. Light Attraction in Endangered Procellariform Birds: Reduction by Shielding Upward Radiation. Auk 102: 377-383.

Simons, T. R., and C. N. Hodges. 1998. Dark-rumped Petrel (*Pterodroma phaeopygia*). *In* A.

Poole and F. Gill (editors). The Birds of North America, No. 345. The Academy of Natural Sciences, Philadelphia, PA. and the American Ornithologists Union, Washington, D.C.

Sincock, J. L. 1981. Saving the Newell ‘ s Shearwater. Pages 76-78 in Proceedings of the Hawaii Forestry and Wildlife Conference, 2-4 October 1980. Department of Land and Natural Resources State of Hawaii, Honolulu.

Telfer, T. C. 1979. Successful Newell’s Shearwater Salvage on Kauai. ‘Elepaio 39:71

Telfer, T. C. , J. L. Sincock, G. V. Byrd, and J. R. Reed. 1987. Attraction of Hawaiian seabirds to lights: Conservation efforts and effects of moon phase. Wildlife Society Bulletin 15:406-413.

Tomich, P.Q. 1986. *Mammals in Hawaii*. Bishop Museum Press. Honolulu, Hawaii. 37 pp.

U.S. Fish & Wildlife Service (USFWS) 1983. Hawaiian Dark-Rumped Petrel & Newell’s Manx Shearwater Recovery Plan. USFWS, Portland, Oregon. February 1983.

________. 2005. Endangered and Threatened Wildlife and Plants. 50CFR 17:11 and 17:12 (Tuesday, November 1, 2005).

_______. 2009. USFWS Threatened and Endangered Species System (TESS), online at http://ecos.fws.gov/tess_public/StartTESS.do

Wagner, W.L., D.R Herbst, and S.H. Sohmer. 1990. *Manual of the Flowering Plants of Hawai‘i*. University of Hawaii Press, Honolulu, Hawaii 1854 pp.

Wagner, W.L. and D.R. Herbst. 1999. *Supplement to the Manual of the flowering plants of Hawai‘i*, pp. 1855-1918. *In:* Wagner, W.L., D.R. Herbst, and S.H. Sohmer, Manual of the flowering plants of Hawai‘i. Revised edition. 2 vols. University of Hawaii Press and Bishop Museum Press, Honolulu.

Wilson, S. B., and A. H. Evans. 1890-1899. *Aves Hawaiiensis: The birds of the Sandwich Islands*. R. H. Porter, London.

Wolfe, E. W., and J. Morris. 1996. Geological Map of the Island of Hawaii. U.S. Department of the Interior, U.S. Geological Survey.

SADDLE ROAD (STATE ROUTE 200)
Mamalahoa Highway (State Route 190) to Milepost 41
County of Hawai‘i, State of Hawai‘i
FHWA Project No. 200(00)

SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

Submitted Pursuant to Section 42 U.S.C. 4332(2)(c)
and Chapter 343, Hawai‘i Revised Statutes by the

U.S. DEPARTMENT OF TRANSPORTATION
Federal Highway Administration (FHWA)
Central Federal Lands Highway Division
and
STATE OF HAWAI‘I
Department of Transportation (HDOT)
Highways Division

Cooperating Agencies
U.S. Army Garrison, Hawai‘i

Appendix E
Depleted Uranium Report

[This page intentionally left blank]

Final
Saddle Road
Uranium Soils Investigation and
Baseline Human Health Risk Assessment

Ke‘amuku Parcel, South Kohala District
Hawai‘i Island, State of Hawai‘i
TMK (3rd) 6-7-001:003

Prepared for:

Hawai‘i Department of Transportation – Highways Division
and
U.S. Department of Transportation – Federal Highway Administration
Central Federal Lands Highway Division

Prepared by:

AMEC Earth and Environmental
3375 Koapaka Street, Suite F-251
Honolulu, Hawai‘i 96819

October 2009

Table of Contents

List of Figures

List of Tables

List of Appendices

GLOSSARY OF ACRONYMS, TECHNICAL TERMS AND MEASUREMENTS

μg/m³ - Micrograms of compound per cubic meter of air.

^{234}Th - Thorium-234

^{234}U - Uranium-234

^{235}U - Uranium-235

^{238}U - Uranium-238

ADD - Average Daily Dose. A compound- and facility-specific value generated by an equation designed to estimate a receptor's potential daily intake from exposure to compound with potential noncarcinogenic effects.

ANL - Argonne National Laboratory

ATSDR - Agency for Toxic Substances and Disease Registry

BHHRA - Baseline Human Health Risk Assessment

C - Carbon

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act

COPC - Compounds of Potential Concern - Those site-related compounds examined in detail in the quantitative risk assessment.

cm - centimeter

CSF - Cancer Slope Factor - A numerical estimate of the carcinogenic potency of a compound. CSFs are developed by the United States Environmental Protection Agency's Human Health Assessment Group for both oral and inhalation routes of exposure.

CSM - Conceptual Site Model

d - day

Dose - Concentration of a compound to which a receptor may be exposed. Dose is usually expressed in units of milligrams of compound per kilogram of body weight per day.

Dose-Response Evaluation - The process of quantitatively evaluating toxicity information and characterizing the relationship between the dose of the compound and the likelihood and magnitude of adverse health effects in the exposed population. From the quantitative dose-response relationship, toxicity values are identified and used in the risk characterization step to estimate the potential for adverse effects occurring in the receptors evaluated in the risk assessment.

DU - Depleted Uranium

EPC - Exposure Point Concentration

EU - Enriched Uranium

F - Temperature in Degrees Fahrenheit

HEAST - Health Effects Assessment Summary Tables

HI - Hazard Index - The sum of the compound-specific hazard quotients for a particular exposure pathway.

HQ - Hazard Quotient - The ratio of the calculated Chronic Average Daily Dose to the Reference Dose for a particular compound. A Hazard Quotient of less than one indicates that the Reference Dose for that compound has not been exceeded. Therefore, it can be assumed with a high degree of certainty that no adverse noncarcinogenic health effects are expected to occur as a result of exposure to that particular compound via that particular route. Because the reference dose is derived using multiple safety factors, a Hazard Quotient greater than one does not indicate that health effects are expected but rather that further analysis is warranted.

IRIS - Integrated Risk Information System - A computerized database of toxicological information maintained by the United States Environmental Protection Agency.

K - Potassium

LADD - Lifetime Average Daily Dose - A compound- and facility-specific value generated by an equation designed to estimate a receptor's potential daily intake from exposure to potentially carcinogenic compounds.

LOAEL - Lowest Observed Adverse Effect Level - The lowest experimental dose above the NOAEL at which a statistically significant difference in response between the control and exposed group is discernable.

mg/kg - Milligrams of compound per kilogram of medium.

mg/kg-day - Milligrams of compound per kilogram of body weight per day.

mg/l - Milligrams of compound per liter of water.

NCP - National Contingency Plan

NOAEL - No Observed Adverse Effect Level - An experimental dose greater than zero at which no statistically significant difference in response can be detected between the control and exposed groups.

Noncarcinogenic Effects - Category of adverse health effects that does not include cancers (e.g., liver effects, changes in blood enzyme levels, variances in body weight).

NRC - Nuclear Regulatory Commission

NTP - National Toxicology Program

pCi/g - picocuries per gram

ppm - part per million

PELCR - Potential Excess Lifetime Cancer Risk - An estimate of the increased probability of developing cancer given exposure to particular doses of particular compounds via specific exposure scenarios. The likelihood, over and above the background cancer rate, that a receptor will develop cancer in his or her lifetime as a result of facility-related exposures to compounds in various environmental media.

PRG - Preliminary Remediation Goal

PTA - Pohakūloa Training Area

Quantitative Risk Assessment - The mathematical and scientific procedure by which compounds present in environmental media are evaluated for their potential to adversely impact the health of individuals who may contact them.

Ra - Radium

Rn - Radon

RCRA - Resource Conservation and Recovery Act

RESRAD - *Res*idual *Rad*ioactivity

Response - Carcinogenic or noncarcinogenic health effect associated with exposure to a compound

RfC - Reference Concentration - An experimentally derived level of a compound in air modified by multiple safety factors of ten. It is the air concentration at which no statistical difference in response is expected to occur for an exposed population. The RfC is a toxicity value for compounds with noncarcinogenic effects via the inhalation route of exposure, and is usually expressed in units of milligrams of compound per cubic meter of air.

RfD - Reference Dose - An experimentally derived level of exposure, modified by multiple safety factors. The RfD is the dose predicted to produce no statistical difference in response for an exposed population. The RfD is a toxicity value for compounds with noncarcinogenic effects via the oral and inhalation routes of exposure, and is expressed in units of milligrams of compound per kilogram of body weight per day.

RME - Reasonable Maximum Exposure

SEIS - Supplemental Environmental Impact Statement

Th - Thorium

Threshold - The level of exposure below which no adverse noncarcinogenic health effects are known or expected to occur.

Total Excess Lifetime Cancer Risk - The sum of all pathway-specific Excess Lifetime Cancer Risks for a given receptor.

Total Hazard Index - The sum of all pathway-specific Hazard Indices for a given receptor.

Uncertainty Factor - An empirically-derived factor that is applied to a NOAEL or LOAEL in order to derive an RfD. Uncertainty factors account for some of the uncertainties associated with extrapolating information in a dose-response study to the general population.

U - Uranium

UCL - Upper Confidence Limit

USEPA - United States Environmental Protection Agency

EXECUTIVE SUMMARY

This report presents the results of a surface soil sampling event, a source determination and background evaluation and Baseline Human Health Risk Assessment (BHHRA) for uranium (U) isotopes along the proposed Saddle Road alignment (State Route 200) bordering Pohakūloa Training Area (PTA). The assessment addresses the public's concern that depleted uranium originating from military operations at PTA may impact the health of those that may be involved in the construction of the proposed alignment as well as those that may use the road in the future. The risk assessment considers both chemical and radiological toxicity from uranium. This document has been prepared in accordance with the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

Site Description

Saddle Road is a narrow, winding, two-lane road with steep grades, sharp curves, poor pavement, and substandard drainage. Parts of the easternmost portion have been widened and repaved by the County of Hawaiʻi, but until the current effort dating from 1996, no attempt had been made to correct deficiencies in vertical or horizontal curves, which reflected the original path built during World War II. Saddle Road has become increasingly important for access to the U.S. Department of the Army's PTA, Mauna Kea, Mauna Loa, Mauna Kea State Park, outdoor recreation areas used for hunting and gathering, ranch lands, and the communities of Waikiʻi Ranch and Kaumana. Its role is increasing as a cross-island transportation route linking East and West Hawaiʻi for business travel, the transport of goods and services, tourism/recreation, shopping, and to some extent for commuting. Currently, about six miles of the improved Saddle Road have been completed, and another nine-mile section is nearly complete. A roughly five-mile section has been graded and is expected to be complete by the end of 2009, at which time another eight-mile section that is currently being designed and undergoing permit review is expected to begin construction. All of these segments are east of the roughly 12-mile section mauka of Mamalahoa Highway that is the subject of the Supplemental EIS to which this analysis pertains.

Project Background

In August 2007, US Army contractors discovered one intact M101 spotting round during a screening survey of the remote Impact Area at PTA. The recovered fragment consisting of depleted uranium (DU) was nearly completely unoxidized and found lying on a bare rock lava surface. Subsequent surveys uncovered aluminum firing tubes for the spotting round, but no additional spotting rounds themselves. Recently, ten soil samples were collected by the US Army from sites where sediment had collected from past runoff/erosion events around the perimeter of PTA. Radiometric analysis of those samples found only natural U abundances and $^{234}U/^{238}U$ isotopic composition (Rubin 2008). Irrespective, a portion of the proposed Saddle Road alignment is proposed to transverse the Ke'āmuku Parcel, a former Parker Ranch property recently deeded to the U.S. Army, which is downwind during times when the prevailing regional tradewinds are in effect, particularly at night or in the early morning before daytime heating causes a convectional sea breeze that blows from the west across Keamuku towards the saddle. The Hawai'i State Department of Transportation, in consultation with the Saddle Road Task Force (a citizen group appointed by U.S. Senator Daniel K. Inouye to guide development of the project), determined that it would be prudent to examine the presence and risk of depleted uranium to human receptors who may construct or traverse Saddle Road, as part of the Supplemental Environmental Impact Statement (SEIS) being prepared to address a modified route across this property.

Analytical Methods and Results

In June 2008, concentrations of ^{234}U, ^{235}U and ^{238}U isotopes in surface soil along the proposed Saddle Road alignment were collected by AMEC and analyzed via two analytical methods. The first method to evaluate uranium isotope concentrations, Inductively Coupled Plasma Mass Spectrometry (ICP-MS), was utilized to provide precision and low detection limits for the ^{235}U and ^{238}U isotopes. Results for the ICP-MS method verify the presence of ^{238}U, but resulted in non-detects for the ^{234}U and ^{235}U isotopes indicating that they were either not present or below their respective minimum detection limits. The ICP-MS data was considered but not used in the background analysis and risk assessment as the assessments require data input by activity and/or mass concentration. The second analytical method utilized in this study was Alpha Spectrometry. The alpha spectrometry results were expected to provide the greatest precision and lowest detection limit for the ^{234}U isotope. Results of the alpha spectrometry analysis indicate the presence of all three isotopes in site soils. ^{235}U was detected in only one of the five (5) locations sampled. Given that data for all three isotopes were available for the alpha spectrometry method, data obtained from this method comprised the data set utilized for both the background analyses and human health risk assessment.

Background Analysis

Uranium occurs naturally in trace amounts in Hawaiian rocks, soils and waters at or below concentrations of 1 to 3 parts per million (ppm) by weight (Rubin 2008). Uranium may also occur in soils due to anthropogenic action, such as from military use or as a byproduct of nuclear energy generation. Determining the source of any uranium isotopes detected along the proposed Saddle Road alignment was one objective of this study. Two methods were employed to evaluate uranium isotope source. The first method compared site-specific total U mass concentrations to naturally occurring U mass concentrations in Hawai‘i. Total U was determined by summing the isotopic concentrations of ^{234}U, ^{235}U and ^{238}U detected at each of the 5 independent sites along the proposed Saddle Road alignment. Results of this analysis indicate that total uranium along the proposed Saddle Road alignment are at or below levels occurring naturally in native Hawaiian soils. Total U based on alpha spectrometry analyses ranged from 0.4 parts per million (ppm) at location DU003 to 1.3 ppm at DU001. The average at all five locations was 0.8 ppm.

The second method used to determine whether detected U originates from natural or DU sources was the evaluation of isotope abundance. Except in extremely rare circumstances (not found in Hawai‘i), natural U dispersed in rocks and soils have a comparatively greater $^{234}U/^{238}U$ and $^{235}U/^{238}U$ ratio than those originating from DU. Although use of the $^{235}U/^{238}U$ is considered a more precise measurement than the $^{234}U/^{238}U$ ratio in isotopic fingerprinting of U contamination, the utility of the $^{234}U/^{238}U$ ratio is significant when ^{235}U data are not available or when concentrations of the ^{235}U isotope are too low to detect. This is the case here and as such, the $^{234}U/^{238}U$ ratio was used as the second method to fingerprint the U source. The naturally occurring $^{234}U/^{238}U$ ratio in soil has been determined to be in the range of 0.5 to 1.2 (Sansone et al. 2001). $^{234}U/^{238}U$ ratios at the Saddle Road alignment ranged from 0.74 to 1.79, with an average ratio across all five (5) locations of 1.16. Assuming the average ratio across the 5 sites is representative of the proposed alignment; these results indicate that the $^{234}U/^{238}U$ isotopic ratio is within the background range.

Baseline Human Health Risk Assessment

A baseline human health risk assessment (BHHRA) was performed to evaluate the potential risk posed by uranium isotopes detected at the proposed Saddle Road alignment. The alignment was evaluated as a single decision unit represented by five (5) distinct sampling locations. Receptors were assumed to be exposed to the lesser of the maximum concentration of each isotope detected or the 95% UCL of the mean. Risks were evaluated for the following receptors:

- A construction worker scenario assumed to be on site for 8 hours a day for 250 days in 1 year and assumed to contact surface and subsurface soil.

- A recreational user of the road assumed to frequent the Site 350 days a year for 2 hours a day, as child for 6 years and as an adult for 24 years, totaling a 30 year recreational tenure. Recreational receptors were assumed to contact just the surface soil

Potential estimated lifetime cancer risks were calculated using the RESidual RADioactivity (RESRAD) computer code, Version 6.4, developed by Argonne National Laboratory (ANL 2007). Carcinogenic risks were compared to the USEPA regulatory level of concern of 10^{-6} and 10^{-4}. Estimated noncarcinogenic risks posed from the chemical toxicity of Uranium are presented as total site Hazard Indices and were calculated by summing the pathway specific Hazard Quotients. A total Hazard Index of 1 was considered to be the regulatory level of concern.

The results for each receptor are presented below. Of the receptors analyzed, none were found to exceed the most conservative USEPA lifetime cancer risk regulatory level of concern of 10^{-6} or the noncarcinogenic Hazard Index regulatory level of concern of 1.

Construction worker

The Construction Worker scenario is assumed to be on site for 8 hours a day for 250 days in 1 year and contact surface and subsurface soil. The construction worker was found to have a carcinogenic risk of 1E-06, and a noncarcinogenic risk of 4E-03.

Recreational/Commuter

This receptor is a user of the road on a daily basis. The recreational receptor is assumed to frequent the Site 350 days a year for 2 hours a day, as child for 6 years and as an adult for 24 years, totaling a 30 year recreational tenure. Recreational receptors were assumed to contact just the surface soil. The carcinogenic risk associated with this receptor were found to be 3E-07 for the Child Receptor and 9E-07 for the Adult Receptor. These carcinogenic risks can be summed for a total carcinogenic risk of a 1E-06 for the full 30 year tenure. The noncarcinogenic risk was calculated to be 3E-03 for the Child Receptor and 1E-03 for the Adult Receptor.

Lead Analysis

In addition to the Uranium investigation and risk assessment, surface soils at all five (5) sample locations were analyzed for lead. Laboratory results can be found in Appendix A. Results were compared to the USEPA Region 9 residential Preliminary Remediation Goals (PRGs) for lead in soil of 400 mg/kg. The maximum lead concentration detected at any site was 3.3 mg/kg at sampling location DU004. All lead values were well below the screening level criteria and was excluded from further analysis.

<u>Conclusions</u>

Based on the available surface soil data collected in June 2008 at five (5) locations along the proposed alignment, it has been determined that uranium detected at the site originates from natural sources. Potential noncancer health risks from the ingestion, inhalation and dermal contact of soil along the proposed alignment are below USEPA's acceptable risk level of concern. Potential cancer risks from radiological activity of the detected U isotopes are below the most conservative regulatory criteria.

SECTION 1
INTRODUCTION

This report presents the results of a surface soil sampling event, a source determination and background evaluation, and a Baseline Human Health Risk Assessment for uranium (U) isotopes along the proposed Saddle Road alignment (State Route 200) bordering Pohakūloa Training Area (PTA). The assessment addresses the public's concern that depleted uranium originating from military operations at PTA may impact the health of those that may be involved in the construction of the proposed alignment as well as those that may use the road in the future. The risk assessment considers both chemical and radiological toxicity from uranium. This evaluation was prepared for the State of Hawai'i Department of Transportation, Highways Division and the U.S. Department of Transportation, Federal Highway Administration Central Federal Lands Highway Division.

1.1 General Site Setting

The Site is contained within or directly adjacent to the Ke'āmuku parcel, a 23,977-acre property (tax map key [TMK]: 3rd Div., 6-7-001:003) purchased in 2006 from Parker Ranch by the U.S. Army as an addition to its Pohakūloa Training Area (PTA) (Figure 1 taken from Geometrician 2007). Although planned for military use, the Army currently allows grazing on the parcel as a fire mitigation measure. The parcel is bordered by the existing Saddle Road, the Waiki'i Ranch subdivision and nearby homes and farms on the north, by the remainder of PTA on the east, by the Pu'uanahulu Game Management Area on the south, and by private, undeveloped lands across Māmalahoa Highway on the west (Geometrician 2007).

1.2 Description of Problem

A surface soils assessment, source analysis and baseline human health risk assessment was requested to support a Supplemental Environmental Impact Statement (SEIS) that is being prepared for the Saddle Road extension and realignment, which will eventually bisect a portion of the PTA northwest of MP42 (proposed W-3 route) or possibly south of the W-3 route (proposed W-7 route. Note: W-7 is in the conceptual stage). These two areas (W-3 and W-7) are in proximity to Ke'āmuku on the western side of PTA.

In August, 2007, U.S. Army contractors discovered depleted uranium (DU) fragments at PTA. Although the Army acknowledges that DU material is considered a chemical hazard, the Army maintains that DU does not pose a risk to public health and that insufficient quantities have been detected to pose a risk to human health. Sampling and analytical data for DU are not available in areas where the proposed Saddle Road extension is to be constructed. In the absence of analytical data, the source of U as well as the potential risks to human receptors (construction workers that will be involved in the construction of the Saddle Road extension or occupants of vehicles that may use the road in the future) cannot be determined.

The objective of this study was therefore to gather analytical data of sufficient quality and quantity necessary to support a background source evaluation and human health risk assessment. The background evaluation is designed to determine whether the source of uranium at the site was naturally occurring or if anthropogenic depleted uranium sources also contribute to uranium presence. The human health risk assessment determines the degree of risk, if any, that uranium and poses for construction workers and users/commuters who may use Saddle Road in the future.

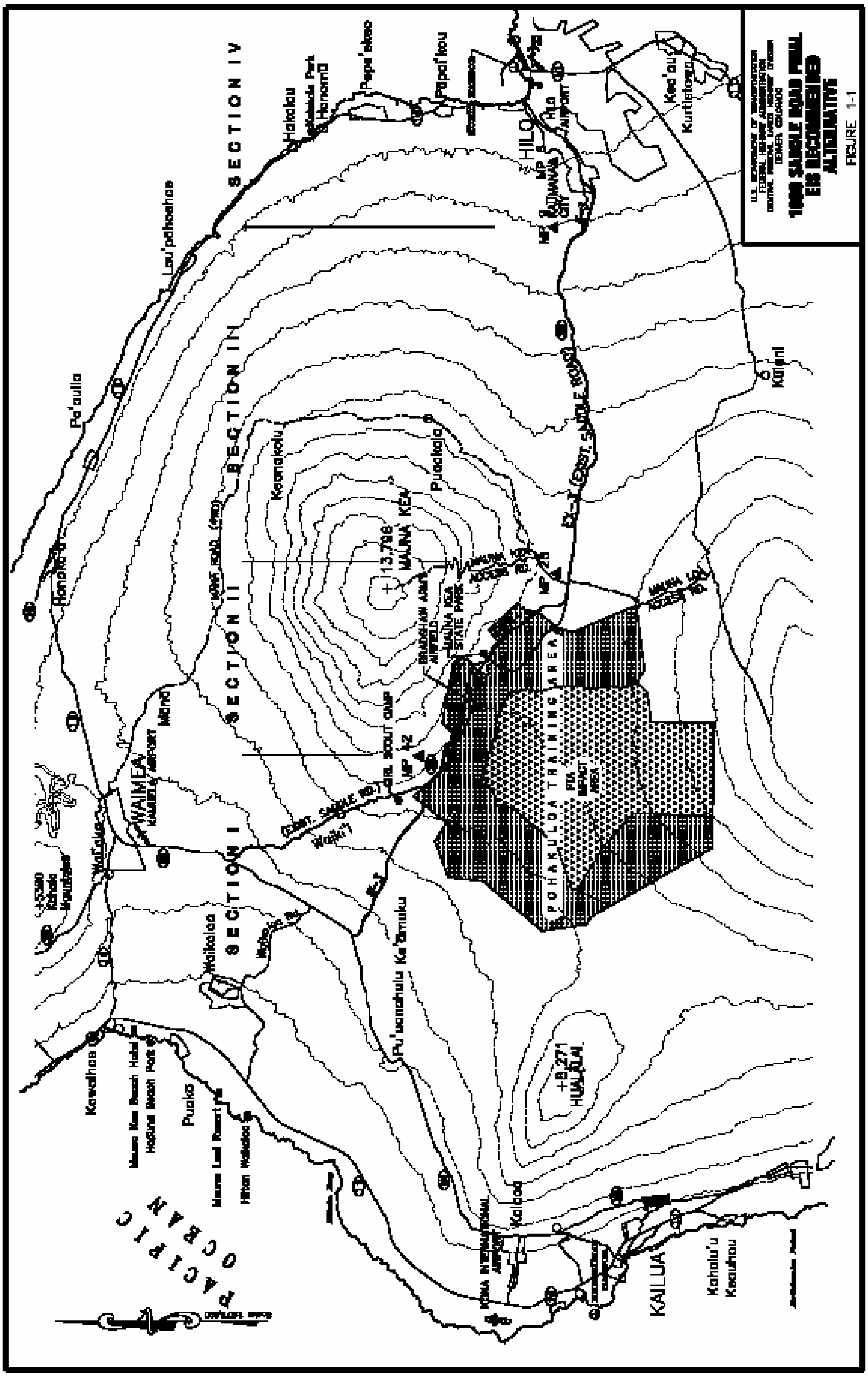


Figure 1: Site Location Map

SECTION 2
SITE DESCRIPTION

This section presents background information relevant to the project including site history, descriptions of geology and soils, hydrogeology, hydrology, and climate.

2.1 Site History

A portion of the proposed Saddle Road alignment is proposed to transverse the Ke’āmuku Parcel, a former Parker Ranch property recently deeded to the U.S. Army, which is downwind from PTA. The Site is currently zoned for agricultural use and it is assumed to have been used for agricultural use throughout most of its recent history. The US Army conducted training at PTA during the mid-1960s using the M101 spotting round of the Davy Crockett Weapon System. The M101 spotting round was a small (20mm) low speed (velocity) projectile that weighed approximately 1 pound. Each round contained approximately one half pound D38 U Alloy (92% DU and 8% molybdenum) (Rubin 2008). This spotting round was designed to mirror the flight characteristics of larger caliber rounds and was fired to identify the correct range and bearing for those larger caliber rounds. These rounds typically broke into large fragments after use.

In August 2007, U.S. Army contractors discovered one intact M101 spotting round during a screening survey of the remote Impact Area at PTA. The recovered fragment consisting of depleted uranium (DU) was nearly completely unoxidized and found lying on a bare rock lava surface. Subsequent surveys uncovered aluminum firing tubes for the spotting round, but no additional spotting rounds themselves. Recently, ten soil samples were collected from sites where sediment had collected from past runoff/erosion events around the perimeter of PTA. Radiometric analysis of those samples found only natural U abundances and $^{234}U/^{238}U$ isotopic composition (Rubin 2008). No sampling has been performed along the proposed alignment.

2.2 Geology and Soils

The Site is situated on late Pleistocene and Holocene lava flows from Mauna Kea covered with volcanic ash deposits (MacDonald 1983; Wolfe 1996). The topography reflects the hummocky character of lava flows. The only major relief features are found in a few gulches and at several 100-foot plus high cinder cones, both of which are concentrated in the northern part of Ke‘āmuku. The surface has weathered through time to produce deep, well-drained soils (Geometrician 2007). Soil types anticipated to be encountered during this sampling effort include: Kilohana loamy fine sand, Pu‘u Pa extremely stony very fine sandy loam, very stony land, and Kaimū extremely stony peat. In general, these soils exhibit fairly rapid permeability, slow runoff, and slight erosion potential (USDA 1973).

2.3 Hydrogeology

According to Mink and Lau (1990), the area of concern overlies two different aquifers, the Anaehoʻomalu aquifer system (Northwest Mauna Loa aquifer sector) and the Waimea aquifer system (West Mauna Kea aquifer sector). The aquifers are both classified as unconfined, high level aquifers in dike compartments and/or flank lava deposits. They are considered irreplaceable, fresh water aquifers (< 250 milligrams per liter [mg/L] chloride content) with high vulnerability to contamination due to its proximity to the surface. Groundwater from portions of these aquifers is currently used as a drinking water source.

2.4 Hydrology

According to maps in the Atlas of Hawaiʻi, 3rd ed. (Juvik 1998), annual rainfall averages approximately 25 inches in Keʻāmuku overall, being slightly greater at higher elevations and less at lower elevations. Although no perennial streams, lakes, springs, or wetlands are present, the Keʻāmuku property includes a number of ephemeral drainages mapped on U.S. Geological Survey (USGS) maps. These originate on the steep slopes of Mauna Kea and cross the existing Saddle Road at various bridges, culverts and dips in the road. There is a distinct shift in the amount of dissection in the Keʻāmuku property from north to south, as the terrain changes from highly-dissected, older Mauna Kea lava flows with many ephemeral streams in the north to younger, lightly-dissected flows with few ephemeral streams in the south. The very youngest Mauna Kea flows are found on the southern margin of the Keʻāmuku property, where the W-7 alignment is located. South of this are Mauna Loa lava flows, which also lack any stream dissection (Geometrician 2007).

Since there are no perennial stream channels within the Keʻāmuku area, no baseline data on surface water quality are available. All of the drainages within the study corridor ultimately discharge to the ocean or to littoral springs through subsurface flow (Geometrician 2007).

The only baseline water quality data available for Keʻāmuku are from required water sampling of a 2,500-foot deep well that supplies water for the Waikiʻi Ranch subdivision. The well is located within 200 feet of the existing Saddle Road and has been consistently found to meet all of the federal standards for safe drinking water. There is no recorded contamination associated with this well (Geometrician 2007). A second well which goes to a depth of 4,300 feet is also located in Waikiʻi. No further information is provided for this well.

2.5 Climate

The average maximum daily temperature in the Keʻāmuku area varies from about 70 to 80 degrees Fahrenheit, with an average minimum of 60 to 70 degrees. Keʻāmuku on average receives about 25 inches of rainfall annually, with greater totals at higher elevations and less at lower ones, according to maps in the Atlas of Hawaiʻi, 3rd ed. (Juvik 1998). Winds vary between northeast trades funneled through the saddle between Mauna Loa and Mauna Kea and upslope winds generated by heating of the land surface. Light and variable “kona” winds occasionally replace this pattern, most often in winter. According to site data, Morning winds are easterly at 15 to 25 knots (17-1/4 to 28-3/4 mph) and afternoon winds are westerly at 15 to 20 knots (17-1/4 to 23 mph). The entire Keʻāmuku parcel is subject to fog, which above 4,000 feet in elevation is frequent (Geometrician 2007).

SECTION 3
SOIL SAMPLING PROGRAM AND RESULTS

The surface soil sampling program is described in its entirety in Final Sampling and Analysis Plan (SAP), Depleted Uranium Risk Assessment (AMEC 2008). The Final SAP describes sample locations, sampling methods, data quality objectives, data quality indicators, desired levels of detection and analytical laboratory Standard Operating Procedures.

Briefly, in June 2008, five (5) surface soil samples were collected, during a single environmental site investigation along the proposed Saddle Road alignment per the AMEC 2008 protocol (Figure 2). The soil samples were analyzed for Uranium by Alpha Spectrometry by USEPA Method EML A-01-R MOD, by ICP-MS by USEPA method SW846 6020, and for Percent Moisture by USEPA method MCAWW 160.3 MOD. Soil samples were also analyzed for Lead by USEPA method SW846 6020.

Results

Analytical laboratory data sheets are provided in Appendix A. Lead and Uranium were analyzed for and detected in surface soil at the Site. Summary analytical results are provided in Table 1.

The first method to evaluate uranium isotope concentrations, Inductively Coupled Plasma Mass Spectrometry (ICP-MS) was utilized to provide precision and low detection limits for the ^{235}U and ^{238}U isotopes. Results for the ICP-MS method verify the presence of ^{238}U, but resulted in non-detects for the ^{234}U and ^{235}U isotopes indicating that they were either not present or below their respective minimum detection limits. These data were considered but not used in the background analysis and risk assessment because the assessments require data input by activity and/or mass concentration. The second analytical method utilized in this study was Alpha Spectrometry. The alpha spectrometry results were expected to provide the greatest precision and lowest detection limit for the ^{234}U isotope. Results of the alpha spectrometry analysis indicate the presence of all three isotopes in site soils. ^{235}U was detected in only one of the 5 locations sampled. Given that data for all three isotopes were available for the alpha spectrometry method, data obtained from this method comprised the data set utilized for both the background analyses and human health risk assessment.

Table 1: Summary of Analytical Results

		ICP-MS	Radiochemistry				Lead
Sample ID	Isotope	Concentration (ppb)	Isotope	Result (pCi/g)	Mass Concentration (ppb)	$^{234}U/^{238}U$ Activity Ratio**	Concentration (mg/kg)
DU0001	234	ND	234	**0.436**	**0.0701**	1.184783	3.0
	235	ND	235/236	ND	NA		
	238	**160**	238	**0.368**	**1094.66**		
DU0002	234	ND	234	**0.157**	**0.0252**	1.180451	2.8
	235	ND	235/236	ND	NA		
	238	**130**	238	**0.133**	**395.62**		
DU0003	234	ND	234	**0.118**	**0.019**	1.787879	1.8
	235	ND	235/236	ND	NA		
	238	**64**	238	**0.066 (J)**	**196.32**		
DU0004	234	ND	234	**0.144**	**0.0231**	1.107692	3.3
	235	ND	235/236	ND	NA		
	238	**100**	238	**0.13**	**386.7**		
DU0005	234	ND	234	**0.199**	**0.032**	0.739777	3.0
	235	ND	235/236	ND	NA		
	238	**140**	238	**0.269**	**800.17**		
DU0006*	234	ND	234	**0.123**	**0.0198**	1.008197	2.0
	235	ND	235/236	**0.018 (J)**	**8.29**		
	238	**100**	238	**0.122**	**362.9**		
DU0007*	234	ND	234	**0.127**	**0.0204**	0.824675	2.4
	235	ND	235/236	ND	NA		
	238	**110**	238	**0.154**	**458.09**		

*Samples DU0006 and DU0007 are replicate samples of DU0002.

**Natural 234/238 Uranium Activity Ratio Ranges from 0.5 to 1.2

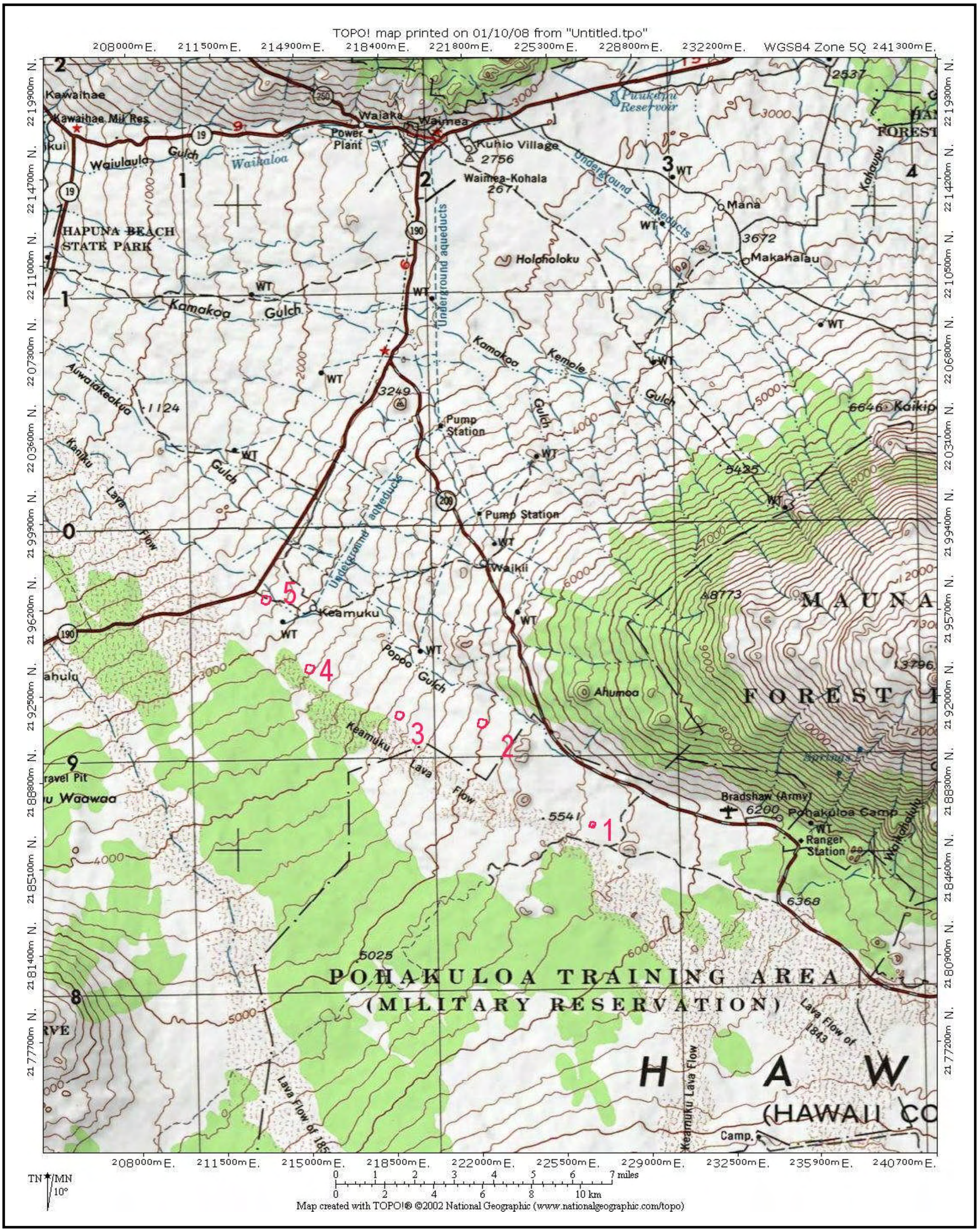


Figure 2: Sample Location Map

SECTION 4
BACKGROUND EVALUATION

Two methods can be utilized to determine whether detected U originates from natural or DU or enriched U (EU) sources. The first method involves a simple comparison of site U concentrations to U concentrations found in typical unimpacted environmental media. The second method compares isotopic abundance (isotope ratios) from site-specific media to the isotope abundance in typical unimpacted environmental media. This study utilized both methods of evaluation. The following sections provide detailed information regarding sources of radiation in the environment, a description of depleted and enriched uranium (DU and EU), and a site-specific source analysis of U at the proposed Saddle Road alignment. Sections 4.1, 4.2, and 4.3 have been taken from Rubin (2008) and are consistent with Sansone et al. (2001), Stegnar and Benedik (2001), and ATSDR (1999).

4.1 Sources of Radiation in the Environment

U is a naturally occurring heavy metal. Rocks, soil, coral, water, air, plants and animals all contain varying amounts of U. Natural U is a mixture of three types (or isotopes) of U, written as ^{234}U, ^{235}U, and ^{238}U. Although these isotopes are different radioactive materials with differing radioactive properties, they are the same chemically. Because U normally occurs at very low concentration in natural materials at Earth's surface, (less than 5 parts per million by weight, ppm), geochemists refer to it as a "trace element". U ores and U rich minerals do not occur in Hawai'i, but U is dispersed at low abundance in normal rock forming minerals.

There are many sources of radioactivity in the environment besides U – some are natural and some are manmade. An environmental assessment typically considers both natural and contaminant sources of radioactivity. There are multiple natural radiation sources that humans come in contact with every day. Those most relevant to this assessment include the chemical elements thorium, radium, radon, potassium and carbon, which have the chemical symbols Th, Ra, Rn, K and C. Th is a heavy metal like U that occurs in rocks and soils at similar concentration to U. Th has one major isotope (^{232}Th) and several minor ones, all of which are radioactive. Ra is a natural radioactive byproduct from the decay of U (and to a much lesser extent, Th). It is in the same chemical family as the element calcium (Ca), and occurs at low levels in many materials at Earth's surface.

Radon is a radioactive gas formed from Ra that continually seeps out of rocks, soils and waters. All of the atoms of U, Th, Ra, and Rn on Earth are radioactive. K and C are slightly different:

these two elements are very common in materials found at Earth's surface, including the human body, yet they are only mildly radioactive because just a small fraction of the K and C atoms are radioactive (these radioactive isotopes are written as ^{40}K and ^{14}C). Both elements are mostly made up of stable (non-radioactive) isotopes; some forms of carbon (such as coal and petroleum) have no ^{14}C in them.

The atomic age brought many new sources of radioactivity into our world. For instance, atmospheric atomic bomb tests in the 20th century produced radioactive isotopes of plutonium, strontium, cesium, and iodine (to name just a few) that were previously extremely rare or not found on Earth. Many of these bomb-test isotopes have since decayed away, although the longest-lived isotopes can still be found at shallow depths in soils, lake sediments, and glaciers around the world. Other modern activities also occasionally release artificial radio-isotopes into the environment, including everything from the nuclear power industry to nuclear medicine to the manufacture and disposal of household smoke detectors. A person exposed to high levels of radioactivity close to the source can suffer numerous possible toxic effects that depend on the type of radioactive material. This is why users of radioactive materials follow strict protocols (based on time, distance, and shielding) to minimize negative impacts on themselves or the general public, and why, for instance, highly radioactive patients undergoing nuclear medicine therapy are kept away from the general public.

4.2 Natural, Depleted, and Enriched Uranium

New forms of U with isotopic compositions that differ greatly from natural U are another development of the atomic age. An industrial process called enrichment is used to concentrate ^{234}U and ^{235}U producing enriched uranium (EU) used for nuclear fuel. The material leftover from the enrichment process is called DU because it has lower concentrations of these two isotopes than natural uranium. DU is thus a modified form of U from which these lighter and more radioactive isotopes have been partially removed, creating a substance that has more ^{238}U than natural U. The resultant change in the isotopic composition makes it possible to distinguish naturally occurring U from enriched and depleted forms.

EU is more radioactive than natural U, with more highly enriched forms being more radioactive than less enriched forms. Depending on the percent enrichment, EU can be used as nuclear fuel for power plants (less enriched, sometimes called "low EU") or atomic weapons (more enriched, sometimes called "high EU"). DU has numerous civilian and military uses that on occasion cause it to be introduced into the environment. Civilian uses include radiation shielding, gyroscopes, and stabilizers in aircraft. Past and present military uses include spotting rounds, munitions and as shielding in armored vehicles.

4.3 U Mass Concentration

Uranium occurs naturally in trace amounts in Hawaiian rocks, soils and waters at or below concentrations of 1 to 3 parts per million (ppm) by weight (Rubin 2008). The sum of the 3 most prevalent isotopes (^{234}U, ^{235}U and ^{238}U) can be used as to estimate total U concentrations. If site-specific U concentrations are significantly greater than representative background U concentrations, one can surmise that additional sources of U exist.

4.4 Isotopic Fingerprinting

The proportions of U isotopes in a substance can be used to determine the source of the U it contains. If environmental U contamination is suspected, isotopic tests can determine if the U came from natural U ore or from non-natural DU or EU. Except in extremely rare cases (not found in Hawai‘i), natural U dispersed in rocks, soils and waters at earth's surface today have the same ^{235}U/^{238}U radioactivity ratio, even if the U concentration (by weight) is different between them. This fact provides a fingerprint of natural U isotopic composition. DU has comparatively less ^{235}U and EU has more, giving this material non-natural ^{235}U/^{238}U ratio. There have been slight variations in the ^{235}U depletion level in DU manufactured in different places and times, but normally ^{235}U has been reduced by at least 70% from its natural value. ^{234}U is affected even more by depletion and enrichment than ^{235}U. However, unlike ^{235}U, the amount of ^{234}U in a natural material can vary relative to the amount of ^{238}U due to natural processes, making the ^{234}U/^{238}U ratio less precise but still useful for isotopic fingerprinting of U contamination. The reason ^{234}U/^{238}U varies in nature and ^{235}U/^{238}U does not is that most ^{234}U in a rock has been produced there from decay of ^{238}U and its immediate daughters, causing slight radiation damage to the place in a mineral where it resides. ^{235}U and ^{238}U are not decay products of other isotopes on Earth so there is no radiation damage to their mineral residence sites.

The radiation damage from ^{234}U production increases with the age of the rock, causing that ^{234}U atom to be more easily leached from the rock during rock weathering. The water that does the leaching usually ends up with elevated ^{234}U/^{238}U and the rock and soil residues usually have lower ratios, although secondary mineral formation can affect rock and water ratios as well. Recoil of ^{234}U atoms as they are produced can also push "extra" ^{234}U into soil water. The changes in ^{234}U/^{238}U from natural processes are usually smaller than the changes caused by the manufacture of DU and EU, so ^{234}U/^{238}U is still useful for fingerprinting of U contamination in nature.

Contamination generally results in elevated U concentrations, although if U is leaching from the environment almost as fast as the contaminant is added, the isotopic composition is affected but the overall U concentration may not change as dramatically. If the contamination is from natural U (e.g., some phosphorous fertilizers or U ores) the U concentration will change but the isotopic composition will not. The isotopic composition will change if contamination is from DU or EU. If DU or EU contamination is present, U in environmental samples will be mixtures of natural and contaminant U, with intermediate isotopic composition, except in extremely contaminated cases. Mixing follows predictable trajectories. Laboratory measurements of U concentration and isotopic composition are used to determine the type and amount of contamination.

4.5 Site Specific U Source Identification

Section 4.5.1 describes the site specific analysis of U mass concentration while sections 4.5.2 describes the use of isotopic fingerprinting to determine whether U at the site is from natural or anthropogenic sources.

4.5.1 U Mass Concentration

Uranium occurs naturally in trace amounts in Hawaiian rocks, soils and waters at or below concentrations of 1 to 3 parts per million (ppm) by weight (Rubin 2008). Total U at the site was determined by summing the isotopic concentrations of ^{234}U, ^{235}U and ^{238}U detected at each of the 5 independent sites along the proposed Saddle Road alignment. Results of this analysis indicate that total uranium along the proposed Saddle Road alignment are at or below levels occurring naturally in native Hawaiian soils. Total U based on alpha spectometry analyses ranged from 0.4 parts per million (ppm) at location DU003 to 1.3 ppm at DU001. The average at all five (5) locations was 0.8 ppm.

4.5.2 Isotopic Fingerprinting

The second method used to determine whether detected U originates from natural or DU sources was the evaluation of isotope abundance. Except in extremely rare circumstances (not found in Hawai'i), natural U dispersed in rocks and soils have a comparatively greater $^{234}U/^{238}U$ and $^{235}U/^{238}U$ ratio than those originating from DU. Although use of the $^{235}U/^{238}U$ is considered a more precise measurement than the $^{234}U/^{238}U$ ratio in isotopic fingerprinting of U contamination, the utility of the $^{234}U/^{238}U$ ratio is significant when ^{235}U data are not available or when concentrations of the ^{235}U isotope are too low to detect. This is the case here and as such, the $^{234}U/^{238}U$ ratio was used as the second method to fingerprint U source. Naturally occurring $^{234}U/^{238}U$ ratio in soil has been determined to be in the range of 0.5 to 1.2 (Sansone et al. 2001).

$^{234}U/^{238}U$ ratios at the Saddle Road alignment ranged from 0.74 to 1.79, with an average ratio across all five (5) locations of 1.16. Assuming the average ratio across the five (5) sites is representative of the proposed alignment, these results indicate that the $^{234}U/^{238}U$ isotopic ratio is within the background range.

SECTION 5
Baseline Human Health Risk Assessment

This section describes the HHRA processes and methodologies used to identify the hazards associated with potential uranium exposures for identified receptors. Information available regarding depleted uranium use was evaluated, a site characterization plan was formulated and implemented, constituents of potential concern (COPCs) were selected for quantitative risk assessment, receptors identified, and risk quantified. Additionally, a screening level lead assessment was performed to determine potential human health risk from lead detected at the site.

5.1 Hazard Identification

In the Hazard Identification step, analytical data are evaluated and constituents of potential concern (COPC) are selected for quantitative risk assessment. Data have been collected during a single phase of investigation. Samples assessed include on-Site surface soil data only. In this risk assessment, subsurface soil concentrations were assumed to be equal to surface soil concentrations. This assumption was considered conservative (protective of human health) because the mobility of U in soils is considered low and it likely that subsurface soil concentrations would be reduced in comparison to surface soils at the same location (Rubin 2008).

5.1.1 Summary of Available Site Data

Data were collected during a single post-remedial phase of investigation in June 2008. Environmental surface soil samples were collected from 10,000 square foot areas at five (5) distinct locations along the proposed alignment. Sampling locations can be found on Figure 2.

The soil samples were analyzed for Uranium by Alpha Spectrometry by USEPA Method EML A-01-R MOD, by ICP-MS by USEPA method SW846 6020, and for Percent Moisture by USEPA method MCAWW 160.3 MOD. Soil samples were also analyzed for Lead by USEPA method SW846 6020.

5.1.2 Selection of COPCs

Based on the nature of the site, problem and need to address public concerns two chemicals were analyzed and considered for evaluation. They included lead and three U isotopes (^{234}U, ^{235}U and ^{238}U). Other chemicals may be present at the Site but were not included in this assessment.

5.1.3 Analysis of Lead

All five (5) soil sample locations were analyzed for lead. Results of the Analysis can be found in Appendix A. Results were compared to the USEPA Region 9 Preliminary Remediation Goals (PRGs) for lead in soil of 400 mg/kg. Of the five (5) soil sample locations, the maximum detected was 3.3 mg/kg at sampling location DU004 falling well below the PRG. Due to these low levels, lead was excluded from any further additional analysis.

5.1.4 Analysis of Uranium

Five (5) soil samples were analyzed for uranium by both Alpha Spectrometry and Inductively Coupled Plasma Mass Spectrometry (ICP-MS). ICP-MS analysis is generally considered to have the greatest precision and lowest detection limits for detecting the ^{235}U and ^{238}U isotopes. The ICP-MS results provided Non Detects for all the samples for the ^{234}U and ^{235}U isotopes. The highest reading for the ^{238}U isotope was 0.16 mg/kg at sampling location DU001.

Soil samples were also analyzed by Alpha Spectrometry to determine radiological activity. Alpha Spectrometry is considered to have greater precision and lower detection limits for the ^{234}U. The highest detected ^{234}U isotope was 0.436 pCi/g at sampling location DU001. The Alpha Spectrometry also has readings as high as 0.018 for ^{235}U at sampling location DU002, and 0.368 pCi/g for ^{235}U at sampling location DU001. It should be noted though that all ^{235}U results were still below the reporting limit.

Activity determined in the alpha spectrometry analysis was converted to a mass concentration by via the following formula:

$$U_{Total} = \left(\frac{^{234}U}{6{,}250\, pCi/\mu g} \right) + \left(\frac{^{235}U}{2.16\, pCi/\mu g} \right) + \left(\frac{^{238}U}{3.36\, pCi/\mu g} \right)$$

where:

U_{Total} = Total mass concentration of uranium (mg/kg)

^{234}U, ^{235}U, and ^{238}U = Isotopic radioactivity concentration (pCi/g)

Based on conversion above, the highest mass concentration detected using Alpha Spectrometry analysis was 1.095 ppm at sampling location DU001. Because the results from the Alpha Spectrometry analysis provide evaluation of the progeny Uranium, and overall recorded higher activity and resulting mass concentrations, in order to be conservative, these results were used in lieu of ICP-MS results in the BHHRA.

5.2 Dose-Response Assessment

The purpose of the Dose-Response Assessment is to identify both the types of adverse health effects a COPC may potentially cause, as well as the relationship between the amount of COPCs to which receptors may be exposed (dose) and the likelihood of an adverse health effect (response). The USEPA characterizes adverse health effects as either carcinogenic or noncarcinogenic and dose-response relationships are defined for oral and inhalation routes of exposure. The results of the toxicity assessment, when combined with the results of the exposure assessment (Section 5.3), provide an estimate of potential risk.

This section provides dose-response information for COPCs evaluated in the risk assessment for the Site. Section 5.2.1 describes the USEPA approach for developing noncarcinogenic dose-response values. The carcinogenic dose-response relationships developed by USEPA are discussed in Section 5.2.2. Noncarcinogenic and carcinogenic dose-response values used in this risk assessment are presented in Table 2. Dose-response information used in this risk assessment was obtained from the following sources:

- USEPA's Integrated Risk Information System (IRIS) (USEPA 2008);
- Agency for Toxic Substances & Disease Registry’s Minimal Risk Levels (MRLs) for Hazardous Substances (ATSDR 2007);
- USEPA Region IX's Preliminary Remediation Goals (USEPA 2004).

5.2.1 Noncarcinogenic Dose-Response

Constituents with known or potential noncarcinogenic effects are assumed to have a dose below which no adverse effect occurs or, conversely, above which an effect may be seen. This dose is called the “threshold dose”. In laboratory experiments, this dose is known as the “no observed adverse effects level” (NOAEL). The lowest dose at which an adverse effect is seen is called the lowest observed adverse effects level (LOAEL). By applying uncertainty factors to the NOAEL or the LOAEL, the USEPA (and other regulatory agencies from which toxicity values used in this assessment were acquired) have developed reference doses (RfDs) for chronic exposures to constituents with potential noncarcinogenic effects.

Table 2: Noncarcinogenic and Carcinogenic Dose Response

	Constituent	
	Uranium	
Oral CSF *(mg/kg-d)^-1*	NA	a
Inhalation CSF *(mg/kg-d)^-1*	NA	a
Inhalation URF *(ug/m^3)^-1*	NA	a
Oral TDI/RfD *(mg/kg-d)*	3.00E-03	a
Inhalation TC/RfC *(ug/m^3)*	3.00E-01	b
Inhalation RFDi *(mg/kg/day)*	8.60E-05	c

NA - Not Applicable
(a) U.S. EPA (2008). IRIS.
(b) ATSDR MRLs (2008)
(c) Derived from Inhalation RfC.

Uncertainty factors account for unknowns associated with the dose-response value, such as the effect of using an animal study to derive a human dose-response value, extrapolating from the high doses used in the laboratory experiment to the low doses typically encountered in environmental settings, and evaluating sensitive subpopulations. For constituents with potential noncarcinogenic effects, the RfD provides reasonable certainty that if the specified exposure dose is below the RfD, then no noncarcinogenic health effects are expected to occur even if daily exposure were to occur for a lifetime. RfDs are expressed in terms of milligrams of constituent per kilogram of body weight per day (mg/kg-day). The oral RfD for Uranium is 3E-03 mg/kg-day (IRIS 2008) and is used for oral and dermal routes of exposure. The inhalation RfD used was 8.6E-05 mg/kg-day and was derived from the ATSDR MRL inhalation reference concentration.

5.2.2 Carcinogenic Dose-Response

The underlying assumption of regulatory risk assessment for constituents with known or assumed potential carcinogenic effects is that no threshold dose exists. In other words, it is assumed that a finite level of risk is associated with any dose above zero. For carcinogenic effects, the USEPA uses a two-step evaluation in which the constituent is assigned a weight-of-evidence classification, and then a cancer slope factor (CSF) is calculated.

The weight-of-evidence classification summarizes the evidence about the likelihood of the constituent being a human carcinogen. Group A constituents are classified as human carcinogens, Group B constituents are probable human carcinogens, Group C constituents are possible human carcinogens, Group D constituents are not classifiable as to human carcinogenicity, and, for Group E constituents, there is evidence of noncarcinogenicity for humans.

In the second part of the evaluation, CSFs are calculated for constituents that are known or probable human carcinogens. The USEPA has developed computerized models that extrapolate observed responses at high doses used in animal studies to predicted responses in humans at the low doses encountered in environmental situations. The models developed by the USEPA assume no threshold and use animal or human data to develop an estimate of the carcinogenic potency of a constituent. The USEPA refers to this numerical estimate as the CSF. The computerized models used by USEPA assume that carcinogenic dose-response is linear at low doses.

Uranium itself is not considered to be carcinogenic when inhaled ingested or contacted dermally. However, its radiological activity is assumed to have carcinogenic effects. Potential carcinogenic risks are therefore addressed using Argonne National Laboratory (ANL 2007) RESidual RADioactivity (RESRAD) computer code, Version 6.4. This software was developed in coordination with the Department of Energy (DOE), USEPA, and Nuclear Regulatory Commission (NRC), as a tool for predicting human health risks due to residual radioactivity in soils. The code uses radionuclide CSFs presented in Federal Guidance Report (FGR) No. 13 (USEPA 2002), which incorporate HEAST 2001 risk coefficient values.

RESRAD's computer code was developed to provide site-specific residual radioactive material guidelines as well as radiation dose and excess lifetime cancer risk to a chronic exposure. RESRAD uses a pathway analysis method in which the relation between radionuclide concentrations in soil and the does to a member of a critical population group is expressed as a pathway sum, which is the sum of products of "pathway factors." Pathway factors correspond to pathway segments connecting compartments in the environment between which radionuclides can be transported or radiation emitted. Radiation doses, health risks, soil guidelines and media concentrations are calculated over user-specified time intervals. The source is adjusted over time to account for radioactive decay and ingrowth, leaching, erosion, and mixing. With few exceptions, all RESRAD default parameters were used without site-specific modification. Site-specific exposure factors used in the RESRAD assessment are described in Section 5.5.

5.3 Exposure Assessment

The risk assessment process requires the creation of exposure scenarios to assess the potential for adverse health effects from constituents at or near the Site. While these scenarios represent hypothetical people and activities, they reflect the physical description of the Site and the surrounding residential, industrial and commercial areas, as well as the activities that may typically occur in these areas. Both current and reasonably foreseeable future potential exposures are evaluated.

In this assessment, past and current uses of the subject site were analyzed in order to determine the potential exposure scenarios relevant for the site. The exposure assessment is divided into seven subsections. Section 5.3.1 describes the potential receptors and exposure scenarios selected for evaluation in the risk assessment. Section 5.3.3 presents the potential exposure pathways evaluated for the Site. Section 5.3.4 describes the conceptual site model. Section 5.4 describes the statistical methods used to estimate exposure-point concentrations. Section 5.5 describes exposure factors used in the risk assessment. Absorption adjustment factors are discussed in Section 5.6 and dermal permeability constants are discussed in Section 5.7. Section 5.8 describes the methods used to estimate potential exposure doses.

5.3.1 Potential Exposure Scenarios

In creating potential exposure scenarios for evaluation in the risk assessment, the likelihood of potential exposure to Site-related constituents via many pathways was considered. Some pathways were excluded from further analysis because the route of exposure was physically impossible or highly unlikely given the conditions of the Site. Based on information about land use, topography, and current Site conditions, current and future exposure scenarios were developed for the Site.

5.3.2 Current and Future Exposure Scenarios

As described in Section 1.1 the Site is located in and around the PTA (Figure 1). A general description of the property and an account of its history are provided. Likely current and future exposure scenarios evaluated include adult construction workers, working on the road, and a commuter, who uses the road on a daily basis. Construction workers were assumed to work on the site and excavate a large area for construction for 8 hours a day, 250 days a year for 1 year. Construction workers are expected to be exposed to both surface and subsurface soils, inhalation of soil derived dust, and any external gamma radiation. Recreational users are commuters assumed to contact surficial soils, breath soil derived dust, and are exposed to external radiation for 2 hours a day for 350 days per year for 30 years, 6 as a child and 24 as an adult.

5.3.3 Identification of Potential Exposure Pathways

As described in Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual (USEPA 1989), four elements must be present in order for a potential human exposure pathway to be complete:

1. a source and mechanism of constituent release to the environment;
2. an environmental transport medium (e.g., soil, water or soil vapor);
3. an exposure point, or point of potential contact with the potentially affected medium; and
4. a receptor (e.g., human) with a route of exposure at the point of contact.

Potential exposure pathways are the mechanisms by which potential receptors may be exposed to constituents. The potential exposure pathways included in this assessment were selected based on the most likely mechanisms of exposure and observations at the Site. The most likely potential exposure pathways at the Site are ingestion of and dermal contact with soil, exposure via inhalation of soil-derived dust, and exposure to external gamma radiation. A Conceptual Site Model summarizing exposure pathways is provided in Figure 3

5.3.4 Conceptual Site Model

The CSM presents potential sources, release mechanisms, transport media, routes of migration through the environment, exposure media, and potential human receptors. The Conceptual Site Model also presents the possible human receptors evaluated in this assessment, and the potential exposure pathways available to these receptors.

5.4 Exposure Point Concentrations

Exposure point concentrations for constituents detected in media at the Site were estimated using all relevant analytical data collected (as representative of current site conditions) from the single site investigation described in Section 3. As described, samples were collected from the surface soil only.

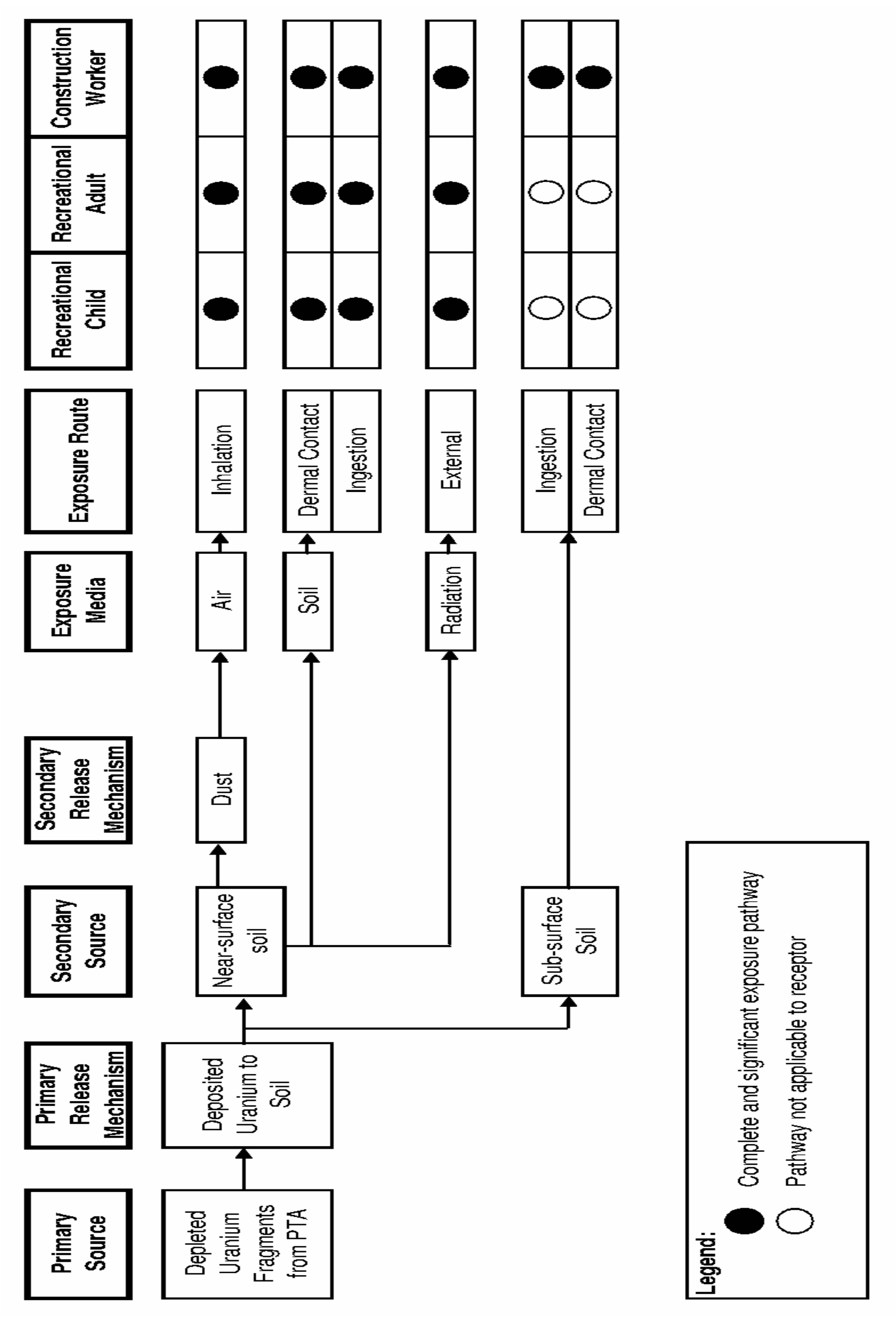


Figure 3: Conceptual Site Model

Surface soil samples were used to estimate exposure point concentrations for direct contact exposure, inhalation of soil derived dust, and external radiation for these scenarios. For direct contact to construction workers, surface soil samples were conservatively used to estimate subsurface soil concentrations assuming the highest concentration of contaminants would be found at the surface as potential contamination was a result of deposition.

In calculating exposure point concentrations, all replicate samples were averaged. Summary statistics (minimum, maximum, mean, standard deviation, frequency of detection, and 95% upper confidence limit on the arithmetic mean concentration [95% UCL]) were calculated for each U isotope detected in soil from the Site. The 95% UCL was calculated using USEPA's ProUCL software Version 4.0 (USEPA 2007). The USEPA has determined that the average concentration of a COPC represents a reasonable estimate of the concentration in an environmental medium that a receptor may potentially contact when that contact occurs at random over an extended period of time. For estimating exposures to COPCs in environmental media, USEPA has proposed various ways of estimating the exposure point concentration to account for the uncertainty due to incomplete sampling and/or analytical data variability. These range from using the maximum concentration when few samples have been collected from a potential exposure area to various methods of estimating a 95% UCL on the mean concentration.

For data with a normal distribution, the 95% UCL of the mean is calculated using the t-distribution (Student's t-statistic) in the following algorithm:

$$95\%\ \ UCL\ (ppm) = x + \frac{s\,t}{\sqrt{n}}$$

where:

x = arithmetic mean concentration (mg/Kg)

s = standard deviation (mg/Kg)

t = Student's *t* distribution statistic

n = number of data points

For data that are log-normally distributed, USEPA recommends the use of the Land method based on the *H*-statistic for determining the 95% UCL of the mean. The algorithm supplied by USEPA for determining the 95% UCL when data are log-normally distributed is:

$$UCL = e^{\left(x + 0.5s^2 + \frac{sH}{\sqrt{n-1}}\right)}$$

where:

x = arithmetic mean concentration (mg/Kg)

s = standard deviation of log transformed data (mg/Kg)

H = Land distribution statistic

n = number of data points

The H-statistic frequently estimates a 95% UCL of the mean that is greater than the maximum concentration observed at a site when the input data are highly variable (i.e., when the relative standard deviation (RSD) exceeds 100%) and, in some cases, estimates concentrations in excess of one part per part. In these cases, the biased estimates of the "average" concentration are likely reflecting datasets that include many samples collected from areas of higher concentrations and fewer samples collected from areas of lower concentrations. This is the case at most sites where sampling efforts have intentionally been focused in areas of expected contamination and their immediate vicinity, but often not in other portions of a site where concentrations are likely to be lower but where potential exposure may occur at equal or even higher frequency. In this case, the data distribution is controlled by the sampling strategy rather than any distribution in nature. That is, areas of high concentration are more frequently represented than areas of lower concentration, even though both may be equally likely to represent a contact point by a hypothetical receptor. Therefore, the estimated exposure point concentration is biased high and does not represent the actual concentration that the receptor "encounters." The "distribution" observed in the biased dataset similarly does not represent the actual distribution of concentrations across the entire site or exposure area. Furthermore, a large part of the error in applying the H statistic lies in the inability of the algorithm to properly calculate the arithmetic mean when the data are not lognormally distributed.

If the data were non-parametric in distribution (i.e., not normal or lognormal in distribution), the data were further evaluated to determine if the sample results represent highly skewed distributions. For datasets that are neither normal nor lognormal or are highly skewed in distribution, the 95% UCL on the mean was based on the higher of the values from the percentile or standard bootstrapping techniques. In cases where sufficient data to calculate a 95% UCL of the mean were not available, the exposure point concentration was based on the maximum detected concentration.

Appendix A presents the analytical results and summary statistics for each constituent detected in soil samples collected from the site. The 95% UCL was calculated for each isotope from the Alpha Spectrometry analysis. For ^{235}U and ^{238}U the calculated UCL exceeded the maximum value detected so the maximum detected activity was used as the EPC. For ^{234}U, the data was found to be normally distributed and the EPC was based on the calculated t-statistic. Table 3 provides a summary of estimated exposure point concentrations used in the quantitative risk assessment for each sampling location.

Table 3: Exposure Point Concentrations

	EPC for Soil (mg/kg)	EPCs for Soil (pCi/g)			EPC Mass Conversion (mg/kg)		
Chemical	***Total***	***234 U***	***235 U***	***238 U***	***234 U***	***235 U***	***238 U***
Uranium	0.925	0.436	0.006	0.310	0.0001	0.0028	0.9226
		Mass Percentage				***Activity Ratio***	
		234 U	***235 U***	***238 U***		***234/238***	***235/238***
		7.54E-05	3.00E-03	9.97E-01		1.41E+00	1.94E-02

5.5 Exposure Factors

The exposure factors used in the quantitative risk assessment are summarized in Table 4.

Individual exposure factors are discussed below.

5.5.1 Body Weight

Body weights were derived from USEPA Exposure Factors Handbook (USEPA 1997) by averaging the male and female data for mean body weight. The average adult body weight used in this risk assessment was 71.8 kg. The average child body weight used in this risk assessment was 16 kg.

5.5.2 Duration of Exposure

Exposure durations were taken from USEPA Exposure Factors Handbook (USEPA 1997). It is important to note that USEPA (1997) states that the average occupation job tenure is 6.6 years, which contrasts significantly from the standard default worker duration of 25 years. This value is the upper bound occupation job tenure, which is consistent with a Reasonable Maximum Exposure (RME) scenario.

Table 4: Exposure Factors

	Parameter (units)	Soil/ Deposited Dust	Rationale
Child – Recreational	Exposure Time - vapor (hr/d)	2	Activity Specific Value
	Exposure Time - dust (hr/d)	2	Activity Specific Value
	Exposure Time - dermal-water (hr/d)	NA	Activity Specific Value
	Exposure Frequency - dermal (event/d)	1	AMEC Assumption
	Exposure Frequency (d/y)	52	Activity Specific Value
	Exposure Duration (y)	6	Activity Specific Value
	Body Weight (kg)	16	USEPA - Exposure Factors (1997)
	Averaging Period - Cancer (d)	25550	USEPA - 70 years
	Averaging Period - Noncancer (d)	2190	Based on Exposure Duration
	Ingestion Rate (mg/d) or (L/d)	200	USEPA - Exposure Factors (1997)
	Inhalation Rate (m^3/hr)	0.417	USEPA - Exposure Factors (1997)
	Fraction from Site (unitless)	1	Activity Specific Value
	Surface Area Exposed (cm^2/d)	2800	USEPA - Region IX PRG
	Soil-to-Skin Adherence Factor (mg/cm^2)	0.29	USEPA - Exposure Factors (1997)
Adult – Recreational	Exposure Time - vapor (hr/d)	2	Activity Specific Value
	Exposure Time - dust (hr/d)	2	Activity Specific Value
	Exposure Time - dermal-water (hr/d)	NA	Activity Specific Value
	Exposure Frequency - dermal (event/d)	1	AMEC Assumption
	Exposure Frequency (d/y)	52	Activity Specific Value
	Exposure Duration (y)	24	Activity Specific Value
	Body Weight (kg)	71.8	USEPA - Exposure Factors (1997)
	Averaging Period - Cancer (d)	25550	USEPA - 70 years
	Averaging Period - Noncancer (d)	8760	Based on Exposure Duration
	Ingestion Rate (mg/d) or (L/d)	100	USEPA - Exposure Factors (1997)
	Inhalation Rate (m^3/hr)	0.833	USEPA - Exposure Factors (1997)
	Fraction from Site (unitless)	1	Activity Specific Value
	Surface Area Exposed (cm^2/d)	5700	USEPA - Region IX PRG
	Soil-to-Skin Adherence Factor (mg/cm^2)	0.29	USEPA - Exposure Factors (1997)
Construction Worker	Exposure Time - vapor (hr/d)	8	Activity Specific Value
	Exposure Time - dust (hr/d)	8	Activity Specific Value
	Exposure Time - dermal-water (hr/d)	NA	Activity Specific Value
	Exposure Frequency - dermal (event/d)	1	AMEC Assumption
	Exposure Frequency (d/y)	250	Activity Specific Value
	Exposure Duration (y)	1	Activity Specific Value
	Body Weight (kg)	71.8	USEPA - Exposure Factors (1997)
	Averaging Period - Cancer (d)	25550	USEPA - 70 years
	Averaging Period - Noncancer (d)	365	Based on Exposure Duration
	Ingestion Rate (mg/d) or (L/d)	330	USEPA - Exposure Factors (1997)
	Inhalation Rate (m^3/hr)	0.833	USEPA - Exposure Factors (1997)
	Fraction from Site (unitless)	1	Activity Specific Value
	Surface Area Exposed (cm^2/d)	3300	USEPA - Region IX PRG
	Soil-to-Skin Adherence Factor (mg/cm^2)	0.29	USEPA - Exposure Factors (1997)

The construction worker scenario assumes an exposure duration for a single year. For the recreational user scenario, it is assumed that a visitor would be exposed to the environmental media for multiple years. The recreational scenario is split, assuming 6 years as a child and 24 years as an adult totaling a 30-year tenure.

5.5.3 Exposure Frequency

The exposure frequency for the on-site worker is a standard Human Health Evaluation Manual: Supplemental Guidance: *Standard Default Exposure Factors* (USEPA 1991a) and Exposure Factors Handbook (USEPA 1997). The Construction worker it is assumed a 250 day exposure frequency for the year they are on site. For the recreational scenario, an exposure frequency of 350 days per year is assumed.

5.5.4 Amount of Soil and Sediment Ingested

In the interest of health protectiveness, AMEC has assumed that the typical adult soil ingestion rate for all workers to be 330 mg/day, recreational adults to be 100 mg/day, and 200 mg/day for recreational children.

5.5.5 Body Surface Area Exposed to Soil/Groundwater

USEPA Region 9 PRG Guidance for Dermal Exposure Pathway (2004) recommends that the skin surface area for recreational adults be set as 5,700 cm^2. This guidance also recommends a surface area for contact for recreational children of 2,900 cm^2 and a surface area for construction workers of 3,300 cm^2.

5.5.6 Lifetime

For carcinogenic risk assessment, the lifetime average daily dose must be calculated. Based on recent studies, the Exposure Factors Handbook (USEPA 1997) recommends that risk assessors use the default value of 70 years.

5.5.7 Soil Adherence Rate

The mean adherence value from USEPA (1997) (0.29 mg/cm^2) is assumed in this risk assessment.

5.6 Relative Absorption Factors

To estimate the potential risk to human health that may be posed by the presence of COPC in soil, it is necessary first to estimate the potential exposure dose of each COPC. The potential exposure dose is similar to the administered dose or applied dose in a laboratory experiment. The animal-derived cancer slope factors (CSFs) and reference doses (RfDs) used in quantitative risk assessment are based on applied doses in most cases. However, the efficiency of COPC absorption via a particular route and from a particular matrix (e.g., soil, water) at the Site may differ from the absorption efficiency for the exposure route and matrix used in the experimental study that serves as the basis for the CSF or RfD. As recommended by USEPA (1989), Relative Absorption Factors (RAFs) for Site-related COPCs have been derived and used in the calculation of potential exposure doses presented above.

RAFs allow risk assessors to make appropriate adjustments if the efficiency of absorption is known to or expected to differ because of physiological effects and/or matrix or vehicle effects. RAFs can be less than one or greater than one, depending on the COPC and potential routes of exposure at a site.

When RfDs and CSFs are based on administered doses, the RAF is calculated as the ratio of the estimated absorption for the site-specific medium and route of potential exposure, to the known or estimated absorption for the laboratory study from which the RfD or CSF was derived. When absorption from the site-specific exposure is assumed to be the same as absorption in the laboratory study, then the RAF is 1.0. This assessment conservatively assumes absorption from all pathways (oral, inhalation and dermal) are equal to the oral absorption from the toxicity study in which the RFD was derived. All RAFs in this assessment were therefore conservatively set at 1.0 including the RAF for the dermal pathway. This almost certainly overestimates absorption and risk. It should also be noted that the Health Effects Assessment Summary Tables (HEAST) - Radionuclides Table (2001) provides a Gastrointestinal (GI) absorption fraction for Uranium of .02. This GI absorption factor represents the fraction of the radionuclide that may be absorbed from the gastrointestinal (GI) tract into blood following an oral intake.

5.7 Method to Estimate Average Daily Dose

Reasonable maximum exposure (RME) scenarios are evaluated in this risk assessment. Conservative exposure assumptions are used to construct a reasonable maximum exposure scenario. Most individuals will not be subject to all the conditions that comprise the RME scenario. Individuals who do not meet all conditions in the RME scenario have lower potential exposures to constituents, and therefore, lower potential risks associated with those exposures.

The Chronic Average Daily Dose (CADD) is an estimate of a receptor's potential daily intake from exposure to constituents with potential noncarcinogenic effects. Note that Average Daily Dose is a term used in risk assessment and does not represent a true average because the assumptions used to derive it do not represent "averages". According to USEPA (1989), the exposure dose should be calculated by averaging over the period of time for which the receptor is assumed to be exposed. The CADD for each constituent via each route of exposure is compared to the RfD for that constituent to estimate the potential hazard index due to exposure to that constituent via that route of exposure. Hazard indices are presented and discussed in Section 5.1

For constituents with potential carcinogenic effects, the Lifetime Average Daily Dose (LADD) is an estimate of potential daily intake over the course of a lifetime. The LADD was not calculated in this assessment as it was assumed that there presently exists no carcinogenic effects from the chemical exposure to Uranium. Carcinogenic risks in this assessment were based on the radiological effects associated with the COPC.

The equations for estimating a receptor's potential chronic average daily dose and the exposure parameters used are discussed in the following paragraphs. The calculations for all receptors evaluated in this risk assessment are presented in Appendix B (Risk Characterization Spreadsheets).

<u>Ingestion & Dermal Contact with Soil & Sediment</u>

$$\mathrm{ADD\,(mg/kg\text{-}day)} = \frac{\mathrm{C} \times [(\mathrm{IR} \times \mathrm{FI} \times \mathrm{RAF_o}) + (\mathrm{SA} \times \mathrm{AF} \times \mathrm{FA} \times \mathrm{RAF_d} \times \mathrm{EFD})] \times \mathrm{EF} \times \mathrm{ED} \times \mathrm{CF}}{\mathrm{BW} \times \mathrm{AT}}$$

where:

ADD = Average Daily Dose (mg/kg-day)

C = Chemical Concentration (mg/kg)

IR = Ingestion Rate (mg/day)

FI = Fraction Ingested from Site (unitless)

RAF_o = Relative Absorption Factor (Oral-Soil) (unitless)

SA = Skin Surface Area (cm2)

AF = Adherence Factor (mg/cm2/event)

FA = Fraction Absorbed from Site (unitless)

RAF_d = Relative Absorption Factor (Dermal-Soil) (unitless)

EFD = Exposure Frequency - Dermal (event/day)

EF = Exposure Frequency (days/year)

ED = Exposure Duration (years)

CF = Conversion factor (kg/mg)

BW = Body Weight (kg)

AT = Averaging Time (days) (ED x 365 days/yr, noncancer) (75 yr. x 365 days/yr, cancer)

Inhalation of Soil Derived Dust

$$\text{ADD (mg/kg - day)} = \frac{C_{dust} \times IR \times RAF_i \times ET \times EF \times ED}{AT \times BW}$$

where :

ADD = Average Daily Dose (mg/kg-day)

C_{dust} = Chemical Concentration (mg/kg)

IR = Ingestion Rate (mg/day)

RAF_i = Relative Absorption Factor (Inhalation) (unitless)

ET = Exposure Time - dust (hr/d)

EF = Exposure Frequency (days/year)

ED = Exposure Duration (years)

BW = Body Weight (kg)

AT = Averaging Time (days) (ED x 365 days/yr, noncancer) (75 yr. x 365 days/yr, cancer)

SECTION 6
RISK CHARACTERIZATION

Risk characterization is the step in the risk assessment process that combines the results of the exposure assessment and the toxicity assessment for each COPC to estimate the potential for carcinogenic and noncarcinogenic human health effects from chronic exposure to that constituent. This section summarizes the results of the risk characterization.

6.1 Noncarcinogenic Risk Assessment

The noncarcinogenic risk assessment for Uranium is generally characterized by combining exposure assumptions and toxicity data to derive Hazard Quotients (HQs) or Hazard Indices (HI). Noncarcinogenic health effects are estimated by comparing the Chronic Average Daily Dose (CADD) for each constituent with the Reference Dose for that constituent. The resulting ratio, which is unitless, is known as the Hazard Quotient (HQ) for that constituent. The HQ is calculated using the following formula:

<u>Hazard Quotient</u>

$A = B \div C$

where:

A = Hazard Quotient (unitless);

B = Chronic Average Daily Dose (mg/kg-day); and

C = Reference Dose (mg/kg-day).

When the Hazard Quotient for a given constituent and pathway does not exceed 1, the Reference Dose has not been exceeded, and no adverse noncarcinogenic health effects are expected to occur as a result of exposure to that constituent via that pathway. The HQs for each constituent are summed to yield the HI for that pathway. A Total HI is then calculated for each exposure medium by summing the pathway-specific HIs. A Total HI that does not exceed 1 indicates that no adverse noncarcinogenic health effects are expected to occur as a result of that receptor's potential exposure to the environmental medium evaluated.

Hazard Indices associated with each receptor are presented below. Summary data is provided in Table 5.

Table 5
Summary of Potential Hazard Indices

	Hazard Index		
Compound	***Child Recreational***	***Adult Recreational***	***Construction Worker***
Uranium	**3.E-03**	**1.E-03**	**4.E-03**

Construction Worker

The Construction Worker scenario assumed that the worker is on site for 8 hours a day for 250 days in 1 year and assumed to contact surface and subsurface soil. The construction worker was found to have a noncarcinogenic HI of 4E-03, well below the USEPA accepted criteria of 1.

Recreational/Commuter

This receptor is a user of the road on a daily basis. The recreational receptor is assumed to frequent the Site 350 days a year for 2 hours a day, as child for 6 years and as an adult for 24 years, totaling a 30 year recreational tenure. Recreational receptors were assumed to contact just the surface soil. The noncarcinogenic risk for this receptor was calculated to be 3E-03 for the Child Receptor and 1E-03 for the Adult Receptor. The higher of the two noncarcinogenic calculated risk is used to estimate the risk for the recreational/commuter receptor. Therefore the noncarcinogenic risk for the full 30 year tenure would be as a child at 3E-03, well below the USEPA accepted criteria of 1.

6.2 Carcinogenic Risk

U is not considered to be carcinogenic. However, the radiological activity of its isotopes and daughter products is considered potentially cancer causing. The RESidual RADioactivity (RESRAD) computer code, Version 6.4 (ANL 2007), was used to estimate the radiological dose and total PELCR for both potential receptors. RESRAD was developed by ANL, in conjunction with the Department of Energy (DOE), USEPA and the Nuclear Regulatory Commission (NRC) as a tool for predicting human health risks due to radioactivity in soils. The code uses radionuclide CSFs presented in Federal Guidance Report (FGR) No. 13 (USEPA 2002), which incorporates HEAST 2001 risk coefficient values.

To determine the dose and total excess cancer risk per unit concentration of U, the EPC in pCi/g was used as the source term for each uranium isotope. Where available, site specific data was incorporated into the model. Site specific parameters include the following:

Pathways – External Gamma, Inhalation, and Soil Ingestion

Cover/Hydrology – Windspeed was adjusted to a site specific value of 9.163 m/s (20.5 mph)

– Precipitation was adjusted to a site specific value of 0.635 m/year

Occupancy – Inhalation rate adjusted to be receptor dependent, 0.833 m^3 per hour for adults and construction workers, and 0.417 m^3 for children.

– Period of exposure adjusted to be site and receptor specific, 350 days per year for children/adults, and 250 days per year for the worker

– Exposure duration adjusted to 6 years for children, 24 for adults, and 25 for the worker

– Outdoor time fraction adjusted to 1, assuming that all exposure would be outdoors

Where site-specific parameters were not available, the RESRAD default parameters were used as model input values. Results from the RESRAD analysis can be found in Appendix C.

In evaluating dose and risk due to the external gamma pathway, it was assumed that all receptors received their exposure while outdoors. For each receptor, the maximum dose-to-source ratios and risk-to-source ratios over a period of 1,000 years were obtained from the corresponding RESRAD dose and health risk output report. Risks from each isotope and their progeny were summed to obtain the total risk for each receptor.

Construction Worker

The Construction Worker scenario was assumed to be on site for 8 hours a day for 250 days in 1 year and assumed to contact surface and subsurface soil. Carcinogenic risk for the construction worker was 1E-06.

Recreational/Commuter

This receptor is a user of the road on a daily basis. The recreational receptor is assumed to use the proposed alignment 350 days a year for 2 hours a day, as child for 6 years and as an adult for 24 years, totaling a 30 year recreational tenure. Recreational receptors were assumed to contact surface soil only. The carcinogenic risk associated with this receptor was found to be 3E-07 for the Child Receptor and 9E-07 for the Adult Receptor. These carcinogenic risks can be summed for a total carcinogenic risk of a 1E-06 for the full 30-year tenure.

A summary of results from the RESRAD analysis can be found on Table 6. A final summary of both the chemical and radiological risk assessment can be found on Table 7.

Table 6: Summary of RESRAD Analysis

		Ac-227	Pa-231	Pb-210	Ra-226	Th-230	U-234	U-235	U-238	Total
Construction Worker	*Ground*	1.14E-11	5.01E-12	2.91E-15	3.44E-11	9.44E-13	2.57E-09	7.53E-08	8.06E-07	9.E-07
	Inhalation	1.01E-14	1.69E-14	1.29E-16	7.06E-16	2.37E-13	1.71E-09	2.11E-11	1.03E-09	3.E-09
	Soil	4.41E-13	7.11E-13	2.05E-13	1.83E-13	1.18E-11	8.34E-08	1.17E-09	7.49E-08	2.E-07
	Total Excess Lifetime Cancer Risk	1.18E-11	5.74E-12	2.08E-13	3.46E-11	1.30E-11	8.77E-08	7.65E-08	8.82E-07	**1.E-06**
Child Recreational	*Ground*	1.90E-13	2.98E-13	1.10E-17	4.85E-13	5.52E-14	6.31E-10	1.85E-08	1.98E-07	2.E-07
	Inhalation	3.55E-16	2.10E-15	1.02E-18	2.10E-17	2.91E-14	8.80E-10	1.09E-11	5.32E-10	1.E-09
	Soil	6.25E-15	3.58E-14	6.59E-16	2.19E-15	5.86E-13	1.74E-08	2.44E-10	1.56E-08	3.E-08
	Total Excess Lifetime Cancer Risk	1.97E-13	3.35E-13	6.71E-16	4.88E-13	6.70E-13	1.89E-08	1.87E-08	2.14E-07	**3.E-07**
Adult Recreational	*Ground*	1.02E-11	4.63E-12	2.49E-15	3.05E-11	8.71E-13	2.47E-09	7.23E-08	7.75E-07	8.E-07
	Inhalation	3.80E-14	6.54E-14	4.62E-16	2.63E-15	9.19E-13	6.89E-09	8.53E-11	4.17E-09	1.E-08
	Soil	1.67E-13	2.79E-13	7.43E-14	6.87E-14	4.62E-12	3.40E-08	4.79E-10	3.05E-08	7.E-08
	Total Excess Lifetime Cancer Risk	1.04E-11	4.97E-12	7.73E-14	3.05E-11	6.41E-12	4.34E-08	7.29E-08	8.10E-07	**9.E-07**

Table 7: Final Summary

Excess Lifetime Cancer Risk				*Hazard Index*		
Construction Worker	*Recreational Child*	*Recreational Adult*	*Total Recreational Scenario*	*Construction Worker*	*Recreational Child*	*Recreational Adult*
1.E-06	**3.E-07**	**9.E-07**	**1.E-06**	**4.E-03**	**3.E-03**	**1.E-03**

SECTION 7
UNCERTAINTY ANALYSIS

Within any of the four steps of the risk assessment process, assumptions must be made due to a lack of absolute scientific knowledge. Some of the assumptions are supported by considerable scientific evidence, while others have less support. Every assumption introduces some degree of uncertainty into the risk assessment process. Conservative assumptions are made throughout the risk assessment to ensure that public health is protected. Therefore, when all of the assumptions are combined, it is much more likely that actual risks, if any, are overestimated rather than underestimated.

The assumptions that introduce the greatest amount of uncertainty in this risk assessment are discussed in this section. They are discussed in general terms, because, for most of the assumptions, there is not enough information to assign a numerical value that can be factored into the calculation of risk.

7.1 Hazard Identification

During the Hazard Identification step, media and constituents of concern are selected for inclusion in the quantitative risk assessment. In this assessment only lead and U were selected as COPCs. Uncertainty may be introduced due to this decision as additional chemicals may be present, but were not evaluated. Additionally, the analytical methods used to determine the concentration of lead or U may introduce significant uncertainty into the risk assessment process. To reduce laboratory method uncertainty, samples were analyzed by two independent methods. They included ICP-MS and Alpha Spectrometry. ICP-MS was theoretically more precise and provided lower detection limits for ^{235}U and ^{238}U isotopes. Alpha Spectrometry was theoretically more precise and provided lower detection limits for ^{234}U. The results indicate that ICP-MS was not the more sensitive method for any isotope, and the differences observed between methods provides some uncertainty as to the validity of our results. To address this uncertainty, this assessment utilized the alpha spectrometry results which overall provided more detailed results as well as higher activity and resulting mass concentrations. Using the higher results may potentially overestimate the actual risk.

7.2 Dose-Response Assessment

Dose-response values are usually based on limited toxicological data. For this reason, a margin of safety is built into estimates of both carcinogenic and noncarcinogenic risk, and actual risks are lower than those estimated. The two major areas of uncertainty introduced in the dose-response assessment are: (1) animal to human extrapolation; and (2) high to low dose extrapolation. These are discussed below.

Human dose-response values are often extrapolated, or estimated, using the results of animal studies. Extrapolation from animals to humans introduces a great deal of uncertainty in the risk assessment because in most instances, it is not known how differently a human may react to the constituent compared to the animal species used to test the constituent. The procedures used to extrapolate from animals to humans involve conservative assumptions and incorporate several uncertainty factors that overestimate the adverse effects associated with a specific dose. As a result, overestimation of the potential for adverse effects to humans is more likely than underestimation.

Predicting potential health effects from the exposure to media on-Site requires the use of models to extrapolate the observed health effects from the high doses used in laboratory studies to the anticipated human health effects from low doses experienced in the environment. The models contain conservative assumptions to account for the large degree of uncertainty associated with this extrapolation (especially for potential carcinogens in the radiological risk assessment) and therefore, tend to be more likely to overestimate than underestimate the risks.

This risk assessment also utilized a conservative set of assumptions when evaluating the bioavailable fraction of COPCs available for absorption by the human body. Relative absorption factors (RAFs) estimate the amount a chemical that is absorbed by the body through different routes of exposure. As very little literature was available on the bioaccessible fraction from Uranium, AMEC used default ingestion, dermal and inhalation absorption fractions of 1, meaning the absorption in the animal study used to derive the toxicity value is identical to that in humans. More realistic bioavailable fractions for these pathways could be derived and would most likely reduce the estimate risk derived in this assessment.

7.3 Exposure Assessment

During the exposure assessment, average daily doses of COPCs to which receptors are potentially exposed are estimated, which involves assumptions about how often exposure occurs. Such assumptions include location, accessibility, and use of an area. With this in mind, the receptor, or person who may potentially be exposed, and the location of exposure, were both defined for this risk assessment. The locations where certain activities were assumed to take place have been purposely selected to be consistent with the use of the Site.

The potential intake rates and exposure frequencies and durations assumed in the risk assessment were considered to be conservative. For example, a potential recreational scenario was assumed to be present at the Site in which a person may be present for 2 hours per day, 350 days per year for 6 years as a child and another 24 as an adult. Such assumptions almost certainly overestimate actual exposures. If more realistic and reasonable potential exposure assumptions had been employed in the risk assessment, the estimated risks would have been lower, perhaps substantially lower. The construction worker scenario assumed an 8-hour workday, 250 days per year, for 1 year.

Exposure point concentrations are estimated values of what is a Reasonable Maximum Exposure across the entire site. Given that these are estimates, a significant amount of uncertainty can be introduced into the assessment. For the soil pathways, the surface soil was assumed to be equivalent to the subsurface soil. This assumes that all Uranium is evenly distributed to depth in the contaminated zone. This could potentially overestimate any exposure to subsurface soils assuming the highest concentrations would be at the surface due to deposition.

Exposure Point Concentrations were also taken from either the calculated using a 95% UCL or the maximum detected activity between the five samples. With very few samples, the variability was high, and in most cases resulted in the EPC being taken from at or near the maximum activity detected. This more than likely overestimated actual site concentrations but, as the site was evaluated as a single decision unit, using statistical analysis to generalize the actual concentrations across the site could possibly overestimate or underestimate the calculated risk.

Additional uncertainty is also introduced by assuming non-detect laboratory results as present as zero. This assumption was based on the very limited and low concentrations detected across the site. Extensive analysis was performed on the sample results before making this assumption. Using half detection limits as a surrogate detection to calculate Exposure Point Concentrations resulted in unrealistic data results especially in the ICP-MS analysis. As there is no effective way to determine actual concentrations of contaminants below the reporting limit of the laboratory, this may potentially underestimate the concentration of contaminants.

Other exposure factors including inhalation rate, ingestion rate, soil adherence factor and body weight were all based on recommendation from the EPA Exposure Factors Handbook (1997), which as closely represent actual site values as reasonably available.

7.4 Risk Characterization

The risk of adverse human health effects depends on estimated levels of exposure and on dose-response relationships. Once exposure to, and risk from, each of the selected constituents is calculated, the total risk posed by exposure to Site-related COPCs is determined by combining the health risk contributed by each constituent. Where COPCs do not interact, do not affect the same target organ or do not have the same mechanism of action, summing the risks for multiple COPCs results in an overestimate of risk posed by the Site. Because U and lead were assessed separately, little uncertainty is added in this phase of the assessment.

SECTION 8
CONCLUSIONS

This study has assessed the potential human health risks associated with Uranium and Lead exposures from surface soils at the proposed Saddle road alignment. Lead concentrations in all samples were well below the USEPA Region IX residential PRG of 400 parts per million, with the maximum lead concentration detected at any location of 3.3 mg/kg at sampling location DU004.

Included in this study was a uranium background level assessment to assess whether onsite uranium was from natural or anthropogenic sources. Two methods were employed to evaluate uranium isotope source. The first method compared site-specific total U mass concentrations to naturally occurring U mass concentrations in Hawai‘i. Total U was determined by summing the isotopic concentrations of ^{234}U, ^{235}U and ^{238}U detected at 5 independent sites along the proposed Saddle Road alignment. Results of this analysis indicated that total uranium along the proposed Saddle Road alignment are at or below levels occurring naturally in native Hawaiian soils. Total U based on alpha spectroscopy analyses ranged from 0.4 parts per million (ppm) at location DU003 to 1.3 ppm at DU001. The average at all five (5) locations was 0.8 ppm. The second method used to determine whether detected U originates from natural or DU sources was the evaluation of isotope abundance. Except in extremely rare circumstances (not found in Hawai‘i), natural U dispersed in rocks and soils have a comparatively greater $^{234}U/^{238}U$ and $^{235}U/^{238}U$ ratio than those originating from DU. Although use of the $^{235}U/^{238}U$ is considered a more precise measurement than the $^{234}U/^{238}U$ ratio in isotopic fingerprinting of U contamination, its utility is significant when ^{235}U data are not available or when concentrations of the ^{235}U isotope are too low to detect. This is the case here and as such, the $^{234}U/^{238}U$ ratio was used as the second method to fingerprint U source. The naturally occurring $^{234}U/^{238}U$ ratio in soil has been determined to be in the range of 0.5 to 1.2 (Sansone et al. 2001). $^{234}U/^{238}U$ ratios at the Saddle Road alignment ranged from 0.74 to 1.79, with an average ratio across all five (5) locations of 1.16. These results indicate that the $^{234}U/^{238}U$ isotopic ratio across the proposed alignment is within the background range.

A baseline human health risk assessment (BHHRA) was performed to evaluate the potential risk posed by uranium isotopes detected at the proposed Saddle Road alignment. The alignment was evaluated as a single decision unit represented by five distinct sampling locations. Receptors were assumed to be exposed to either the maximum concentration of each isotope detected or the 95% UCL of the mean. Risks were evaluated for the following receptors:

- A construction worker scenario assumed to be on site for 8 hours a day for 250 days in 1 year and assumed to contact surface and subsurface soil.
- A recreational user of the road assumed to frequent the Site 350 days a year for 2 hours a day, as child for 6 years and as an adult for 24 years, totaling a 30 year recreational tenure. Recreational receptors were assumed to contact just the surface soil

The Construction Worker scenario assumed to be on site for 8 hours a day for 250 days in 1 year and assumed to contact surface and subsurface soil. The construction worker was found to have a carcinogenic risk of 1E-06, and a noncarcinogenic risk of 4E-03.

The recreational receptor was assumed to frequent the Site 350 days a year for 2 hours a day, as child for 6 years and as an adult for 24 years, totaling a 30 year recreational tenure. Recreational receptors were assumed to contact only surficial soils. The carcinogenic risk associated with this receptor was found to be 3E-07 for the Child Receptor and 9E-07 for the Adult Receptor. These carcinogenic risks can be summed for a total carcinogenic risk of a 1E-06 for the full 30 year tenure. The noncarcinogenic risk was calculated to be 3E-03 for the Child Receptor and 1E-03 for the Adult Receptor. The higher of the two noncarcinogenic calculated risk is used to estimate the risk for the recreational/commuter receptor. Therefore the noncarcinogenic risk for the full 30 year tenure would be as a child at 3E-03.

Based on the available surface soil data collected in June 2008 at five (5) locations along the proposed alignment, it has been determined that uranium detected at the site originates from natural sources. Potential noncancer health risks from the ingestion, inhalation and dermal contact of soil along the proposed alignment are below USEPA's acceptable risk level of concern. Potential cancer risks from radiological activity of the detected U isotopes are below the most conservative regulatory criteria.

SECTION 9
REFERENCES

AMEC 2008. *Sampling and Analysis Plan, Depleted Uranium Risk Assessment. Ke'āmuku Parcel, South Kohala District. Hawai'i Island, State of Hawai'i.*

ANL 2007. *RESRAD Computer Code, Version 6.4.* Argonne National Laboratory. December 19, 2007.

ATSDR 1999. *Toxicological Profile for Uranium*. US Department of Health and Human Services.

ATSDR 2008. *Minimal Risk Levels (MRLs) for Hazardous Substances*. US Department of Health and Human Services. http://www.atsdr.cdc.gov/mrls/#bookmark01. As of August 2008.

Geometrician 2007. *Supplemental Environmental Impact Statement Preparation Notice, Saddle Road (State Route 200), Mamalahoa Highway (State Route 190) to Milepost 42, County of Hawai'i, State of Hawai'i. FHWA Project No. 200(00).*

Juvik, S.P., and Juvik, J.O. (eds.) 1998. *Atlas of Hawai'i*, Third Edition. University of Hawai'i Press, Honolulu.

MacDonald, B., Abbott, A., and Peterson, F. 1983. *Volcanoes in the sea, 2nd ed*. Honolulu, University of Hawai'i Press, Honolulu.

Mink, J. F. and S. L. Lau 1993. *Aquifer Identification and Classification for the Island of Hawai'i: Groundwater Protection Strategy for Hawai'i.* Water Resources Research Center, University of Hawai'i at Manoa,

Rubin, Kenneth H., Ph.D. 2008. *Depleted Uranium, Natural Uranium and Other Naturally Occurring Radioactive Elements in Hawaiian Environments.*

Sansone, U., Stellato, L., Jia, G., Rosamilia, S., Gaudino, S., Barbizzi, S., and Belli, M. 2001. *Levels of Depleted Uranium in Kosovo Soils.*

Stegnar, Peter and Benedik, Ljudmila 2001. *Depleted Uranium in the Environment – An Issue of Concern?*

USDA 1972. *Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawai'i.* United States Soil Conservation Service Washington, DC

USEPA 1989. *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A),* EPA 540/1-89/002, PB90-155581.

USEPA 1991. *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Supplemental Guidance. Standard Default Exposure Factors – Interim Final.* OSWER Directive 9285.6-03.

USEPA 1997. *Exposure Factors Handbook*, Volumes I, II, and III, USEPA/600/P-95/002Fa-c, EPA, Office of Research and Development, Washington, DC.

USEPA 2001. *Health Effects Assessment Summary Tables.* Online database maintained by USEPA. (http://www.epa.gov/radiation/heast). As of April 2001.

USEPA 2002. *Federal Guidance Report No. 13: Cancer Risk Coefficients for Environmental Exposure to Radionuclides.* EPA-402/R-99-001.

USEPA 2004. *EPA Region 9 Preliminary Remediation Goal Tables and User's Guide.* U.S. Environmental Protection Agency Region 9.

USEPA 2007. *ProUCL Version 4.0, a Statistical Software*, National Exposure Research Lab, EPA, Las Vegas Nevada. ProUCL 3.0 can be freely downloaded from the EPA website: http://www.epa.gov/nerlesd1/tsc/tsc.htm

USEPA 2008. *Integrated Risk Information System.* Online database maintained by USEPA. (http://www.epa.gov/iris). As of July 2006

Wolfe, E.W., and J. Morris. 1996. *Geologic Map of the Island of Hawai'i.* USGS Misc Investigations Series Map I-2524-A. Washington, D.C.: U.S. Geological Survey.

Appendix **A**

ANALYTICAL SAMPLING RESULTS

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

PROJECT NO. PTA DU SAMPLING

Soil Sampling

Lot #: F8F190108

Jamie Anderson

AMEC Earth & Environmental
Airport Industrial Center
3375 Koapaka St., Ste F251
Honolulu, HI 96819

TESTAMERICA LABORATORIES, INC.

Sheryl A. Adams
for Kay Clay
Project Manager

July 3, 2008

Case Narrative
LOT NUMBER: **F8F190108**

This report contains the analytical results for the seven samples received under chain of custody by TestAmerica St. Louis on June 18, 2008. These samples are associated with your Soil Sampling project.

The analytical results included in this report meet all applicable quality control procedure requirements except as noted on the following page.

The test results in this report meet all NELAP requirements for parameters in which accreditations are held by TestAmerica St. Louis. Any exceptions to NELAP requirements are noted in the case narrative. The case narrative is an integral part of this report.

All chemical analysis results are based upon sample as received, wet weight, unless noted otherwise. All radiochemistry results are based upon sample as dried and ground with the exception of tritium, unless requested wet weight by the client.

Observations/Nonconformances
Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

ICP-MS (6020)
Batch: 8176078
1) The samples were analyzed at a dilution due to high concentrations of target analytes. The reporting limit has been adjusted only for those targets reported from the dilution run.

2) The ICB was above the reporting limit for uranium 238. However, the bracketing CCB's are all within limits. The CCB's are sampled from the same cup as the ICB, indicating the ICB failure is an anomaly. The sample results will be reported with this narrative.

3) The MS (MSD) recovery for uranium 235 and 238 is outside the established QC limits. The RPD is within method acceptance criteria indicating a possible matrix interference. Method performance is demonstrated by acceptable LCS recovery.

Affected Samples:
F8F190108 (1): DU 001
F8F190108 (2): DU 002
F8F190108 (3): DU 003
F8F190108 (4): DU 004
F8F190108 (5): DU 005
F8F190108 (6): DU 006
F8F190108 (7): DU 007

METHODS SUMMARY

F8F190108

PARAMETER	ANALYTICAL METHOD	PREPARATION METHOD
Isotopic Uranium by Alpha Spectroscopy	EML A-01-R MOD	
ICP-MS (6020)	SW846 6020	
Percent Moisture	MCAWW 160.3 MOD	MCAWW 160.3 MOD

References:

EML	"ENVIRONMENTAL MEASUREMENTS LABORATORY PROCEDURES MANUAL" HASL-300 28TH EDITION, VOLUME I and II DEPARTMENT OF ENERGY
MCAWW	"Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020, March 1983 and subsequent revisions.
SW846	"Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 and its updates.

SAMPLE SUMMARY

F8F190108

WO #	SAMPLE#	CLIENT SAMPLE ID	SAMPLED DATE	SAMP TIME
KP7GK	001	DU 001	06/11/08	12:00
KP7HT	002	DU 002	06/11/08	15:15
KP7HX	003	DU 003	06/11/08	14:30
KP7H0	004	DU 004	06/11/08	13:32
KP7H1	005	DU 005	06/11/08	12:45
KP7H2	006	DU 006	06/11/08	15:15
KP7H4	007	DU 007	06/11/08	15:15

NOTE(S):

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

AMEC Earth & Environmental

Client Sample ID: DU 001

TOTAL Metals

Lot-Sample #...: F8F190108-001 **Matrix.......:** SOLID
Date Sampled...: 06/11/08 12:00 **Date Received..:** 06/18/08
% Moisture.....: 1.0

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 8176078						
Lead	**3.0**	**0.76**	**mg/kg**	**SW846 6020**	**06/24-07/01/08**	**KP7GK1AD**
		Dilution Factor: 2.5		Analysis Time..: 00:36		
Uranium 234	ND	0.0051	mg/kg	SW846 6020	06/24-07/01/08	KP7GK1AF
		Dilution Factor: 1		Analysis Time..: 16:09		
Uranium 235	ND	0.0051	mg/kg	SW846 6020	06/24-07/01/08	KP7GK1AG
		Dilution Factor: 1		Analysis Time..: 16:09		
Uranium 238	**0.16**	**0.0051**	**mg/kg**	**SW846 6020**	**06/24-07/01/08**	**KP7GK1AH**
		Dilution Factor: 1		Analysis Time..: 16:09		

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

AMEC Earth & Environmental

Client Sample ID: DU 001

General Chemistry

Lot-Sample #...: F8F190108-001 **Work Order #...:** KP7GK **Matrix.........:** SOLID
Date Sampled...: 06/11/08 12:00 **Date Received..:** 06/18/08
% Moisture.....: 1.0

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Moisture	**1.0**	**0.10**	**%**	**MCAWW 160.3 MOD**	**06/20-06/23/08**	**8172171**
		Dilution Factor: 1		Analysis Time..: 00:00		

AMEC Earth & Environmental

Client Sample ID: DU 002

TOTAL Metals

Lot-Sample #...: F8F190108-002 **Matrix.......:** SOLID
Date Sampled...: 06/11/08 15:15 **Date Received..:** 06/18/08
% Moisture.....: 5.2

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 8176078						
Lead	**2.8**	**0.79**	**mg/kg**	**SW846 6020**	**06/24-07/01/08**	**KP7HT1AD**
		Dilution Factor: 2.5		Analysis Time..: 01:00		
Uranium 234	ND	0.0053	mg/kg	SW846 6020	06/24-07/01/08	KP7HT1AF
		Dilution Factor: 1		Analysis Time..: 16:32		
Uranium 235	ND	0.0053	mg/kg	SW846 6020	06/24-07/01/08	KP7HT1AG
		Dilution Factor: 1		Analysis Time..: 16:32		
Uranium 238	**0.13**	**0.0053**	**mg/kg**	**SW846 6020**	**06/24-07/01/08**	**KP7HT1AH**
		Dilution Factor: 1		Analysis Time..: 16:32		

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

AMEC Earth & Environmental

Client Sample ID: DU 002

General Chemistry

Lot-Sample #...: F8F190108-002 **Work Order #...:** KP7HT **Matrix.........:** SOLID
Date Sampled...: 06/11/08 15:15 **Date Received..:** 06/18/08
% Moisture.....: 5.2

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Moisture	**5.2**	**0.10**	**%**	**MCAWW 160.3 MOD**	**06/20-06/23/08**	**8172171**
		Dilution Factor: 1		Analysis Time..: 00:00		

AMEC Earth & Environmental

Client Sample ID: DU 003

TOTAL Metals

Lot-Sample #...: F8F190108-003 **Matrix.......:** SOLID
Date Sampled...: 06/11/08 14:30 **Date Received..:** 06/18/08
% Moisture.....: 10

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 8176078						
Lead	**1.8**	**0.84**	**mg/kg**	**SW846 6020**	**06/24-07/01/08**	**KP7HX1AD**
		Dilution Factor: 2.5		Analysis Time..: 01:04		
Uranium 234	ND	0.0056	mg/kg	SW846 6020	06/24-07/01/08	KP7HX1AF
		Dilution Factor: 1		Analysis Time..: 16:37		
Uranium 235	ND	0.0056	mg/kg	SW846 6020	06/24-07/01/08	KP7HX1AG
		Dilution Factor: 1		Analysis Time..: 16:37		
Uranium 238	**0.064**	**0.0056**	**mg/kg**	**SW846 6020**	**06/24-07/01/08**	**KP7HX1AH**
		Dilution Factor: 1		Analysis Time..: 16:37		

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

AMEC Earth & Environmental

Client Sample ID: DU 003

General Chemistry

Lot-Sample #...: F8F190108-003 **Work Order #...:** KP7HX **Matrix.........:** SOLID
Date Sampled...: 06/11/08 14:30 **Date Received..:** 06/18/08
% Moisture.....: 10

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Moisture	**10.2**	**0.10**	**%**	**MCAWW 160.3 MOD**	**06/20-06/23/08**	**8172171**
		Dilution Factor: 1		Analysis Time..: 00:00		

AMEC Earth & Environmental

Client Sample ID: DU 004

TOTAL Metals

Lot-Sample #...: F8F190108-004 **Matrix.......:** SOLID
Date Sampled...: 06/11/08 13:32 **Date Received..:** 06/18/08
% Moisture.....: 23

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 8176078						
Lead	**3.3**	**0.98**	**mg/kg**	**SW846 6020**	**06/24-07/01/08**	**KP7H01AD**
		Dilution Factor: 2.5		Analysis Time..: 01:08		
Uranium 234	ND	0.0065	mg/kg	SW846 6020	06/24-07/01/08	KP7H01AF
		Dilution Factor: 1		Analysis Time..: 16:43		
Uranium 235	ND	0.0065	mg/kg	SW846 6020	06/24-07/01/08	KP7H01AG
		Dilution Factor: 1		Analysis Time..: 16:43		
Uranium 238	**0.10**	**0.0065**	**mg/kg**	**SW846 6020**	**06/24-07/01/08**	**KP7H01AH**
		Dilution Factor: 1		Analysis Time..: 16:43		

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

AMEC Earth & Environmental

Client Sample ID: DU 004

General Chemistry

Lot-Sample #...: F8F190108-004 **Work Order #...:** KP7H0 **Matrix.........:** SOLID
Date Sampled...: 06/11/08 13:32 **Date Received..:** 06/18/08
% Moisture.....: 23

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Moisture	**23.3**	**0.10**	**%**	**MCAWW 160.3 MOD**	**06/20-06/23/08**	**8172171**
		Dilution Factor: 1		Analysis Time..: 00:00		

AMEC Earth & Environmental

Client Sample ID: DU 005

TOTAL Metals

Lot-Sample #...: F8F190108-005 **Matrix.......:** SOLID
Date Sampled...: 06/11/08 12:45 **Date Received..:** 06/18/08
% Moisture.....: 16

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 8176078						
Lead	**3.0**	**0.89**	**mg/kg**	**SW846 6020**	**06/24-07/01/08**	**KP7H11AD**
		Dilution Factor: 2.5		Analysis Time..: 01:12		
Uranium 234	ND	0.006	mg/kg	SW846 6020	06/24-07/01/08	KP7H11AF
		Dilution Factor: 1		Analysis Time..: 16:48		
Uranium 235	ND	0.006	mg/kg	SW846 6020	06/24-07/01/08	KP7H11AG
		Dilution Factor: 1		Analysis Time..: 16:48		
Uranium 238	**0.14**	**0.006**	**mg/kg**	**SW846 6020**	**06/24-07/01/08**	**KP7H11AH**
		Dilution Factor: 1		Analysis Time..: 16:48		

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

AMEC Earth & Environmental

Client Sample ID: DU 005

General Chemistry

Lot-Sample #...: F8F190108-005 **Work Order #...:** KP7H1 **Matrix.........:** SOLID
Date Sampled...: 06/11/08 12:45 **Date Received..:** 06/18/08
% Moisture.....: 16

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Moisture	**16.1**	**0.10**	**%**	**MCAWW 160.3 MOD**	**06/20-06/23/08**	**8172171**
		Dilution Factor: 1		Analysis Time..: 00:00		

AMEC Earth & Environmental

Client Sample ID: DU 006

TOTAL Metals

Lot-Sample #...: F8F190108-006 **Matrix.......:** SOLID
Date Sampled...: 06/11/08 15:15 **Date Received..:** 06/18/08
% Moisture.....: 5.8

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 8176078						
Lead	**2.0**	**0.80**	**mg/kg**	**SW846 6020**	**06/24-07/01/08**	**KP7H21AD**
		Dilution Factor: 2.5		Analysis Time..: 01:15		
Uranium 234	ND	0.0053	mg/kg	SW846 6020	06/24-07/01/08	KP7H21AF
		Dilution Factor: 1		Analysis Time..: 17:13		
Uranium 235	ND	0.0053	mg/kg	SW846 6020	06/24-07/01/08	KP7H21AG
		Dilution Factor: 1		Analysis Time..: 17:13		
Uranium 238	**0.10**	**0.0053**	**mg/kg**	**SW846 6020**	**06/24-07/01/08**	**KP7H21AH**
		Dilution Factor: 1		Analysis Time..: 17:13		

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

AMEC Earth & Environmental

Client Sample ID: DU 006

General Chemistry

Lot-Sample #...: F8F190108-006 **Work Order #...:** KP7H2 **Matrix.........:** SOLID
Date Sampled...: 06/11/08 15:15 **Date Received..:** 06/18/08
% Moisture.....: 5.8

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Moisture	**5.8**	**0.10**	**%**	**MCAWW 160.3 MOD**	**06/20-06/23/08**	**8172171**
		Dilution Factor: 1		Analysis Time..: 00:00		

AMEC Earth & Environmental

Client Sample ID: DU 007

TOTAL Metals

Lot-Sample #...: F8F190108-007 **Matrix.......:** SOLID
Date Sampled...: 06/11/08 15:15 **Date Received..:** 06/18/08
% Moisture.....: 6.3

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 8176078						
Lead	**2.4**	**0.80**	**mg/kg**	**SW846 6020**	**06/24-07/01/08**	**KP7H41AD**
		Dilution Factor: 2.5		Analysis Time..: 01:19		
Uranium 234	ND	0.0053	mg/kg	SW846 6020	06/24-07/01/08	KP7H41AF
		Dilution Factor: 1		Analysis Time..: 17:18		
Uranium 235	ND	0.0053	mg/kg	SW846 6020	06/24-07/01/08	KP7H41AG
		Dilution Factor: 1		Analysis Time..: 17:18		
Uranium 238	**0.11**	**0.0053**	**mg/kg**	**SW846 6020**	**06/24-07/01/08**	**KP7H41AH**
		Dilution Factor: 1		Analysis Time..: 17:18		

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

AMEC Earth & Environmental

Client Sample ID: DU 007

General Chemistry

Lot-Sample #...: F8F190108-007 **Work Order #...:** KP7H4 **Matrix.........:** SOLID
Date Sampled...: 06/11/08 15:15 **Date Received..:** 06/18/08
% Moisture.....: 6.3

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Moisture	**6.3**	**0.10**	**%**	**MCAWW 160.3 MOD**	**06/20-06/23/08**	**8172171**
		Dilution Factor: 1		Analysis Time..: 00:00		

METHOD BLANK REPORT

TOTAL Metals

Client Lot #...: F8F190108 **Matrix..........:** SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
MB Lot-Sample #: F8F240000-078		**Prep Batch #...:** 8176078				
Lead	ND	0.30	mg/kg	SW846 6020	06/24-07/01/08	KQF4L1AA
		Dilution Factor: 1				
		Analysis Time..: 00:28				
Uranium 234	ND	0.005	mg/kg	SW846 6020	06/24-07/01/08	KQF4L1AC
		Dilution Factor: 1				
		Analysis Time..: 15:58				
Uranium 235	ND	0.005	mg/kg	SW846 6020	06/24-07/01/08	KQF4L1AD
		Dilution Factor: 1				
		Analysis Time..: 15:58				
Uranium 238	ND	0.005	mg/kg	SW846 6020	06/24-07/01/08	KQF4L1AE
		Dilution Factor: 1				
		Analysis Time..: 15:58				

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

LABORATORY CONTROL SAMPLE EVALUATION REPORT

TOTAL Metals

Client Lot #...: F8F190108 **Matrix.........:** SOLID

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
LCS Lot-Sample#: F8F240000-078 **Prep Batch #...:** 8176078					
Lead	105	(82 - 118)	SW846 6020	06/24-07/01/08	KQF4L1AF
		Dilution Factor: 12.5		Analysis Time..: 00:32	
Uranium 235	104	(80 - 120)	SW846 6020	06/24-07/01/08	KQF4L1AH
		Dilution Factor: 1		Analysis Time..: 16:03	
Uranium 238	103	(80 - 120)	SW846 6020	06/24-07/01/08	KQF4L1AJ
		Dilution Factor: 1		Analysis Time..: 16:03	

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX SPIKE SAMPLE EVALUATION REPORT

TOTAL Metals

Client Lot #...: F8F190108 **Matrix.........:** SOLID
Date Sampled...: 06/11/08 12:00 **Date Received..:** 06/18/08

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD	RPD LIMITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
MS Lot-Sample #: F8F190108-001 **Prep Batch #...:** 8176078						**% Moisture.....:** 1.0	
Lead	100	(75 - 125)			SW846 6020	06/24-07/01/08	KP7GK1AL
	91	(75 - 125)	8.6	(0-30)	SW846 6020	06/24-07/01/08	KP7GK1AM
		Dilution Factor: 2.5					
		Analysis Time..: 00:44					
Uranium 235	44	(75 - 125)			SW846 6020	06/24-07/01/08	KP7GK1AN
	42	(75 - 125)		(0-30)	SW846 6020	06/24-07/01/08	KP7GK1AP
		Dilution Factor: 1					
		Analysis Time..: 16:20					
Uranium 238	37	(75 - 125)			SW846 6020	06/24-07/01/08	KP7GK1AQ
	35	(75 - 125)		(0-30)	SW846 6020	06/24-07/01/08	KP7GK1AR
		Dilution Factor: 1					
		Analysis Time..: 16:20					

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

Results and reporting limits have been adjusted for dry weight.

SAMPLE DUPLICATE EVALUATION REPORT

General Chemistry

Client Lot #...: F8F190108 **Work Order #...:** KP7H4-SMP KP7H4-DUP **Matrix.......:** SOLID

Date Sampled...: 06/11/08 15:15 **Date Received..:** 06/18/08

% Moisture.....: 6.3

PARAM RESULT	DUPLICATE RESULT	UNITS	RPD	RPD LIMIT	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Moisture					SD Lot-Sample #: F8F190108-007		
6.3	7.5	%	17	(0-30)	MCAWW 160.3 MOD	06/20-06/23/08	8172171

Dilution Factor: 1 Analysis Time..: 00:00

AMEC Earth & Environmental

Client Sample ID: DU 001

Radiochemistry

Lab Sample ID: F8F190108-001
Work Order: KP7GK
Matrix: SOLID

Date Collected: 06/11/08 1200
Date Received: 06/18/08 0915

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	MDC	Prep Date	Analysis Date
Iso URANIUM (LONG CT) DOE A-01-R MOD				**pCi/g**	**Batch # 8175252**		**Yld % 80**
Uranium 234	**0.436**		**0.096**	0.100	**0.024**	**06/23/08**	**06/26/08**
Uranium 235/236	0.014	U	0.020	0.100	0.031	06/23/08	06/26/08
Uranium 238	**0.368**		**0.087**	0.100	**0.024**	**06/23/08**	**06/26/08**

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

U Result is less than the sample detection limit.

AMEC Earth & Environmental

Client Sample ID: DU 001 DUP

Radiochemistry

Lab Sample ID:	F8F190108-001X	Date Collected:	06/11/08 1200
Work Order:	KP7GK	Date Received:	06/18/08 0915
Matrix:	SOLID		

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	MDC	Prep Date	Analysis Date
Iso URANIUM (LONG CT) DOE A-01-R MOD				**pCi/g**	**Batch # 8175252**		**Yld % 82**
Uranium 234	**0.300**		**0.076**	0.100	**0.025**	**06/23/08**	**06/26/08**
Uranium 235/236	0.003	U	0.011	0.100	0.028	06/23/08	06/26/08
Uranium 238	**0.298**		**0.076**	0.100	**0.027**	**06/23/08**	**06/26/08**

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

U Result is less than the sample detection limit.

AMEC Earth & Environmental

Client Sample ID: DU 002

Radiochemistry

Lab Sample ID: F8F190108-002
Work Order: KP7HT
Matrix: SOLID

Date Collected: 06/11/08 1515
Date Received: 06/18/08 0915

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	MDC	Prep Date	Analysis Date
Iso URANIUM (LONG CT) DOE A-01-R MOD				**pCi/g**		**Batch # 8175252**	**Yld % 92**
Uranium 234	**0.157**		**0.051**	0.100	**0.024**	**06/23/08**	**06/26/08**
Uranium 235/236	0.008	U	0.013	0.100	0.021	06/23/08	06/26/08
Uranium 238	**0.133**		**0.047**	0.100	**0.025**	**06/23/08**	**06/26/08**

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

U Result is less than the sample detection limit.

AMEC Earth & Environmental

Client Sample ID: DU 003

Radiochemistry

Lab Sample ID: F8F190108-003
Work Order: KP7HX
Matrix: SOLID

Date Collected: 06/11/08 1430
Date Received: 06/18/08 0915

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	MDC	Prep Date	Analysis Date
Iso URANIUM (LONG CT) DOE A-01-R MOD				**pCi/g**	**Batch # 8175252**		**Yld % 83**
Uranium 234	**0.118**		**0.047**	0.100	**0.029**	**06/23/08**	**06/26/08**
Uranium 235/236	0.017	U	0.022	0.100	0.031	06/23/08	06/26/08
Uranium 238	**0.066**	**J**	**0.035**	0.100	**0.023**	**06/23/08**	**06/26/08**

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.
U Result is less than the sample detection limit.

AMEC Earth & Environmental

Client Sample ID: DU 004

Radiochemistry

Lab Sample ID:	F8F190108-004	Date Collected:	06/11/08 1332
Work Order:	KP7H0	Date Received:	06/18/08 0915
Matrix:	SOLID		

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	MDC	Prep Date	Analysis Date
Iso URANIUM (LONG CT) DOE A-01-R MOD				**pCi/g**	**Batch # 8175252**		**Yld % 87**
Uranium 234	**0.144**		**0.050**	0.100	**0.025**	**06/23/08**	**06/26/08**
Uranium 235/236	0.0050	U	0.0099	0.100	0.013	06/23/08	06/26/08
Uranium 238	**0.130**		**0.047**	0.100	**0.018**	**06/23/08**	**06/26/08**

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

U Result is less than the sample detection limit.

AMEC Earth & Environmental

Client Sample ID: DU 005

Radiochemistry

Lab Sample ID: F8F190108-005
Work Order: KP7H1
Matrix: SOLID

Date Collected: 06/11/08 1245
Date Received: 06/18/08 0915

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	MDC	Prep Date	Analysis Date
Iso URANIUM (LONG CT) DOE A-01-R MOD				**pCi/g**	**Batch # 8175252**		**Yld % 76**
Uranium 234	**0.199**		**0.062**	0.100	**0.026**	**06/23/08**	**06/26/08**
Uranium 235/236	0.01	U	0.016	0.100	0.025	06/23/08	06/26/08
Uranium 238	**0.269**		**0.073**	0.100	**0.026**	**06/23/08**	**06/26/08**

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

U Result is less than the sample detection limit.

AMEC Earth & Environmental

Client Sample ID: DU 006

Radiochemistry

Lab Sample ID: F8F190108-006
Work Order: KP7H2
Matrix: SOLID

Date Collected: 06/11/08 1515
Date Received: 06/18/08 0915

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	MDC	Prep Date	Analysis Date
Iso URANIUM (LONG CT) DOE A-01-R MOD				pCi/g	Batch # 8175252		Yld % 72
Uranium 234	**0.123**		0.049	0.100	0.013	06/23/08	06/26/08
Uranium 235/236	**0.018**	J	0.020	0.100	0.016	06/23/08	06/26/08
Uranium 238	**0.122**		0.049	0.100	0.021	06/23/08	06/26/08

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.

AMEC Earth & Environmental

Client Sample ID: DU 007

Radiochemistry

Lab Sample ID:	F8F190108-007	Date Collected:	06/11/08 1515
Work Order:	KP7H4	Date Received:	06/18/08 0915
Matrix:	SOLID		

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	MDC	Prep Date	Analysis Date
Iso URANIUM (LONG CT) DOE A-01-R MOD				**pCi/g**	**Batch # 8175252**		**Yld % 79**
Uranium 234	**0.127**		**0.048**	0.100	**0.012**	**06/23/08**	**06/26/08**
Uranium 235/236	0.0	U	0.0055	0.100	0.015	06/23/08	06/26/08
Uranium 238	**0.154**		**0.054**	0.100	**0.026**	**06/23/08**	**06/26/08**

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

U   Result is less than the sample detection limit.

METHOD BLANK REPORT

Radiochemistry

Client Lot ID: F8F190108
Matrix: SOLID

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	MDC	Prep Date	Lab Sample ID / Analysis Date
Iso URANIUM (LONG CT) DOE A-01-R MOD			**pCi/g**	**Batch # 8175252**		**Yld % 87**	**F8F230000-252B**
Uranium 234	0.007	U	0.015	0.100	0.027	06/23/08	06/26/08
Uranium 235/236	-0.0012	U	0.0025	0.100	0.023	06/23/08	06/26/08
Uranium 238	0.003	U	0.015	0.100	0.033	06/23/08	06/26/08

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined using instrument performance only
Bold results are greater than the MDC

U Result is less than the sample detection limit.

Laboratory Control Sample Report

Radiochemistry

Client Lot ID: F8F190108
Matrix: SOLID

Parameter	Spike Amount	Result	Total Uncert. (2 σ+/-)	MDC	% Yld	% Rec	Lab Sample ID / QC Control Limits
Iso URANIUM (LONG CT) DOE A-01-R MOD			**pCi/g**	**A-01-R MOD**			**F8F230000-252C**
Uranium 234	19.6	20.1	2.8	0.3	86	103	(70 - 122)
Uranium 238	19.6	17.4	2.5	0.3	86	89	(69 - 119)
	Batch #:	8175252		**Analysis Date:**	06/26/08		

NOTE(S)

MDC is determined by instrument performance only
Calculations are performed before rounding to avoid round-off error in calculated results

DUPLICATE EVALUATION REPORT

Radiochemistry

Client Lot ID:	F8F190108	Date Sampled:	06/11/08
Matrix:	SOLID	Date Received:	06/18/08

Parameter	SAMPLE Result		Total Uncert. (2σ +/-)	% Yld	DUPLICATE Result		Total Uncert. (2 σ +/-)	% Yld	QC Sample ID Precision	
Iso URANIUM (LONG CT) DOE A-01-R MOD				**pCi/g**	**A-01-R MOD**				**F8F190108-001**	
Uranium 234	**0.436**		**0.096**	80	**0.300**		**0.076**	82	37	%RPD
Uranium 235/236	0.014	U	0.020	80	0.003	U	0.011	82	139	%RPD
Uranium 238	**0.368**		**0.087**	80	**0.298**		**0.076**	82	21	%RPD
	Batch #:		8175252 (Sample)		8175252 (Duplicate)					

NOTE(S)

Data are incomplete without the case narrative.
Calculations are performed before rounding to avoid round-off error in calculated results

U Result is less than the sample detection limit.

is
er Trail North
, MO 63045
.298.8566 fax 314.298.8757

cw
3270

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Client Contact	Project Manager: Russell Okoji	Site Contact:	Date: 6/11/08	COC No: 001
rth & Environmental	Tel/Fax: 808-391-9906	Lab Contact:	Carrier: FedEx	1 of 1 COCs
paka Street, Suite F251	Analysis Turnaround Time			Job No.
HI 96819	Calendar (C) or Work Days (W) Standard			
-2462 Phone	TAT if different from Below			SDG No.
-5379 FAX	☐ 2 weeks			
ame: PTA DU Sampling	☐ 1 week			
	☐ 2 days			
	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type	Matrix	# of Cont.	Filtered Sample	Lead by ICP-MS (6020A)	Isotopic Uranium by ICP-MS (6020A)	Isotopic Uranium by Alpha Spec.	Long Count (U234, U235, U238)	Prep - Dry and Grind	Prep - Total Dissolution Prep	Sample Specific Notes:
DU 001	6/11/2008	12:00	Composite	Soil	1		X	X	X	X	X	X	
DU 002	6/11/2008	3:15	Composite	Soil	1		X	X	X	X	X	X	
DU 003	6/11/2008	2:30	Composite	Soil	1		X	X	X	X	X	X	
DU 004	6/11/2008	1:32	Composite	Soil	1		X	X	X	X	X	X	
DU 005	6/11/2008	12:45	Composite	Soil	1		X	X	X	X	X	X	MS/MSD
DU 006	6/11/2008	3:15	Composite	Soil	1		X	X	X	X	X	X	
DU 007	6/11/2008	3:15	Composite	Soil	1		X	X	X	X	X	X	

Bag

SW 06.18.08

tion Used: Ice

Hazard Identification

-Hazard ☐ Flammable ☐ Skin Irritant Poison B ☐ Unknown ☐

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return To Client ☒ Disposal By Lab ☐ Archive For ________ Months

structions/QC Requirements & Comments: Conduct MS/MSD on DU 005. Dry and grind all soil before subsampling.

hed by: Jamie L Anderson	Company: AMEC	Date/Time: 6/16/08 @ 13:00	Received by:	Company: TA-STL	Date/Time: 06.18.08 0915
hed by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
hed by:	Company:	Date/Time:	Received by:	Company:	Date/Time:

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

- 3270 -

Lot #(s): F8F190108

Condition Upon Receipt Form

Client: AMEC
Quote No: 79901
COC/RFA No: 001
Initiated By: SV
Date: 06.18.08
Time: 0915

Shipping Information

Shipper Name: FedX
Shipping # (s):*
1. 7920 7241 6660
2.
3.
4.
5.
6.
7.
8.
9.
10.

Multiple Packages Y N
Sample Temperature (s):**
1. 4
2.
3.
4.
5.
6.
7.
8.
9.
10.

*Numbered shipping lines correspond to Numbered Sample Temp lines

**Sample must be received at 4°C ± 2°C- If not, note contents below. Temperature variance does NOT affect the following: Metals-Liquid or Rad tests- Liquid or Solids

Condition (Circle "Y" for yes, "N" for no and "N/A" for not applicable):

1.	Y N	Are there custody seals present on the cooler?	8.	Y N	Are there custody seals present on bottles?
2.	Y N N/A	Do custody seals on cooler appear to be tampered with?	9.	Y N N/A	Do custody seals on bottles appear to be tampered with?
3.	Y N	Were contents of cooler frisked after opening, but before unpacking?	10.	Y N N/A	Was sample received with proper pH[1]? (If not, make note below)
4.	Y N	Sample received with Chain of Custody?	11.	Y N	If N/A- Was pH taken by original TestAmerica lab?
5.	Y N N/A	Does the Chain of Custody match sample ID's on the container(s)?	12.	Y N	Sample received in proper containers?
6.	Y N	Was sample received broken?	13.	Y N N/A	Headspace in VOA or TOX liquid samples? (If Yes, note sample ID's below)
7.	Y N	Is sample volume sufficient for analysis?	14.	Y N NA	Was Internal COC/Workshare received?

[1] For DOE-AL (Pantex, LANL, Sandia) sites, pH of ALL containers received must be verified, EXCEPT VOA, TOX and soils.

Notes:

Corrective Action:
☐ Client Contact Name:
☐ Sample(s) processed "as is"
☐ Sample(s) on hold until: NA

Informed by:
If released, notify: NA

Appendix **B**

CHEMICAL ASSESSMENT RISK CHARACTERIZATION SPREADSHEETS

APPENDIX C
SUMMARY OF POTENTIAL CANCER RISKS AND HAZARD INDICES
CONSTRUCTION WORKER

SADDLE ROAD

Compound	Excess Lifetime Cancer Risk					Hazard Index				
	Soil	Sediment	Groundwater	Surface Water	Total	Soil	Sediment	Groundwater	Surface Water	Total
Uranium	NA	NA	NA	NA	NA	3.82E-03	NA	NA	NA	3.82E-03

CONSTRUCTION WORKER SOIL EXPOSURES
RISK CHARACTERIZATION
SADDLE ROAD

Scenario:	Subactivity name
Receptor:	Construction Worker
Medium:	Soil
Exposure Pathway:	Ingestion and Dermal Contact

ADD (mg/kg-day) = $\frac{CS \times [(IR \times FI \times RAF) + (SA \times AF \times FA \times RAF \times EFD)] \times EF \times ED \times CF}{BW \times AT}$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-day)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	330
RAF: Relative Absorption Factor (Oral-Soil) (unitless)	Chemical-Specific
FI: Fraction Ingested from Site (unitless)	1
SA: Skin Surface Area (cm2)	3300
AF: Adherence Factor (mg/cm2/event)	0.29
RAF: Relative Absorption Factor (Dermal-Soil) (unitless)	Chemical-Specific
FA: Fraction Absorbed from Site (unitless)	1
EFD: Exposure Frequency - Dermal (event/day)	1
EF: Exposure Frequency (days/year)	250
ED: Exposure Duration (years)	1
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	365
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	25550
CF: Conversion factor (kg/mg)	1.00E-06
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific

		Noncancer Hazard Quotient					Excess Lifetime Cancer Risk				
Compound	Soil Concentration (mg/kg)	Oral-Soil RAF (noncancer)	Dermal-Soil RAF (noncancer)	ADD (noncancer) (mg/kg-day)	Chronic TDI/RfD (mg/kg-day)	Soil HQ	Oral-Soil RAF (cancer)	Dermal-Soil RAF (cancer)	ADD (cancer) (mg/kg-day)	CSF [1/(mg/kg-day)]	Soil Risk
Uranium	9.25E-01	1	1	1.14E-05	3.00E-03	3.79E-03	1	1	NA	NA	NA
						3.79E-03					0.00E+00

CONSTRUCTION WORKER - SOIL EXPOSURES
RISK CHARACTERIZATION
SADDLE ROAD

Scenario:	Subactivity name
Receptor:	Construction Worker
Medium:	Dust from soil
Exposure Pathway:	Inhalation

ADD (mg/kg/day) = $\frac{\text{Cdust x IR x RAF x ET x EF x ED}}{\text{AT x BW}}$

Hazard Quotient (HQ) = ADD (mg/kg/day) / RfDi (mg/kg/day)
Cancer Risk (ELCR) = ADD (mg/kg/day) * CSFi [1/(mg/kg/day)]

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg/day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
Cdust: Concentration of dust-bound chemical in air (mg/m3)	Calculated
RAF: Relative Absorption Factor (Inhalation) (unitless)	Chemical-Specific
ET: Exposure Time - dust (hr/d)	8
EF: Exposure Frequency (days/year)	250
ED: Exposure Duration (years)	1
IR: Inhalation Rate (m3/hr)	0.833
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	365
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	25550
BW: Body Weight (kg)	71.8
RfDi: Reference Dose Inhalation (mg/kg/day)	Chemical-Specific
CSFi: Cancer Slope Factor Inhalation [1/(mg/kg/day)]	Chemical-Specific

			Noncancer Hazard Quotient				Excess Lifetime Cancer Risk			
Compound	Soil Concentration (mg/kg)	Chemical Concentration in Air (mg/m3)	Inhalation RAF (noncancer)	ADD (noncancer) (mg/kg/day)	RFDi (non-cancer) (mg/kg/day)	Soil-Dust HQ	Inhalation RAF (cancer)	ADD (cancer) (mg/kg/day)	CSFi [1/(mg/kg/day)]	Soil- Dust Risk
Uranium	9.25E-01	4.63E-08	1	2.94E-09	8.60E-05	3.42E-05	1	NA	NA	NA
						3.42E-05				0.00E+00

APPENDIX C
SUMMARY OF POTENTIAL CANCER RISKS AND HAZARD INDICES
CHILD-SUBACTIVITY
SADDLE ROAD

	Excess Lifetime Cancer Risk					Hazard Index				
Compound	Soil	Sediment	Groundwater	Surface Water	Total	Soil	Sediment	Groundwater	Surface Water	Total
Uranium	NA	NA	NA	NA	NA	2.78E-03	NA	NA	NA	2.78E-03

CHILD - SUBACTIVITY - SOIL EXPOSURES
RISK CHARACTERIZATION
SADDLE ROAD

Scenario:	Subactivity name
Receptor:	Child
Medium:	Soil
Exposure Pathway:	Ingestion and Dermal Contact

$$ADD\ (mg/kg\text{-}day) = \frac{CS \times [(IR \times FI \times RAF) + (SA \times AF \times FA \times RAF \times EFD)] \times EF \times ED \times CF}{BW \times AT}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-day)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	200
RAF: Relative Absorption Factor (Oral-Soil) (unitless)	Chemical-Specific
FI: Fraction Ingested from Site (unitless)	1
SA: Skin Surface Area (cm2)	2800
AF: Adherence Factor (mg/cm2/event)	0.29
RAF: Relative Absorption Factor (Dermal-Soil) (unitless)	Chemical-Specific
FA: Fraction Absorbed from Site (unitless)	1
EFD: Exposure Frequency - Dermal (event/day)	1
EF: Exposure Frequency (days/year)	52
ED: Exposure Duration (years)	6
BW: Body Weight (kg)	16
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	2190
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	25550
CF: Conversion factor (kg/mg)	1.00E-06
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific

		Noncancer Hazard Quotient					Excess Lifetime Cancer Risk				
Compound	Soil Concentration (mg/kg)	Oral-Soil RAF (noncancer)	Dermal-Soil RAF (noncancer)	ADD (noncancer) (mg/kg-day)	Chronic TDI/RfD (mg/kg-day)	Soil HQ	Oral-Soil RAF (cancer)	Dermal-Soil RAF (cancer)	ADD (cancer) (mg/kg-day)	CSF [1/(mg/kg-day)]	Soil Risk
Uranium	9.25E-01	1	1	8.34E-06	3.00E-03	2.78E-03	1	1	NA	NA	NA
						2.78E-03					0.00E+00

CHILD - SUBACTIVITY - SOIL EXPOSURES
RISK CHARACTERIZATION
SADDLE ROAD

Scenario:	Subactivity name
Receptor:	Child
Medium:	Dust from soil
Exposure Pathway:	Inhalation

$$\text{ADD (mg/kg/day)} = \frac{\text{Cdust x IR x RAF x ET x EF x ED}}{\text{AT x BW}}$$

Hazard Quotient (HQ) = ADD (mg/kg/day) / RfDi (mg/kg/day)
Cancer Risk (ELCR) = ADD (mg/kg/day) * CSFi [1/(mg/kg/day)]

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg/day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
Cdust: Concentration of dust-bound chemical in air (mg/m3)	Calculated
RAF: Relative Absorption Factor (Inhalation) (unitless)	Chemical-Specific
ET: Exposure Time - dust (hr/d)	2
EF: Exposure Frequency (days/year)	52
ED: Exposure Duration (years)	6
IR: Inhalation Rate (m3/hr)	0.417
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	2190
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	25550
BW: Body Weight (kg)	16
RfDi: Reference Dose Inhalation (mg/kg/day)	Chemical-Specific
CSFi: Cancer Slope Factor Inhalation [1/(mg/kg/day)]	Chemical-Specific

			Noncancer Hazard Quotient				Excess Lifetime Cancer Risk			
Compound	Soil Concentration (mg/kg)	Chemical Concentration in Air (mg/m3)	Inhalation RAF (noncancer)	ADD (noncancer) (mg/kg/day)	RFDi (non-cancer) (mg/kg/day)	Soil-Dust HQ	Inhalation RAF (cancer)	ADD (cancer) (mg/kg/day)	CSFi [1/(mg/kg/day)]	Soil- Dust Risk
Uranium	9.25E-01	4.63E-08	1	3.43E-10	8.60E-05	3.99247E-06	1	NA	NA	NA
						3.99E-06				0.00E+00

APPENDIX C
SUMMARY OF POTENTIAL CANCER RISKS AND HAZARD INDICES
ADULT -SUBACTIVITY
SADDLE ROAD

	Excess Lifetime Cancer Risk					Hazard Index				
Compound	Soil	Sediment	Groundwater	Surface Water	Total	Soil	Sediment	Groundwater	Surface Water	Total
Uranium	NA	NA	NA	NA	NA	1.07E-03	NA	NA	NA	1.07E-03

ADULT - SUBACTIVITY - SOIL EXPOSURES
RISK CHARACTERIZATION
SADDLE ROAD

Scenario:	Subactivity name
Receptor:	Adult Resident
Medium:	Soil
Exposure Pathway:	Ingestion and Dermal Contact

$$\text{ADD (mg/kg-day)} = \frac{CS \times [(IR \times FI \times RAF) + (SA \times AF \times FA \times RAF \times EFD)] \times EF \times ED \times CF}{BW \times AT}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-day)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	100
RAF: Relative Absorption Factor (Oral-Soil) (unitless)	Chemical-Specific
FI: Fraction Ingested from Site (unitless)	1
SA: Skin Surface Area (cm2)	5700
AF: Adherence Factor (mg/cm2/event)	0.29
RAF: Relative Absorption Factor (Dermal-Soil) (unitless)	Chemical-Specific
FA: Fraction Absorbed from Site (unitless)	1
EFD: Exposure Frequency - Dermal (event/day)	1
EF: Exposure Frequency (days/year)	52
ED: Exposure Duration (years)	24
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	8760
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	25550
CF: Conversion factor (kg/mg)	1.00E-06
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific

		Noncancer Hazard Quotient					Excess Lifetime Cancer Risk				
Compound	Soil Concentration (mg/kg)	Oral-Soil RAF (noncancer)	Dermal-Soil RAF (noncancer)	ADD (noncancer) (mg/kg-day)	Chronic TDI/RfD (mg/kg-day)	Soil HQ	Oral-Soil RAF (cancer)	Dermal-Soil RAF (cancer)	ADD (cancer) (mg/kg-day)	CSF [1/(mg/kg-day)]	Soil Risk
Uranium	9.25E-01	1	1	3.22E-06	3.00E-03	1.07E-03	1	1	NA	NA	NA
						1.07E-03					0.00E+00

ADULT - SUBACTIVITY - SOIL EXPOSURES
RISK CHARACTERIZATION
SADDLE ROAD

Scenario:	Subactivity name
Receptor:	Adult Resident
Medium:	Dust from soil
Exposure Pathway:	Inhalation

ADD (mg/kg/day) = $\frac{\text{Cdust x IR x RAF x ET x EF x ED}}{\text{AT x BW}}$

Hazard Quotient (HQ) = ADD (mg/kg/day) / RfDi (mg/kg/day)
Cancer Risk (ELCR) = ADD (mg/kg/day) * CSFi [1/(mg/kg/day)]

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg/day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
Cdust: Concentration of dust-bound chemical in air (mg/m3)	Calculated
RAF: Relative Absorption Factor (Inhalation) (unitless)	Chemical-Specific
ET: Exposure Time - dust (hr/d)	2
EF: Exposure Frequency (days/year)	52
ED: Exposure Duration (years)	24
IR: Inhalation Rate (m3/hr)	0.833
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	8760
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	25550
BW: Body Weight (kg)	71.8
RfDi: Reference Dose Inhalation (mg/kg/day)	Chemical-Specific
CSFi: Cancer Slope Factor Inhalation [1/(mg/kg/day)]	Chemical-Specific

			Noncancer Hazard Quotient				Excess Lifetime Cancer Risk			
Compound	Soil Concentration (mg/kg)	Chemical Concentration in Air (mg/m3)	Inhalation RAF (noncancer)	ADD (noncancer) (mg/kg/day)	RFDi (non-cancer) (mg/kg/day)	Soil-Dust HQ	Inhalation RAF (cancer)	ADD (cancer) (mg/kg/day)	CSFi [1/(mg/kg/day)]	Soil- Dust Risk
Uranium	9.25E-01	4.63E-08	1	1.53E-10	8.60E-05	1.78E-06	1	NA	NA	NA
						1.78E-06				0.00E+00

Appendix C

RADIOLOGICAL ASSESSMENT RISK CHARACTERIZATION REPORTS

Uranium Soils Investigation
Baseline Human Health Risk Assessment
Saddle Road
October 2009

RESRAD
CONSTRUCTION WORKER

Uranium Soils Investigation
Baseline Human Health Risk Assessment
Saddle Road
October 2009

Table of Contents

Part III: Intake Quantities and Health Risk Factors

Cancer Risk Slope Factors Summary Table
Risk Library: FGR 13 Morbidity

Menu	Parameter	Current Value	Base Case*	Parameter Name
Sf-1	Ground external radiation slope factors, 1/yr per (pCi/g):			
Sf-1	Ac-227+D	1.47E-06	3.48E-10	SLPF(1,1)
Sf-1	Pa-231	1.39E-07	1.39E-07	SLPF(2,1)
Sf-1	Pb-210+D	4.21E-09	1.41E-09	SLPF(3,1)
Sf-1	Ra-226+D	8.49E-06	2.29E-08	SLPF(4,1)
Sf-1	Th-230	8.19E-10	8.19E-10	SLPF(5,1)
Sf-1	U-234	2.52E-10	2.52E-10	SLPF(6,1)
Sf-1	U-235+D	5.43E-07	5.18E-07	SLPF(7,1)
Sf-1	U-238	4.99E-11	4.99E-11	SLPF(8,1)
Sf-1	U-238+D	1.14E-07	4.99E-11	SLPF(9,1)
Sf-2	Inhalation, slope factors, 1/(pCi):			
Sf-2	Ac-227+D	2.13E-07	1.49E-07	SLPF(1,2)
Sf-2	Pa-231	7.62E-08	7.62E-08	SLPF(2,2)
Sf-2	Pb-210+D	3.08E-08	1.58E-08	SLPF(3,2)
Sf-2	Ra-226+D	2.83E-08	2.82E-08	SLPF(4,2)
Sf-2	Th-230	3.40E-08	3.40E-08	SLPF(5,2)
Sf-2	U-234	2.78E-08	2.78E-08	SLPF(6,2)
Sf-2	U-235+D	2.50E-08	2.50E-08	SLPF(7,2)
Sf-2	U-238	2.36E-08	2.36E-08	SLPF(8,2)
Sf-2	U-238+D	2.36E-08	2.36E-08	SLPF(9,2)
Sf-3	Food ingestion, slope factors, 1/(pCi):			
Sf-3	Ac-227+D	6.53E-10	2.45E-10	SLPF(1,3)
Sf-3	Pa-231	2.26E-10	2.26E-10	SLPF(2,3)
Sf-3	Pb-210+D	3.44E-09	1.18E-09	SLPF(3,3)
Sf-3	Ra-226+D	5.15E-10	5.14E-10	SLPF(4,3)
Sf-3	Th-230	1.19E-10	1.19E-10	SLPF(5,3)
Sf-3	U-234	9.55E-11	9.55E-11	SLPF(6,3)
Sf-3	U-235+D	9.76E-11	9.44E-11	SLPF(7,3)
Sf-3	U-238	8.66E-11	8.66E-11	SLPF(8,3)
Sf-3	U-238+D	1.21E-10	8.66E-11	SLPF(9,3)
Sf-3	Water ingestion, slope factors, 1/(pCi):			
Sf-3	Ac-227+D	4.86E-10	2.01E-10	SLPF(1,4)
Sf-3	Pa-231	1.73E-10	1.73E-10	SLPF(2,4)
Sf-3	Pb-210+D	2.66E-09	8.81E-10	SLPF(3,4)
Sf-3	Ra-226+D	3.86E-10	3.85E-10	SLPF(4,4)
Sf-3	Th-230	9.10E-11	9.10E-11	SLPF(5,4)
Sf-3	U-234	7.07E-11	7.07E-11	SLPF(6,4)
Sf-3	U-235+D	7.18E-11	6.96E-11	SLPF(7,4)
Sf-3	U-238	6.40E-11	6.40E-11	SLPF(8,4)
Sf-3	U-238+D	8.71E-11	6.40E-11	SLPF(9,4)
Sf-3	Soil ingestion, slope factors, 1/(pCi):			
Sf-3	Ac-227+D	6.53E-10	2.45E-10	SLPF(1,5)
Sf-3	Pa-231	2.26E-10	2.26E-10	SLPF(2,5)
Sf-3	Pb-210+D	3.44E-09	1.18E-09	SLPF(3,5)
Sf-3	Ra-226+D	5.15E-10	5.14E-10	SLPF(4,5)
Sf-3	Th-230	1.19E-10	1.19E-10	SLPF(5,5)

Cancer Risk Slope Factors Summary Table (continued)

Risk Library: FGR 13 Morbidity

Menu	Parameter	Current Value	Base Case*	Parameter Name
Sf-3	U-234	9.55E-11	9.55E-11	SLPF(6,5)
Sf-3	U-235+D	9.76E-11	9.44E-11	SLPF(7,5)
Sf-3	U-238	8.66E-11	8.66E-11	SLPF(8,5)
Sf-3	U-238+D	1.21E-10	8.66E-11	SLPF(9,5)
Sf-Rn	Radon Inhalation slope factors, 1/(pCi):			
Sf-Rn	Rn-222	1.80E-12	1.80E-12	SLPFRN(1,1)
Sf-Rn	Po-218	3.70E-12	3.70E-12	SLPFRN(1,2)
Sf-Rn	Pb-214	6.20E-12	6.20E-12	SLPFRN(1,3)
Sf-Rn	Bi-214	1.50E-11	1.50E-11	SLPFRN(1,4)
Sf-Rn	Radon K factors, (mrem/WLM):			
Sf-Rn	Rn-222 Indoor	7.60E+02	7.60E+02	KFACTR(1,1)
Sf-Rn	Rn-222 Outdoor	5.70E+02	5.70E+02	KFACTR(1,2)

*Base Case means Default.Lib w/o Associate Nuclide contributions.

Risk Slope and Environmental Transport Factors for the Ground Pathway

Nuclide	Slope(i)*	ETFG(i,t) At Time in Years (dimensionless)							
(i)		t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227	3.480E-10	9.567E-01	9.567E-01	9.567E-01	9.567E-01	9.567E-01	9.567E-01	9.567E-01	9.567E-01
At-218	3.570E-09	9.702E-01	9.702E-01	9.702E-01	9.702E-01	9.702E-01	9.702E-01	9.702E-01	9.702E-01
Bi-210	2.760E-09	9.450E-01	9.450E-01	9.450E-01	9.450E-01	9.450E-01	9.450E-01	9.450E-01	9.450E-01
Bi-211	1.880E-07	9.453E-01	9.453E-01	9.453E-01	9.453E-01	9.453E-01	9.453E-01	9.453E-01	9.453E-01
Bi-214	7.480E-06	9.401E-01	9.401E-01	9.401E-01	9.401E-01	9.401E-01	9.401E-01	9.401E-01	9.400E-01
Fr-223	1.400E-07	9.502E-01	9.502E-01	9.502E-01	9.502E-01	9.502E-01	9.502E-01	9.502E-01	9.502E-01
Pa-231	1.390E-07	9.456E-01	9.456E-01	9.456E-01	9.456E-01	9.456E-01	9.456E-01	9.456E-01	9.456E-01
Pa-234	8.710E-06	9.400E-01	9.400E-01	9.400E-01	9.400E-01	9.400E-01	9.400E-01	9.400E-01	9.400E-01
Pa-234m	6.870E-08	9.393E-01	9.393E-01	9.393E-01	9.393E-01	9.393E-01	9.393E-01	9.393E-01	9.393E-01
Pb-210	1.410E-09	9.813E-01	9.813E-01	9.813E-01	9.813E-01	9.813E-01	9.813E-01	9.813E-01	9.813E-01
Pb-211	2.290E-07	9.399E-01	9.399E-01	9.399E-01	9.399E-01	9.399E-01	9.399E-01	9.399E-01	9.399E-01
Pb-214	9.820E-07	9.456E-01	9.456E-01	9.456E-01	9.456E-01	9.456E-01	9.456E-01	9.456E-01	9.456E-01
Po-210	3.950E-11	9.390E-01	9.390E-01	9.390E-01	9.390E-01	9.390E-01	9.390E-01	9.390E-01	9.390E-01
Po-211	3.580E-08	9.360E-01	9.360E-01	9.360E-01	9.360E-01	9.360E-01	9.360E-01	9.360E-01	9.360E-01
Po-214	3.860E-10	9.360E-01	9.360E-01	9.360E-01	9.360E-01	9.360E-01	9.360E-01	9.360E-01	9.360E-01
Po-215	7.480E-10	9.410E-01	9.410E-01	9.410E-01	9.410E-01	9.410E-01	9.410E-01	9.410E-01	9.410E-01
Po-218	4.260E-11	9.390E-01	9.390E-01	9.390E-01	9.390E-01	9.390E-01	9.390E-01	9.390E-01	9.390E-01
Ra-223	4.340E-07	9.496E-01	9.496E-01	9.496E-01	9.496E-01	9.496E-01	9.496E-01	9.496E-01	9.496E-01
Ra-226	2.290E-08	9.524E-01	9.524E-01	9.524E-01	9.524E-01	9.524E-01	9.524E-01	9.524E-01	9.524E-01
Rn-219	2.250E-07	9.461E-01	9.461E-01	9.461E-01	9.461E-01	9.461E-01	9.461E-01	9.461E-01	9.461E-01
Rn-222	1.740E-09	9.370E-01	9.370E-01	9.370E-01	9.370E-01	9.370E-01	9.370E-01	9.370E-01	9.370E-01
Th-227	3.780E-07	9.508E-01	9.508E-01	9.508E-01	9.508E-01	9.508E-01	9.508E-01	9.508E-01	9.508E-01
Th-230	8.190E-10	9.588E-01	9.588E-01	9.588E-01	9.588E-01	9.588E-01	9.588E-01	9.588E-01	9.588E-01
Th-231	2.450E-08	9.599E-01	9.599E-01	9.599E-01	9.599E-01	9.599E-01	9.599E-01	9.599E-01	9.599E-01
Th-234	1.630E-08	9.610E-01	9.610E-01	9.610E-01	9.610E-01	9.610E-01	9.610E-01	9.610E-01	9.610E-01
Tl-207	1.520E-08	9.403E-01	9.403E-01	9.403E-01	9.403E-01	9.403E-01	9.403E-01	9.403E-01	9.403E-01
Tl-210	0.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
U-234	2.520E-10	9.643E-01	9.643E-01	9.643E-01	9.643E-01	9.643E-01	9.643E-01	9.643E-01	9.643E-01
U-235	5.180E-07	9.520E-01	9.520E-01	9.520E-01	9.520E-01	9.520E-01	9.520E-01	9.520E-01	9.520E-01
U-238	4.990E-11	9.912E-01	9.912E-01	9.912E-01	9.912E-01	9.912E-01	9.912E-01	9.912E-01	9.912E-01

* - Units are 1/yr per (pCi/g) at infinite depth and area. Multiplication by ETFG(i,t) converts to site conditions.

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 0.000E+00 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Ac-227	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pa-231	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-230	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-234	2.529E-03	0.000E+00	0.000E+00	0.000E+00	3.597E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.597E+01
U-235	3.480E-05	0.000E+00	0.000E+00	0.000E+00	4.950E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.950E-01
U-238	1.798E-03	0.000E+00	0.000E+00	0.000E+00	2.558E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.558E+01

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 0.000E+00 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	1.139E-11	0.0000	1.012E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.414E-13	0.0000
Pa-231	5.014E-12	0.0000	1.686E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.112E-13	0.0000
Pb-210	2.907E-15	0.0000	1.287E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.049E-13	0.0000
Ra-226	3.438E-11	0.0000	7.062E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.829E-13	0.0000
Th-230	9.444E-13	0.0000	2.372E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.181E-11	0.0000
U-234	2.572E-09	0.0025	1.707E-09	0.0016	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.340E-08	0.0797
U-235	7.526E-08	0.0719	2.113E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.173E-09	0.0011
U-238	8.061E-07	0.7705	1.032E-09	0.0010	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.489E-08	0.0716
Total	8.840E-07	0.8449	2.760E-09	0.0026	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.595E-07	0.1524

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.184E-11	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.742E-12	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.080E-13	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.456E-11	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.299E-11	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.768E-08	0.0838
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.646E-08	0.0731
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.821E-07	0.8431
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.046E-06	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 0.000E+00 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	2.483E-14	4.982E-16	6.246E-19	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	2.483E-14	4.982E-16	6.246E-19	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	2.608E-09	0.0025	1.707E-09	0.0016	2.533E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.341E-08	0.0797
U-235	7.528E-08	0.0719	2.115E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.175E-09	0.0011
U-238	8.061E-07	0.7705	1.032E-09	0.0010	3.171E-19	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.490E-08	0.0716
Total	8.840E-07	0.8449	2.760E-09	0.0026	2.533E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.595E-07	0.1524

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.773E-08	0.0838
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.648E-08	0.0731
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.821E-07	0.8431
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.046E-06	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+00 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Ac-227	1.156E-11	0.000E+00	0.000E+00	0.000E+00	1.644E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.644E-07
Pa-231	7.347E-10	0.000E+00	0.000E+00	0.000E+00	1.045E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.045E-05
Pb-210	5.063E-14	0.000E+00	0.000E+00	0.000E+00	7.201E-10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	7.201E-10
Ra-226	4.924E-12	0.000E+00	0.000E+00	0.000E+00	7.003E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	7.003E-08
Th-230	2.274E-08	0.000E+00	0.000E+00	0.000E+00	3.234E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.234E-04
U-234	2.523E-03	0.000E+00	0.000E+00	0.000E+00	3.589E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.589E+01
U-235	3.472E-05	0.000E+00	0.000E+00	0.000E+00	4.938E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.938E-01
U-238	1.794E-03	0.000E+00	0.000E+00	0.000E+00	2.551E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.551E+01

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
  and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 1.000E+00 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	2.723E-06	2.658E-08	1.988E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	2.723E-06	2.658E-08	1.988E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	1.269E-11	0.0000	1.127E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.918E-13	0.0000
Pa-231	5.406E-12	0.0000	1.818E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.669E-13	0.0000
Pb-210	3.378E-15	0.0000	1.496E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.381E-13	0.0000
Ra-226	3.863E-11	0.0000	7.934E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.055E-13	0.0000
Th-230	1.019E-12	0.0000	2.560E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.274E-11	0.0000
U-234	2.566E-09	0.0025	1.703E-09	0.0016	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.321E-08	0.0797
U-235	7.509E-08	0.0719	2.108E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.171E-09	0.0011
U-238	8.043E-07	0.7705	1.029E-09	0.0010	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.472E-08	0.0716
Total	8.820E-07	0.8449	2.754E-09	0.0026	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.591E-07	0.1524

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.319E-11	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.191E-12	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.416E-13	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.883E-11	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.402E-11	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.748E-08	0.0838
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.628E-08	0.0731
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.800E-07	0.8431
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.044E-06	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 1.000E+00 years

Radon Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	2.790E-14	5.597E-16	7.017E-19	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	2.790E-14	5.597E-16	7.017E-19	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

(Column group heading: Radionuclides)

Water-ind. == Water-independent Water-dep. == Water-dependent

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	2.606E-09	0.0025	1.703E-09	0.0016	2.846E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.322E-08	0.0797
U-235	7.510E-08	0.0720	2.111E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.172E-09	0.0011
U-238	8.043E-07	0.7705	1.029E-09	0.0010	3.705E-19	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.472E-08	0.0716
Total	8.820E-07	0.8449	2.754E-09	0.0026	2.846E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.591E-07	0.1524

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.753E-08	0.0839
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.630E-08	0.0731
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.800E-07	0.8431
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.044E-06	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 3.000E+00 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Ac-227	1.011E-10	0.000E+00	0.000E+00	0.000E+00	1.439E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.439E-06
Pa-231	2.194E-09	0.000E+00	0.000E+00	0.000E+00	3.120E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.120E-05
Pb-210	1.342E-12	0.000E+00	0.000E+00	0.000E+00	1.909E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.909E-08
Ra-226	4.419E-11	0.000E+00	0.000E+00	0.000E+00	6.284E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.284E-07
Th-230	6.806E-08	0.000E+00	0.000E+00	0.000E+00	9.680E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.680E-04
U-234	2.511E-03	0.000E+00	0.000E+00	0.000E+00	3.572E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.572E+01
U-235	3.456E-05	0.000E+00	0.000E+00	0.000E+00	4.915E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.915E-01
U-238	1.786E-03	0.000E+00	0.000E+00	0.000E+00	2.540E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.540E+01

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 3.000E+00 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	2.443E-05	2.384E-07	1.784E-10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	2.443E-05	2.384E-07	1.784E-10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	1.553E-11	0.0000	1.380E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.019E-13	0.0000
Pa-231	6.185E-12	0.0000	2.080E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.774E-13	0.0000
Pb-210	4.482E-15	0.0000	1.985E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.160E-13	0.0000
Ra-226	4.808E-11	0.0000	9.875E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.557E-13	0.0000
Th-230	1.168E-12	0.0000	2.934E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.460E-11	0.0000
U-234	2.554E-09	0.0025	1.695E-09	0.0016	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.282E-08	0.0797
U-235	7.473E-08	0.0719	2.098E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.165E-09	0.0011
U-238	8.005E-07	0.7705	1.024E-09	0.0010	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.437E-08	0.0716
Total	8.778E-07	0.8449	2.741E-09	0.0026	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.584E-07	0.1524

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.614E-11	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.083E-12	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.207E-13	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.833E-11	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.607E-11	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.707E-08	0.0838
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.592E-08	0.0731
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.759E-07	0.8430
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.039E-06	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 3.000E+00 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	3.472E-14	6.966E-16	8.733E-19	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	3.472E-14	6.966E-16	8.733E-19	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent Water-dep. == Water-dependent

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	2.603E-09	0.0025	1.695E-09	0.0016	3.542E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.283E-08	0.0797
U-235	7.476E-08	0.0720	2.101E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.167E-09	0.0011
U-238	8.005E-07	0.7705	1.025E-09	0.0010	4.968E-19	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.437E-08	0.0716
Total	8.778E-07	0.8449	2.741E-09	0.0026	3.542E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.584E-07	0.1524

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.713E-08	0.0839
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.594E-08	0.0731
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.759E-07	0.8430
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.039E-06	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+01 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Ac-227	1.021E-09	0.000E+00	0.000E+00	0.000E+00	1.452E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.452E-05
Pa-231	7.192E-09	0.000E+00	0.000E+00	0.000E+00	1.023E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.023E-04
Pb-210	4.669E-11	0.000E+00	0.000E+00	0.000E+00	6.641E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.641E-07
Ra-226	4.859E-10	0.000E+00	0.000E+00	0.000E+00	6.910E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.910E-06
Th-230	2.250E-07	0.000E+00	0.000E+00	0.000E+00	3.200E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.200E-03
U-234	2.470E-03	0.000E+00	0.000E+00	0.000E+00	3.513E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.513E+01
U-235	3.400E-05	0.000E+00	0.000E+00	0.000E+00	4.835E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.835E-01
U-238	1.756E-03	0.000E+00	0.000E+00	0.000E+00	2.498E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.498E+01

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
  and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 1.000E+01 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	2.685E-04	2.621E-06	1.961E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	2.685E-04	2.621E-06	1.961E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	2.764E-11	0.0000	2.456E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.071E-12	0.0000
Pa-231	8.853E-12	0.0000	2.977E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.256E-12	0.0000
Pb-210	1.037E-14	0.0000	4.590E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.309E-13	0.0000
Ra-226	9.106E-11	0.0001	1.870E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.843E-13	0.0000
Th-230	1.684E-12	0.0000	4.229E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.105E-11	0.0000
U-234	2.513E-09	0.0025	1.667E-09	0.0016	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.147E-08	0.0797
U-235	7.351E-08	0.0719	2.064E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.146E-09	0.0011
U-238	7.874E-07	0.7704	1.008E-09	0.0010	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.315E-08	0.0716
Total	8.636E-07	0.8449	2.696E-09	0.0026	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.558E-07	0.1524

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.873E-11	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.014E-11	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.417E-13	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.154E-11	0.0001
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.316E-11	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.565E-08	0.0838
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.468E-08	0.0731
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.616E-07	0.8430
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.022E-06	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 1.000E+01 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	6.574E-14	1.319E-15	1.653E-18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	6.574E-14	1.319E-15	1.653E-18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	2.605E-09	0.0025	1.668E-09	0.0016	6.706E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.148E-08	0.0797
U-235	7.355E-08	0.0720	2.069E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.149E-09	0.0011
U-238	7.874E-07	0.7704	1.008E-09	0.0010	1.193E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.316E-08	0.0716
Total	8.636E-07	0.8449	2.696E-09	0.0026	6.706E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.558E-07	0.1524

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.576E-08	0.0839
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.472E-08	0.0731
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.616E-07	0.8430
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.022E-06	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 3.000E+01 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Ac-227	7.112E-09	0.000E+00	0.000E+00	0.000E+00	1.011E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.011E-04
Pa-231	2.058E-08	0.000E+00	0.000E+00	0.000E+00	2.927E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.927E-04
Pb-210	1.063E-09	0.000E+00	0.000E+00	0.000E+00	1.512E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.512E-05
Ra-226	4.245E-09	0.000E+00	0.000E+00	0.000E+00	6.037E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.037E-05
Th-230	6.594E-07	0.000E+00	0.000E+00	0.000E+00	9.378E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.378E-03
U-234	2.357E-03	0.000E+00	0.000E+00	0.000E+00	3.352E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.352E+01
U-235	3.243E-05	0.000E+00	0.000E+00	0.000E+00	4.613E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.613E-01
U-238	1.676E-03	0.000E+00	0.000E+00	0.000E+00	2.383E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.383E+01

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 3.000E+01 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	2.343E-03	2.286E-05	1.711E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	2.343E-03	2.286E-05	1.711E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	7.412E-11	0.0001	6.586E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.873E-12	0.0000
Pa-231	1.599E-11	0.0000	5.378E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.269E-12	0.0000
Pb-210	5.034E-14	0.0000	2.229E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.549E-12	0.0000
Ra-226	2.950E-10	0.0003	6.060E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.569E-12	0.0000
Th-230	3.111E-12	0.0000	7.814E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.890E-11	0.0000
U-234	2.397E-09	0.0025	1.591E-09	0.0016	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.772E-08	0.0797
U-235	7.014E-08	0.0719	1.969E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.094E-09	0.0011
U-238	7.513E-07	0.7702	9.615E-10	0.0010	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.979E-08	0.0716
Total	8.242E-07	0.8450	2.573E-09	0.0026	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.487E-07	0.1524

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.706E-11	0.0001
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.831E-11	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.602E-12	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.966E-10	0.0003
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.279E-11	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.171E-08	0.0838
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.125E-08	0.0730
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.220E-07	0.8427
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.754E-07	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 3.000E+01 years

Radon Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	2.123E-13	4.258E-15	5.338E-18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	2.123E-13	4.258E-15	5.338E-18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent Water-dep. == Water-dependent

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	2.695E-09	0.0028	1.591E-09	0.0016	2.165E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.776E-08	0.0797
U-235	7.023E-08	0.0720	1.981E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.099E-09	0.0011
U-238	7.513E-07	0.7702	9.616E-10	0.0010	6.452E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.980E-08	0.0716
Total	8.242E-07	0.8450	2.573E-09	0.0026	2.165E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.487E-07	0.1524

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.205E-08	0.0841
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.135E-08	0.0731
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.220E-07	0.8427
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.754E-07	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+02 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Ac-227	3.802E-08	0.000E+00	0.000E+00	0.000E+00	5.407E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.407E-04
Pa-231	5.815E-08	0.000E+00	0.000E+00	0.000E+00	8.271E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.271E-04
Pb-210	2.369E-08	0.000E+00	0.000E+00	0.000E+00	3.369E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.369E-04
Ra-226	4.254E-08	0.000E+00	0.000E+00	0.000E+00	6.050E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.050E-04
Th-230	2.028E-06	0.000E+00	0.000E+00	0.000E+00	2.884E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.884E-02
U-234	1.999E-03	0.000E+00	0.000E+00	0.000E+00	2.843E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.843E+01
U-235	2.751E-05	0.000E+00	0.000E+00	0.000E+00	3.913E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.913E-01
U-238	1.422E-03	0.000E+00	0.000E+00	0.000E+00	2.022E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.022E+01

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
  and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 1.000E+02 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	2.327E-02	2.271E-04	1.699E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	2.327E-02	2.271E-04	1.699E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	2.580E-10	0.0003	2.292E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.000E-11	0.0000
Pa-231	3.595E-11	0.0000	1.209E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.100E-12	0.0000
Pb-210	5.440E-13	0.0000	2.409E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.835E-11	0.0000
Ra-226	1.824E-09	0.0022	3.747E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.703E-12	0.0000
Th-230	7.608E-12	0.0000	1.911E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.512E-11	0.0001
U-234	2.033E-09	0.0025	1.349E-09	0.0016	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.593E-08	0.0795
U-235	5.950E-08	0.0717	1.670E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.277E-10	0.0011
U-238	6.373E-07	0.7684	8.156E-10	0.0010	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.921E-08	0.0714
Total	7.010E-07	0.8452	2.184E-09	0.0026	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.262E-07	0.1522

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+02 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All Pathways** risk	All Pathways** fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.682E-10	0.0003
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.117E-11	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.892E-11	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.834E-09	0.0022
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.046E-10	0.0001
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.931E-08	0.0836
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.044E-08	0.0729
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.973E-07	0.8408
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.294E-07	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 1.000E+02 years

Radon Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	1.303E-12	2.615E-14	3.278E-17	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	1.303E-12	2.615E-14	3.278E-17	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent Water-dep. == Water-dependent

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground risk	Ground fract.	Inhalation risk	Inhalation fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	Soil risk	Soil fract.
U-234	3.865E-09	0.0047	1.351E-09	0.0016	1.330E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.606E-08	0.0796
U-235	5.979E-08	0.0721	1.705E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.428E-10	0.0011
U-238	6.373E-07	0.7684	8.159E-10	0.0010	9.875E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.922E-08	0.0714
Total	7.010E-07	0.8452	2.184E-09	0.0026	1.330E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.262E-07	0.1522

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.128E-08	0.0859
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.075E-08	0.0733
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.973E-07	0.8408
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.294E-07	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 3.000E+02 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Ac-227	8.883E-08	0.000E+00	0.000E+00	0.000E+00	1.263E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.263E-03
Pa-231	1.088E-07	0.000E+00	0.000E+00	0.000E+00	1.547E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.547E-03
Pb-210	2.337E-07	0.000E+00	0.000E+00	0.000E+00	3.324E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.324E-03
Ra-226	2.873E-07	0.000E+00	0.000E+00	0.000E+00	4.087E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.087E-03
Th-230	4.891E-06	0.000E+00	0.000E+00	0.000E+00	6.957E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.957E-02
U-234	1.249E-03	0.000E+00	0.000E+00	0.000E+00	1.777E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.777E+01
U-235	1.720E-05	0.000E+00	0.000E+00	0.000E+00	2.446E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.446E-01
U-238	8.885E-04	0.000E+00	0.000E+00	0.000E+00	1.264E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.264E+01

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 3.000E+02 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	1.541E-01	1.504E-03	1.125E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	1.541E-01	1.504E-03	1.125E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	5.402E-10	0.0010	4.799E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.094E-11	0.0000
Pa-231	6.232E-11	0.0001	2.096E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.841E-12	0.0000
Pb-210	4.364E-12	0.0000	1.932E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.077E-10	0.0006
Ra-226	1.054E-08	0.0199	2.165E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.608E-11	0.0001
Th-230	1.702E-11	0.0000	4.274E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.128E-10	0.0004
U-234	1.271E-09	0.0024	8.432E-10	0.0016	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.120E-08	0.0779
U-235	3.719E-08	0.0703	1.044E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.798E-10	0.0011
U-238	3.983E-07	0.7534	5.098E-10	0.0010	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.700E-08	0.0700
Total	4.479E-07	0.8472	1.369E-09	0.0026	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.939E-08	0.1502

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.616E-10	0.0011
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.137E-11	0.0001
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.122E-10	0.0006
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.060E-08	0.0200
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.341E-10	0.0004
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.331E-08	0.0819
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.778E-08	0.0715
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.358E-07	0.8243
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.287E-07	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 3.000E+02 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	7.382E-12	1.481E-13	1.857E-16	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	7.382E-12	1.481E-13	1.857E-16	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	1.183E-08	0.0224	8.474E-10	0.0016	7.529E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.175E-08	0.0790
U-235	3.779E-08	0.0715	1.113E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.096E-10	0.0012
U-238	3.983E-07	0.7534	5.103E-10	0.0010	1.473E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.703E-08	0.0700
Total	4.479E-07	0.8472	1.369E-09	0.0026	7.530E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.939E-08	0.1502

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.443E-08	0.1030
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.841E-08	0.0727
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.358E-07	0.8244
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.287E-07	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+03 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Ac-227	6.086E-08	0.000E+00	0.000E+00	0.000E+00	8.656E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.656E-04
Pa-231	6.948E-08	0.000E+00	0.000E+00	0.000E+00	9.882E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.882E-04
Pb-210	1.208E-06	0.000E+00	0.000E+00	0.000E+00	1.718E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.718E-02
Ra-226	1.287E-06	0.000E+00	0.000E+00	0.000E+00	1.831E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.831E-02
Th-230	8.696E-06	0.000E+00	0.000E+00	0.000E+00	1.237E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.237E-01
U-234	2.410E-04	0.000E+00	0.000E+00	0.000E+00	3.427E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.427E+00
U-235	3.319E-06	0.000E+00	0.000E+00	0.000E+00	4.720E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.720E-02
U-238	1.715E-04	0.000E+00	0.000E+00	0.000E+00	2.439E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.439E+00

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
  and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 1.000E+03 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	5.678E-01	5.542E-03	4.146E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	5.678E-01	5.542E-03	4.146E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	3.585E-10	0.0024	3.185E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.390E-11	0.0001
Pa-231	3.869E-11	0.0003	1.301E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.489E-12	0.0000
Pb-210	2.120E-11	0.0001	9.386E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.494E-09	0.0102
Ra-226	4.474E-08	0.3042	9.189E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.380E-10	0.0016
Th-230	2.952E-11	0.0002	7.413E-12	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.690E-10	0.0025
U-234	2.451E-10	0.0017	1.626E-10	0.0011	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.946E-09	0.0540
U-235	7.176E-09	0.0488	2.014E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.119E-10	0.0008
U-238	7.687E-08	0.5227	9.838E-11	0.0007	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.141E-09	0.0486
Total	1.295E-07	0.8804	2.727E-10	0.0019	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.732E-08	0.1178

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.727E-10	0.0025
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.431E-11	0.0003
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.517E-09	0.0103
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.497E-08	0.3058
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.060E-10	0.0028
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.354E-09	0.0568
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.290E-09	0.0496
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.411E-08	0.5719
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.471E-07	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 1.000E+03 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	2.563E-11	5.142E-13	6.447E-16	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	2.563E-11	5.142E-13	6.447E-16	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent Water-dep. == Water-dependent

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	4.501E-08	0.3060	1.716E-10	0.0012	2.613E-11	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.003E-08	0.0682
U-235	7.574E-09	0.0515	2.463E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.313E-10	0.0009
U-238	7.689E-08	0.5227	9.871E-11	0.0007	1.373E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.158E-09	0.0487
Total	1.295E-07	0.8802	2.727E-10	0.0019	2.615E-11	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.732E-08	0.1177

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.524E-08	0.3755
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.707E-09	0.0524
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.415E-08	0.5721
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.471E-07	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

RESRAD
CHILD COMMUTER

Table of Contents

Part III: Intake Quantities and Health Risk Factors

Cancer Risk Slope Factors Summary Table
Risk Library: FGR 13 Morbidity

Menu	Parameter	Current Value	Base Case*	Parameter Name
Sf-1	Ground external radiation slope factors, 1/yr per (pCi/g):			
Sf-1	Ac-227+D	1.47E-06	3.48E-10	SLPF(1,1)
Sf-1	Pa-231	1.39E-07	1.39E-07	SLPF(2,1)
Sf-1	Pb-210+D	4.21E-09	1.41E-09	SLPF(3,1)
Sf-1	Ra-226+D	8.49E-06	2.29E-08	SLPF(4,1)
Sf-1	Th-230	8.19E-10	8.19E-10	SLPF(5,1)
Sf-1	U-234	2.52E-10	2.52E-10	SLPF(6,1)
Sf-1	U-235+D	5.43E-07	5.18E-07	SLPF(7,1)
Sf-1	U-238	4.99E-11	4.99E-11	SLPF(8,1)
Sf-1	U-238+D	1.14E-07	4.99E-11	SLPF(9,1)
Sf-2	Inhalation, slope factors, 1/(pCi):			
Sf-2	Ac-227+D	2.13E-07	1.49E-07	SLPF(1,2)
Sf-2	Pa-231	7.62E-08	7.62E-08	SLPF(2,2)
Sf-2	Pb-210+D	3.08E-08	1.58E-08	SLPF(3,2)
Sf-2	Ra-226+D	2.83E-08	2.82E-08	SLPF(4,2)
Sf-2	Th-230	3.40E-08	3.40E-08	SLPF(5,2)
Sf-2	U-234	2.78E-08	2.78E-08	SLPF(6,2)
Sf-2	U-235+D	2.50E-08	2.50E-08	SLPF(7,2)
Sf-2	U-238	2.36E-08	2.36E-08	SLPF(8,2)
Sf-2	U-238+D	2.36E-08	2.36E-08	SLPF(9,2)
Sf-3	Food ingestion, slope factors, 1/(pCi):			
Sf-3	Ac-227+D	6.53E-10	2.45E-10	SLPF(1,3)
Sf-3	Pa-231	2.26E-10	2.26E-10	SLPF(2,3)
Sf-3	Pb-210+D	3.44E-09	1.18E-09	SLPF(3,3)
Sf-3	Ra-226+D	5.15E-10	5.14E-10	SLPF(4,3)
Sf-3	Th-230	1.19E-10	1.19E-10	SLPF(5,3)
Sf-3	U-234	9.55E-11	9.55E-11	SLPF(6,3)
Sf-3	U-235+D	9.76E-11	9.44E-11	SLPF(7,3)
Sf-3	U-238	8.66E-11	8.66E-11	SLPF(8,3)
Sf-3	U-238+D	1.21E-10	8.66E-11	SLPF(9,3)
Sf-3	Water ingestion, slope factors, 1/(pCi):			
Sf-3	Ac-227+D	4.86E-10	2.01E-10	SLPF(1,4)
Sf-3	Pa-231	1.73E-10	1.73E-10	SLPF(2,4)
Sf-3	Pb-210+D	2.66E-09	8.81E-10	SLPF(3,4)
Sf-3	Ra-226+D	3.86E-10	3.85E-10	SLPF(4,4)
Sf-3	Th-230	9.10E-11	9.10E-11	SLPF(5,4)
Sf-3	U-234	7.07E-11	7.07E-11	SLPF(6,4)
Sf-3	U-235+D	7.18E-11	6.96E-11	SLPF(7,4)
Sf-3	U-238	6.40E-11	6.40E-11	SLPF(8,4)
Sf-3	U-238+D	8.71E-11	6.40E-11	SLPF(9,4)
Sf-3	Soil ingestion, slope factors, 1/(pCi):			
Sf-3	Ac-227+D	6.53E-10	2.45E-10	SLPF(1,5)
Sf-3	Pa-231	2.26E-10	2.26E-10	SLPF(2,5)
Sf-3	Pb-210+D	3.44E-09	1.18E-09	SLPF(3,5)
Sf-3	Ra-226+D	5.15E-10	5.14E-10	SLPF(4,5)
Sf-3	Th-230	1.19E-10	1.19E-10	SLPF(5,5)
Sf-3	U-234	9.55E-11	9.55E-11	SLPF(6,5)

Cancer Risk Slope Factors Summary Table (continued)

Risk Library: FGR 13 Morbidity

Menu	Parameter	Current Value	Base Case*	Parameter Name
Sf-3	U-235+D	9.76E-11	9.44E-11	SLPF(7,5)
Sf-3	U-238	8.66E-11	8.66E-11	SLPF(8,5)
Sf-3	U-238+D	1.21E-10	8.66E-11	SLPF(9,5)
Sf-Rn	Radon Inhalation slope factors, 1/(pCi):			
Sf-Rn	Rn-222	1.80E-12	1.80E-12	SLPFRN(1,1)
Sf-Rn	Po-218	3.70E-12	3.70E-12	SLPFRN(1,2)
Sf-Rn	Pb-214	6.20E-12	6.20E-12	SLPFRN(1,3)
Sf-Rn	Bi-214	1.50E-11	1.50E-11	SLPFRN(1,4)
Sf-Rn	Radon K factors, (mrem/WLM):			
Sf-Rn	Rn-222 Indoor	7.60E+02	7.60E+02	KFACTR(1,1)
Sf-Rn	Rn-222 Outdoor	5.70E+02	5.70E+02	KFACTR(1,2)

*Base Case means Default.Lib w/o Associate Nuclide contributions.

Risk Slope and Environmental Transport Factors for the Ground Pathway

Nuclide (i)	Slope(i)*	ETFG(i,t) At Time in Years (dimensionless) t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227	3.480E-10	9.567E-01	9.567E-01	9.567E-01	9.567E-01	9.567E-01	9.567E-01	9.567E-01	9.567E-01
At-218	3.570E-09	9.702E-01	9.702E-01	9.702E-01	9.702E-01	9.702E-01	9.702E-01	9.702E-01	9.702E-01
Bi-210	2.760E-09	9.450E-01	9.450E-01	9.450E-01	9.450E-01	9.450E-01	9.450E-01	9.450E-01	9.450E-01
Bi-211	1.880E-07	9.453E-01	9.453E-01	9.453E-01	9.453E-01	9.453E-01	9.453E-01	9.453E-01	9.453E-01
Bi-214	7.480E-06	9.401E-01	9.401E-01	9.401E-01	9.401E-01	9.401E-01	9.401E-01	9.401E-01	9.400E-01
Fr-223	1.400E-07	9.502E-01	9.502E-01	9.502E-01	9.502E-01	9.502E-01	9.502E-01	9.502E-01	9.502E-01
Pa-231	1.390E-07	9.456E-01	9.456E-01	9.456E-01	9.456E-01	9.456E-01	9.456E-01	9.456E-01	9.456E-01
Pa-234	8.710E-06	9.400E-01	9.400E-01	9.400E-01	9.400E-01	9.400E-01	9.400E-01	9.400E-01	9.400E-01
Pa-234m	6.870E-08	9.393E-01	9.393E-01	9.393E-01	9.393E-01	9.393E-01	9.393E-01	9.393E-01	9.393E-01
Pb-210	1.410E-09	9.813E-01	9.813E-01	9.813E-01	9.813E-01	9.813E-01	9.813E-01	9.813E-01	9.813E-01
Pb-211	2.290E-07	9.399E-01	9.399E-01	9.399E-01	9.399E-01	9.399E-01	9.399E-01	9.399E-01	9.399E-01
Pb-214	9.820E-07	9.456E-01	9.456E-01	9.456E-01	9.456E-01	9.456E-01	9.456E-01	9.456E-01	9.456E-01
Po-210	3.950E-11	9.390E-01	9.390E-01	9.390E-01	9.390E-01	9.390E-01	9.390E-01	9.390E-01	9.390E-01
Po-211	3.580E-08	9.360E-01	9.360E-01	9.360E-01	9.360E-01	9.360E-01	9.360E-01	9.360E-01	9.360E-01
Po-214	3.860E-10	9.360E-01	9.360E-01	9.360E-01	9.360E-01	9.360E-01	9.360E-01	9.360E-01	9.360E-01
Po-215	7.480E-10	9.410E-01	9.410E-01	9.410E-01	9.410E-01	9.410E-01	9.410E-01	9.410E-01	9.410E-01
Po-218	4.260E-11	9.390E-01	9.390E-01	9.390E-01	9.390E-01	9.390E-01	9.390E-01	9.390E-01	9.390E-01
Ra-223	4.340E-07	9.496E-01	9.496E-01	9.496E-01	9.496E-01	9.496E-01	9.496E-01	9.496E-01	9.496E-01
Ra-226	2.290E-08	9.524E-01	9.524E-01	9.524E-01	9.524E-01	9.524E-01	9.524E-01	9.524E-01	9.524E-01
Rn-219	2.250E-07	9.461E-01	9.461E-01	9.461E-01	9.461E-01	9.461E-01	9.461E-01	9.461E-01	9.461E-01
Rn-222	1.740E-09	9.370E-01	9.370E-01	9.370E-01	9.370E-01	9.370E-01	9.370E-01	9.370E-01	9.370E-01
Th-227	3.780E-07	9.508E-01	9.508E-01	9.508E-01	9.508E-01	9.508E-01	9.508E-01	9.508E-01	9.508E-01
Th-230	8.190E-10	9.588E-01	9.588E-01	9.588E-01	9.588E-01	9.588E-01	9.588E-01	9.588E-01	9.588E-01
Th-231	2.450E-08	9.599E-01	9.599E-01	9.599E-01	9.599E-01	9.599E-01	9.599E-01	9.599E-01	9.599E-01
Th-234	1.630E-08	9.610E-01	9.610E-01	9.610E-01	9.610E-01	9.610E-01	9.610E-01	9.610E-01	9.610E-01
Tl-207	1.520E-08	9.403E-01	9.403E-01	9.403E-01	9.403E-01	9.403E-01	9.403E-01	9.403E-01	9.403E-01
Tl-210	0.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
U-234	2.520E-10	9.643E-01	9.643E-01	9.643E-01	9.643E-01	9.643E-01	9.643E-01	9.643E-01	9.643E-01
U-235	5.180E-07	9.520E-01	9.520E-01	9.520E-01	9.520E-01	9.520E-01	9.520E-01	9.520E-01	9.520E-01
U-238	4.990E-11	9.912E-01	9.912E-01	9.912E-01	9.912E-01	9.912E-01	9.912E-01	9.912E-01	9.912E-01

* - Units are 1/yr per (pCi/g) at infinite depth and area. Multiplication by ETFG(i,t) converts to site conditions.

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 0.000E+00 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Ac-227	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pa-231	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-230	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-234	5.313E-03	0.000E+00	0.000E+00	0.000E+00	3.052E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.052E+01
U-235	7.312E-05	0.000E+00	0.000E+00	0.000E+00	4.200E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.200E-01
U-238	3.778E-03	0.000E+00	0.000E+00	0.000E+00	2.170E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.170E+01

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 0.000E+00 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	1.899E-13	0.0000	3.545E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.246E-15	0.0000
Pa-231	2.975E-13	0.0000	2.102E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.581E-14	0.0000
Pb-210	1.101E-17	0.0000	1.024E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.585E-16	0.0000
Ra-226	4.854E-13	0.0000	2.095E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.191E-15	0.0000
Th-230	5.521E-14	0.0000	2.913E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.857E-13	0.0000
U-234	6.312E-10	0.0025	8.800E-10	0.0035	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.737E-08	0.0690
U-235	1.847E-08	0.0734	1.089E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.443E-10	0.0010
U-238	1.978E-07	0.7864	5.319E-10	0.0021	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.559E-08	0.0620
Total	2.169E-07	0.8623	1.423E-09	0.0057	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.320E-08	0.1320

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.965E-13	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.354E-13	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.705E-16	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.876E-13	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.701E-13	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.888E-08	0.0750
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.872E-08	0.0744
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.139E-07	0.8505
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.515E-07	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 0.000E+00 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	7.374E-16	1.479E-17	1.855E-20	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	7.374E-16	1.479E-17	1.855E-20	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	6.317E-10	0.0025	8.801E-10	0.0035	7.522E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.737E-08	0.0690
U-235	1.847E-08	0.0734	1.089E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.444E-10	0.0010
U-238	1.978E-07	0.7864	5.319E-10	0.0021	2.271E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.559E-08	0.0620
Total	2.169E-07	0.8623	1.423E-09	0.0057	7.522E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.320E-08	0.1320

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.888E-08	0.0750
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.872E-08	0.0744
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.139E-07	0.8505
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.515E-07	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+00 years

Radio-Nuclide	Water Independent Pathways (Inhalation w/o radon): Inhalation	Plant	Meat	Milk	Soil	Water Dependent Pathways: Water	Fish	Plant	Meat	Milk	Total Ingestion*
Ac-227	2.428E-11	0.000E+00	0.000E+00	0.000E+00	1.395E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.395E-07
Pa-231	1.543E-09	0.000E+00	0.000E+00	0.000E+00	8.866E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.866E-06
Pb-210	1.064E-13	0.000E+00	0.000E+00	0.000E+00	6.110E-10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.110E-10
Ra-226	1.034E-11	0.000E+00	0.000E+00	0.000E+00	5.942E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.942E-08
Th-230	4.777E-08	0.000E+00	0.000E+00	0.000E+00	2.744E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.744E-04
U-234	5.301E-03	0.000E+00	0.000E+00	0.000E+00	3.045E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.045E+01
U-235	7.295E-05	0.000E+00	0.000E+00	0.000E+00	4.190E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.190E-01
U-238	3.769E-03	0.000E+00	0.000E+00	0.000E+00	2.165E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.165E+01

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 1.000E+00 years

Radon Pathway	Radionuclides: Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	5.721E-06	5.583E-08	4.177E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	5.721E-06	5.583E-08	4.177E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground risk	Ground fract.	Inhalation risk	Inhalation fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	Soil risk	Soil fract.
Ac-227	2.975E-13	0.0000	5.554E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.786E-15	0.0000
Pa-231	3.960E-13	0.0000	2.798E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.766E-14	0.0000
Pb-210	2.024E-17	0.0000	1.883E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.211E-15	0.0000
Ra-226	7.677E-13	0.0000	3.313E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.465E-15	0.0000
Th-230	7.355E-14	0.0000	3.881E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.803E-13	0.0000
U-234	6.297E-10	0.0025	8.780E-10	0.0035	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.732E-08	0.0690
U-235	1.843E-08	0.0734	1.087E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.438E-10	0.0010
U-238	1.974E-07	0.7864	5.306E-10	0.0021	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.556E-08	0.0620
Total	2.164E-07	0.8623	1.419E-09	0.0057	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.313E-08	0.1320

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.079E-13	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.465E-13	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.233E-15	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.712E-13	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.926E-13	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.883E-08	0.0750
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.868E-08	0.0744
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.134E-07	0.8505
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.510E-07	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 1.000E+00 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	1.166E-15	2.339E-17	2.933E-20	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	1.166E-15	2.339E-17	2.933E-20	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	6.306E-10	0.0025	8.780E-10	0.0035	1.190E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.733E-08	0.0690
U-235	1.843E-08	0.0734	1.087E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.438E-10	0.0010
U-238	1.974E-07	0.7864	5.306E-10	0.0021	4.199E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.556E-08	0.0620
Total	2.164E-07	0.8623	1.419E-09	0.0057	1.190E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.313E-08	0.1320

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.883E-08	0.0750
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.868E-08	0.0744
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.134E-07	0.8505
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.510E-07	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 3.000E+00 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Ac-227	2.125E-10	0.000E+00	0.000E+00	0.000E+00	1.221E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.221E-06
Pa-231	4.608E-09	0.000E+00	0.000E+00	0.000E+00	2.647E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.647E-05
Pb-210	2.820E-12	0.000E+00	0.000E+00	0.000E+00	1.620E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.620E-08
Ra-226	9.283E-11	0.000E+00	0.000E+00	0.000E+00	5.332E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.332E-07
Th-230	1.430E-07	0.000E+00	0.000E+00	0.000E+00	8.213E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.213E-04
U-234	5.276E-03	0.000E+00	0.000E+00	0.000E+00	3.031E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.031E+01
U-235	7.260E-05	0.000E+00	0.000E+00	0.000E+00	4.170E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.170E-01
U-238	3.751E-03	0.000E+00	0.000E+00	0.000E+00	2.155E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.155E+01

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
  and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 3.000E+00 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	5.133E-05	5.009E-07	3.748E-10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	5.133E-05	5.009E-07	3.748E-10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	5.970E-13	0.0000	1.114E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.964E-14	0.0000
Pa-231	5.915E-13	0.0000	4.179E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.120E-14	0.0000
Pb-210	5.384E-17	0.0000	5.008E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.221E-15	0.0000
Ra-226	1.572E-12	0.0000	6.783E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.095E-15	0.0000
Th-230	1.101E-13	0.0000	5.810E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.168E-12	0.0000
U-234	6.268E-10	0.0025	8.738E-10	0.0035	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.724E-08	0.0690
U-235	1.834E-08	0.0734	1.081E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.426E-10	0.0010
U-238	1.964E-07	0.7864	5.281E-10	0.0021	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.548E-08	0.0620
Total	2.154E-07	0.8623	1.413E-09	0.0057	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.297E-08	0.1320

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.178E-13	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.669E-13	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.279E-15	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.579E-12	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.336E-12	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.874E-08	0.0750
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.859E-08	0.0744
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.124E-07	0.8505
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.498E-07	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 3.000E+00 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	2.387E-15	4.790E-17	6.005E-20	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	2.387E-15	4.790E-17	6.005E-20	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	6.284E-10	0.0025	8.739E-10	0.0035	2.435E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.724E-08	0.0690
U-235	1.834E-08	0.0734	1.082E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.427E-10	0.0010
U-238	1.964E-07	0.7864	5.281E-10	0.0021	1.130E-20	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.548E-08	0.0620
Total	2.154E-07	0.8623	1.413E-09	0.0057	2.435E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.297E-08	0.1320

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.875E-08	0.0751
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.859E-08	0.0744
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.124E-07	0.8505
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.498E-07	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+01 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Ac-227	2.145E-09	0.000E+00	0.000E+00	0.000E+00	1.232E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.232E-05
Pa-231	1.511E-08	0.000E+00	0.000E+00	0.000E+00	8.679E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.679E-05
Pb-210	9.809E-11	0.000E+00	0.000E+00	0.000E+00	5.635E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.635E-07
Ra-226	1.021E-09	0.000E+00	0.000E+00	0.000E+00	5.863E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.863E-06
Th-230	4.727E-07	0.000E+00	0.000E+00	0.000E+00	2.715E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.715E-03
U-234	5.190E-03	0.000E+00	0.000E+00	0.000E+00	2.981E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.981E+01
U-235	7.142E-05	0.000E+00	0.000E+00	0.000E+00	4.102E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.102E-01
U-238	3.690E-03	0.000E+00	0.000E+00	0.000E+00	2.120E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.120E+01

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 1.000E+01 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	5.641E-04	5.506E-06	4.119E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	5.641E-04	5.506E-06	4.119E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	2.412E-12	0.0000	4.502E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.933E-14	0.0000
Pa-231	1.261E-12	0.0000	8.912E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.518E-13	0.0000
Pb-210	4.361E-16	0.0000	4.057E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.609E-14	0.0000
Ra-226	6.866E-12	0.0000	2.963E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.099E-14	0.0000
Th-230	2.367E-13	0.0000	1.249E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.511E-12	0.0000
U-234	6.165E-10	0.0025	8.596E-10	0.0035	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.696E-08	0.0690
U-235	1.804E-08	0.0734	1.064E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.387E-10	0.0010
U-238	1.932E-07	0.7864	5.195E-10	0.0021	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.523E-08	0.0620
Total	2.119E-07	0.8623	1.390E-09	0.0057	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.243E-08	0.1320

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.496E-12	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.422E-12	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.656E-14	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.897E-12	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.872E-12	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.844E-08	0.0750
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.829E-08	0.0744
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.090E-07	0.8505
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.457E-07	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 1.000E+01 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	1.042E-14	2.091E-16	2.621E-19	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	1.042E-14	2.091E-16	2.621E-19	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	6.236E-10	0.0025	8.597E-10	0.0035	1.063E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.696E-08	0.0690
U-235	1.804E-08	0.0734	1.065E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.389E-10	0.0010
U-238	1.932E-07	0.7864	5.195E-10	0.0021	9.579E-20	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.523E-08	0.0620
Total	2.119E-07	0.8623	1.390E-09	0.0057	1.063E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.243E-08	0.1320

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.845E-08	0.0751
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.829E-08	0.0744
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.090E-07	0.8505
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.457E-07	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 3.000E+01 years

Radio-Nuclide	Water Independent Pathways (Inhalation w/o radon): Inhalation	Plant	Meat	Milk	Soil	Water Dependent Pathways: Water	Fish	Plant	Meat	Milk	Total Ingestion*
Ac-227	1.494E-08	0.000E+00	0.000E+00	0.000E+00	8.582E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.582E-05
Pa-231	4.324E-08	0.000E+00	0.000E+00	0.000E+00	2.484E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.484E-04
Pb-210	2.234E-09	0.000E+00	0.000E+00	0.000E+00	1.283E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.283E-05
Ra-226	8.917E-09	0.000E+00	0.000E+00	0.000E+00	5.122E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.122E-05
Th-230	1.385E-06	0.000E+00	0.000E+00	0.000E+00	7.957E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	7.957E-03
U-234	4.951E-03	0.000E+00	0.000E+00	0.000E+00	2.844E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.844E+01
U-235	6.814E-05	0.000E+00	0.000E+00	0.000E+00	3.914E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.914E-01
U-238	3.521E-03	0.000E+00	0.000E+00	0.000E+00	2.022E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.022E+01

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 3.000E+01 years

Radon Pathway	Radionuclides: Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	4.921E-03	4.803E-05	3.594E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	4.921E-03	4.803E-05	3.594E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground risk	Ground fract.	Inhalation risk	Inhalation fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	Soil risk	Soil fract.
Ac-227	1.194E-11	0.0001	2.228E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.926E-13	0.0000
Pa-231	3.056E-12	0.0000	2.159E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.678E-13	0.0000
Pb-210	5.792E-15	0.0000	5.388E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.465E-13	0.0000
Ra-226	4.233E-11	0.0002	1.827E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.910E-13	0.0000
Th-230	5.870E-13	0.0000	3.097E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.227E-12	0.0000
U-234	5.882E-10	0.0025	8.201E-10	0.0035	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.618E-08	0.0690
U-235	1.721E-08	0.0734	1.015E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.277E-10	0.0010
U-238	1.843E-07	0.7862	4.957E-10	0.0021	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.453E-08	0.0620
Total	2.022E-07	0.8624	1.326E-09	0.0057	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.095E-08	0.1320

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.235E-11	0.0001
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.445E-12	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.528E-13	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.252E-11	0.0002
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.124E-12	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.759E-08	0.0750
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.745E-08	0.0744
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.994E-07	0.8503
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.345E-07	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 3.000E+01 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	6.417E-14	1.287E-15	1.614E-18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	6.417E-14	1.287E-15	1.614E-18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	6.311E-10	0.0027	8.204E-10	0.0035	6.546E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.619E-08	0.0690
U-235	1.723E-08	0.0735	1.019E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.285E-10	0.0010
U-238	1.844E-07	0.7862	4.957E-10	0.0021	1.449E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.453E-08	0.0620
Total	2.022E-07	0.8624	1.326E-09	0.0057	6.546E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.095E-08	0.1320

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.764E-08	0.0752
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.746E-08	0.0745
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.994E-07	0.8503
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.345E-07	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+02 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Ac-227	7.986E-08	0.000E+00	0.000E+00	0.000E+00	4.587E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.587E-04
Pa-231	1.222E-07	0.000E+00	0.000E+00	0.000E+00	7.018E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	7.018E-04
Pb-210	4.977E-08	0.000E+00	0.000E+00	0.000E+00	2.859E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.859E-04
Ra-226	8.937E-08	0.000E+00	0.000E+00	0.000E+00	5.133E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.133E-04
Th-230	4.260E-06	0.000E+00	0.000E+00	0.000E+00	2.447E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.447E-02
U-234	4.200E-03	0.000E+00	0.000E+00	0.000E+00	2.413E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.413E+01
U-235	5.780E-05	0.000E+00	0.000E+00	0.000E+00	3.320E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.320E-01
U-238	2.987E-03	0.000E+00	0.000E+00	0.000E+00	1.716E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.716E+01

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 1.000E+02 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	4.888E-02	4.771E-04	3.569E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	4.888E-02	4.771E-04	3.569E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	5.644E-11	0.0003	1.053E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.856E-12	0.0000
Pa-231	8.085E-12	0.0000	5.712E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.732E-13	0.0000
Pb-210	1.059E-13	0.0000	9.848E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.333E-12	0.0000
Ra-226	3.711E-10	0.0019	1.602E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.675E-12	0.0000
Th-230	1.690E-12	0.0000	8.920E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.793E-11	0.0001
U-234	4.990E-10	0.0025	6.957E-10	0.0035	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.373E-08	0.0689
U-235	1.460E-08	0.0732	8.610E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.932E-10	0.0010
U-238	1.564E-07	0.7846	4.205E-10	0.0021	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.233E-08	0.0618
Total	1.719E-07	0.8625	1.126E-09	0.0056	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.628E-08	0.1318

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.840E-11	0.0003
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.116E-12	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.449E-12	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.728E-10	0.0019
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.052E-11	0.0001
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.492E-08	0.0749
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.480E-08	0.0743
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.691E-07	0.8485
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.993E-07	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 1.000E+02 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	5.576E-13	1.119E-14	1.402E-17	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	5.576E-13	1.119E-14	1.402E-17	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	8.718E-10	0.0044	6.964E-10	0.0035	5.688E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.375E-08	0.0690
U-235	1.466E-08	0.0736	8.773E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.960E-10	0.0010
U-238	1.564E-07	0.7846	4.206E-10	0.0021	3.850E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.233E-08	0.0619
Total	1.719E-07	0.8625	1.126E-09	0.0056	5.688E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.628E-08	0.1318

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.532E-08	0.0769
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.487E-08	0.0746
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.691E-07	0.8485
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.993E-07	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 3.000E+02 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Ac-227	1.866E-07	0.000E+00	0.000E+00	0.000E+00	1.072E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.072E-03
Pa-231	2.286E-07	0.000E+00	0.000E+00	0.000E+00	1.313E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.313E-03
Pb-210	4.910E-07	0.000E+00	0.000E+00	0.000E+00	2.820E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.820E-03
Ra-226	6.036E-07	0.000E+00	0.000E+00	0.000E+00	3.467E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.467E-03
Th-230	1.028E-05	0.000E+00	0.000E+00	0.000E+00	5.903E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.903E-02
U-234	2.625E-03	0.000E+00	0.000E+00	0.000E+00	1.508E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.508E+01
U-235	3.613E-05	0.000E+00	0.000E+00	0.000E+00	2.075E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.075E-01
U-238	1.867E-03	0.000E+00	0.000E+00	0.000E+00	1.072E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.072E+01

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
  and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 3.000E+02 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	3.237E-01	3.159E-03	2.364E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	3.237E-01	3.159E-03	2.364E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	1.282E-10	0.0010	2.393E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.216E-12	0.0000
Pa-231	1.483E-11	0.0001	1.048E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.786E-12	0.0000
Pb-210	9.914E-13	0.0000	9.223E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.931E-11	0.0005
Ra-226	2.410E-09	0.0190	1.040E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.088E-11	0.0001
Th-230	4.000E-12	0.0000	2.111E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.243E-11	0.0003
U-234	3.118E-10	0.0025	4.347E-10	0.0034	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.578E-09	0.0676
U-235	9.125E-09	0.0719	5.381E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.207E-10	0.0010
U-238	9.774E-08	0.7698	2.628E-10	0.0021	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.704E-09	0.0607
Total	1.097E-07	0.8643	7.055E-10	0.0056	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.652E-08	0.1301

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.326E-10	0.0010
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.672E-11	0.0001
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.039E-11	0.0005
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.421E-09	0.0191
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.854E-11	0.0004
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.324E-09	0.0734
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.251E-09	0.0729
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.057E-07	0.8326
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.270E-07	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 3.000E+02 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	3.550E-12	7.122E-14	8.928E-17	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	3.550E-12	7.122E-14	8.928E-17	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	2.727E-09	0.0215	4.367E-10	0.0034	3.621E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.685E-09	0.0684
U-235	9.268E-09	0.0730	5.725E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.267E-10	0.0010
U-238	9.774E-08	0.7698	2.631E-10	0.0021	6.881E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.710E-09	0.0607
Total	1.097E-07	0.8643	7.055E-10	0.0056	3.621E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.652E-08	0.1301

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.185E-08	0.0933
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.400E-09	0.0740
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.057E-07	0.8326
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.270E-07	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+03 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Ac-227	1.279E-07	0.000E+00	0.000E+00	0.000E+00	7.344E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	7.344E-04
Pa-231	1.460E-07	0.000E+00	0.000E+00	0.000E+00	8.384E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.384E-04
Pb-210	2.537E-06	0.000E+00	0.000E+00	0.000E+00	1.457E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.457E-02
Ra-226	2.704E-06	0.000E+00	0.000E+00	0.000E+00	1.553E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.553E-02
Th-230	1.827E-05	0.000E+00	0.000E+00	0.000E+00	1.049E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.049E-01
U-234	5.062E-04	0.000E+00	0.000E+00	0.000E+00	2.908E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.908E+00
U-235	6.972E-06	0.000E+00	0.000E+00	0.000E+00	4.005E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.005E-02
U-238	3.602E-04	0.000E+00	0.000E+00	0.000E+00	2.069E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.069E+00

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 1.000E+03 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	1.193E+00	1.164E-02	8.710E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	1.193E+00	1.164E-02	8.710E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	8.713E-11	0.0025	1.626E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.866E-12	0.0001
Pa-231	9.407E-12	0.0003	6.646E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.132E-12	0.0000
Pb-210	5.046E-12	0.0001	4.694E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.019E-10	0.0086
Ra-226	1.066E-08	0.3029	4.598E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.809E-11	0.0014
Th-230	7.068E-12	0.0002	3.730E-12	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.498E-11	0.0021
U-234	6.014E-11	0.0017	8.384E-11	0.0024	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.654E-09	0.0470
U-235	1.761E-09	0.0501	1.038E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.330E-11	0.0007
U-238	1.886E-08	0.5361	5.071E-11	0.0014	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.487E-09	0.0423
Total	3.145E-08	0.8939	1.405E-10	0.0040	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.593E-09	0.1021

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.016E-11	0.0026
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.061E-11	0.0003
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.074E-10	0.0087
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.070E-08	0.3043
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.578E-11	0.0024
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.798E-09	0.0511
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.785E-09	0.0507
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.040E-08	0.5798
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.518E-08	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 1.000E+03 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	1.289E-11	2.587E-13	3.243E-16	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	1.289E-11	2.587E-13	3.243E-16	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	1.072E-08	0.3047	8.833E-11	0.0025	1.315E-11	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.076E-09	0.0590
U-235	1.858E-09	0.0528	1.268E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.729E-11	0.0008
U-238	1.887E-08	0.5361	5.089E-11	0.0014	6.859E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.490E-09	0.0423
Total	3.145E-08	0.8935	1.405E-10	0.0040	1.315E-11	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.593E-09	0.1021

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.290E-08	0.3665
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.886E-09	0.0536
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.041E-08	0.5799
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.519E-08	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Table of Contents

Part III: Intake Quantities and Health Risk Factors

Cancer Risk Slope Factors Summary Table
Risk Library: FGR 13 Morbidity

Menu	Parameter	Current Value	Base Case*	Parameter Name
Sf-1	Ground external radiation slope factors, 1/yr per (pCi/g):			
Sf-1	Ac-227+D	1.47E-06	3.48E-10	SLPF(1,1)
Sf-1	Pa-231	1.39E-07	1.39E-07	SLPF(2,1)
Sf-1	Pb-210+D	4.21E-09	1.41E-09	SLPF(3,1)
Sf-1	Ra-226+D	8.49E-06	2.29E-08	SLPF(4,1)
Sf-1	Th-230	8.19E-10	8.19E-10	SLPF(5,1)
Sf-1	U-234	2.52E-10	2.52E-10	SLPF(6,1)
Sf-1	U-235+D	5.43E-07	5.18E-07	SLPF(7,1)
Sf-1	U-238	4.99E-11	4.99E-11	SLPF(8,1)
Sf-1	U-238+D	1.14E-07	4.99E-11	SLPF(9,1)
Sf-2	Inhalation, slope factors, 1/(pCi):			
Sf-2	Ac-227+D	2.13E-07	1.49E-07	SLPF(1,2)
Sf-2	Pa-231	7.62E-08	7.62E-08	SLPF(2,2)
Sf-2	Pb-210+D	3.08E-08	1.58E-08	SLPF(3,2)
Sf-2	Ra-226+D	2.83E-08	2.82E-08	SLPF(4,2)
Sf-2	Th-230	3.40E-08	3.40E-08	SLPF(5,2)
Sf-2	U-234	2.78E-08	2.78E-08	SLPF(6,2)
Sf-2	U-235+D	2.50E-08	2.50E-08	SLPF(7,2)
Sf-2	U-238	2.36E-08	2.36E-08	SLPF(8,2)
Sf-2	U-238+D	2.36E-08	2.36E-08	SLPF(9,2)
Sf-3	Food ingestion, slope factors, 1/(pCi):			
Sf-3	Ac-227+D	6.53E-10	2.45E-10	SLPF(1,3)
Sf-3	Pa-231	2.26E-10	2.26E-10	SLPF(2,3)
Sf-3	Pb-210+D	3.44E-09	1.18E-09	SLPF(3,3)
Sf-3	Ra-226+D	5.15E-10	5.14E-10	SLPF(4,3)
Sf-3	Th-230	1.19E-10	1.19E-10	SLPF(5,3)
Sf-3	U-234	9.55E-11	9.55E-11	SLPF(6,3)
Sf-3	U-235+D	9.76E-11	9.44E-11	SLPF(7,3)
Sf-3	U-238	8.66E-11	8.66E-11	SLPF(8,3)
Sf-3	U-238+D	1.21E-10	8.66E-11	SLPF(9,3)
Sf-3	Water ingestion, slope factors, 1/(pCi):			
Sf-3	Ac-227+D	4.86E-10	2.01E-10	SLPF(1,4)
Sf-3	Pa-231	1.73E-10	1.73E-10	SLPF(2,4)
Sf-3	Pb-210+D	2.66E-09	8.81E-10	SLPF(3,4)
Sf-3	Ra-226+D	3.86E-10	3.85E-10	SLPF(4,4)
Sf-3	Th-230	9.10E-11	9.10E-11	SLPF(5,4)
Sf-3	U-234	7.07E-11	7.07E-11	SLPF(6,4)
Sf-3	U-235+D	7.18E-11	6.96E-11	SLPF(7,4)
Sf-3	U-238	6.40E-11	6.40E-11	SLPF(8,4)
Sf-3	U-238+D	8.71E-11	6.40E-11	SLPF(9,4)
Sf-3	Soil ingestion, slope factors, 1/(pCi):			
Sf-3	Ac-227+D	6.53E-10	2.45E-10	SLPF(1,5)
Sf-3	Pa-231	2.26E-10	2.26E-10	SLPF(2,5)
Sf-3	Pb-210+D	3.44E-09	1.18E-09	SLPF(3,5)
Sf-3	Ra-226+D	5.15E-10	5.14E-10	SLPF(4,5)
Sf-3	Th-230	1.19E-10	1.19E-10	SLPF(5,5)
Sf-3	U-234	9.55E-11	9.55E-11	SLPF(6,5)

RESRAD
ADULT COMMUTER

Uranium Soils Investigation
Baseline Human Health Risk Assessment
Saddle Road
October 2009

Cancer Risk Slope Factors Summary Table (continued)

Risk Library: FGR 13 Morbidity

Menu	Parameter	Current Value	Base Case*	Parameter Name
Sf-3	U-235+D	9.76E-11	9.44E-11	SLPF(7,5)
Sf-3	U-238	8.66E-11	8.66E-11	SLPF(8,5)
Sf-3	U-238+D	1.21E-10	8.66E-11	SLPF(9,5)
Sf-Rn	Radon Inhalation slope factors, 1/(pCi):			
Sf-Rn	Rn-222	1.80E-12	1.80E-12	SLPFRN(1,1)
Sf-Rn	Po-218	3.70E-12	3.70E-12	SLPFRN(1,2)
Sf-Rn	Pb-214	6.20E-12	6.20E-12	SLPFRN(1,3)
Sf-Rn	Bi-214	1.50E-11	1.50E-11	SLPFRN(1,4)
Sf-Rn	Radon K factors, (mrem/WLM):			
Sf-Rn	Rn-222 Indoor	7.60E+02	7.60E+02	KFACTR(1,1)
Sf-Rn	Rn-222 Outdoor	5.70E+02	5.70E+02	KFACTR(1,2)

*Base Case means Default.Lib w/o Associate Nuclide contributions.

Risk Slope and Environmental Transport Factors for the Ground Pathway

Nuclide	Slope(i)*	ETFG(i,t) At Time in Years (dimensionless)							
(i)	t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227	3.480E-10	9.567E-01	9.567E-01	9.567E-01	9.567E-01	9.567E-01	9.567E-01	9.567E-01	9.567E-01
At-218	3.570E-09	9.702E-01	9.702E-01	9.702E-01	9.702E-01	9.702E-01	9.702E-01	9.702E-01	9.702E-01
Bi-210	2.760E-09	9.450E-01	9.450E-01	9.450E-01	9.450E-01	9.450E-01	9.450E-01	9.450E-01	9.450E-01
Bi-211	1.880E-07	9.453E-01	9.453E-01	9.453E-01	9.453E-01	9.453E-01	9.453E-01	9.453E-01	9.453E-01
Bi-214	7.480E-06	9.401E-01	9.401E-01	9.401E-01	9.401E-01	9.401E-01	9.401E-01	9.401E-01	9.400E-01
Fr-223	1.400E-07	9.502E-01	9.502E-01	9.502E-01	9.502E-01	9.502E-01	9.502E-01	9.502E-01	9.502E-01
Pa-231	1.390E-07	9.456E-01	9.456E-01	9.456E-01	9.456E-01	9.456E-01	9.456E-01	9.456E-01	9.456E-01
Pa-234	8.710E-06	9.400E-01	9.400E-01	9.400E-01	9.400E-01	9.400E-01	9.400E-01	9.400E-01	9.400E-01
Pa-234m	6.870E-08	9.393E-01	9.393E-01	9.393E-01	9.393E-01	9.393E-01	9.393E-01	9.393E-01	9.393E-01
Pb-210	1.410E-09	9.813E-01	9.813E-01	9.813E-01	9.813E-01	9.813E-01	9.813E-01	9.813E-01	9.813E-01
Pb-211	2.290E-07	9.399E-01	9.399E-01	9.399E-01	9.399E-01	9.399E-01	9.399E-01	9.399E-01	9.399E-01
Pb-214	9.820E-07	9.456E-01	9.456E-01	9.456E-01	9.456E-01	9.456E-01	9.456E-01	9.456E-01	9.456E-01
Po-210	3.950E-11	9.390E-01	9.390E-01	9.390E-01	9.390E-01	9.390E-01	9.390E-01	9.390E-01	9.390E-01
Po-211	3.580E-08	9.360E-01	9.360E-01	9.360E-01	9.360E-01	9.360E-01	9.360E-01	9.360E-01	9.360E-01
Po-214	3.860E-10	9.360E-01	9.360E-01	9.360E-01	9.360E-01	9.360E-01	9.360E-01	9.360E-01	9.360E-01
Po-215	7.480E-10	9.410E-01	9.410E-01	9.410E-01	9.410E-01	9.410E-01	9.410E-01	9.410E-01	9.410E-01
Po-218	4.260E-11	9.390E-01	9.390E-01	9.390E-01	9.390E-01	9.390E-01	9.390E-01	9.390E-01	9.390E-01
Ra-223	4.340E-07	9.496E-01	9.496E-01	9.496E-01	9.496E-01	9.496E-01	9.496E-01	9.496E-01	9.496E-01
Ra-226	2.290E-08	9.524E-01	9.524E-01	9.524E-01	9.524E-01	9.524E-01	9.524E-01	9.524E-01	9.524E-01
Rn-219	2.250E-07	9.461E-01	9.461E-01	9.461E-01	9.461E-01	9.461E-01	9.461E-01	9.461E-01	9.461E-01
Rn-222	1.740E-09	9.370E-01	9.370E-01	9.370E-01	9.370E-01	9.370E-01	9.370E-01	9.370E-01	9.370E-01
Th-227	3.780E-07	9.508E-01	9.508E-01	9.508E-01	9.508E-01	9.508E-01	9.508E-01	9.508E-01	9.508E-01
Th-230	8.190E-10	9.588E-01	9.588E-01	9.588E-01	9.588E-01	9.588E-01	9.588E-01	9.588E-01	9.588E-01
Th-231	2.450E-08	9.599E-01	9.599E-01	9.599E-01	9.599E-01	9.599E-01	9.599E-01	9.599E-01	9.599E-01
Th-234	1.630E-08	9.610E-01	9.610E-01	9.610E-01	9.610E-01	9.610E-01	9.610E-01	9.610E-01	9.610E-01
Tl-207	1.520E-08	9.403E-01	9.403E-01	9.403E-01	9.403E-01	9.403E-01	9.403E-01	9.403E-01	9.403E-01
Tl-210	0.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
U-234	2.520E-10	9.643E-01	9.643E-01	9.643E-01	9.643E-01	9.643E-01	9.643E-01	9.643E-01	9.643E-01
U-235	5.180E-07	9.520E-01	9.520E-01	9.520E-01	9.520E-01	9.520E-01	9.520E-01	9.520E-01	9.520E-01
U-238	4.990E-11	9.912E-01	9.912E-01	9.912E-01	9.912E-01	9.912E-01	9.912E-01	9.912E-01	9.912E-01

* - Units are 1/yr per (pCi/g) at infinite depth and area. Multiplication by ETFG(i,t) converts to site conditions.

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 0.000E+00 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Ac-227	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pa-231	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-230	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-234	1.063E-02	0.000E+00	0.000E+00	0.000E+00	1.526E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.526E+01
U-235	1.462E-04	0.000E+00	0.000E+00	0.000E+00	2.100E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.100E-01
U-238	7.556E-03	0.000E+00	0.000E+00	0.000E+00	1.085E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.085E+01

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 0.000E+00 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	1.017E-11	0.0000	3.797E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.672E-13	0.0000
Pa-231	4.628E-12	0.0000	6.539E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.785E-13	0.0000
Pb-210	2.485E-15	0.0000	4.624E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.434E-14	0.0000
Ra-226	3.045E-11	0.0000	2.628E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.871E-14	0.0000
Th-230	8.710E-13	0.0000	9.192E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.620E-12	0.0000
U-234	2.472E-09	0.0027	6.894E-09	0.0074	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.401E-08	0.0367
U-235	7.234E-08	0.0781	8.532E-11	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.785E-10	0.0005
U-238	7.748E-07	0.8369	4.166E-09	0.0045	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.054E-08	0.0330
Total	8.497E-07	0.9177	1.115E-08	0.0120	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.503E-08	0.0702

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.037E-11	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.972E-12	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.729E-14	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.052E-11	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.410E-12	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.337E-08	0.0468
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.290E-08	0.0787
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.095E-07	0.8744
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.258E-07	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 0.000E+00 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	9.242E-14	1.854E-15	2.325E-18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	9.242E-14	1.854E-15	2.325E-18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	2.504E-09	0.0027	6.894E-09	0.0074	9.428E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.401E-08	0.0367
U-235	7.235E-08	0.0781	8.542E-11	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.789E-10	0.0005
U-238	7.748E-07	0.8369	4.167E-09	0.0045	1.133E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.054E-08	0.0330
Total	8.497E-07	0.9177	1.115E-08	0.0120	9.428E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.503E-08	0.0702

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.341E-08	0.0469
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.292E-08	0.0788
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.095E-07	0.8744
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.258E-07	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+00 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Ac-227	4.856E-11	0.000E+00	0.000E+00	0.000E+00	6.974E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.974E-08
Pa-231	3.087E-09	0.000E+00	0.000E+00	0.000E+00	4.433E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.433E-06
Pb-210	2.127E-13	0.000E+00	0.000E+00	0.000E+00	3.055E-10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.055E-10
Ra-226	2.069E-11	0.000E+00	0.000E+00	0.000E+00	2.971E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.971E-08
Th-230	9.555E-08	0.000E+00	0.000E+00	0.000E+00	1.372E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.372E-04
U-234	1.060E-02	0.000E+00	0.000E+00	0.000E+00	1.522E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.522E+01
U-235	1.459E-04	0.000E+00	0.000E+00	0.000E+00	2.095E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.095E-01
U-238	7.538E-03	0.000E+00	0.000E+00	0.000E+00	1.082E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.082E+01

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 1.000E+00 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	1.144E-05	1.117E-07	8.354E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	1.144E-05	1.117E-07	8.354E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	1.139E-11	0.0000	4.250E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.872E-13	0.0000
Pa-231	5.005E-12	0.0000	7.073E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.012E-13	0.0000
Pb-210	2.907E-15	0.0000	5.408E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.694E-14	0.0000
Ra-226	3.438E-11	0.0000	2.967E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.757E-14	0.0000
Th-230	9.429E-13	0.0000	9.950E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.001E-12	0.0000
U-234	2.466E-09	0.0027	6.877E-09	0.0074	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.393E-08	0.0367
U-235	7.217E-08	0.0781	8.512E-11	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.774E-10	0.0005
U-238	7.730E-07	0.8369	4.157E-09	0.0045	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.047E-08	0.0330
Total	8.477E-07	0.9177	1.112E-08	0.0120	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.488E-08	0.0702

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.161E-11	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.377E-12	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.038E-14	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.446E-11	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.939E-12	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.327E-08	0.0468
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.273E-08	0.0787
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.076E-07	0.8743
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.237E-07	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 1.000E+00 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	1.043E-13	2.093E-15	2.624E-18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	1.043E-13	2.093E-15	2.624E-18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	2.502E-09	0.0027	6.878E-09	0.0074	1.064E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.393E-08	0.0367
U-235	7.218E-08	0.0781	8.523E-11	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.778E-10	0.0005
U-238	7.730E-07	0.8369	4.157E-09	0.0045	1.332E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.047E-08	0.0330
Total	8.477E-07	0.9177	1.112E-08	0.0120	1.064E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.488E-08	0.0702

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.331E-08	0.0469
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.275E-08	0.0788
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.076E-07	0.8744
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.237E-07	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 3.000E+00 years

Radio-Nuclide	Water Independent Pathways (Inhalation w/o radon): Inhalation	Plant	Meat	Milk	Soil	Water Dependent Pathways: Water	Fish	Plant	Meat	Milk	Total Ingestion*
Ac-227	4.250E-10	0.000E+00	0.000E+00	0.000E+00	6.103E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.103E-07
Pa-231	9.217E-09	0.000E+00	0.000E+00	0.000E+00	1.324E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.324E-05
Pb-210	5.640E-12	0.000E+00	0.000E+00	0.000E+00	8.099E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.099E-09
Ra-226	1.857E-10	0.000E+00	0.000E+00	0.000E+00	2.666E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.666E-07
Th-230	2.860E-07	0.000E+00	0.000E+00	0.000E+00	4.107E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.107E-04
U-234	1.055E-02	0.000E+00	0.000E+00	0.000E+00	1.515E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.515E+01
U-235	1.452E-04	0.000E+00	0.000E+00	0.000E+00	2.085E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.085E-01
U-238	7.502E-03	0.000E+00	0.000E+00	0.000E+00	1.077E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.077E+01

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 3.000E+00 years

Radon Pathway	Radionuclides: Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	1.027E-04	1.002E-06	7.496E-10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	1.027E-04	1.002E-06	7.496E-10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground risk	Ground fract.	Inhalation risk	Inhalation fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	Soil risk	Soil fract.
Ac-227	1.405E-11	0.0000	5.245E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.311E-13	0.0000
Pa-231	5.755E-12	0.0000	8.132E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.463E-13	0.0000
Pb-210	3.901E-15	0.0000	7.258E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.167E-13	0.0000
Ra-226	4.315E-11	0.0000	3.724E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.737E-14	0.0000
Th-230	1.086E-12	0.0000	1.146E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.760E-12	0.0000
U-234	2.455E-09	0.0027	6.845E-09	0.0074	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.377E-08	0.0367
U-235	7.183E-08	0.0781	8.472E-11	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.751E-10	0.0005
U-238	7.694E-07	0.8369	4.137E-09	0.0045	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.032E-08	0.0330
Total	8.437E-07	0.9177	1.107E-08	0.0120	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.457E-08	0.0702

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.433E-11	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.182E-12	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.213E-13	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.325E-11	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.992E-12	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.307E-08	0.0468
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.239E-08	0.0787
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.038E-07	0.8743
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.193E-07	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 3.000E+00 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	1.310E-13	2.627E-15	3.294E-18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	1.310E-13	2.627E-15	3.294E-18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent Water-dep. == Water-dependent

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	2.499E-09	0.0027	6.846E-09	0.0074	1.336E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.377E-08	0.0367
U-235	7.185E-08	0.0782	8.485E-11	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.757E-10	0.0005
U-238	7.694E-07	0.8369	4.137E-09	0.0045	1.807E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.032E-08	0.0330
Total	8.437E-07	0.9177	1.107E-08	0.0120	1.336E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.457E-08	0.0702

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.312E-08	0.0469
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.241E-08	0.0788
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.038E-07	0.8743
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.193E-07	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+01 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Ac-227	4.291E-09	0.000E+00	0.000E+00	0.000E+00	6.161E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.161E-06
Pa-231	3.022E-08	0.000E+00	0.000E+00	0.000E+00	4.340E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.340E-05
Pb-210	1.962E-10	0.000E+00	0.000E+00	0.000E+00	2.817E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.817E-07
Ra-226	2.041E-09	0.000E+00	0.000E+00	0.000E+00	2.932E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.932E-06
Th-230	9.454E-07	0.000E+00	0.000E+00	0.000E+00	1.358E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.358E-03
U-234	1.038E-02	0.000E+00	0.000E+00	0.000E+00	1.491E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.491E+01
U-235	1.428E-04	0.000E+00	0.000E+00	0.000E+00	2.051E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.051E-01
U-238	7.380E-03	0.000E+00	0.000E+00	0.000E+00	1.060E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.060E+01

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 1.000E+01 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	1.128E-03	1.101E-05	8.238E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	1.128E-03	1.101E-05	8.238E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	2.550E-11	0.0000	9.521E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.194E-13	0.0000
Pa-231	8.322E-12	0.0000	1.176E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.008E-13	0.0000
Pb-210	9.284E-15	0.0000	1.727E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.777E-13	0.0000
Ra-226	8.338E-11	0.0001	7.196E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.882E-13	0.0000
Th-230	1.582E-12	0.0000	1.669E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.390E-12	0.0000
U-234	2.415E-09	0.0027	6.733E-09	0.0074	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.322E-08	0.0367
U-235	7.066E-08	0.0781	8.334E-11	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.674E-10	0.0005
U-238	7.568E-07	0.8368	4.070E-09	0.0045	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.983E-08	0.0330
Total	8.300E-07	0.9177	1.089E-08	0.0120	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.352E-08	0.0702

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.602E-11	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.941E-12	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.887E-13	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.358E-11	0.0001
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.164E-11	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.237E-08	0.0468
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.121E-08	0.0787
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.907E-07	0.8743
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.044E-07	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 1.000E+01 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	2.529E-13	5.074E-15	6.362E-18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	2.529E-13	5.074E-15	6.362E-18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent Water-dep. == Water-dependent

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	2.500E-09	0.0028	6.735E-09	0.0074	2.580E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.322E-08	0.0367
U-235	7.069E-08	0.0782	8.355E-11	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.683E-10	0.0005
U-238	7.568E-07	0.8368	4.070E-09	0.0045	4.466E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.983E-08	0.0330
Total	8.300E-07	0.9177	1.089E-08	0.0120	2.580E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.352E-08	0.0702

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.246E-08	0.0469
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.124E-08	0.0788
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.907E-07	0.8743
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.044E-07	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 3.000E+01 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Ac-227	2.988E-08	0.000E+00	0.000E+00	0.000E+00	4.291E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.291E-05
Pa-231	8.648E-08	0.000E+00	0.000E+00	0.000E+00	1.242E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.242E-04
Pb-210	4.468E-09	0.000E+00	0.000E+00	0.000E+00	6.416E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.416E-06
Ra-226	1.783E-08	0.000E+00	0.000E+00	0.000E+00	2.561E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.561E-05
Th-230	2.770E-06	0.000E+00	0.000E+00	0.000E+00	3.978E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.978E-03
U-234	9.903E-03	0.000E+00	0.000E+00	0.000E+00	1.422E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.422E+01
U-235	1.363E-04	0.000E+00	0.000E+00	0.000E+00	1.957E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.957E-01
U-238	7.041E-03	0.000E+00	0.000E+00	0.000E+00	1.011E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.011E+01

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 3.000E+01 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	9.843E-03	9.606E-05	7.187E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	9.843E-03	9.606E-05	7.187E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	6.989E-11	0.0001	2.609E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.149E-12	0.0000
Pa-231	1.519E-11	0.0000	2.147E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.143E-13	0.0000
Pb-210	4.669E-14	0.0000	8.686E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.396E-12	0.0000
Ra-226	2.764E-10	0.0003	2.386E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.238E-13	0.0000
Th-230	2.954E-12	0.0000	3.117E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.567E-11	0.0000
U-234	2.304E-09	0.0027	6.424E-09	0.0074	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.169E-08	0.0367
U-235	6.741E-08	0.0781	7.951E-11	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.459E-10	0.0005
U-238	7.221E-07	0.8365	3.883E-09	0.0045	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.846E-08	0.0330
Total	7.921E-07	0.9177	1.039E-08	0.0120	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.062E-08	0.0702

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.130E-11	0.0001
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.632E-11	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.452E-12	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.771E-10	0.0003
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.174E-11	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.042E-08	0.0468
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.794E-08	0.0787
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.544E-07	0.8740
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.631E-07	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 3.000E+01 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	8.370E-13	1.679E-14	2.105E-17	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	8.370E-13	1.679E-14	2.105E-17	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	2.583E-09	0.0030	6.427E-09	0.0074	8.538E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.171E-08	0.0367
U-235	6.750E-08	0.0782	7.999E-11	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.480E-10	0.0005
U-238	7.221E-07	0.8365	3.883E-09	0.0045	2.508E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.846E-08	0.0330
Total	7.921E-07	0.9177	1.039E-08	0.0120	8.538E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.062E-08	0.0702

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.072E-08	0.0472
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.803E-08	0.0788
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.544E-07	0.8740
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.631E-07	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+02 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Ac-227	1.597E-07	0.000E+00	0.000E+00	0.000E+00	2.294E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.294E-04
Pa-231	2.443E-07	0.000E+00	0.000E+00	0.000E+00	3.509E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.509E-04
Pb-210	9.954E-08	0.000E+00	0.000E+00	0.000E+00	1.429E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.429E-04
Ra-226	1.787E-07	0.000E+00	0.000E+00	0.000E+00	2.567E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.567E-04
Th-230	8.520E-06	0.000E+00	0.000E+00	0.000E+00	1.223E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.223E-02
U-234	8.400E-03	0.000E+00	0.000E+00	0.000E+00	1.206E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.206E+01
U-235	1.156E-04	0.000E+00	0.000E+00	0.000E+00	1.660E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.660E-01
U-238	5.973E-03	0.000E+00	0.000E+00	0.000E+00	8.578E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.578E+00

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 1.000E+02 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	9.776E-02	9.541E-04	7.139E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	9.776E-02	9.541E-04	7.139E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	2.465E-10	0.0003	9.204E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.055E-12	0.0000
Pa-231	3.440E-11	0.0000	4.861E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.070E-12	0.0000
Pb-210	5.167E-13	0.0000	9.614E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.546E-11	0.0000
Ra-226	1.737E-09	0.0024	1.499E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.919E-12	0.0000
Th-230	7.275E-12	0.0000	7.678E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.859E-11	0.0001
U-234	1.954E-09	0.0027	5.449E-09	0.0074	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.688E-08	0.0366
U-235	5.719E-08	0.0779	6.745E-11	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.783E-10	0.0005
U-238	6.125E-07	0.8345	3.294E-09	0.0045	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.414E-08	0.0329
Total	6.737E-07	0.9179	8.820E-09	0.0120	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.147E-08	0.0701

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.515E-10	0.0003
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.696E-11	0.0001
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.607E-11	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.741E-09	0.0024
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.354E-11	0.0001
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.429E-08	0.0467
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.763E-08	0.0785
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.400E-07	0.8719
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.340E-07	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 1.000E+02 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	5.214E-12	1.046E-13	1.311E-16	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	5.214E-12	1.046E-13	1.311E-16	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent Water-dep. == Water-dependent

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	3.698E-09	0.0050	5.456E-09	0.0074	5.318E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.693E-08	0.0367
U-235	5.747E-08	0.0783	6.886E-11	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.844E-10	0.0005
U-238	6.125E-07	0.8345	3.295E-09	0.0045	3.931E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.415E-08	0.0329
Total	6.737E-07	0.9179	8.820E-09	0.0120	5.319E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.147E-08	0.0701

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.609E-08	0.0492
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.792E-08	0.0789
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.400E-07	0.8719
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.340E-07	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 3.000E+02 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Ac-227	3.732E-07	0.000E+00	0.000E+00	0.000E+00	5.360E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.360E-04
Pa-231	4.572E-07	0.000E+00	0.000E+00	0.000E+00	6.565E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.565E-04
Pb-210	9.820E-07	0.000E+00	0.000E+00	0.000E+00	1.410E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.410E-03
Ra-226	1.207E-06	0.000E+00	0.000E+00	0.000E+00	1.734E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.734E-03
Th-230	2.055E-05	0.000E+00	0.000E+00	0.000E+00	2.951E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.951E-02
U-234	5.249E-03	0.000E+00	0.000E+00	0.000E+00	7.538E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	7.538E+00
U-235	7.225E-05	0.000E+00	0.000E+00	0.000E+00	1.038E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.038E-01
U-238	3.733E-03	0.000E+00	0.000E+00	0.000E+00	5.361E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.361E+00

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 3.000E+02 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	6.474E-01	6.318E-03	4.727E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	6.474E-01	6.318E-03	4.727E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	5.183E-10	0.0011	1.935E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.523E-12	0.0000
Pa-231	5.980E-11	0.0001	8.450E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.599E-12	0.0000
Pb-210	4.177E-12	0.0000	7.772E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.249E-10	0.0003
Ra-226	1.010E-08	0.0216	8.713E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.278E-11	0.0000
Th-230	1.632E-11	0.0000	1.722E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.656E-11	0.0002
U-234	1.221E-09	0.0026	3.405E-09	0.0073	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.680E-08	0.0359
U-235	3.574E-08	0.0763	4.215E-11	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.364E-10	0.0005
U-238	3.828E-07	0.8173	2.059E-09	0.0044	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.509E-08	0.0322
Total	4.305E-07	0.9191	5.528E-09	0.0118	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.237E-08	0.0691

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

Water Dependent Pathways

Radio- Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All Pathways** risk	All Pathways** fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.287E-10	0.0011
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.425E-11	0.0001
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.299E-10	0.0003
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.012E-08	0.0216
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.201E-10	0.0003
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.142E-08	0.0457
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.602E-08	0.0769
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.000E-07	0.8539
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.684E-07	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 3.000E+02 years

Radon Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	2.970E-11	5.959E-13	7.471E-16	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	2.970E-11	5.959E-13	7.471E-16	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio- Nuclide	Ground risk	Ground fract.	Inhalation risk	Inhalation fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	Soil risk	Soil fract.
U-234	1.133E-08	0.0242	3.422E-09	0.0073	3.029E-11	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.702E-08	0.0363
U-235	3.632E-08	0.0775	4.493E-11	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.485E-10	0.0005
U-238	3.828E-07	0.8173	2.061E-09	0.0044	5.919E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.510E-08	0.0322
Total	4.305E-07	0.9190	5.528E-09	0.0118	3.030E-11	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.237E-08	0.0691

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.181E-08	0.0679
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.661E-08	0.0782
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.000E-07	0.8539
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.684E-07	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+03 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Ac-227	2.557E-07	0.000E+00	0.000E+00	0.000E+00	3.672E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.672E-04
Pa-231	2.919E-07	0.000E+00	0.000E+00	0.000E+00	4.192E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.192E-04
Pb-210	5.074E-06	0.000E+00	0.000E+00	0.000E+00	7.287E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	7.287E-03
Ra-226	5.408E-06	0.000E+00	0.000E+00	0.000E+00	7.767E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	7.767E-03
Th-230	3.654E-05	0.000E+00	0.000E+00	0.000E+00	5.247E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.247E-02
U-234	1.012E-03	0.000E+00	0.000E+00	0.000E+00	1.454E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.454E+00
U-235	1.394E-05	0.000E+00	0.000E+00	0.000E+00	2.002E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.002E-02
U-238	7.204E-04	0.000E+00	0.000E+00	0.000E+00	1.035E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.035E+00

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 1.000E+03 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	2.386E+00	2.328E-02	1.742E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	2.386E+00	2.328E-02	1.742E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent   Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	3.444E-10	0.0026	1.286E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.663E-12	0.0000
Pa-231	3.717E-11	0.0003	5.252E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.237E-12	0.0000
Pb-210	2.034E-11	0.0002	3.784E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.084E-10	0.0046
Ra-226	4.293E-08	0.3239	3.705E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.688E-11	0.0007
Th-230	2.833E-11	0.0002	2.990E-11	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.503E-10	0.0011
U-234	2.355E-10	0.0018	6.568E-10	0.0050	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.240E-09	0.0244
U-235	6.897E-09	0.0520	8.135E-12	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.562E-11	0.0003
U-238	7.388E-08	0.5574	3.973E-10	0.0030	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.912E-09	0.0220
Total	1.244E-07	0.9384	1.101E-09	0.0083	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.061E-09	0.0533

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.513E-10	0.0027
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.993E-11	0.0003
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.325E-10	0.0048
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.303E-08	0.3247
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.085E-10	0.0016
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.132E-09	0.0312
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.951E-09	0.0524
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.719E-08	0.5824
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.325E-07	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 1.000E+03 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	1.034E-10	2.074E-12	2.600E-15	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	1.034E-10	2.074E-12	2.600E-15	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent Water-dep. == Water-dependent

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	4.319E-08	0.3256	6.928E-10	0.0052	1.054E-10	0.0008	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.088E-09	0.0308
U-235	7.279E-09	0.0549	9.946E-12	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.352E-11	0.0004
U-238	7.390E-08	0.5572	3.986E-10	0.0030	5.535E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.919E-09	0.0220
Total	1.244E-07	0.9377	1.101E-09	0.0083	1.055E-10	0.0008	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.061E-09	0.0532

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.808E-08	0.3625
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.342E-09	0.0554
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.722E-08	0.5822
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.326E-07	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

SADDLE ROAD (STATE ROUTE 200)
Mamalahoa Highway (State Route 190) to Milepost 41
County of Hawai‘i, State of Hawai‘i
FHWA Project No. 200(00)

SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

Submitted Pursuant to Section 42 U.S.C. 4332(2)(c)
and Chapter 343, Hawai‘i Revised Statutes by the

U.S. DEPARTMENT OF TRANSPORTATION
Federal Highway Administration (FHWA)
Central Federal Lands Highway Division
and
STATE OF HAWAI‘I
Department of Transportation (HDOT)
Highways Division

Cooperating Agencies
U.S. Army Garrison, Hawai‘i

Appendix F1
Archaeological Report

[This page intentionally left blank]

SCS Project Number 885-1.3

AN ARCHAEOLOGICAL INVENTORY SURVEY REPORT FOR 600 ACRES LOCATED ON LANDS OF KE‘ĀMUKU, WAIKŌLOA AHUPUA‘A, SOUTH KOHALA DISTRICT, HAWAI‘I ISLAND, HAWAI‘I [TMK (3) 6-7-001:09]

Prepared by:
Glenn G. Escott, M.A.

and

Suzan Keris, B.A.

October 2009
FINAL DRAFT

Prepared for:
DMT Consultant Engineers
677 Ala Moana Blvd., Suite 703
Honolulu, HI 96813

SCIENTIFIC CONSULTANT SERVICES Inc.
711 Kapiolani Blvd. Suite 975 Honolulu, Hawai`i 96813

ABSTRACT

An Archaeological Inventory Survey was conducted along an approximately 600-acre study corridor across the lands of the Parker Ranch Keʻāmuku cattle station in the *ahupuaʻa* of Waikōloa, South Kohala District, Island of Hawaiʻi, TMK: (3) 6-7-001:09. The lands of Keʻāmuku were traditionally used as *pili* lands by the people of Waikōloa and Waimea. At the beginning of the post-Contact era, the area was given over to wild cattle. It was soon after fenced off and used by the Waimea Grazing and Agricultural Company (WGAC) for sheep and cattle ranching. Parker Ranch acquired the land in 1904 and still uses it for cattle grazing though the property is now owned by the U.S. Army. The present study corridor is the location for a segment (W-7 Alignment) of the proposed Saddle Road Extension between the existing Saddle Road near Kilohana to the Mamalahoa Highway along the border of South Kohala and North Kona.

There are seven archaeological sites in the project corridor, including five rock mounds (SIHP Sites 50-10-21-23528, 50-10-21-26875, 50-10-21-26876, 50-10-21-26877, and 50-10-21-26878), a segment of the old Waimea-Kona Belt Road (SIHP Site 50-10-21-20855), and remnants of a ranching-era fence (SIHP Site 50-10-21-23452).

Four of the rock mounds (Sites 23528, 26875, 26877, and 26878) correspond very roughly to the boundary between the Keʻāmuku cattle station lands and ranch lands to the southwest. This area is also the boundary between Waikōloa and Puʻuanahulu *ahupuaʻa*. Site 26875 contained a Kalopa Soda Works bottle and a roll of galvanized fence wire in its construction. A fifth rock mound (Site 26876) marks the intersection of two ranch roads along the southeast side of the Keʻāmuku cattle station lands. The ranching-era fence (Site 23452) appears to have been used early in the history of sheep and cattle ranching at Keʻāmuku. The original fence wire has been removed and it passes through the middle of several more recently fenced paddocks.

Four one meter by one meter test-units were excavated at rock mound Sites 26875, 26876, 26877, and 26878. Site 26875 contained a Kalopa Soda Works bottle and a roll of galvanized fence wire in its construction. No other artifacts or cultural material were recovered during the present study.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

The Federal Highway Administration (FHWA), Central Federal Lands Highway Division and the Hawai‘i Department of Transportation (HDOT) have contracted with DMT Consultant Engineers to prepare a Supplemental Environmental Impact Statement (SEIS) for a segment (W-7 Alignment) of the proposed Saddle Road extension across lands of the former Parker Ranch Ke‘āmuku cattle station in the *ahupua‘a* of Waikōloa, South Kohala District, Island of Hawai‘i, TMK: (3) 6-7-001:09 (Figure 1). The proposed 200ft wide construction corridor (Area of Potential Effect) extends approximately ten miles from the existing Saddle Road near Kilohana to the Mamalahoa Highway at the border of North Kona and South Kohala (Figure 2). Scientific Consultant Services, Inc. (SCS) surveyed an approximately 600-acre study corridor (roughly 10 miles by 500ft wide) to identify and evaluate historical properties. The survey corridor extends 150ft beyond both sides of the 200ft wide construction corridor (APE).

The project is a federal undertaking and is subject to the procedures and policies of Section 106 of the National Historic Preservation Act (NHPA). In addition, cultural resources are considered under Section 4(f) of the DoT Act (49 U.S.C. 303), and the state of Hawai‘i historic preservation review process (H.R.S. Chapter 6E). Scientific Consultant Services (SCS), Inc. has performed the appropriate studies to inventory and evaluate the historical and cultural resources in compliance with the regulations above.

There are seven archaeological sites documented in the project, including five rock mounds (SIHP Sites 50-10-21-23528, 50-10-21-26875, 50-10-21-26876, 50-10-21-26877, and 50-10-21-26878), a segment of the old Waimea-Kona Belt Road (SIHP Site 50-10-21-20855), and remnants of a ranching-era fence (SIHP Site 50-10-21-23452). Four of the rock mounds (Sites 23528, 26875, 26877, and 26878) correspond roughly to the boundary between the Ke‘āmuku cattle station lands and ranch lands to the southwest. This area is also the boundary between Waikōloa and Pu‘uanahulu *ahupua‘a*. Site 26875 contained a Kalopa Soda Works bottle and a roll of galvanized fence wire in its construction. A third rock mound (Site 26878) appears to mark a possible hunting spot. A fourth rock mound (Site 26876) marks the intersection of two ranch roads along the southeast side of the Ke‘āmuku cattle station lands. The ranching-era fence (Site 23452) appears to have been used early in the history of sheep and cattle ranching at Ke‘āmuku. The original fence wire has been removed and it passes through the middle of several more recently fenced paddocks.

ENVIRONMENTAL SETTING

THE GEOGRAPHY OF WAIKŌLOA

Waikōloa is a large land-locked *ahupua'a* in South Kohala District (Figure 3). In the past it was an *'ili* of Waimea (see below). The western portion of Waikōloa is composed of moderately sloping *'a'ā* and *pāhoehoe* lava flows. This region is extremely dry (less than ten inches of rainfall annually), hot, and barren except for patches of fountaingrass (*Pennisetum setaceum*). The northeastern portion of Waikōloa is a large grassy plain bounded on the south and southwest by grass covered rolling hills (Figure 4).

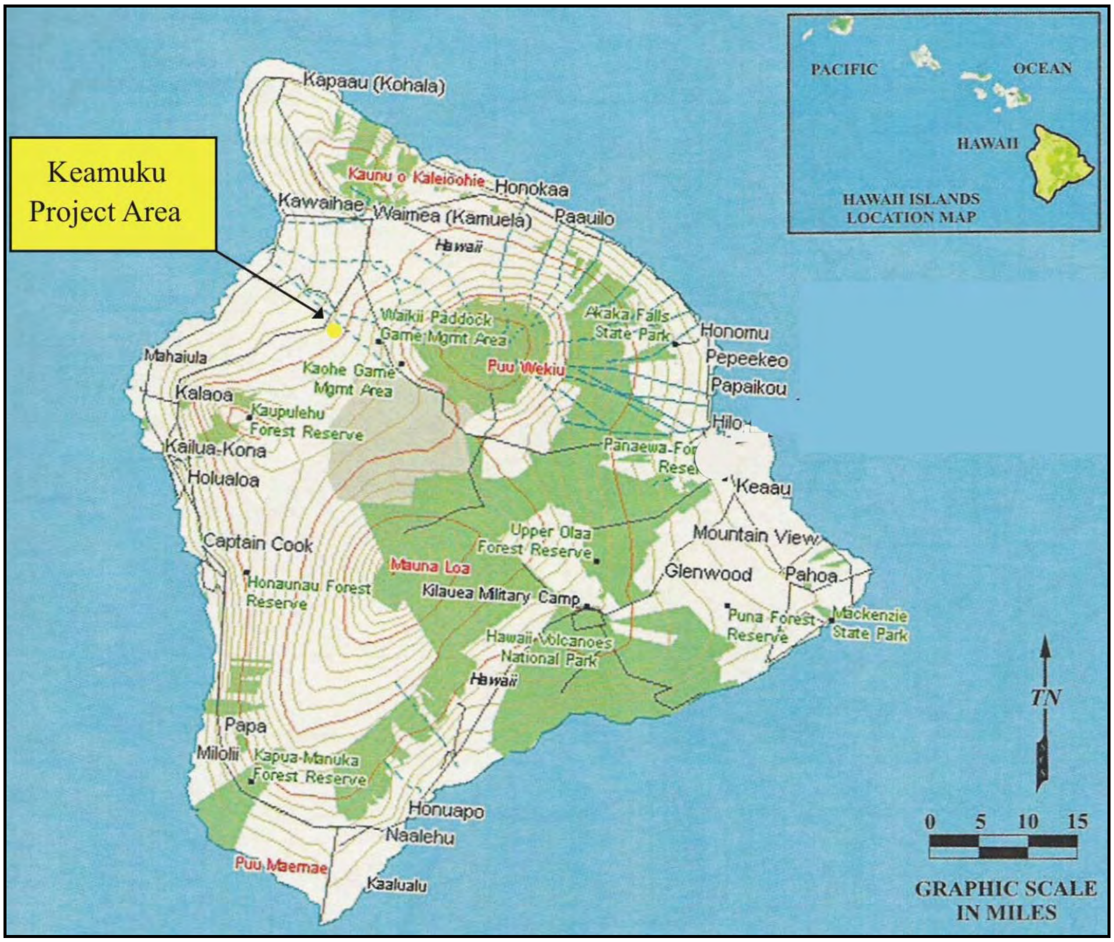


Figure 1: Hawai'i Island Map Showing Project Area Location.

LAVA FLOWS

The project area corridor is situated on gently sloping to level land that increases in elevation from 2,480 (756 m) to 5,240 (1,598 m) feet above mean sea level (amsl). Slopes range from 7% to 20% within the project area. The project area is located on a single Mauna Kea *'a'ā* flow dated to more than 10,000 years before present (ybp) (Wolfe and Morris 1996).

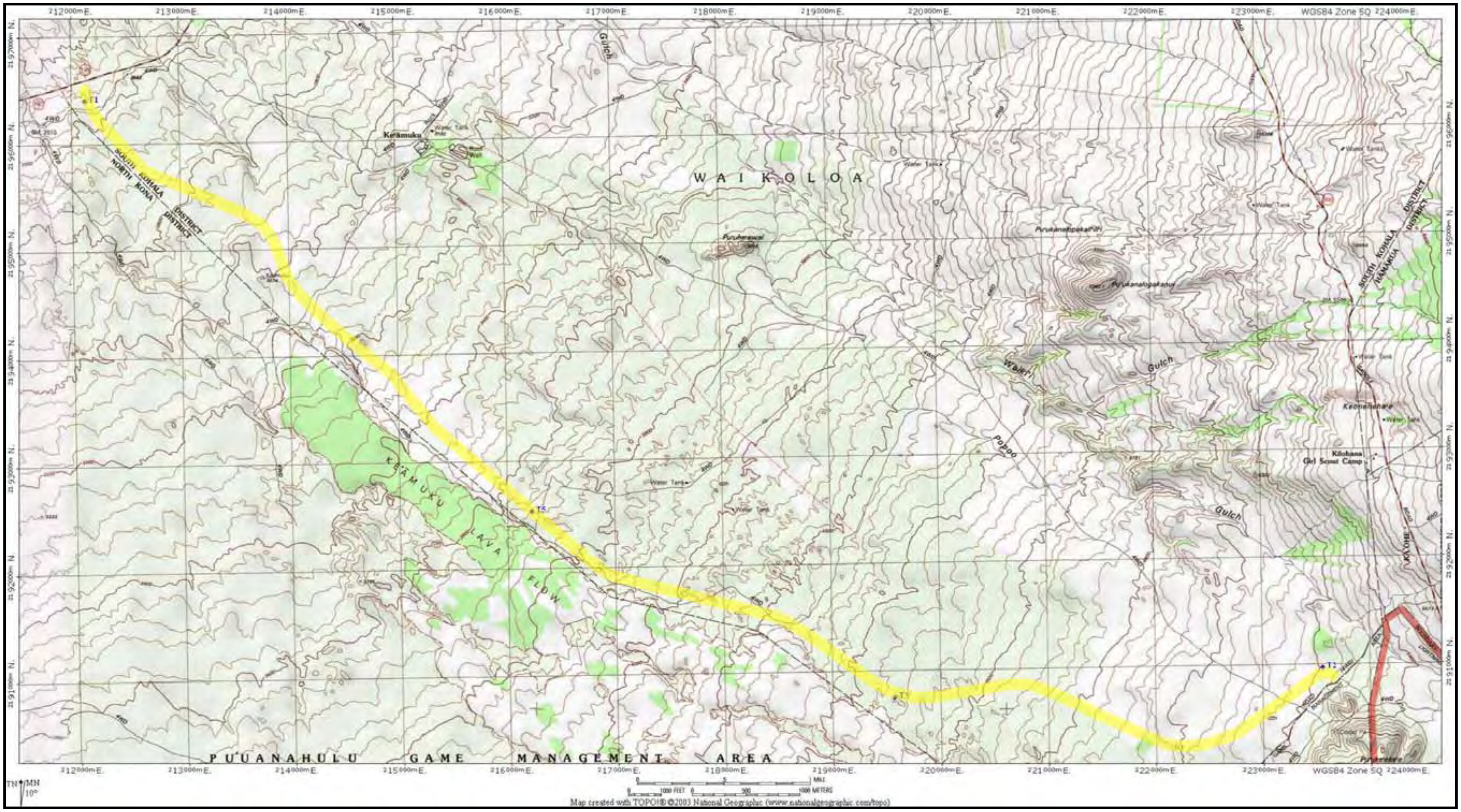


Figure 2: USGS TOPO Map Showing Project Area Location in Yellow.

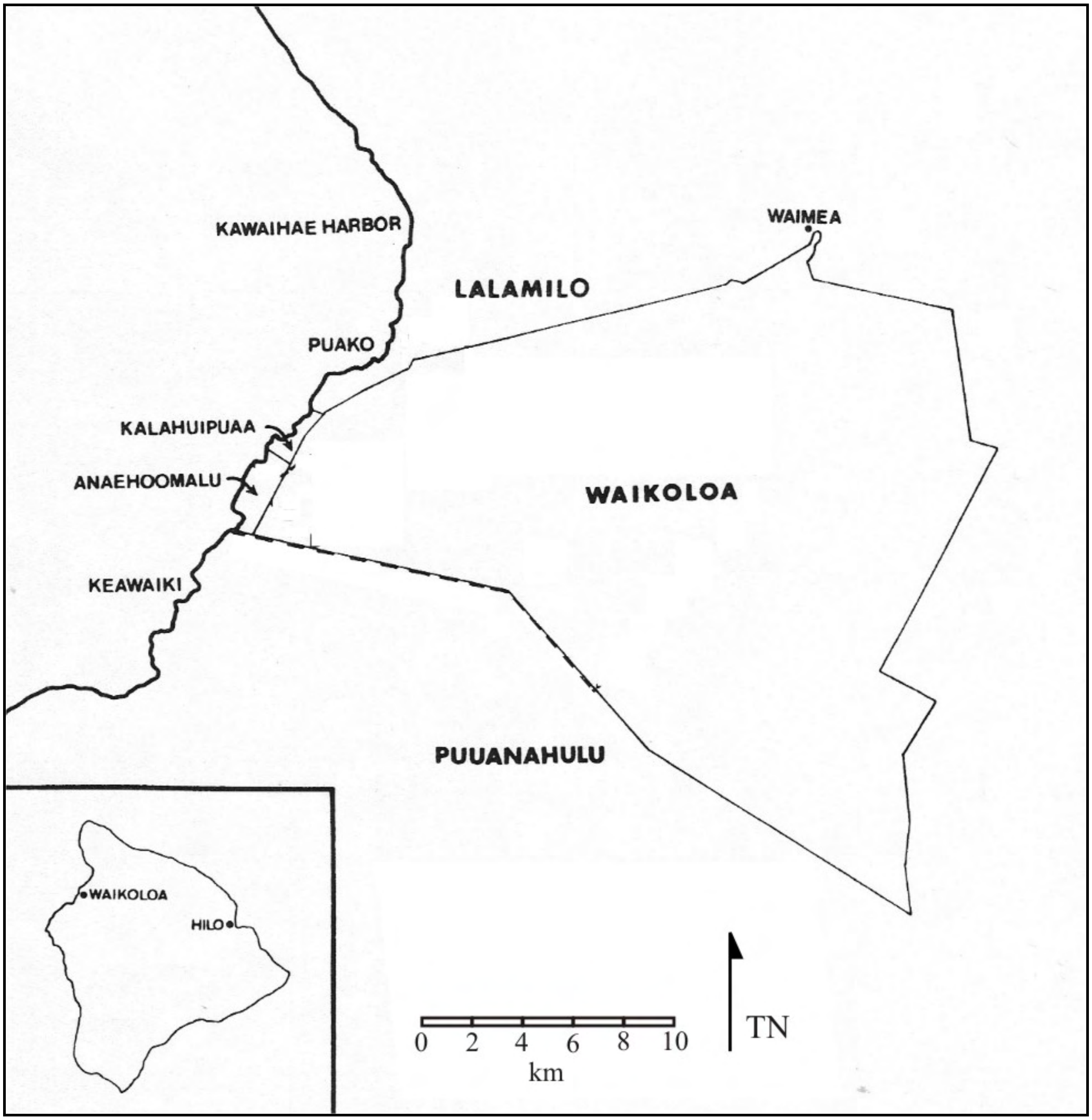


Figure 3: Waikōloa *Ahupua'a*.

Figure 4: Grasslands of Waikōloa.

SOILS

Soils in the project area belong to the Pu‘u Pa and Kaimu series. Soil in the majority of the project area consist of Kaimu series (rKED) very dark brown extremely stony peat on a substratum of *a‘ā* (Sato et al. 1973). Soil in the northern 1/8th of the corridor consist of Pu‘u Pa (PVD) extremely stony very fine sandy loam. Both types of soil are characterized as poorly suited or unsuited to mechanized-farming (Soil Survey of the Territory of Hawaii 1955).

RAINFALL AND DRAINAGE

Average annual rainfall at the Ke‘āmuku Sheep and Cattle Station between 1908 and 1947 was recorded (daily rain gauge readings) at 20.86 inches, and at 25.04 inches during the 15-year period between 1929 and 1943 (Parker Ranch Office Account Books and Rainfall Data). The average annual rainfall in the project area from 1942 to 1952 was approximately 25.59 inches. Rainfall on lands of the Ke‘āmuku Sheep and Cattle Station is supplemented by fog and mist, and was collected on rooftop water catchment systems. Rally Greenwell recalled torrential rainfall about every 20 years while he was there (Rally Greenwell interview, Escott 2008). The Keʻāmuku Station rain gauge recorded daily rainfall readings as high as 7.28 inches. Natural drainage in the area runs from southeast to northwest and a seasonal gulch in the center of the project area channels water westward away from the site. Water in the Poʻopoʻo Gulch (see Figure 2), roughly 1.5 miles north of the project corridor, rises three to four feet during torrential rains and flooding and erosion affect the silty ground surface in the area.

WIND

The area of Waikōloa and Waimea are famous for the winds that blow down from the Kohala Mountains, the saddle area between Mauna Kea and Mauna Loa, and from the Hāmākua region. They are called the *ʻĀpaʻapaʻa* wind, and the Waikōloa and *Kaumuku* winds (Maly and Maly 2002: 21). In other sources there is a strong wind called the *Mūmuku* wind (Wilkes 1845, Bergin 2004: 15). The *ʻĀpaʻapaʻa* wind, and the Waikōloa wind is believed to bring moisture and rain, and the strong *Mūmuku* wind drives away the rain, stirs up the fine silt in the area, and carries it westward. The *Mūmuku* wind is famous even in Kawaihae, where residents there were forced to lash their canoes to rocks, stakes, or trees to keep them from being carried off (Doyle 1953: 48). According to Doyle (1953), the winds have decreased in strength and frequency because of deforestation.

VEGETATION

Vegetation also changed dramatically after the late 1700s (see blow). Large areas of the foothills of southern Waikōloa were once covered in *pili* grass (*Heteropogon contortus*). *Māmane* (*Sophora chysophylla*), *naio* (*Myoporum sandwicense*) and *ʻōhiʻa* (*Metrosideros polymorpha*) grew on the upper plains of Waimea and at upper elevations in the foothills of Mauna Kea and Mauna Loa. The suite of present day flora on the project area is dominated by introduced species.

Gerrish (2003), based on field survey, characterizes vegetation within the project area as Fountain Grass Pasture with Native Shrubs and Scattered Introduced Trees. This zone of vegetation extends from 2200 ft amsl to 3200 ft amsl, is heavily grazed by cattle, and is characterized by low plant diversity dominated by fountaingrass (*Pennisetum setaceum*).

Low shrubs of native *ʻaʻāliʻi* (*Dodonaea viscosa*) and ʻā*kia* (*Wikstroemia pulcherrima*) dot the hilly pastureland. Kikuyugrass (*Pennisetum clandestinum*) and Natal redtop

(*RhyncheIytrum repens*) grow in wetter areas along the dirt access roads. Introduced trees such as eucalyptus, olive (*Olea europaea*), and silk oak (*Grevillea robusta*) were planted at the Keʻāmuku Sheep and Cattle Station, and many volunteers are growing along the project area.

FAUNA

Several economically important animals within Waikōloa are documented in historical narratives and oral interviews. Native species include *kōlea*, or Golden Plover (*Pluvialis dominica fulva*); *ʻuaʻu*, or Hawaiian Petrel (*Pterodrama phaeopygia sandwichensis*); *nēnē*, or Hawaiian Goose (*Nesochen sandwichensis*). Polynesian-introduced species include the pig (*Sus scrofa*) . Several species of quail, pheasant, partridge, and turkey introduced during the Historic-era are still present at Keʻāmuku.

HISTORICAL AND CULTURAL CONTEXTS

EARLY SETTLEMENT AND EXPANSION

Archaeological evidence suggests Hawaiʻi was first settled between A.D. 0 and 700 by people sailing from the Marquesas (Cordy 2000). Early settlements on the Island of Hawaiʻi were founded on the windward shores in likely places such as Waipiʻo, Waimanu, and Hilo Bay. The windward, or *koʻolau* shores receive abundant rainfall and have numerous streams that facilitated agricultural and fishpond production (Maly and Maly 2002). The windward shores also provide rich benthic and pelagic marine resources.

Historical accounts of residential patterns, land-use, and subsistence horticulture are believed to be indicative of traditional practices developed long before contact with Europeans (McEldowney 1979). Early accounts of settlements along the windward shores describe the area as divided into several distinct environmental regions (Ellis 1963: 291-292). At Hilo Bay, from the coast to a distance of five or six miles scattered subsistence agriculture was evident, followed by a region of tall fern and bracken, flanked at higher elevations by a forest region between 10 and 20 miles wide, beyond which was an expanse of grass and lava (Ellis 1963:403).

The American Missionary C.S. Stewart wrote, “the first four miles of the country is open and uneven, and beautifully sprinkled with clumps, groves, and single trees of the bread-fruit, pandanus, and candle tree” (Stewart 1970:361-363). The majority of inhabitants (in 1825) lived within this coastal region (Ellis1969: 253). Taro, plantains, bananas, coconuts, sweet potatoes, and breadfruit were grown individually or in small garden plots. Fish, pig, dog, and birds were also raised and captured for consumption. Wood, such as ‘ō*hi‘a* and *koa* for house construction, canoe building, and fires was obtained from the upland agricultural zone (McEldowney 1979:18-19), and from the dense forests above (Ellis 1963:236).

The dry leeward shores of Hawai‘i Island presented a very different environment requiring a modified set of subsistence strategies. Archaeologists and historians are uncertain about the motives that lead to the establishment and spread of settlements on the leeward side of Hawai‘i, but archaeological evidence suggests the process was underway between the A.D. 900s and 1100s (Cordy 2000). Coastal sites in South Kohala District, *makai* of Waikōloa, at Kalāhuipua‘a and ‘Anaeho‘omalu and inland sites in the *ahupua‘a* of Waimea (Figure 3) have been dated to the A.D. 800s to 900s (Kirch 1979: 198, Cordy 2000: 130).

The early coastal settlements are located on or adjacent to the dry rocky shoreline and consist of temporary habitation caves containing midden, fishing tools, and fish remains; and two possibly permanent habitation sites (Barrera 1971, Jenson 1989a, 1989b, 1990a, and 1990b). The earlier phases of occupation were likely temporary habitations used when fishing, and later permanent habitations associated with fishpond production. Cordy suggests people who lived at inland Waimea occasionally frequented the Kalāhuipua‘a and ‘Anaeho‘omalu area for its anchialine pond and marine resources (Cordy 2000:131). The implication is that inland settlements and agriculture may have developed first, perhaps spreading from nearby Waimanu and Waipi‘o. Maly suggests that people living permanently along the dry shoreline shared extended family relations with people inland, allowing for an exchange system that distributed marine resources to inland agriculturalists and brought inland agricultural products to people at the coastal settlements (Maly and Maly 2002).

The fertile plain of Waimea, which receives 40 to 80 inches of rainfall annually and is watered by streams from the Kohala Mountains (the Waikōloa, Wai‘aka, and Keanu‘i‘omanō streams), was planted in taro and sweet potato. Sweet potato was the dominant crop at elevations that received from 30 to 60 inches (Cordy 2000: 135). At lower elevations in South Kohala District, especially along the coast, rainfall is less than thirty inches and soils are shallow or nonexistent. It is possible that mulching with rocks or cut plant materials allowed for a limited amount of root crop and arboreal agriculture in pockets of soil.

In Waimea and Kohala, new settlements and agricultural field systems continued to spread and intensify during the A.D. 1200s to 1400s. Permanent communities were developing at Lapakahi and along the coastal region from ‘Upolu Point to Kawaihae (Cordy 2000: 140). Temporary residences and an agricultural field system were also established in the uplands of the Waikōloa-Waimea area (Moffat and Fitzpatrick 1995, Maly and Maly 2002: 4). As communities grew and agriculture intensified during this period, polities began to form, along with competition between polities. Large polities influencing communities within modern district-size boundaries emerged in the 1300s (Cordy 2000: 142). Cordy notes that just north of the project area “two different settlement and political zones seem to have developed prior to the 1200s and to have lasted until late in prehistory—one focused on Waimea and Kawaihae in the south, and the other in north Kohala up to ‘Upolu Point” (Cordy 2000:385, footnote 15).

By the late 1700s extensive permanent field systems were well established in North Kohala, Waimea, and Lālāmilo (Clark 1981, Clark and Kirch 1983, Cordy 2000). The Lālāmilo swale land fields, described in Clark (1981) and Cordy (2000), were part of the Waimea Field System (Figure 5) and were the nearest agricultural lands to the Ke‘āmuku Sheep and Cattle Station project area (the field system is more than 18 km to the north). Cordy describes the fields as,

> rectilinear fields with terrace facings or low-ridged walls . . . fed by six major canals (one an extension out of the airport area) and a vast number of interlinking branches of these canals. The walled fields diminished to the south about half way to Pu‘u Huluhulu and Pu‘u Pā, where rainfall and soil quality drop—although the swales were still fed by canals (Cordy 2000: 310).

Banana, sweet potato, sugar cane, and dry land taro were cultivated in the fields by farmers who built C-shaped and L-shaped enclosures for temporary use and lived some distance away from the fields (Cordy 2000:310-311).

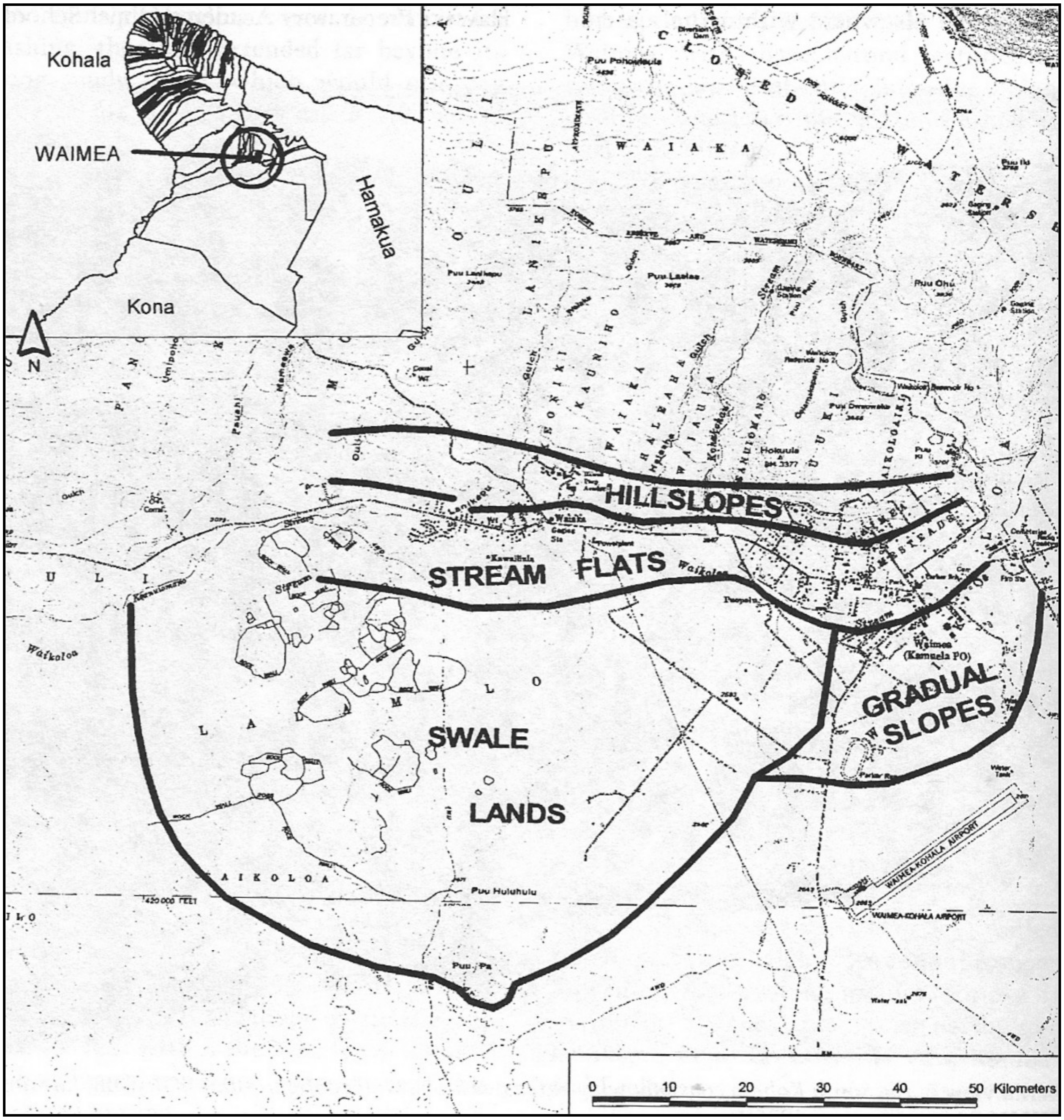


Figure 5: The Swale Lands of the Waimea Field System.

THE TRADITIONAL LAND DIVISIONS OF WAIMEA AND WAIKŌLOA

The traditional land divisions of Hawaiʻi, established during the 16th century recognized Kohala as one of the six districts (*moku-a-loko*) of the island. Waimea was a sub-district (*ʻokana* or *kalana*) of Kohala, and Waikōloa was an *ʻili* of Waimea. ʻŌuli, Waiʻaka, Lālāmilo, Puakō, Kalāhuipuaʻa, ʻAnaehoʻomalu, Kanakanaka, Alaʻōhia, Paulama, Puʻukalani, and Puʻukapu were also *ʻili* of Waimea. Other accounts state that Waimea was an *ahupuaʻa* that had the status of *moku* (Curtis Lyons, quoted in Maly and Maly 2002: 6).

TRADITIONAL ACCOUNTS OF EARLY WAIKŌLOA, WAIMEA, AND SURROUNDING LANDS

Traditional accounts (*moʻolelo ʻāina*) of Waikōloa, Waimea, and areas adjacent to lands of the Keʻāmuku Sheep and Cattle Station include legends and historical narratives documented in historic times by native Hawaiians and 19th century authors. The accounts refer to events that took place from the 13th century to the arrival of European explorers. None of the accounts pertain directly to lands within the project area, but do refer to lands directly north (Waikōloa, Waimea, and Lālāmilo), northwest (the coastal region from ʻAnaehoʻomalu to Puakō), east (Waikiʻi), and south (lands between Hualalai and Mauna Kea). Accounts include legends of supernatural entities that describe places they traveled to in this region, and also legends that tell the stories of deities and persons whose actions and namesakes are the origins of prominent natural features and places on the landscape. There are also historical narratives that describe battles between warring *aliʻi* and describe land traversed by warriors, and the place names where battles were fought.

Legends, Place Names, and Descriptions of the Land

The Heart Stirring Legend of Ka-Miki, published in the Hawaiian language newspaper *Ka Hoku o Hawaii* and translated by Maly (pertinent excerpts in Maly and Maly 2002) contains an extensive description of customs, lands, and places near the project area, as well as many places on the Island of Hawaiʻi. The legend is set in the 13th century but also reflects more recent influences (Maly and Maly 2002: 17). Underlined quotes in this report are from Maly's original and are his emphasis.

The District of Kohala is described in the legend as divided into smaller units that included:

> Large Kohala, little Kohala, inner Kohala, outer Kohala, Kohala of the ʻĀpaʻapaʻa wind, of Pili and Kalāhikiola, the two traveling hills. Indeed! They are the combined districts of this proud land brushed by the ʻĀpaʻapaʻa wind, maturing like love fondly in the bosom of love (*Ka Hoku o Hawaii*, March 22, 1917, translated in Maly and Maly 2002: 18).

Maly defines outer Kohala (Kohala *waho)* as the lands from Kawaihae to Waikōloa, and ʻAnaehoʻomalu. The Hawaiian language names for the smaller districts are as follows: large Kohala is Kohala *nui*, little Kohala is Kohala *iki*, inner Kohala is Kohala *loko*, outer Kohala is Kohala *waho*, Pili and Kalāhikiola are as written, and the two traveling hills is *Na-puʻu-haele-lua*.

Dr. Bergin describes the traditional boundaries of Kohala as divided into two major divisions. Kohala *Iloko* is the name of the windward lands east of ʻUpolu Point (Bergin 2004:15). Leeward Kohala is the second major division and is further divided into four zones that posses four distinctive types of terrain. Kohala *i waho* is the traditional name of the lands from ʻUpolu Point to Kahuā, north of Kawaihae. *ʻĀina* Kawaihae refers to the coastal area at present day Kawaihae. *Wai one* are the coastal plains south of Kawaihae to ʻAnaehoʻomalu. The k*ula* area refers to the Waimea plains area roughly ten miles inland.

Waikoloa without a *kahako* means "duck water" (Pukui *et al*. 1976), perhaps a reference to lands that attracted wetland ducks. In many references it is written with a *kahako* and means "northwest wind," perhaps a reference to the strong wind that blows through the area. If the *kahako* was over the last "o" it might be translated as "the long, sweet water." This might be a reference to the lack of water and its refreshing flavor when finally reached (Andrade interview, collected for Wolforth *et al*. 2004).

The Heart Stirring Legend of Ka-Miki also relates the origins of several place names in the area of South Kohala.

The region of Lālāmilo was named for the young chief Lālāmilo, grandson of Kanakanaka, an expert lawaiʻa hī-ʻahi (deep sea tuna lure fisherman) and Pilia-moʻo, a powerful priestess and ʻōlohe. Kanakanaka and Piliamoʻo were the parents of Nē'ula (a fishing goddess), and she married Puʻu-hīnaʻi a chief of the inlands, and they in turn were the parents of Lālāmilo. Kanakanaka's sister was the wind goddess, Waikōloa, for whom the lands are now named.

Lālāmilo gained fame as an expert ʻōlohe and fisherman. And through his wife Puakō, he came to possess the supernatural leho (cowry octopus lure) which had been an ʻōnohi (cherished) possession of Ha'aluea, a goddess with an octopus form... How this octopus lure came to rest on the reefs fronting this land remains a mystery. . .

Puakō was the daughter of Waʻawaʻa (kāne) and Anahulu (wahine), and the sister of: ʻAnaehoʻomalu (wahine); Pūʻālaʻa (kāne); and Maui-loa (kāne). Puakō's great desire was to eat heʻe (octopus), and Pūʻālaʻa was kept continually busy acquiring heʻe for Puakō, and getting paʻouʻou fish for ʻAnaehoʻomalu. When he could no longer provide sufficient numbers of fish for his sisters they left Puna and set out in search of suitable husbands who could provide for their needs.

Because of their great love for ʻAnaehoʻomalu and Puakō, Anahulu, Waʻawaʻa, their relatives and attendants also moved to the Kona - Kohala region and dwelt at sites which now bear their names; only Pūʻālaʻa remained in Puna. This is how Puʻu-Huluhulu, Puʻu-Iki, and Mauiloa came to be named; and Puʻu Anahulu (Ten day hill [ceremonial period]) was named for Anahulu, the chiefess wife of Waʻawaʻa (Puʻu Waʻawaʻa).

Arriving at Kapalaoa in the Kekaha lands of Kona, ʻAnaehoʻomalu married Nāipuakalaulani, son of the chiefess Kuaīwa of Kapalaoa. Puakō went on to Waima where she met with natives of that area, and was introduced to the chiefess Nēʻula, mother of Lālāmilo. When Nēʻula learned that Puakō greatly coveted heʻe, she told Puakō that her son was the foremost lawaiʻa ʻōkilo heʻe (octopus fisherman) of the region. And because Puakō was so beautiful, Nēʻula introduced her to Lālāmilo. Lālāmilo saw Puakō, and compared her to the foremost "heʻe" which he could catch (*Ka Hoku o Hawaii*, July 5 and 19, 1917, translated in Maly and Maly 2002: 22-23, underlined emphasis is Maly's).

Another *mo'olelo 'āina* collected by Maly (1999) relates the story of Kanikū and Kanimoe, two *mo'o wahine* who were sisters and guardians of Kamehameha's fishpond Wainānāli'i. They were covered by a lava flow when the *lua-i-Pele* came down to the coast and they and are now two stones in the flow. They are visible *makai* of the highway. Kanikū is an upright *pōhaku* and Kanimoe is behind (Keakealani interview, collected for Wolforth *et al*. 2004).

The Heart Stirring Legend of Ka-Miki contains several descriptions of weather and agriculture in Waimea-Waikōloa region and surrounding areas. The frequent strong westerly winds that originate in the Kohala Mountains and from Mauna Kea are called the *'Āpa'apa'a* wind, and the Waikōloa and *Kaumuku* winds (Maly and Maly 2002: 21). In other sources there is the *mūmuku* wind (Wilkes 1845, Bergin 2004: 15). The winds in this region bring moisture and rain, and when strong, stir up the fine silt in the area and carry it westward. Many of the trees in Waimea lean in that direction from the constant buffeting they receive.

There is a rain called *nāulu* (southern rain storms) in *The Heart Stirring Legend of Ka-Miki* (Maly and Maly 2002: 25). Cultural informants recall the *ua nāula* that is a sudden downpour that disappears as quickly as it develops (Andrade interview, collected for Wolforth *et al*. 2004; Greenwell interview, collected for Maly and Maly 2002). Another legend tells of rain sent by Kahaloi-wai-a-ka-Nā'ulu, the keeper of the *nā'ulu* rain. He was said to live on a *pu'u* in the Kohala Mountains where he could keep watch on his sister Pu'u Anahulu. He would send his rains to shower Pu'u Anahulu and Pu'u Wa'awa'a when they were dry (Keakealani interview, collected for Wolforth *et al*. 2004).

Sources of water play a prominent role in *The Heart Stirring Legend of Ka-Miki*. *Ka-Miki* is tasked with retrieving the water of *Kāne* and *Kanaloa*, at the royal compound of Poli'ahu and Lilinoe, below the sacred platform of *Pōhaku-a-Kāne* on Mauna Kea. He fills the *'awa* bowl *Hōkū'ula* with the water and returns to meet his brother *Maka-'iole*.

> Ka-Miki then joined Maka-'iole at Holoholokū on the plain of Waikōloa. And as they traveled across the plains on their way back to Hualālai, the wind goddess Wai-kō-loa (Water carried far) caused the water to splash over the brim of Hokū'ula. Some of the water was carried afar by the wind and fell, forming a new spring.

> When the spring appeared, Pōhaku-a-Kāne fetched some of the water. Because Pōhaku-a-Kāne fetched some of the water, that place is called Wai-kiʻi (Fetched-water) to this day. This happened near the hills of Puʻu Kekeʻe.
>
> Pōhaku-a-Kā took the water he retrieved to the base of the cliffs of Mauna Kea and dug into the earthen plain of Pōhakuloa and placed the water there. From Pōhakuloa, the water flowed under ground and appeared as springs at several other places, including Ana-o-Hiku at Hanakaumalu. Honuaʻula, and Kīpaheʻe-wai on the slopes of Hualalai... (*Ka Hoku o Hawaii*, March 12, 1914, translated in Maly and Maly 2002: 21, emphasis Maly and Maly).

In another legend, *Hōkūʻula* is the name of the place where the great Akua Makuakua from Kahiki lived with the goddess Wao. Wao would journey to the Waimea hills, which were sacred for her to give birth. She was accompanied by her servants, whom she turned to stone each night to guard the land (Doyle 1953).

The origin of the large gulch ʻAuwaiakeakua situated east/west between Keʻāmuku and Waikiʻi was told to Maly by former residents of Waikiʻi Village. ʻAuwaiakeakua (Water channel of the gods) was built by *menehune* who abandoned the construction in fear of the coming dawn (Maly and Maly 2002: 27).

References to agriculture in *The Heart Stirring Legend of Ka-Miki* include:

> Lālāmilo arose and told his wife Puakō and his mother Nē'ula that he was going to the uplands to visit his father, sister, and the people who worked the upland plantations. Lālāmilo desired to eat the sugar cane and bananas and drink the ʻawa which grew on the hill of Poʻopoʻo. Poʻopoʻo was also the name of a makāula (seer) who saw to the continued peaceful dwelling of the people. . .
>
> Lālāmilo then departed and traveled up towards the residences and agricultural lands of Puʻu Hīnaʻi mā (*Ka Hoku o Hawaii*, July 5, 1917, translated in Maly and Maly 2002: 22, emphasis Maly and Maly).

Poʻopoʻo (dark headed) is the name of a gulch that is oriented southeast/northwest roughly 1.5 miles north of the project area. The area mentioned, Puʻu Hīnaʻi mā, is several miles west of the project area. It is also mentioned in the legend that *ʻawa* was grown at Poʻopoʻo (Maly and Maly 2002: 25).

The trail between Waimea and Mauna Kea also figures prominently in *The Heart Stirring Legend of Ka-Miki*. The trail that leads to “the whitened peaks” of “the sacred and astonishing mountain (Mauna Kea)” is a “lonely path” and a “damp dreary path” through “the mists that seem to crawl upon the forest growth” where people often go astray (Maly and Maly 2002: 19). Aside from the Poʻopoʻo gulch, none of the places mentioned above are near the project corridor.

Historical Narratives, the *Aliʻi*, and Warfare in the Region

Historical narratives set near the project area describe battles between warring *aliʻi*, land traversed by warriors, and the place names where battles were fought. There are five accounts of historical events that took place near the project area between the 14th and 18th centuries. The events are documented by Fornander (1996), Kalakaua (1990), Kamakau (1961), and Malo (1951), and are treated in detail by Maly (Maly and Maly 2002) and Wolforth (Wolforth *et al*. 2004).

The first event is the 14th century battle between Kamiole, a Kaʻū chief and Kalapana, the son of Kanipahu the sixth *moi* of the *Pili* line (Wolforth *et al*. 2004: 3-5). Kamiole and his warriors, reinforced by warriors from Kona, Hilo, and Puna had previously defeated Kanipahu at Kohala. Kalapana, with the aid of chiefs from Kohala and Hāmākua met Kamiole at ʻAnaehoʻomalu and defeated him.

The second event is the battle between Umi (ruler, A.D.1600-1620) and a chief from Kailua. An elder man named Kanuha recounted the events of the battle to Jules Remy, a Frenchman who arrived in Hawaii in 1851 (Maly and Maly: 2002: 9-10). The French version was translated and printed in the Hawaiian language newspaper *Ke Au Okoa* May 8, 15, and 22, 1865. The account was then translated into English by Maly (Maly and Maly 2002: 9-12). The version referred to in this report is drawn from Maly’s translation.

Umi ruled the eastern side of the Island of Hawaiʻi, while a chief from Kailua ruled the western side. The chief from Kailua was reputed to have committed various evil deeds and Umi set out to defeat him. Maly’s translation of the events follows:

Umi marched to battle, joined by his famous warrior, Piimaiwaa, and his companions Koi and Omaokamau. Also with him were his favorite, Pakaa, and his priest Lono. . .

Between Mauna Kea and Hualalai the chief and all his party traveled, with the thought of descending to Kailua. Keliiokaloa did not wait though, but instead, traveled with his warriors to meet Umi in battle. The two armies met on a broad open plain, surrounded by the three mountains, at the place [now] called Ahu a Umi. There, Laepuni and them (people who were unattached to a chief) fought with Umi. Umi was almost killed, but Piimaiwaa leapt in and helped him, it was he who turned the battle in the favor of Umi's side. There is not much else that is said, but, it is known that the chief of Kailua died in the battle. Thus, with this battle, the entire kingdom was gained by Umi. He became the chief that controlled the entire island of Hawaii. So that the battle would be remembered from generation to generation, he (Umi) built the stone altar, that remains to this day, the altar (ahua) of Umi... (Ke Au Okoa; Mei 22, 1865)

...He (Umi) also built a heiau (temple) below Pohaku Hanalei, it is called the altar (ahua) of Hanalei; and on the side of Mauna Kea, by where one travels to Hilo, he built the third of his temples, at the place called Puukekee [also written Puu Keekee in historical texts]; and there at Mauna Halepohaku he built the fourth of his temples; there, it is said, Umi dwelt with his many people. It is said that Umi was a chief who dwelt upon the mountain, it was because of his love of his people, that he (Umi) returned and dwelt in the middle of the island [Ahu-a-Umi], that is where he dwelt with his beloved people. His commoners lived along the shores, and they brought food for them (in the uplands), from one side of the island to the other... (Ke Au Okoa; Me*i* 22, 1865, translated in Maly and Maly 2002:10-12, emphasis is Maly's).

The third historical event that took place near the project area is the battle between Lonoikamakahiki (ruler, A.D. 1640-1660) and rebel chiefs (most notably his elder brother Kanaloa-kuaʻana) encamped along the shore at ʻAnaehoʻomalu. Lonoikamakahiki and his Kona warriors were joined by forces from Kaʻū at the border of Kohala and Kona, on inland ʻAnaehoʻomalu.

The next day Lono marched down and met the rebels at the place called Wailea, not far from Wainanalii, where in those days a

> watercourse appears to have been flowing. Lono won the battle, and the rebel chiefs fled northward with their forces. At Kaunooa, between Puako and Kawaihae, they made another stand, but were again routed by Lono, and retreated to Nakikiaianihau, where they fell in with reinforcements from Kohala and Hamakua. Two other engagements were fought at Puupa and Puukohola, near the Heiau of that name, in both of which Lono was victorious (Fornander 1996:120-121).

A fourth battle was fought north of project area during the reign of Lonomakahiki. The king of Maui (Kamalālāwalu), desiring to take over the Island of Hawaiʻi, sent spies to discover the best place from which to launch an attack (Kamakau 1961). They returned after investigating the shores of Hawaiʻi and reported that Kohala would be easy to capture as the inhabitants lived only on the coast and were few in number (Kamakau 1961: 56). They further thought that,

> if Kohala was conquered, Kona, Ka-ʻu, and Puna would be easily taken, and they felt that Hilo and Hamakua would lend no assistance. This was true, for the chiefs of these districts were cousins of the chiefs of Maui (Kamakau 1961: 57).

Kamalālāwalu and his forces captured Puakō, and mislead by two old men of Kawaihae, marched to the dry grassy plain of Waimea (Waikōloa), and the hills of Hōkūʻula and Puʻu ʻOaʻoaka to await the warriors of Hawaiʻi. The warriors of Hawaiʻi took several routes to Waikōloa and stationed themselves around the forces of Maui. Fornander records:

> During the night and including the following morning the Kona men arrived and were assigned to occupy a position from Puupa to Haleapala. The Kau and Puna warriors were stationed from Holoholoku to Waikoloa. Those of Hilo and Hamakua were located from Mahiki to Puukanikanihia, while those of Kohala guarded from Momoualoa to Waihaka (Fornander 1917, quoted in Cordy 2000: 229).

Kamakau recorded:

> After Kama-lala-walu's warriors reached the grassy plain, they looked seaward on the left and beheld the men of Kona advancing toward them. The lava bed of Kaniku and all the land up to Hu'ehu'e was covered with the men of Kona. Those of Ka'u and Puna were coming down from Mauna Kea, and those of Waimea and Kohala were on the level plain of Waimea. The men covered the whole of the grassy plain of Waimea like locusts.

> Kamalalawalu with his warriors dared to fight. The battlefield of Pu'oa'oaka was outside of the grassy plain of Waimea, but the men of Hawaii were afraid of being taken captive by Kama, so they led (Kamalalawalu's forces) to the waterless plain lest Maui's warriors find water and hard, waterworn pebbles (Kamakau: 1961:58).

The two armies only skirmished in the beginning, soon turning into a full battle, and a final route of the forces of Maui (Kamakau 1961). Almost all of the chiefs and warriors of Maui were slain either on the field of battle or at the Kawaihae shoreline.

The alter (*Ke Ahu a Lono*) at the coastal boundary between Kona and Kohala is often described as an alter for “the warrior leaders and warriors of Lonoikamakahiki, built at the time he went to battle with Kamalalawalu” (Kihe in *Ka Hoku o Hawaii* Jan. 31-Feb. 14, 1924, translated by Maly 2002: 15). A second account ascribes *Ke Ahu a Lono* to the restoration of friendship between Lonoikamakahiki and Kapaihiahilina. Lonoikamakahiki built the *ahu* for offerings made to consecrate their reconciliation. The *Ahu a Lono* was also the place where offerings were gathered during the *Makahiki* (Andrade interview, collected for Wolforth *et al*. 2004).

Kamehameha also built (rebuilt) Puʻukoholā *heiau* (possibly completed by 1791) *mauka* of Mailekini *heiau* above Kawaihae (Kamakau 1961, Cordy 2000). Kinny (1913: 43) and Kamakau (1961: 154) suggest the construction undertaken by Kamehameha was a reconstruction of a previously built *heiau* reconsecrated to his god Kūkāʻilimoku. Kamehameha and his chiefs resided in Kawaihae during the construction and after, from 1792 to 1796 (Maly and Maly 2002: 16). Lonoikamakahiki, Alapaʻinui, Keaweʻāpala, and numerous lower chiefs often visited and stayed at Kawaihae, Puakō, and Waimea (Kamakau 1961: 182-183).

Historical narratives of the Waikōloa area underline its geographical location as a nexus of travel between often contending political centers (Figure 6). Trails from Kona to Kohala crossed the lava flats inland of ʻAnaehoʻomalu and Puakō. Trails stretched from the coast to Waimea. Other trails ran from Kona, south and then east of Hualalai, and down to Waimea or the coast. Trails from Hilo crossed the saddle, past Mauna Kea and Mauna Loa, and downhill to Lālāmilo where travelers could take trails either east or west. Trails were also used between the Waipiʻo-Hāmākua region and Waimea. The trails connected Kawaihae, Waimea, and leeward

Kohala to other centers of royal power and figured prominently in interregional conflict. Kawaihae was also a center of political power and the fishponds at ‘Anaeho‘omalu and Kalāhuipua‘a were *‘ili kūpono* from around the 12th century onward (Cordy 1987; Andrade interview, collected for Wolforth *et al*. 2004). The battles detailed above were fought several miles from the project corridor and there are no trails near the project corridor.

DESCRIPTIONS OF KOHALA, WAIMEA, AND WAIKŌLOA IN HISTORIC-ERA TRAVEL ACCOUNTS

By the late 1700s the Waimea area supported an estimated population of approximately 24,000, mostly inland (Wellmon 1969, Cordy 2000). Captain Cook’s journals from his arrival in 1779 describe the area along the coast of Kohala as unpopulated, with very few houses or agricultural fields (Beaglehole 1967). Fishing, aquiculture, salt production, and abrader production were carried out along the coast from Kawaihae to ‘Anaeho‘omalu (Vancouver 1967, Ellis 1969, Barrère 1971, Kirch 1975 and 1979, Cordy 2000). The majority of agricultural production was carried out in the foothills of the Kohala mountains and from Lālāmilo to the Waipi‘o Valley, especially along the Waimea’s three streams; Waikōloa, Wai‘aka, and Keanu‘i‘omanō. Large areas of the foothills of southern Waikōloa were covered in *pili* grass traditionally used for thatching. *Māmane* (*Sophora chysophylla*), *naio* (*Myoporum sandwicense*), *wauke* or paper mulberry (*Broussonetia papyrifera*), *‘iliahi* or sandalwood (*Santalum spicatum*), and *‘ōhi‘a* (*Metrosideros polymorpha*) grew on the plains of Waimea and at upper elevations in the foothills of Mauna Kea and Mauna Loa. Traditional resource extraction from these areas included *kapa* cloth made from *wauke* (Wilkes 1970: 217-218), m*āmane* limbs cut for adze handles, and birds trapped for their meat and feathers.

The arrival of Europeans and the Hawaiian people’s introduction to world markets drastically altered the distribution of population centers, agriculture, and cultural practices in Hawai‘i. In the Waimea-Waikōloa region, maritime trade and ranching slowly replaced traditional fishing, aquiculture and farming practices as chief economic activities. Sandalwood harvesting for China’s markets commenced in 1808 and reached a peak in the 1820s. Kamehameha held a monopoly on the collection and sale of sandalwood to foreign trading vessels.

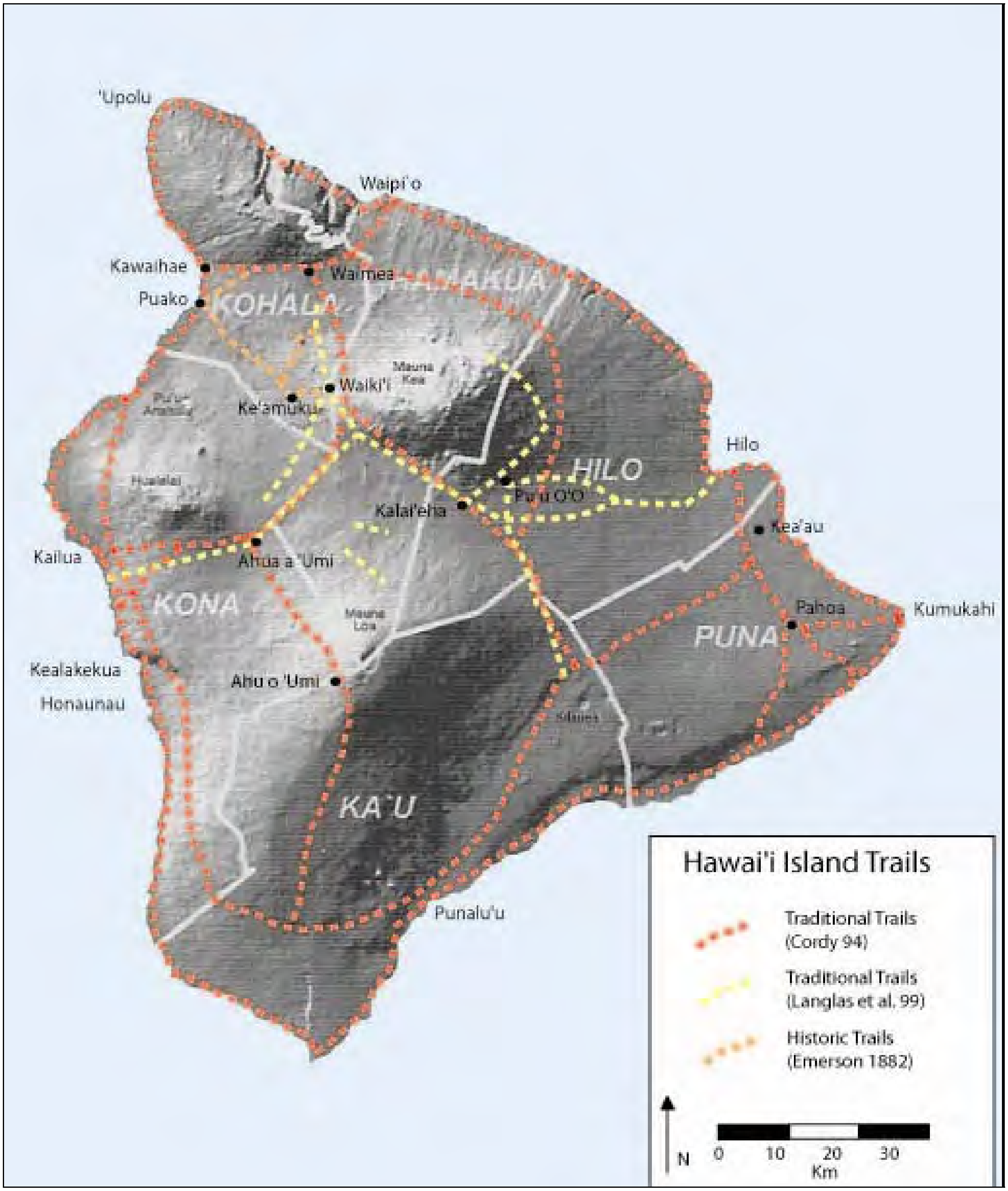


Figure 6: Hawai‘i Island Trails.

Sandalwood trees were rapidly harvested from the Waimea-Waikōloa area and an island-wide *kapu* was placed on the cutting of sandalwood in 1830. The royal government next looked to ranching as a steady source of income. Sheep and cattle ranching provided wool, fresh meat, salted beef, tallow, and hides for local markets on Hawaiʻi and Oʻahu, and for provisioning merchant and whaling vessels (until 1860).

Ranching has its roots in the first cattle and sheep brought to the island in 1793 by Vancouver. Six cows, one bull, four ewes, and two rams were released to prosper in the region of Waimea, Mauna Kea, Mauna Loa, and Hualalai (Vancouver 1967). Kamehameha placed a ten-year *kapu* on the killing of cattle so that they would have time to multiply (Ellis 1963: 291). Vancouver wrote:

> In this valley is a great tract of luxuriant, natural pasture, whither all the cattle and sheep imported by me were to be driven, there to roam unrestrained, to "increase and multiply" far from the sight of strangers, and consequently less likely to tempt the inhabitants to violate the sacred promise they had made; the observance of the which, for the time stipulated in their interdiction, cannot fail to render the extirpation of these animals a task not easily to be accomplished (Vancouver 1967(3):64).

Vancouver returned in 1794 with more cattle, sheep, goats, geese, and various plants and seeds. Two American captains, William Shaler and Richard Cleveland presented two horses to John Young in 1803. Cleveland later returned with more than 200 horses brought from California. Donkeys, mules and oxen were also imported for transportation and hauling.

By 1813 to 1815 cows began overrunning agricultural fields and became a danger to travelers and residents alike (Ellis 1963: 291, Wilkes 1970: 204). A wall, called *Kauliokamoa* for the King's k*onohiki*, was constructed between 1813 and 1819 (Barrère 1983) to keep cattle in Waikōloa and off of agricultural land to the east (Lālāmilo and Waimea). The wall was located from roughly the northern border of Waikōloa to near Puʻu Huluhulu and separated the less fertile annual grasslands from the perennial grasslands (Boundary Commission Book for Hawaiʻi Vol. A, 6, 10; Wolforth *et al*. 2004).

John Parker was granted permission to hunt wild bullock for the crown in 1822. Wild cattle were captured in bullock pits seven to eight feet long by four feet wide covered with braches and a thin layer of dirt (Wilkes 1970: 204). They were also hunted with guns and were lassoed in later years, after the arrival of *vaqueros*, "Spaniards [Central and South Americans] with horses from California" (Wilkes 1970: 203). Ellis also described the nature of the herds and bullock hunting.

> Although there are immense herds of them, they do not attempt to tame any; and the only advantage they derive is by employing persons, principally foreigners, to shoot them, salt the meat in the mountains, and bring it down to the shore for the purpose of provisioning the native vessels. But this is attended with great labour and expense. They first carry all the salt to the mountains. When they have killed the animals, the flesh is cut off their bones, salted immediately, and afterwards put into small barrels, which are brought on men's shoulders ten or fifteen miles to the sea-shore (Ellis 1963: 291).

In 1830 Governor Kuakini moved to Waimea to oversee and improve government cattle. He ordered the construction of corrals and the widening and improvement of twelve miles of the Waimea to Kawaihae trail. Liholiho visited the same year to witness strides made in the nascent cattle ranching industry. It was hoped that the exportation of tallow, hides, and salted beef would supplant the defunct sandalwood trade as a major source of income. In 1835 William French opened a store in Waimea and began several ventures related to ranching, including tallow making, tanning, and saddle making (Bergin 2004: 156). Cowhide was tanned using the astringent bark of local trees (Wilkes 1970: 218). Other craftsmen included carpenters and a blacksmith.

The lion's share of French's trade involved supplying whaling ships and the local market with beef. A description of French's operation in 1840 describes their capture and shipment.

> Our principal object in taking the walk was to witness the marking of a lot of cattle that had been driven down from the mountains not long since. Great numbers of wild bullocks are caught in the mountains every year by the hunters: The lasso, the principal instrument in their capture is made of braided thong upon one end of which is a ring forming a slip noose which is thrown with astonishing precision around any part of the animal. Even while at

> a full gallop in pursuit, the hunter grasps his lasso and giving it two or three twirls around his head with his right hand, throws it unerringly and entangles his victim by the horns or limbs. . . For their capture a mode frequently resorted to by the hunters was to dig deep pits and cover them with underbrush and dirt. . . . The bullocks to be marked were driven into a pen towards which we directed our steps. They were noble animals and had been tamed by tying them singly with tame cattle for a time. . . . There were not far from 40 bullocks marked on this occasion intended for the Clementine in her trip down to Honolulu. They are then put into pasture to be fattened for the supply of ships visiting Honolulu in the fall season.

> This brig Clementine had upon its deck about 40 head of bullocks arranged closely together with their heads turned inwards. They were tied down by the horns to a strong framework of spars so that there was no danger of their getting loose (Olmstead, quoted in Bergin 2004: 156).

By 1840 bullock hunting had drastically reduced the numbers of wild cattle, driving them to higher and higher elevations of Mauna Loa and Mauna Kea (Wellmon 1969). A five-year *kapu* was placed on cattle hunting and lead to further efforts to tame, brand, and fence in herds on privately owned land (Wilkes 1970: 200). The decline of whaling and the *kapu* placed on killing cattle created economic hardship and population decline in the Waimea area. Wilkes reported that during this time there were still three or four stores operated by foreigners at Waimea (Wilkes 1970: 218). In 1880 George Bowser's "Directory and Tourists Guide" reported that,

> Waimea itself, although of immemorial age, and once populous, is now only a scattered village, with but two stores and a boarding and lodging house and coffee saloon (quoted in Maly and Maly 2002: 60, emphasis Maly's).

Grazing, the opening of new pastureland, and fires was denuding the forested plains of Waimea, and pushing the tree line to higher and higher elevations (Doyle 1953: 47-48). An article published in the S*andwich Island Monthly Magazine* in 1856, and quoted in Wolforth *et al.* 2004, described the deforestation in the following terms:

> It is in the memory of many foreigners now living there, when the whole of these plains were covered with a thick wood, to the very

> edge of the slope. Where now hardly a tree is to be seen for miles, we were informed by an old resident, that twenty-five years ago he lost himself with his team in the weeds. He also stated that at that time there was far more rain at Waimea than there is now, which indeed might be readily inferred, as clearing the land has been almost entirely effected by the cattle...At this moment they swarm the thick jungle that covers the windward or eastern slope towards Hamakua. They are now gradually destroying this, and thousands of old dead trees die of age, no young ones are seen taking their places, as during the last thirty or forty years, the cattle have eaten or trodden them down...At the present time the vapors and rain which are brought across the plain by the trade winds, are generally dissipated between Waimea Village and Lihue...But when some twenty-five or thirty years ago, woods extended over the whole plain and to the very edge of it, close on to this debatable ground–and when rain was in consequence more frequent over this district, the vapors and cold moist atmosphere, instead of being dissipated near Waimea Village, would necessarily have more frequently extended to the debatable ground... (February 1856:44-47).

A report written in 1877 by the Royal Commissioners on Development of Resources documents similar environmental impacts in the Kohala, Waimea, and Waikōloa area. The report states:

> The forests on the Kohala mountains are dying rapidly. The land is mostly for grazing purposes, though on the mountain potatoes of fine quality can be raised in large quantities. In sheltered places, coffee would doubtless grow, but owning to the sparseness of the population and the superior attractions to other parts of the district, this part will hardly soon be settled. The once fertile and populous plain of Waimea looked sterile and desolate when visited by the Commission-a painful contrast to Kohala loko on the other side of the mountain.
>
> The complaint of the people is well founded. The water they use is fouled in many places by cattle, horses and other animals, and as the stream is sluggish it has no chance to free itself of impurities, and the water used bb the people in their houses must be a cause of disease and death, especially to the children... It is little wonder that with his crops trodden out by the sheep or cattle of his stronger neighbors, his family sickened perhaps to death by the polluted Waters, that the small holder should yield to despair, and abandoning his homestead seek employment in some other district, usually without making another home...

The plains of Pukapu and Waimea are subject to high winds, aggravated by the loss of the sheltering forests of former days. The soil however is very good in many places for sugar cane and other products. To develop its best resources, efforts must be made to restore the forests and husband the supply of water at their sources to furnish a supply for agricultural purposes. At present the lands are used almost exclusively for grazing purposes. Although the proprietors and lessors are probably not averse to the establishment of agricultural enterprises, it is to be feared that the denudation of the neighboring mountains and plains of the forests will render the climatic conditions unfavorable to success.

It would seem that a wise appreciation of the best interests of this district, even of the grazing interests themselves, would lead to the decrease of the immense herds which threaten not only Waimea but even Hamakua with almost irreparable disaster. It is to be feared that they will in time render a large part of the land of little value even for grazing purposes. Owing to the increasing frequency and severity of droughts and consequent failure of springs. Some thousands of cattle are said to have died this last winter from want of water, and the works erected in Waimea for the purpose of trying out cattle have been idle for months for want of water.

The commission do not propose here to discuss fully the vexed Questions of the causes of the diminution of the forests, but in view of the fact that they are diminishing and the streams and springs diminishing a corresponding rations, also that with the cattle running upon the lands as at present, any effort to restore them must be futile and any hopes of their recuperation vain, the Government, if it would wish to preserve that part of the island of Hawaii from serious injury, must take some steps for reclaiming the forests.

In this connection we would say that it is unfortunate that large tracts of Crown and Government lands have been lately leased on long terms for grazing purposes, without conditions as to their protection from permanent injury, at rates much lower than their value even as preserves for Government purposes or public protection. The commission deem (*sic*) this a matter of grave importance, challenging the earnest attention of the Government, and involving the prosperity of two important districts (Report of the Royal Commissioners on Development of Resources 1877, quoted in Maly and Maly 2002: 58-59).

The impacts recorded above were the results of grazing sheep and cattle in the 80-year period after Vancouver landed the first of their kind. The history of herding and ranching these animals proceeds from hunting wild herds to the organization of ranching in an effort to consolidate ownership, improve breeding stock, and to prevent further degradation of the lands of Waimea and Waikōloa.

THE MĀHELE (1845)

Article IV of the Board of Commissioners to Quiet Land Titles was passed in December 1845 and began the legal process of private land ownership based on western law. The law established a board of five commissioners to oversee land claims and to issue patents and leases for valid claims. Many scholars believe that Kauikeaouli (Kamehameha III) was forced to establish laws in order to protect Hawaiian sovereignty and crown lands from foreigners who had already begun claiming ownership of land they were granted permission to use for homes and business interests (Daws 1968:111; Kuykendall 1938(1): 145 footnote 47, 152, 165-6, 170; Kame`eleihiwa 1992: 169-70, 176; Kelly 1983: 45, 1998). Among other things, the foreigners were demanding private ownership of land to secure their island investments (Kuykendall 1938(1): 138, 145, 178, 184, 202, 206, 271; Kame`eleihiwa 1992: 178).

As legal statutes defining the Māhele continued to evolve (up to 1850), the lands of the kingdom of Hawai‘i were divided among the king (crown lands), the *ali‘i* and *konohiki*, and the government. Once lands were thus divided and private ownership was instituted, the *maka`āinana* (commoners), if they had been made aware of the procedures, were able to claim the plots on which they had been cultivating and living as stipulated in the *Kuleana* Act (1849). These claims, however, could not include any previously cultivated or presently fallow land, *okipu`u*, stream fisheries, or many other resources traditionally necessary for survival (Kelly 1983, Kame`eleihiwa 1992:295, Kirch and Sahlins 1992). The right of claimants to land was based on the written testimony of at least two witnesses who could corroborate the claimant’s long-standing occupation and use of the parcel(s) in question. The claimant was then awarded a patent for the property, subsequently called Land Commission Awards (LCAs) (Chinen 1961:16).

At least 26 claims were made for *kuleana* plots in Waikōloa (Maly and Maly 2002: 66). Table 2 below lists claims and awards within the lands of Waikōloa (adapted from Maly and Maly 2002: 66).

Table 1: Claims and Land Commission Awards in Waikōloa.

Applicant	LCA	Register	Testimony	Award Book
James Fay (Kimo Fe)	Helu 589	NR 2:281	*n/a*	*n/a*
James Hall (Kimo Holo)	Helu 672	FR 2:103	FT 5:67 & NT 4:48	MA 3:100
Edmund Bright (Braita)	Helu 986	FR 2:125	FT 5:67 & NT 4:43	MA 3:91
Kipikane (w.)	Helu 1117	*n/a*	NT 4:45 & FT 5:66	*n/a*
James Fay	Helu 2258	FR 2:147	NT 5:65-66	MA 3:52
Nahoena	Helu 3195	NR 8:50	NT 4:8	*n/a*
Makalahae	Helu 3684	NR 8:44	NT 4:33	MA 5:48-49
Waiahole	Helu 3738	NR 8:46	NT 4:34-35	MA 5:48-49
Auwae	Helu 3762	NR 8:47	NT 4:35-36	MA 5:46
Ohiaku	Helu 3783	NR 8:47-48	NT 4:39-40	MA 5:47
Opunui (w.)	Helu 3786	NR 8:48	NT 4:38	MA 4:287
I.A. Palea	Helu 3828	NR 8:380	NT 4:31-32	MA 5:46
Pauhala	Helu 3844	NR 8:51	NT 4:10	MA 5:51
J. Seaboy (Seabury)	Helu 4024	NR 8:55-56	NT 4:44	MA 5:49-50
James Hall	Helu 4036	FR 1:3	*n/a*	*n/a*
Wm. Beadle	Helu 4038	FR 3:2	FT 5:67 & NT 4:42	MA 3:9
Kaahukoo	Helu 4126	NR 8:64	NT 4:12	*n/a*
Kaumu	Helu 4129	NR 8:64	NT 4:37	MA 5:51
Keaulama	Helu 4184	NR 8:53-54	NT 4:36	
Kua	Helu 4215	NR 8:59-60	NT 4:24	MA 5:47
Kaulua	Helu 4231	NR 8:58	NT 4:25-26	MA 5:48
Manuwa	Helu 4505	NR 8:66	NT 4:20	MA 5:50
G.D. Hueu	Helu 8068	NR 8:70-71	NT 4:18-19	
Kipikane (w.)	Helu 8505	FR 3:19	FT 5:67 & NT 4:45	MA 3:55
G.D. Hueu	Helu 8521 B	NR 3:709	*n/a*	*n/a*
Laahiwa	Helu 9972	NR 8:169	*n/a*	*n/a*

THE LANDS OF G.D. HUʻEU (GEORGE DAVIS)

George Davis Huʻeu (George Davis) inherited and owned a large portion of the good grazing lands of Waikōloa. Kamehameha I had given the land to G.D. Huʻeu's father, Isaac

Davis, as an *‘ili kūpono* for services rendered during the conquest of the Hawaiian Islands. Local chiefs claimed some portions of his land when he died in testate in 1810 (Macrae 1972: 44). It became necessary for Isaac Davis’ friend John Young to ask the crown for stewardship of the property for Davis’ children’s sake. When the Davis children came of age, Young requested that,

> the King, Kaahumanu [Kina`u], Adams [Kuakini] and Rooke and all the Chiefs will let Isaac Davis’ children keep their father’s lands that King Kamehameha gave to him as a reward for assisting the King in his wars in conquering the islands of Hawaii, Maui, Molokai, and Oahu, and which I hope in God our young king will fulfill the wishes of his honored father (Collins 1951: 12-13).

Isaac Davis’ land (Royal Patent Grant 5671) was granted to George Davis Hu‘eu as an unsurveyed LCA (8521B) in 1865.

The lack of longtime residents to testify to the traditional boundaries, the nature of the existing survey maps, and various contradictory land claims created further problems concerning G.D. Hu‘eu’s land award. Early survey maps of the area depicted traditional boundaries in locations that are very different from those codified only five to ten years later.

The Wiltse map of 1860 Waimea places the boundary between North Kona and South Kohala Districts further north and east than its later accepted location.

The *mauka* boundary of Waimea, and so Waikōloa, are described in a letter from three Commissioners of Crown Lands based on the Wiltse map. The description of the boundary relating specifically to the area of Davis’ land and shown on the Wiltse map is as follows:

> Thence to Pumahoelua. Thence to a large rock marked “H.” Thence to Kuikahekili; then to Namahana on the line of Kona. Thence along the gulch called Poopoo, bordering the land called Puuanahulu to an ohia tree marked “H.” Thence to Puuiwaiwa. Thence to a point of rocks maked “H.” Thence along the line of Puuanahulu to Kahooalapiko, then to Puuhinei (Maly and Maly 2002: 82, emphasis Maly’s).

The remainder of the boundary between North Kona and South Kohala is much further north than the later, officially agreed apron boundary.

The extent of Davis' property was contested by the Crown in court in 1866, and was finally surveyed and mapped in 1867. Counsel for Davis contended the land granted by Kamehameha included the plains near the seacoast. Representatives of the Crown contended the grant consisted of the hill country only and no land on the Waikōloa plain. A.F. Judd recorded the court proceedings as follows:

> Conspicuous land marks, geographical points are the boundaries of districts and large lands; so Waikoloa has Puaapilau; Keahualono, Puukapele, and Puuhuluhulu, all hills, and not a low place on the plain and the meeting of two gulches in the plain, as alleged by the Crown, to the boundaries of Waikoloa. Puukapele and Keahualono are hills visible each from the other, and the two points establishing the base of the triangle (Handwritten notes of A.F. Judd November 28, 1866, Bergin collection).

The hills of Waikōloa were determined to be Davis' land and the plains along the seacoast remained possessions of the Crown. G.D. Hu'eu's property contained:

> . . .a house lot in the ili of Waikoloa, the cattle corral in the ili of Nohoaina, the goat corral in the ili land of Paulama, and the house site there. There are four sections.
>
> The first section is the house site in the ili of Waikoloa, it has been enclosed and there are two houses within; one house for the school teacher, Kauahi, he has only a house there; the other one is for Hueu.
>
> To the uplands and outer area (waho) is the land of Uilama Pakele (William Beckley); the kula (plain or open) lands on the lower (makai) side are also his; and on the Kohala side is the Alanui hele (path) and the corral of Parker folks and William [Beadle]. It is his old land, gotten from his father, Aikake (Isaac). From KI [Kamehameha I]. Gotten by Aikake from Koapapaa. No one has objected.
>
> Parcel two is in the ili land of Nohaaina, a cattle corral. Uilama Pakele's land is mauka, and on all sides.

> [Parcel three] The goat corral in ili land of Paulama. Uilama Pakele is the only one who bounds it on all sides.
>
> Parcel 4. Keoni's house lot is to the upland side; the outer (waho) and shoreward (makai) sides are Uilama Pakele's land; towards Kohala is Leleiohoku's cattle corral. Hueu's interest is from Uilama. No one has objected.
>
> William Beckley, sworn and stated: I know this, and his interest is from me. I gave him these sections in 1845-1846. (Native Testimony Volume 4:18-19, translated in Maly and Maly 2002: 68-69).

William Beckley was an agent of the Crown entrusted with the management of cattle on Crown lands. Hu‘eu's property eventually became the lands of the Ke‘āmuku Sheep and Cattle Station. The project corridor is located along the southwest boundary of the property.

THE HISTORY OF RANCHING AT THE KE‘ĀMUKU SHEEP STATION

Ke‘āmuku, as recorded on the first and all survey maps since, translates as "cut-off lava" and refers to the lava flow and low prominence (3074 ft amsl) west of the Ke‘āmuku Sheep Station (Pukui et al. 1974: 102). Cultural informants specified that in the Waimea-Waikōloa area, the station and ranch have from time immemorial been called Ke‘āmoku. Both *muku* and *moku* can be translated as cut off, or severed, as an island or district is delineated from its surroundings (Andrews 2003: 402, 407). The Ke‘āmuku lava flow runs parallel to and along the boundary between Kona and Kohala for more than 10 kilometers and Ke‘āmuku might refer to the lava flow's function of delineating the two *moku* of Kona and Kohala.

The origin of organized sheep ranching in the Waimea region is credited to William French, who first arrived in Hawaii in 1819 as a representative of an American shipping venture involved in the sandalwood trade (Wellmon 1969: 49). By 1826 he was grazing sheep and cattle between Waimea and Kawaihae and by 1844 was exporting wool (Wellmon 1969: 57). French owned the Līhu‘e Livestock Farm and a home in Waimea (the historic Spencer House) (Bergin 2004: 156). French also established a store at Pu‘u Loa, and tallow works, a tannery, and blacksmith and carpentry shops (Bergin 2004: 156) in Waimea. French's ranching operation was taken over by Francis Spencer and partners after French's death in the mid-1850s (Bergin 2004: 157).

Francis Mcfarland Spencer (Born in England 1818, died 1897) arrived in Kawaihae in 1839 with his wife and two young children. For a time he ran the stagecoach from Kawaihae to Waimea, from Waimea to Kukuihaele, Honokaa, and Pauuilo (John Spencer interview, recorded by A. Wakayama 1983). Oxen, horses (Percherons), and mules were the primary draught animals for the stagecoach at that time. Spencer used his income to purchase land, and by the 1854 was operating a store and a sheep and cattle farm in Līhu‘e. Spencer’s copartners in the Līhu‘e sheep farm were James Louzada and Henry Cornell (Maly and Maly 2002: 135). James Louzada was one of three “Spaniards” that were hired between 1930 and 1932 to hunt bullock on the island of Hawai‘i. Spencer and Louzada imported six Saxon-merino crossed sheep in 1858 to improve their stock (Bergin 2004: 229). Spencer also operated a sheep farm at Pu‘u Loa (his primary residence), which combined with his other ranching interests, was called F. Spencer and Company.

F. Spencer and Company entered into a partnership in 1861 with the newly formed Waimea Grazing and Agricultural Company (WGAC), owned and operated by Robert Cheshire Janion and his partner William H. Green (Maly and Maly 2002: 134). The WGAC, like all ranching operations in the area, was involved in bullock hunting and the production of salted beef and hides as well as sheep and cattle ranching. The new joint business venture, consolidated under the name of the Waimea Grazing and Agricultural Company, became the largest ranching operation of its time.

In 1865 Francis Spencer bought out the ranch operation of three Hawaiian ranchers who held a lease (General Lease No. 106) on the entire *ahupua‘a* of Pu‘u Anahulu adjacent to and west of Ke‘āmuku (Maly and Maly 2002: 137). On July 2, 1868 G.D. Hu‘eu leased his land in Waikōloa to William L. Green on behalf of the WGAC for $600 per year (Maly and Maly 2002: 139). The 20-year lease included all of the land awarded to G.D. Hu‘eu under LCA Number 8521 B Parcel 1, except properties previously sold to William Claude Jones in October 1866 (Maly and Maly 2002: 137-139). The Hu‘eu family was allowed to continue grazing their 1,000 cattle, 100 horses, and 1,000 sheep on the land under the terms of the lease.

The WGAC, in turn, leased the land to Francis Spencer, who leased the grazing rights to the WGAC. The lease, combined with previously owned/leased land (seven properties altogether) gave Francis Spencer and the WGAC the right to hunt wild (unbranded) cattle and sheep, and to graze their cattle, sheep, horses, and mules over a vast area of land from Hilo to Hāmākua, to South Kohala, and to Kona (Maly and Maly 2002: 137). William L. Green estimated that in 1870 100 “bush cattle” hides (also called “mountain hides”) per year could be taken from Keʻāmuku with a maximum return of 9.5 cents a hide (Maly and Maly 2002: 143). An early survey map drawn by Kaelemakula shows a “Hale o Spencer” (Spencer House) in the vicinity of the historic residence of the Keʻāmuku Sheep Station (Figure 7). Given the difficulties of early survey procedure, the Hale o Spencer is situated very close to the Keʻāmuku Sheep Station residence when plotted on the USGS Keamuku Quadrangle map (1982). It must be noted that the Kaelemakula map depicts the house on the southern bank of the gulch, not on the northern bank, as is the case with the location the residence at the Keʻāmuku Sheep Station. There are two possible locations along the Keʻāmuku gulch that are likely locations for the original house (suggested by archaeological investigations and map analysis) if the map is not incorrect. Cultural informants have maintained that the Keʻāmuku House at the Keʻāmuku Sheep Station is the original Spencer house.

An English traveler, Isabella Bird, passed through the Waimea area in 1873 and described the Spencer residence and sheep operations at Puʻu Loa.

> On clambering over the wall which surrounds my host's kraal of dwellings, I heard in the dusk strange, sweet voices crying rudely and emphatically, "Who are you? What do you want?" and was relieved to find that the somewhat inhospitable interrogation only proceeded from two Australian magpies. Mr. S. is a Tasmanian, married to a young half-white lady; and her native mother and seven or eight dark girls are here, besides a number of natives and Chinese, and half Chinese, who are employed about the place. Sheep are the source of my host's wealth. He has 25,000 at three stations on Mauna Kea, and, at an altitude of 6000 feet they flourish, and are free from some of the maladies to which they are liable elsewhere. Though there are only three or four sheep owners on the islands, they exported 288.526 lbs. of wool in 1872. Mr. S. has also 1000 head of cattle and 50 horses (Bird 1998: 147-148).

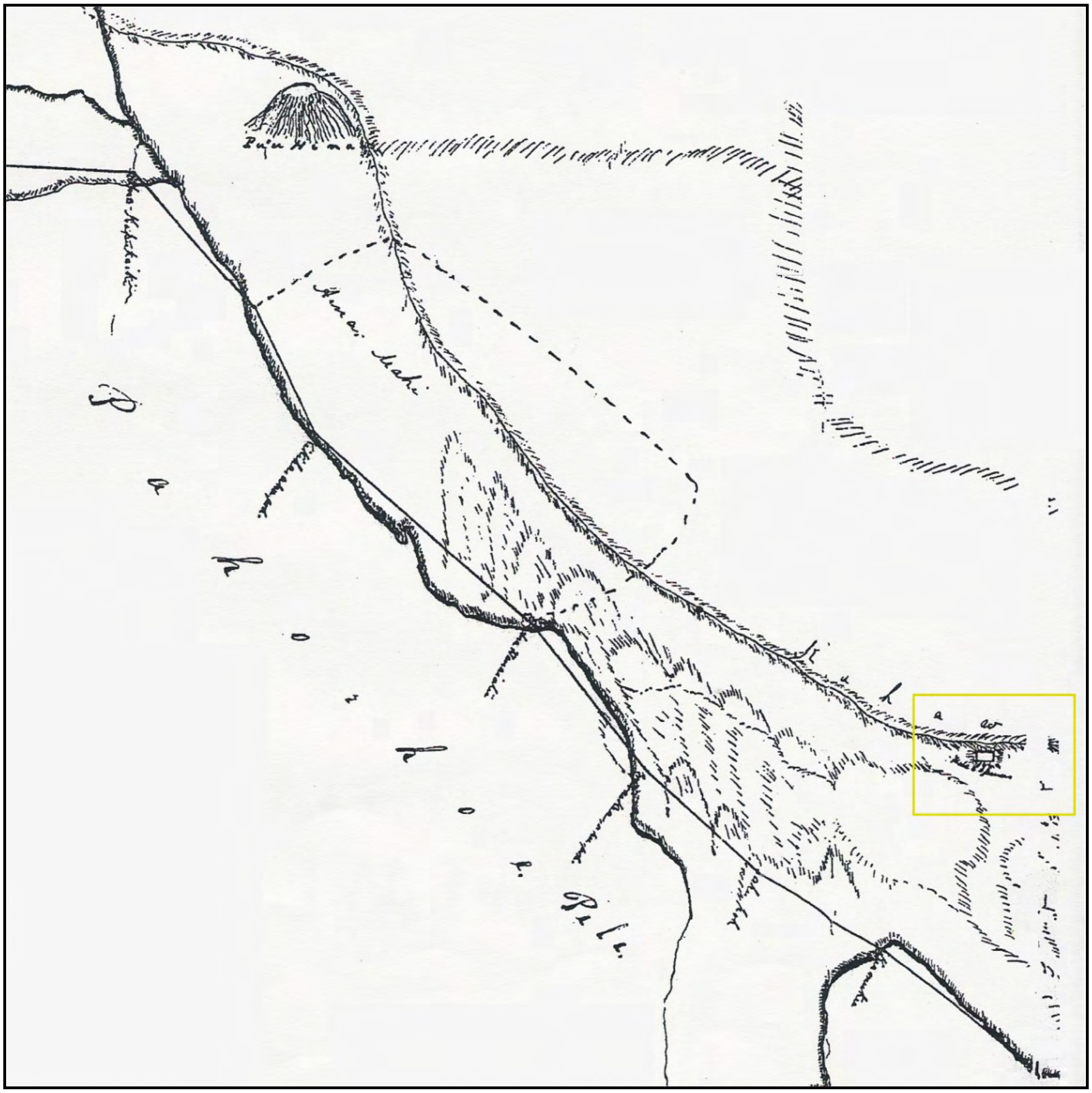


Figure 7: Kaelemakula Map Showing Hale o Spencer.

She also described the Spencer sheep station at Kalaiʻehā where Francis Spencer's oldest son Ashford (1847-1891) and his wife Puakalehua Awai lived.

> I have described the "foreign residences" elsewhere. Here is one of another type, in which a wealthy sheep owner's son, married to a very pretty native woman, leads for some months in the year, from choice, a life so rough, that most people would think it a hardship to lead it from necessity. There are two apartments, a loft and a "lean-to." The hospitable owners gave me their sleeping-room, which was divided from the "living-room" by a canvas partition.

> This last has a rude stone chimney split by an earthquake, holding fire enough to roast an ox. Round it the floor is paved with greatrough stones. A fire of logs, fully three feet high, was burning, but there was a faulty draught, and it emitted a stinging smoke. I looked for something to sit upon, but there was nothing but a high bench, or chopping-block, and a fixed seat in the corner of the wall. The rest of the furniture consisted of a small table, some pots, a frying-pan, a tin dish and plates, a dipper, and some tin pannikins. Four or five rifles and "shot-guns," and a piece of raw meat, were hanging against the wall. A tin bowl was brought to me for washing, which served the same purpose for everyone. The oil was exhausted, so recourse was had to the native expedient of a jar of beef fat with a wick in it.
>
> We were most hospitably received, but the native wife, as is usually the case, was too shy to eat with us, or even to appear at all. Our host is a superb young man, very frank and pre-possessing looking, a thorough mountaineer, most expert with the lasso and in hunting wild cattle. The "station" consists of a wool shed, a low grass hut, a hut with one side gone, a bell-tent, and the more substantial cabin in which we are lodged. Several saddled horses were tethered outside, and some natives were shearing sheep, but the fog shut out whatever else there might be of an outer world. Every now and then a native came in and sat on the floor to warm himself, but there were no mats as in native houses. It was intolerably cold. I singed my clothes by sitting in the chimney, but could not warm myself. A fowl was stewed native fashion, and some rice was boiled, and we had sheep's milk and some ice cold water, the drip, I think, from a neighbouring cave, as running and standing water are unknown.
>
> There are 9000 sheep here, but they require hardly any attendance except at shearing time, and dogs are not used in herding them. Indeed, labour is much dispensed with, as the sheep are shorn unwashed, a great contrast to the elaborate washings of the flocks of the Australian Riverina. They come down at night of their own sagacity, in close converging columns, sleep on the gravel about the station, and in the early morning betake themselves to their feeding grounds on the mountain. (Bird 1998: 232-233).

George Bowser also described Waimea and the Spencer sheep ranching interests in the following terms:

> ... Waimea has always been a place of some considerable importance, and there are around it several pretty homesteads,

> notably the residences of Mr. F. Spencer and the Reverend Mr. Lyons. From Mr. Spencer's veranda there is a striking view of Maunakea, the summit of which was at this time of the year still in its winter robe of snow. The snow never leaves this mountain-top entirely, but the position of the snow-line varies considerably with the season of the year, and also from one year to another, according to the weather which characterizes them. The country all round is chiefly suitable for grazing, and, besides innumerable wild cattle, descended, no doubt, from those which Vancouver gave to Kamehameha I, there are some 20,000 head depastured in the neighborhood, the property of Mr. Parker, who has, besides, some large droves of horses, probably numbering a thousand head in all. Mr. Spencer has turned his attention chiefly to sheep farming, and occupies a large tract of country with his flock of 15,000 sheep and 15,000 goats. Waimea itself, although of immemorial age, and once populous, is now only a scattered village, with but two stores and a boarding and lodging house and coffee saloon (Bowser 1880, quoted in Maly and Maly 2002:60, emphasis Maly's).

At some point between the end of 1871 and the beginning of 1876, the WGAC went out of business due to drought (Wellmon 1969). Francis Spencer formed the Puuloa Sheep and Stock Company out of his sheep stations in Waimea, Waikōloa, and Puʻu Anahulu (Wellmon 1969: 44). In October of 1876 he sold (mortgaged) his interest in the Puuloa Sheep Ranch to George W. Macfarlane (Maly and Maly 2002: 145). Macfarlane sold a fourth of the interest to W. L. Green including,

> ... Twenty one thousand sheep with one fourth increase of the same, all sheep stations on the Island of Hawaii aforesaid with the improvements, and everything appurtenant to said sheep stations, all waggons, oxcarts, spring waggon, working oxen, steers, cows and calves, horses, mares, mules and all the goods, wares and merchandise in the retail store in Lihue, Island of Hawaii... the wool press, vats, tanks, pots, and all the implements and appurtenances belonging to or appertaining to sheep raising which were conveyed to me by Francis Spencer... I the said George W. Macfarlane have granted, sold, assigned and set over, and by these presents do grant, bargain, sell, assign and set over unto the said W.L. Green, the undivided fourth interest in all the several leases of land in the Island of Hawaii aforesaid, as follows, the lese of the Ahupuaa of Waikoloa, the land called Beadles Hill or Hokuula, Pitman's lease, the land called Holuokawai, and Kalopa... (Bureau of Conveyances Lib. 54:185-186, quoted in Maly and Maly 2002: 145).

According to Maly, Spencer "still maintained a residence and station at Keʻāmuku through the 1880s and held his interests in the Puʻu Anahulu Ranch lease through 1895. A sketch of the Waikōloa area drawn by J. Perryman in 1882 shows a series of buildings labeled "Warren's Keamuku" at the location of the Keʻāmuku Sheep Station (Figure 8). Warren is most likely a reference to William Warren who used the name Jack Purdy and worked for William Green and the WGAC (Bergin 2004: 84-85). Francis Spencer died in 1897.

A.W. Carter purchased the Puuloa Sheep and Stock Company interests for $20,000 (Brennan 1972: 136) in January 1904 on behalf of Parker Ranch, including,

> the Keamuku Sheep Station. This was purchased from the MacFarlane interests and included 4,500 ewes, 800 lambs, 300 wethers, and an undisclosed number of rams of reasonable breed-mainly merino crosses. Also undisclosed was the exact number of semiwild range sheep that grazed in adjoining Kālawamauna, but estimates were between *2,000* and *2,500.* At the time of purchase there were substantial improvements, including a dwelling, men's quarters, and outbuildings that housed scales and equipment for shearing sheep and packing wool. Pens, corrals, and yards were left intact also. All told, A. W. acquired nearly *8,000* head of sheep, together with station improvements and equipment-but the centerpiece was the Lihuʻe *kuleana* (property) itself adjacent to Waimea, followed by the Keamuku lands, which included Kālawamauna (Bergin 2004: 230).

One of the outbuildings was a shearing barn that was photographed in the early 1960s before it was demolished (Figure 9).

Richard Smart wrote of the purchase and early sheep operations at Keʻāmuku in the newsletter *Paka Paniolo* noting that it

> . . . was purchased by Parker Ranch in February 1904 along with the stock numbering 6,175 sheep. Wool produced that year totaled 10,000 pounds. Mr. Frank Johnson was the manager of the Puuloa Sheep and Stock Ranch when it was purchased by Parker Ranch, and remained as manager of the station until 1906 when Mr. A.C. Aubrey became the manager (Richard Smart 1965, quoted in Maly and Maly 2002: 210).

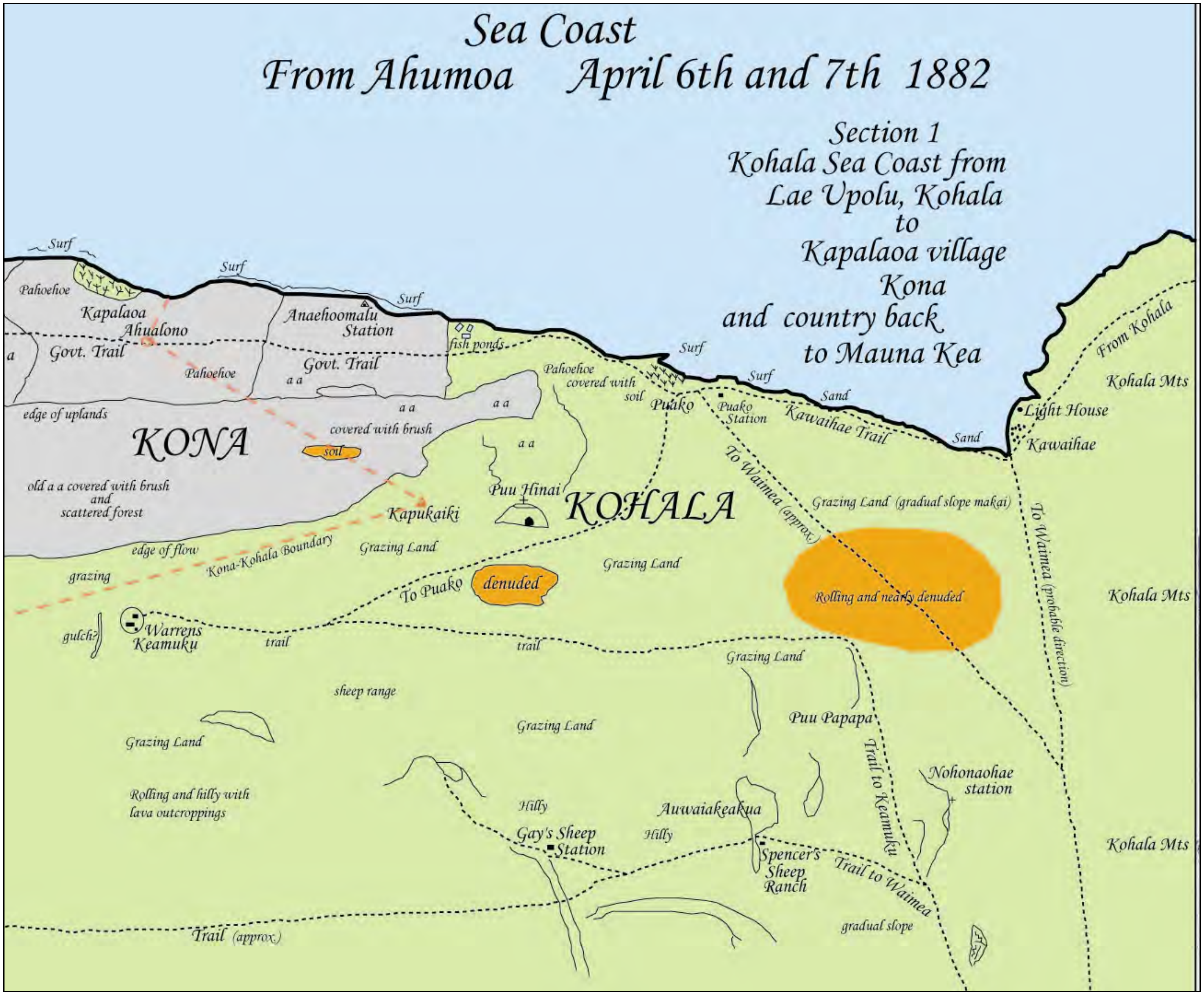


Figure 8: J. Perryman's 1882 Map of the Waikōloa Area.

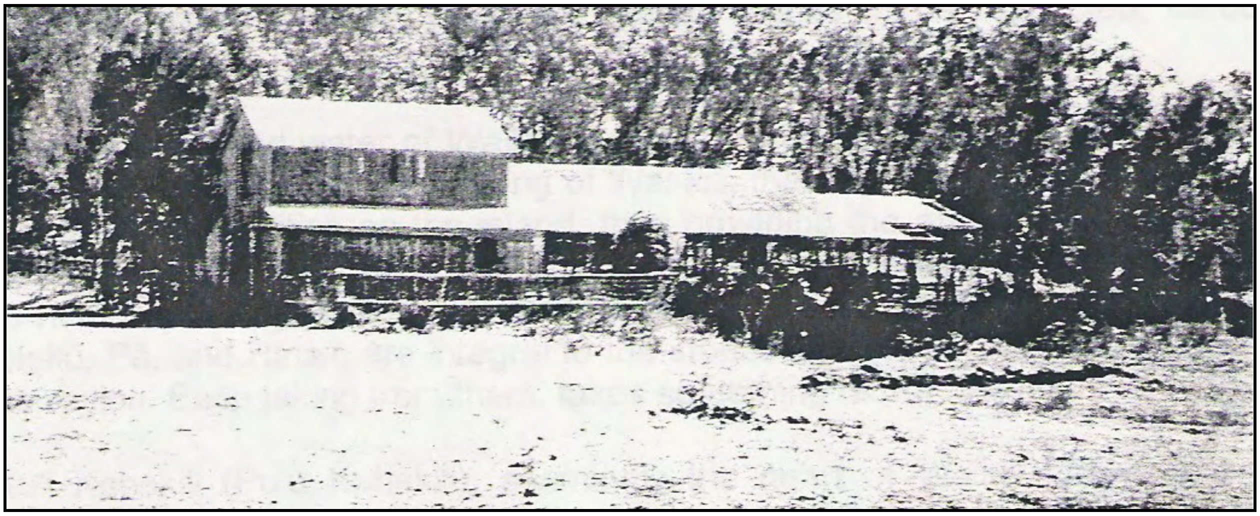


Figure 9: The Keʻāmuku Sheep Shearing Barn.

Yutaka Kimura, who began working at Keʻāmuku Section in 1919, was interviewed by Langlas and described early ranching at Keʻāmuku, before the purchase, as follows:

> Kimura was told that the sheep range was not fenced, but that two men with dogs kept the sheep from wandering away. A Hawaiian named Nahulu lived on the lower side, in a shack at Puʻu Hinei, and a Chinese named Akuna lived on the upper side, in another shack *makai* of Pu ʻu Keʻekeʻe. The Keʻamoku sheep operation ended not too long after Parker Ranch took it over. Mr. Kimura said that the sheep were taken from there up to Humuʻula "before my time." (Langlas *et al*. 1999: 46).

A.W. Carter began grazing cattle at Keʻāmuku Section in 1907 (Wellmon 1969). At that time there were eight employees listed as working at Keʻāmuku Section including, Condo (Kondo), Ah Kune, Ah Him, Mori, Suketa, Kanikubo, Yamamoto, Egawa, and Codeiro (Maly and Maly 2002: 173). By 1908 there were 18 employees, predominantly of Japanese descent (Maly and Maly 2002: 174). In March 1908 water was piped up to the Keʻāmuku Section *via* Waikiʻi. As a result, sheep and wool production from Parker ranch's Keʻāmuku Section continued to increase and improve as documented in the following *Paka Paniolo* article:

> By June 1908 the station had increased its stock to 10,997 sheep and produced 30,000 pounds of wool which was almost completely free of kikania (cockle burr). Therefore, Parker Ranch wool always brought good prices in Boston where it was marketed. Shearing was done early in the Spring before the kikania burrs had a chance to mature and harden and stick to the wool. For this reason also

> Parker Ranch wool was always preferred in the Islands as padding for the Hawaiian quilts. Speaking of quilts, Mrs. Theresa Quinn of Kohala was contracted to make a quilt for Queen Liliuokalani's bed at Washington Place during Governor Stainback's term of office. The wool for this quilt was donated by Parker Ranch (Richard Smart article 1965, quoted in Maly and Maly 2002: 210).

In 1914, after Parker Ranch acquired the Humuʻula Sheep Station, A.W. Carter began to phase out sheep at the Keʻāmuku Section. The invasion of *kīkānia* that lodged in sheep's wool and made sheep shearing unprofitable at other locations in the early 1900s did not immediately affect the sheep at Keʻāmuku Section. Wool continued to be produced at Keʻāmuku until around 1918 when the remaining sheep and equipment were finally transferred to Humuʻula (Maly and Maly 2002: 171-172, 206). A.W. Carter commented on his sheep ranching experiences writing,

> I do not profess to be a sheep man. My business has been primarily cattle. However, I have learned considerable about sheep with reference to our own peculiar conditions.
>
> The only experience that I have had with sheep has been with a special type of Merino and I have imported rams of this type from Australia. This is a wool type. By the importation of rams I have been able to raise the average wool clip to about eight pounds per animal and it is the type of wool that is desired in trade. I ship it to Boston, the headquarters of wool in the United States, and we get a very good price. For many years the wool clip continued to be profitable.
>
> The wethers and ewes were sent to the Honolulu market. The wethers dressed out at about 48 pounds. The real demand is for lamb.
>
> We are not in a position on this particular Ranch to go into the lamb business. I have raised a few lambs for our local supply on Hawaii by crossing the English Leicester, which is a large long-wool sheep, on Merino ewes and I think this is a good practice if anyone should want to follow that line of business.
>
> For many years I have used an arsenic dip to cure and prevent sheep scabs and finally eliminated it. I have continued however, to use a carbolic dip annually and I think that anyone running sheep must dip their flocks every 12 months to keep them clean.
>
> We are fortunate in not having any burrs and our wool is very

> clean as it comes from the sheep's back. Dirt and burrs, of course, depreciate the value [of] wool.
>
> The Merinos, which we use, are small, chunky animals, not like the large sized Merinos that you often see in Australia. We have a very rough and rugged country and we find that these do much better than heavier sheep. We run our sheep in paddocks; they are not herded. I have handled Southdowns and Shropshires but without much success (Bergin 2004: 236).

Sheep were dipped annually in a cement dipping vat at Keʻāmuku until they were transferred to the Humuʻula (Figure 10).

There were no automobiles in 1910 and very few in the 1920s, all transportation was by foot, horse, or by wagon, carriage and buggy (Figure 11). Three major cart roads led to and from the Keʻāmuku Section. The Keʻāmuku-Waimea trail was situated from Keʻāmuku, north past the eastern bases of Puʻu Papapa and Puʻu Nohonaohae (where it joined the trail to Spencer's sheep operations on Mauna Kea), and on to Waimea town (J.S. Emerson Field Book 251:83 and 109, in Maly and Maly 2002: 100-101). A second trail ran from Keʻāmuku, northwest past the east side of Puʻu Hinai, and down to Puakō (*ibid*). A third trail constructed in the 1800s is situated west of Keʻāmuku Station in the direction of Puʻu Hinai (Maly and Maly 2002: A-472). Two later dirt roads connected Keʻāmuku to Waikiʻi and to the Kona-Waimea Road. Rally Greenwell and Jiro Yamaguchi commuted by vehicle from Hale Kea (Parker Ranch headquarters) and Waimea to Keʻāmuku every day (Rally Greenwell interview, Jiro Yamaguchi interview collected for Maly and Maly 2002). A small crew of three two four hands lived at Keʻāmuku House (Rally Greenwell interview collected for Langlas *et al*. 1999).

Work at Keʻāmuku included weeding, fence mending, goat eradication, rain gauge reading, sheep dipping and shearing, and the tending and driving of cattle. The earliest cowboys and ranch hands were mostly Hawaiian and cowboys like Matsuichi Yamaguchi learned to speak

Figure 10: Dipping Sheep at Ke‘āmuku in 1906.

Figure 11: A Buckboard Wagon Used for Early Transportation at Parker Ranch.

fluent Hawaiian (Jiro Yamaguchi interview collected for Wolforth *et al*. 2004, and Ichiro Yamaguchi interview).

The Plaster Gang, usually comprised of a Hawaiian foreman, a *luna*, and Japanese crew, constructed new fences, mended fences, and removed noxious weeds. Fence checking was done once a month. It took a day to check the fence from the Waimea-Kona belt road to Puʻu Hinai and another day to check it from Puʻu Hinai to Puakō (Greenwell interview collected in Maly and Maly 2002). The type of fence post used for the construction of new fence lines was dependent primarily on location. Hardwood such as *kiawe* was preferred and used in places where it was close by, such as Puakō (Rally Greenwell interview). *Kiawe* was also transported for use as corner posts where strength was important. Most of the fence posts at Keʻāmuku are eucalyptus because they were grown there. Two types of Eucalyptus were used: red gum and blue gum. Red gum is easier to split and was used for central posts and the more solid blue gum was used for corner posts (Ichiro Yamaguchi interview).

The Plaster Gang also removed *Pampas*—a name ranchers commonly used to refer to fountaingrass (*Pennisetum setaceum*)—spreading from the Kona side, from lava flows (up to a mile within the flow) surrounding Keʻāmuku. As a result, Parker Ranch was free of fountaingrass. From the 1930s to1960s Parker Ranch worked to eradicate the *pānini* or prickly pear cactus (*Opuntia ficus-indica* and *O. cordobensis*). The cactus, brought from Mexico in 1809 for forage and moisture, was rampant by the early 1900s. Cactus eradication crews began working in the 1930s and cleared roughly 60,000 acres by 1965 (Bergin 2004: 272).

Sheep were dipped annually and were shorn two to three times a year. Lambs were shorn in February and rams and ewes were shorn in May or June. Parker Ranch employees, contract men, and day workers were carried out the shearing. Eight or nine men could shear roughly 100 sheep a day (Ichiro Yamaguchi interview). Sheep were lead by ramp into the pen in the center of the shear barn where men working at individual stations along the outside edges of the central pen would select sheep for shearing. Each station had a mechanical clipper attached to a single motor for clipping the wool.

Shorn sheep were pushed individually into an outside corral through a hatch in the side of the shear barn. Each man kept a count for pay purposes. The combing (highest grade wool) and tags (lower grade wool) were then baled in a manual wool press.

Nānā ʻāina men kept and eye on the land and watched over the cattle (Rally Greenwell interview). Their daily presence with the cattle kept them familiar with men and kept them *laka* (tame). A *nānā ʻāina* man knew the cycles of the environment and cattle. He was first to know when the calves were ready to drop, or when illness and death struck. He kept track of the water in paddocks and the state of the forage. The cowboy gang also ran the cattle from paddock to paddock depending on the rain. It was common to ride with a rifle to eradicate goats and to shoot older cattle to feed the pigs at Waikiʻi (Foreman Books for Parker Ranch, H.P.A. collection).

Wild pigs and plover (*kōlea*) were often shot to supplement provisions brought up from Waimea (Rally Greenwell interview). Rally remembered a smokehouse at the Keʻāmuku House where they smoked pork and mutton (Rally Greenwell interview collected in Maly and Maly 2002). Figs, peaches, and watermelon were grown at Keʻāmuku Station. Vegetables, hogs, and fowl raised at Waikiʻi, and meat butchered and cut in Waimea supplemented food at all Parker Ranch sections (Rally Greenwell interview). Most food supplies and other necessities were sent up from Waimea.

Three or four men lived at Keʻāmuku year round. Three unmarried men lived at Keʻāmuku House and went home to Waimea on weekends. Mr. Uyehara lived in a small cottage near the north gate and watched over the ranch on the weekends. Water for cooking, cleaning and bathing was collected from the shear barn roof (fog, dew, and mist more often than rain) before water was piped to Keʻāmuku. The piped water was stored in a metal tank until a redwood tank was constructed in 1945 (Ichiro Yamaguchi interview).

During World War II (between 1942 and 1945) portions of Parker Ranch were used for military training. The Army and Marines stationed some 30,000 to 50,000 men in Waimea. Tents and Quonset huts were located south of Waimea at Camp Tarawa. A firing range for artillery practice was set up and a dirt road for tank travel extended between Kawaihae and Pu`u

Ke`eke`e (Brennan 1974:164). The old wagon road Connecting Waimea to the Humu`ula area became the Saddle road, constructed by the Civilian Conservation Corps in 1943 (Langlas *et* al. 1999: 29). Jiro Yamaguchi noted that some 26,000 marines were training out by Puʻupā between the Waikiʻi and Keʻāmuku sections (Jiro Yamaguchi interview collected for Maly and Maly 2002).

Though the Keʻāmuku Section was off the beaten track, it was renowned for the size and health of the cattle raised there. Dr. Billy Bergin attributes the success of both sheep and cattle ranching at Keʻāmuku to its environment. The cool arid weather, "strong ground" and "strong grass" at Keʻāmuku are ideal conditions for raising healthy livestock (Bergin interview). Changes in weather patterns, improvement in transportation, and the impetus to consolidate and centralize operations in the late 1940s foreshadowed a process that would eventually close outlying sections such as Keʻāmuku and Waikiʻi (Bergin interview).

> Up until the late 1940s, the annual rains remained consistent. There was a time for planting and for rotating livestock through regional paddocks, and the weather could be counted on. This changed and by the early 1950s, crops were lost, and the ranch's feed planting program diminished, adjusting to the weather patterns (Maly and Maly 2002: 202).

Waikiʻi Village and ranch section closed and most of the houses there were moved to "Little Waikiʻi" in Waimea by 1957. Keʻāmuku continued as a ranch section and in 1962 general repairs were made (Malay and Maly 2002: 204). Only a small crew remained at Keʻāmuku, while other ranch hands commuted from Waimea. The hands were kept busy weeding and mending fences.

Further changes in ranching strategy at Parker Ranch led to the consolidation of herds (Rally Greenwell and Bergin, personal communication). Cattle were no longer moved (seasonally) from paddock to paddock within individual ranch sections as forage was depleted. As consolidation occurred Keʻāmuku became less necessary, or even economical to maintain on a full-time and full-scale basis. Richard Smart wrote in *Paka Paniolo* that:

> In the early days it was necessary to maintain Keamuku as an outpost camp as transportation and communication to and from the

> camp were difficult but with the modern means of communication of today the Keamuku area may be inspected and worked very readily from headquarters at Waikii. This was a decision by management in the interest of streamlining ranch operations.
>
> The present buildings at the Keamuku camp will eventually be dismantled. Standing there now are several interesting old buildings including an old shearing barn (Richard Smart 1965, quoted in Maly and Maly 2002: 209-210).

The house (bachelor's quarters) at the Keʻāmuku Section was moved to the grounds of the Japanese Church (*Hongwanji*) in Waimea, the shear barn was demolished, and the area around it bulldozed (Rally Greenwell interview).

Keʻāmuku was used for joint military operations in the 1980s that included a Korean contingent (Mark Yamaguchi, interview collected for Maly and Maly 2002). In 2005, Keʻāmuku was purchased by the U.S. Army for use as a STRYKER Brigade training area. The property is known as the Keʻāmuku Maneuver Area at the U.S. Army Pōhakuloa Training Area. Parker Ranch continues to use the property to pasture cattle.

There are no military training features within the project corridor. All of the archaeological features identified within the project corridor date to the time period the property was used for sheep and cattle ranching.

METHODOLOGY

ARCHIVAL METHODS

In addition to referencing available resources at SCS, archival research was conducted in the State Historic Preservation Division (SHPD) report database and library facility (Hilo, HI), the Hawaii County land records office, the *Waihona ʻAina Mahele* database website, the Hawaiian collections holdings at the University of Hawaiʻi-Hilo Library, and the Hawaii State Library system. Archival work consisted of general research on the history and archaeology of the project area, as well as specific searches of previous archaeological studies in and around the current project area. Historic land use data, land ownership, maps, and narrative information were obtained from the Hawaii County land records office, the *Waihona ʻAina Mahele* database website, and the University of Hawaiʻi, Hilo, Special Collections.

CONSULTATION

Oral interviews conducted by SCS with Jiro Yamaguchi, Rally Greenwell, Dr. Billy Bergin, and Ichiro Yamaguchi for lands of Keʻāmuku were used in the present study. In addition, oral interviews collected with John Spencer (Wakayama 1983) and others (Langlas *et al*. 1999) knowledgeable about the lands of Keʻāmuku were consulted.

FIELD METHODS

Inventory Survey work was conducted intermittently from September 16, 2008 to March 26, 2009 (320 man-hours total) by Suzan Keris, B.A. and Glenn Escott, M.A (Project Director). Bob Spear, PhD was the Principle Investigator for the project. There were four main field components to Inventory Survey process: pedestrian survey of the entire project area; plotting located sites on a project area map with Global Position System (GPS) Universal Transverse Mercator (UTM) units (Zone 5 North) using WSGS84 datum for all three sites; individual site mapping and recording; and hand excavations. Survey was conducted along east/west traverse lines at ten to 15 meter intervals apart. Observed cultural features were assigned temporary feature numbers. The site UTM was recorded at the site datum, which is marked with a metal tag.

Four sites (rock mounds) were selected for test excavation to determine several site characteristics including site function, construction method, and timing. Test-units were excavated as 0.5 x 0.5 meter and 1.0 x 1.0 meter dug in both natural and arbitrary 10 centimeter levels. These were used on features that were thought to have a high potential for yielding functional or temporal data, and used where vertical control would contribute to this data. Test-units were screened for cultural material through 1/8th inch mesh, and all units were stratigraphically profiled.

Cultural material was recorded by type on standard SCS excavation forms and collected. Soil colors were recorded using Munsell color charts, soil composition was recorded with the aid of the U.S. Department of Agriculture Soil Survey Manual on standard soil stratigraphy forms, and profiles were drawn. Overview photographs were taken of individual site features, sites, excavations, and the project area. Color photographs were taken with a 3.2 mega-pixel digital camera using a 20 cm long north arrow scale divided into 10 cm black and white increments.

LABORATORY METHODS

Inventory of midden and artifacts collected from the test excavations were analyzed and weighed. Bottle glass recorded during the current study was automatic bottle machine made (after 1900 to 1910). No earlier, dark green, hand blown or mould blown bottle glass was recorded during the current study. All field notes, maps, cultural material, and photographs pertaining to this project are currently being curated at the SCS facilities on the Island of Hawai‘i.

PREVIOUS ARCHAEOLOGICAL INVESTIGATIONS

Past archaeological investigations along the coast near the *ahupuaʻa* of Waikōloa are numerous. Several studies document sites on the inland plain of Waikōloa. Archaeological studies in the uplands of Waikōloa near the present project area are few in number. Sites from all three environmental areas function together in a cultural and economic sense, but are very different in their regional characteristics. This report briefly summarizes archaeological feature types common to the coastal and inland plain. Individual archaeological reports pertaining to upland Waikōloa and lands of Keʻāmuku are discussed in greater detail.

COASTAL ARCHAEOLOGICAL INVESTIGATIONS

More than 30 archaeological studies have been conducted along the coast from ʻAnaehoʻomalu Bay to Puakō (discussed in detail in the "Early Settlement and Expansion" section above). Coastal archaeological features include habitation sites (lava tubes, C-shapes, and platforms) and tool production sites associated with fishing. Fishhooks, octopus lures, and marine midden are common artifacts found at coastal sites.

Basalt extraction and abrader production features are located up to a half mile from the coast on lava fields. Small excavations in the lava likely used to trap birds for food are interspersed with abrader production features. Numerous trails connect the coastal habitation sites with these inland economic features.

ARCHAEOLOGICAL INVESTIGATIONS ON THE INLAND PLAINS TO THE UPLANDS OF WAIKŌLOA

The Mudlane-Waimea-Kawaihae Road Project surveyed a large strip of the Waimea (or Lālāmilo) Field System in Kawaihae, Lālāmilo, Waimea, and Mudlane (Barrerra and Kelly 1974, Kirch and Clause 1981, Athens 1981, Clark and Kirch 1983). The major result of this study was the documentation of an agricultural system that combined traditional irrigated pondfield cultivation and dryland cultivation to form an intensive "supplemental irrigation" form of cultivation (Kirch 1983: 527). Common agricultural features of the Waimea Field System include walled and rectilinear fields, terraces, and canals. An example of field distribution in one portion of the field system is depicted in above.

ACOE conducted a reconnaissance survey of a 60 m wide corridor along the PTA to Kawaihae tank trail (Figure 12). The project area covered an area from the inland plain to the uplands of Waikōloa. No cultural or archaeological resources were identified within the study area (Cox 1983).

Ogden Environmental and Energy Services, Inc. (OEES) conducted an archaeological inventory survey in central Waikōloa (Nees and Williams 2000a). Three pre-Contact era sites and several Historic period sites were recorded. Pre-Contact sites included the mid-17th century battlefield site at Puʻu Pa (battle between Lonoikamakahiki and Kamalālāwalu), two agricultural sites, and the prison camp located near the Kamakao Gulch.

Ogden Environmental and Energy Services, Inc. (OEES) conducted archaeological monitoring and reconnaissance survey on six parcels within the *ahupuaʻa* of Kawaihae 2, ʻOuli, Lālāmilo, Waikōloa, and Puʻukapu (Robins *et al*. 2001). The majority of the 153 sites are associated with military training (defensive positions). Fifty-three sites have features associated with the pre-Contact era or traditional Hawaiian practices (mainly habitation). The remaining sites are associated with Historic period ranching.

Two sites were recorded on Keʻāmuku ranch section lands, including a dryland agricultural complex (Site 22929) and a pre-Contact era temporary habitation (Site 22933). The former site is located within the crater of Puʻu Heʻewai and the latter within the crater of Puʻu Kanalopakanui.

Scientific Consultant Services, Inc. (SCS) conducted an archaeological inventory survey of 723 acres (292 hectares) for the proposed Saddle Road Extension corridor situated east of ʻAnaehoʻomalu Bay to approximately 300 m southeast of the present project area (Wolforth *et al*. 2006). Fifty-seven sites, located primarily at lower elevations, were identified. The majority of sites are associated with the extraction of scoriaceous lava, abrader production, and a network of trails that connect these sites to coastal habitation sites. Low and mid-elevation sites also include basalt extraction quarries and caves, including habitation/refuge caves.

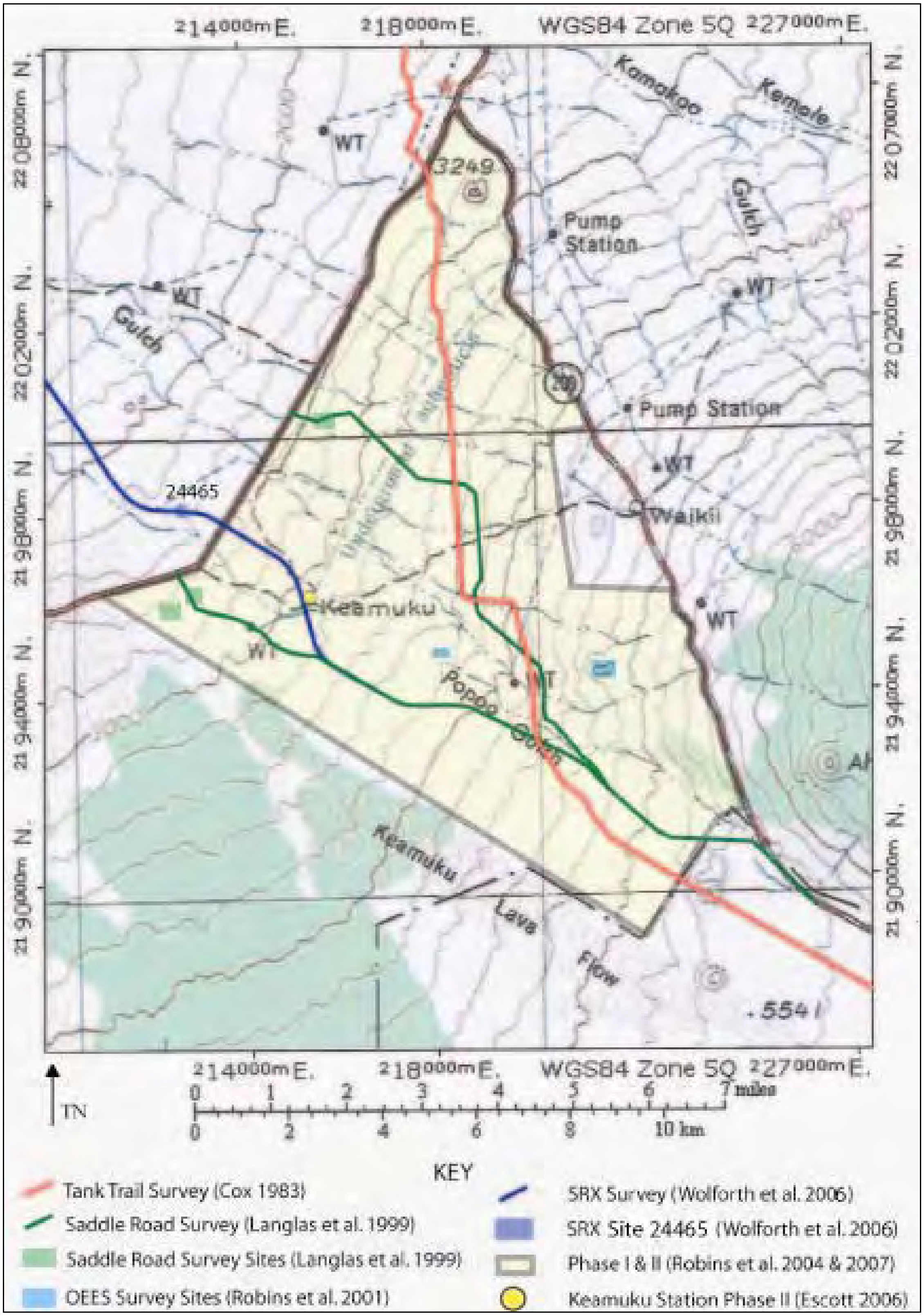


Figure 12: Previous Archaeological Projects on Lands of Keʻāmuku.

One site (Site 24465) was recorded in the upland Waikōloa region near the present project area (see Figure 12). Site 24465 is a multi-component site situated below the Mamalahoa Highway approximately 3.25 km northwest of the Keʻāmuku Sheep and Cattle Station (Wolforth *et al*. 2006:32-44)). The site consists of five features associated with pre-Contact and post-Contact era farming and ranching (Figure 13).

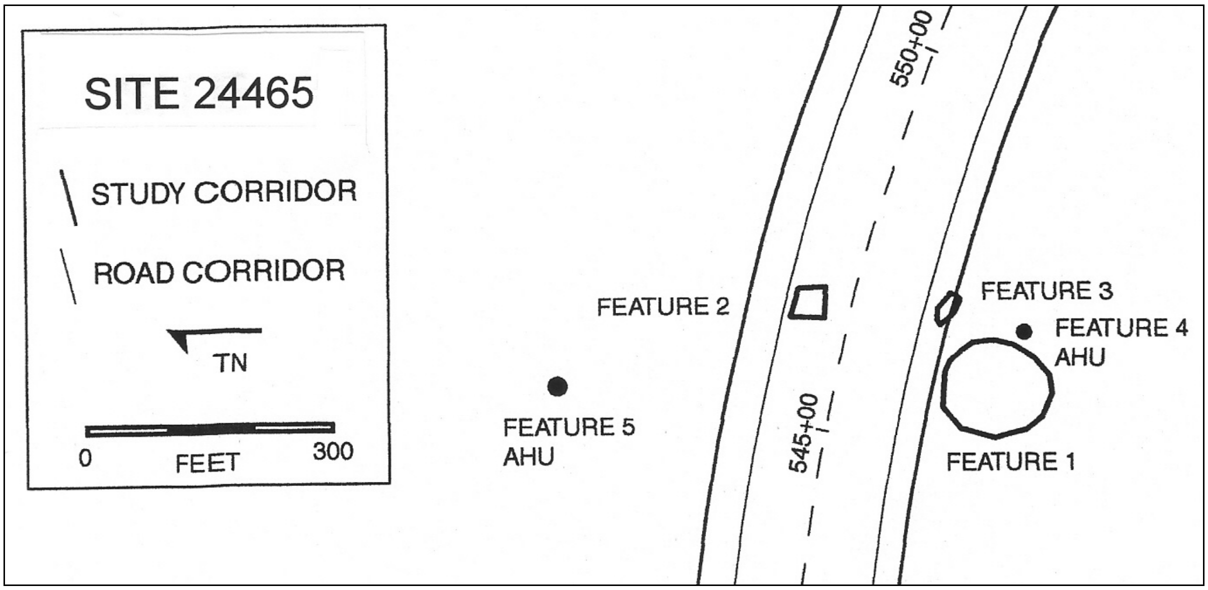


Figure 13: Site 24465 Planview.

Feature 1 is a roughly circular enclosure 37 to 40 meters in diameter, from 0.3 to 0.9 meters in height, and located at the southern edge of the site (Figure 14). It is constructed of dry-laid *pāhoehoe* (vesicular basalt) cobbles and boulders stacked three to five stones wide (1 to 2 meters) and four to five courses high. The ground surface within the enclosure is 40% exposed *pāhoehoe* and 60% shallow sediment with a dense cover of fountain grass. The interior ground surface is uneven and undulating, slopes gently to the northwest, and is dominated by 4 small hillocks at the center of the enclosure. The hillocks are the remains of pressure blisters in the *pāhoehoe* flow that left exposed outcrops ranging from 1.0 to 1.7 meters above the interior ground surface of the enclosure. No cultural remains were present within or around Feature 1.

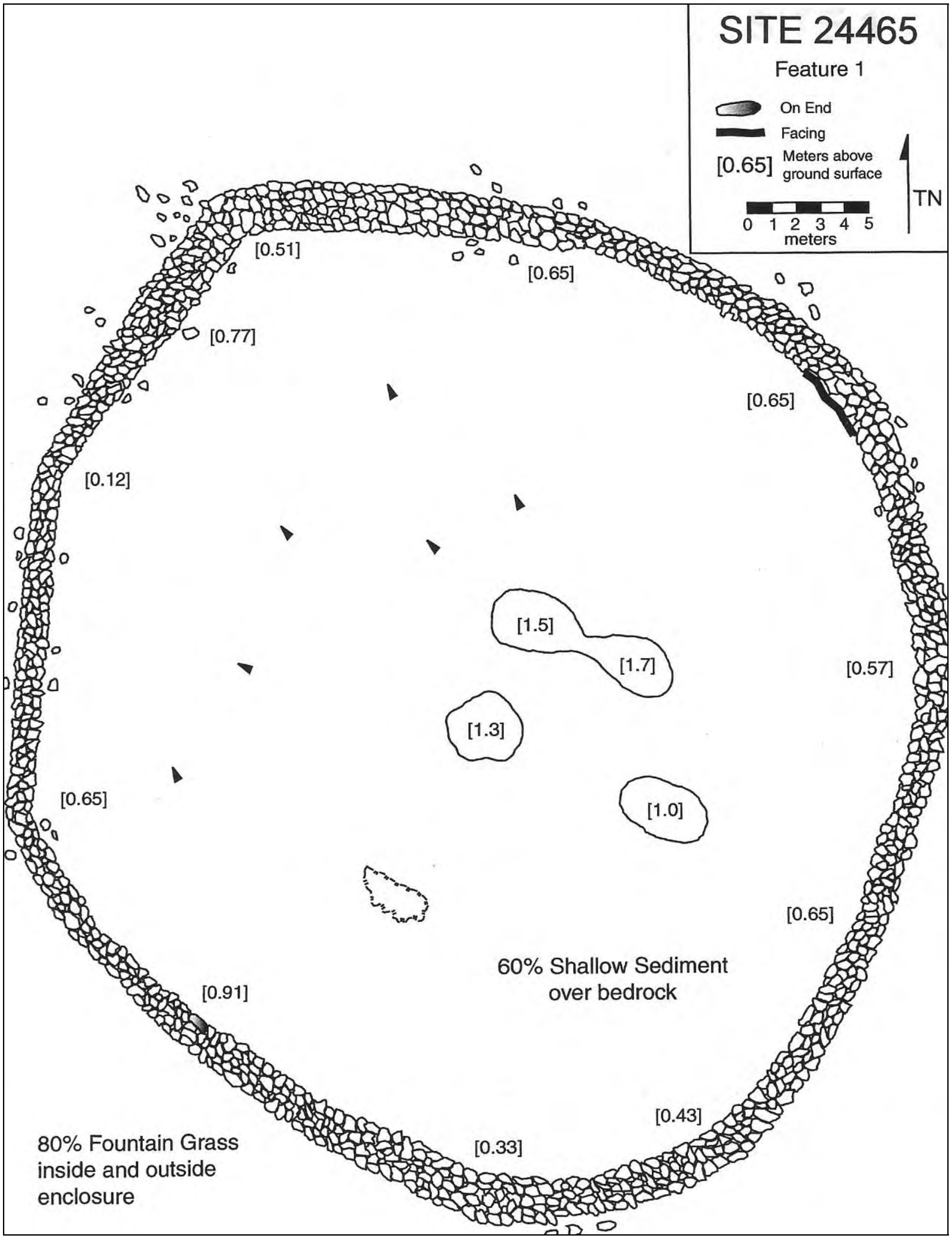


Figure 14: Site 24465 Feature 1 Plan.

Feature 2 is a rectangular enclosure 18 by 16 meters, from 0.2 to 0.6 meters in height, at the northern edge of the site (Figure 15). The enclosure is constructed of platy *pāhoehoe* cobbles stacked three to four courses high and three to four stones wide (1 to 2 meters). The walls appear to have been faced on both the interior and exterior by placing the platy *pāhoehoe* on end either on or in the ground surface. Numerous facing stones are still in position and many others have fallen over onto the ground surface around the perimeter of the enclosure. Four "entrances" exist in the enclosure walls and appear to be caused by cattle or goats passing in and out of the enclosure. The enclosure is in fair condition and has been altered by the action of ruminants grazing in and around it. The ground surface is level consisting predominantly of shallow sandy silt deposits supporting a 90% coverage of fountain grass. Ash and charred grass from recent burning is evident on the ground surface. A 4 cm wide by 70 cm long band of metal strapping and green bottle glass were located on the ground surface within the enclosure. No other cultural material was present in the vicinity of Feature 2.

Twenty Four shovel probes and two one by one meter test units were excavated at Feature 2.   A *kukui* nut fragment submitted for radiocarbon dating returned a calibrated range of 1490 to 1660, with an intercept at AD 1640. The majority of artifacts recovered from both test units and shovel probes included early post-contact, dark green bottle glass, square-cut nail fragments, and other historic items, as well as marine shell fragments, and bone animal fragments.

Feature 3 is an oval enclosure measuring 15 by 8 meters, and from 0.4 to 0.6 meter in height (Figure 16). The enclosure is constructed of *pāhoehoe* cobbles stacked two to three courses high and two to three stones wide (1 to 2 m). The interior of the enclosure is level sediment with 25% fountain grass, and is 11 by 5 meters.   There is roughly 6 meters of facing on the interior of the eastern portion of enclosure wall, but it lacks a formal entrance. Feature 3 is in fair condition and has been altered by ruminants grazing in the area. Numerous cobbles appear to have fallen out of the enclosure wall and are scattered on the surrounding ground surface. No cultural remains were present on the surface in the vicinity of Feature 3. A small amount of charred material was recovered from four shovel probes excavated at Feature 3. No cultural material was recovered from a one by one meter test-unit excavated at Feature 3.

Feature 4 and Feature 5 were identified as *ahu* (rock mounds) likely marking a trail or used for some other function.

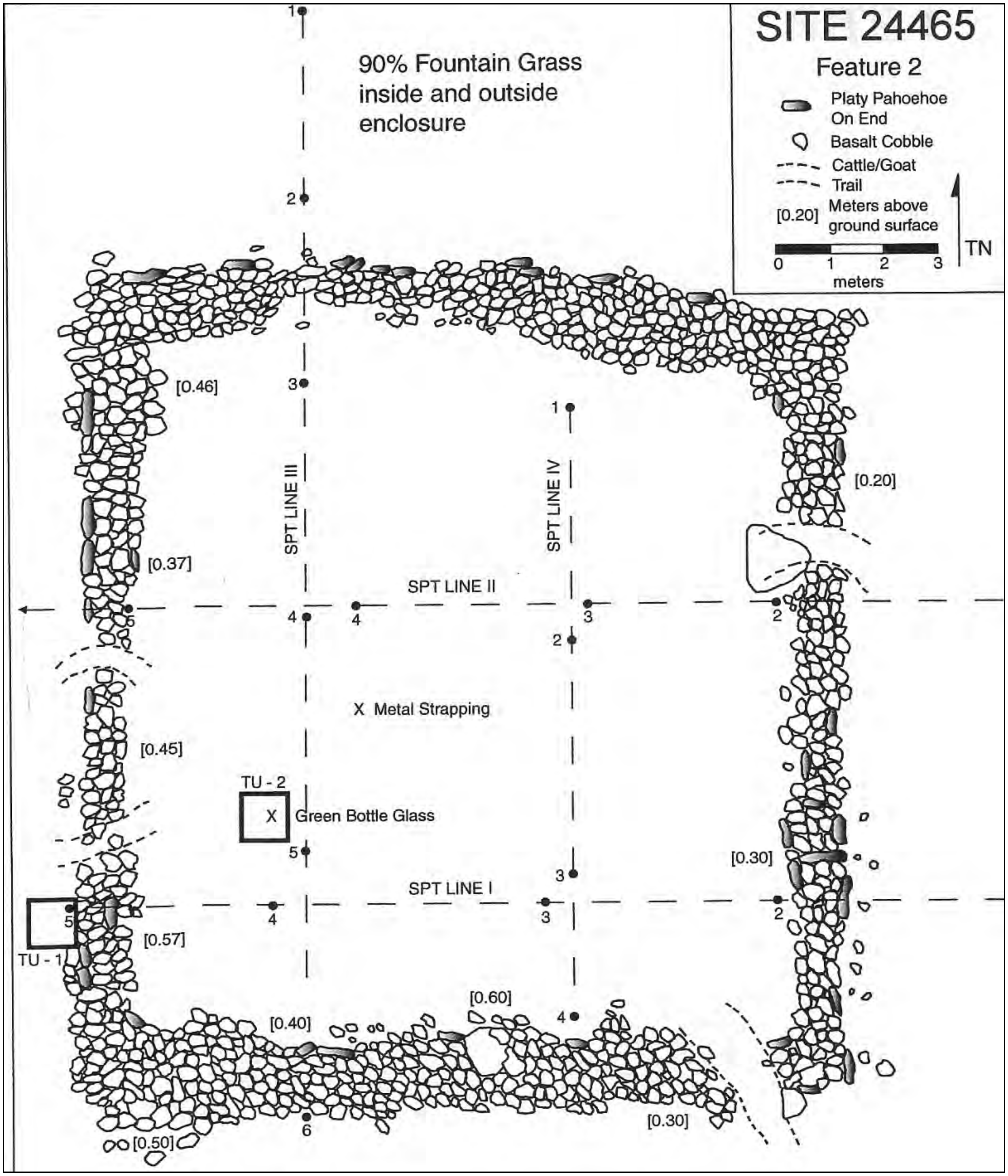


Figure 15: Site 24465 Feature 2 Plan.

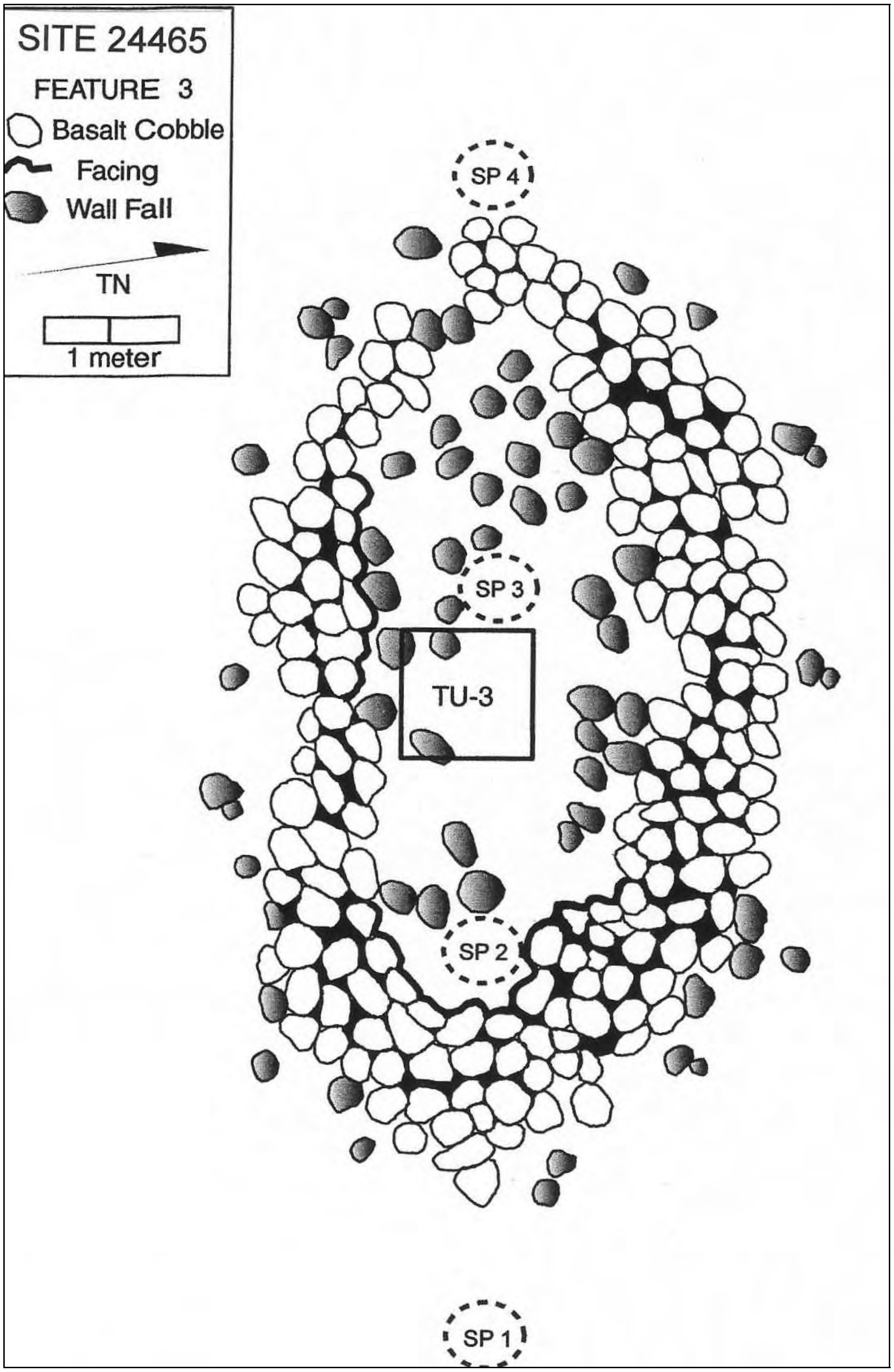


Figure 16: Site 24465 Feature 3 Plan.

Site 24465 is a multicomponent site with a prehistoric occupation of unknown function, and a historic farmstead occupation dating to the mid-1800s. The physical characteristics of the stone enclosures suggest that they were created during prehistory. They are low, stone alignments lacking the core-fill indicative of historically created walls. They are too low to keep animals in or out, and this is reinforced by their lack of use by ranchers: Parker Ranch did not use these features in any way (Mark Yamaguchi interview). Although there are no distinctly prehistoric artifacts in the small material assemblage collected in this investigation, there is one *kukui* nut fragment. *Kukui* trees are not present in the area now, and it is unlikely that they were present in the area in the past. None of the historical or botanical research indicates that *kukui* trees were native to the region. The *kukui* nut fragment in the Site 24465 assemblage was brought to the area. The radiocarbon results indicate that the most likely time that it was brought to the site was around AD 1640. The nearby *ahu* (Feature 5) is also a typical prehistoric feature, and is similar in configuration to other trail markers in the project area and throughout Hawai‘i. The origin and function of the pair of *ahu* (Feature 4) near the large circular enclosure (Feature 1) is less clear, but they may also represent a trail pathway

The way that this set of features was used during prehistory is unclear. The nearby level pockets of soil may have been used for agriculture, and the enclosures may have been a habitation associated with that activity. There are numerous caves in the area, and the enclosures may have functioned as an activity node for people entering and using the caves. Battles were fought along the shoreline to the west of here, and the enclosures may be related to battle camps or battlefields in some way.

The historical component is associated with agriculture. The nearby level colluvial soils were used for farming in the 1800s (see Figure 4), and it has been passed down that pumpkin was one of the cultigens grown in the area (Mark Yamaguchi interview). The paucity of material remains suggests that the historical occupation was short in duration, or not very intensive.

ARCHAEOLOGICAL INVESTIGATIONS ON LANDS OF KE‘ĀMUKU

Paul H. Rosendahl, Ph.D., Inc (PHRI) conducted an archaeological inventory survey of two proposed Saddle Road alignments within the present project area (Langlas *et al*. 1999). PHRI recorded two historic sites on the property, including the Old Waimea-Kona Belt Road (Site 50-10-33-20855) and two Historic period enclosures (Site 50-10-33-20854).

Phase I (Robins *et al.* 2004) and Phase II (Robins *et al.* 2007) archaeological studies were conducted on the entire property of the Parker Ranch Ke‘āmuku Station by GANDA, and a Phase II study (Escott 2006; Johnson and Escott 2009 draft) was conducted by Scientific Consultant Services, Inc. on the primary work and living areas of the station (see Figure 12). GANDA documented 68 sites comprised of 265 features (Table 3) within the project area. Fifty two (76%) of the sites contain post-Contact features associated with ranching, habitation, and boundary markers. Four sites (6%) contain possible pre-Contact or early post-Contact era features, including a burial cave, a temporary habitation enclosure, a petroglyph, and a pictograph. Two (3%) sites had both pre- and post-Contact features. The period associations of ten (15%) sites were unclear and could not be determined.

The majority of features are rock mounds and cairns associated with ranching era land clearing, boundary demarcation, and the quarrying of rock for construction material (most likely for construction of the Kona-Waimea Belt Road. A number of terraces, enclosures, C-shapes, two rock shelters, and an L-shape are associated with temporary habitation and agriculture. Several walls are associated with ranching and agriculture. Sites are concentrated in the northern along the existing Mamalahoa Highway, in the vicinity of the Keʻāmuku Sheep and Cattle Station, along the southwestern edge of the Keʻāmuku Station Parcel, and to a lesser extent at north tip of the Keʻāmuku Station Parcel, and at two upland paddock areas (Figure 17).

Table 2: West PTA Acquisition Area, Phase I Sites (GANDA 2003: 39-42).

Site No.	Feature No.	Site/Feature Type	Probable Function	Age
20854	1-5	C-shape Complex	Habitation	Post-Contact
20855	1	Kona-Waimea Belt Road	Government road	Post-1916
21132	1-5	Mound complex	Construction Material	Post-Contact
22929	1-12	Terrace-Enclosure Complex	Habitation	Undetermined
22933	1	Rockshelter	Habitation	Undetermined
23467	1	Enclosure	Military	Post-Contact
23468	1-2	Mound Complex	Boundary Marker	Post-Contact
23472	1-2	Cairn complex	Boundary Markers	Post-Contact
23473	1-2	Mound complex	Markers	Post-Contact
23489	1	Mound	Land Clearing	Post-Contact
23490	1-2	Enclosure Complex	Temporary Habitation	Pre-Contact
23491	1	Mound	Boundary Marker	Post-Contact
23492	1	Wall section	Boundary Remnant	Post-Contact
23493	1	Mound	Land clearing	Post-Contact
23494	1	Cairn	Marker	Post-Contact
23495	1-5	Complex	Agriculture	Post-Contact
23496	1	Platform	Water tank foundation	Post-Contact
23498	1	Cairn	Marker	Post-Contact
23499	1-8	Complex	Cattle Watering/Agriculture	Post-Contact

Site No.	Feature No.	Site/Feature Type	Probable Function	Age
23500	1-2	Parallel walls	Possible cattle chute	Post-Contact
23501	1	Petroglyph	Rock art	Pre-Contact
23502	1	Cairn	Possible Marker	Undetermined
23503	1	Cairn	Possible Marker	Undetermined
23504	1	Cairn	Possible Marker	Undetermined
23505	1-2	Enclosure/Platform Complex	Habitation	Post-Contact
23506	1	Wall	Possible cattle chute	Post-Contact
23508	1	Terrace	Erosion Control	Post-Contact
23509	1-24	Mound Complex	Construction Material	Post-Contact
23510	1	Mound	Survey Marker	Post-Contact
23511	1	Enclosure	Temporary habitation	Pre-Contact/Post-Contact
23512	1-3	Enclosure/Mound Complex	Possible Habitation	Post-Contact
23513	1	Cairn	Boundary Marker	Post-Contact
23514	1	Cairn	Boundary Marker	Post-Contact
23515	1	Firing Position	Military Training	Post-Contact
23516	1	Ranch Road	Transportation	Post-Contact
23517	4	Cremation Remains	Burial	Modern
23518	1	Retaining Wall	Ranch Road	Post-Contact
23519	1-4	Complex	Habitation/ Animal Pen?	Post-Contact
23520	1-3	Mound Complex	Construction Material	Post-Contact
23521	1-7	Mound Complex	Construction Material	Post-Contact
23522	1-6	Mound complex	Construction Material	Post-Contact
23523	1-2	Terrace, Mound	Possible Habitation	Pre-Contact/Post-Contact
23524	1	Cairn	Marker	Post-Contact
23525	1-2	Mound	Survey Markers	Post-Contact
23526	1	Enclosure Remnant	Habitation	Post-Contact
23527	1	Pictograph	Rock art	Pre-Contact
23528	1	Cairn	Boundary Marker	Undetermined
23529	1	Mound	Boundary Marker	Post-Contact
23530	1	Cairn	Boundary Marker	Post-Contact
23531	1	Cairn	Boundary Marker	Post-Contact
23532	1	Cairn	Boundary Marker	Post-Contact
23533	1	Cairn	Boundary Marker	Post-Contact
23534	1	Mound	Boundary Marker	Post-Contact
23536	1	Mound	Boundary Marker	Post-Contact
23537	1	Mound	Boundary Marker	Post-Contact
23538	1	Mound	Land Clearing	Post-Contact
23539	1-100	Keʻāmuku Ranch Station	Sheep-cattle station: permanent habitation; animal pens	Post-Contact
23540	1	Retaining Wall	Road	Post-Contact
23541	1-3	Enclosure Complex	Animal Pens	Post-Contact
23542	1	C-Shaped Enclosure	Temporary Habitation/Hunting?	Post-Contact

Site No.	Feature No.	Site/Feature Type	Probable Function	Age
23543	1-83	Mound Complex	Construction Material	Post-Contact
23576	1-5	Concrete Pads	Foundation	Post-Contact
23579	1-33	Complex	Temporary Habitation; Agriculture; Boundary	Post-Contact
23580	1	Enclosure	Temporary Habitation	Post-Contact
23588	1	Faced Mound	Marker/Possible Shrine	Undetermined
23591	1	Lava Tube	Burial	Pre-Contact
23592	1	Mound	Possible Marker	Undetermined
23593	1-2	Mound Complex	Markers	Undetermined
23594	1	Mound	Marker	Undetermined
23597	1	Mound	Land Clearing	Post-Contact
23599	1-3	Mound Complex	Construction Material	Post-Contact
23600	1	Mound Complex	Land Clearing	Post-Contact
23620	1-3	Mound Complex	Land Clearing	Post-Contact

Sites highlighted blue are documented in Escott 2006 and Johnson and Escott 2009.

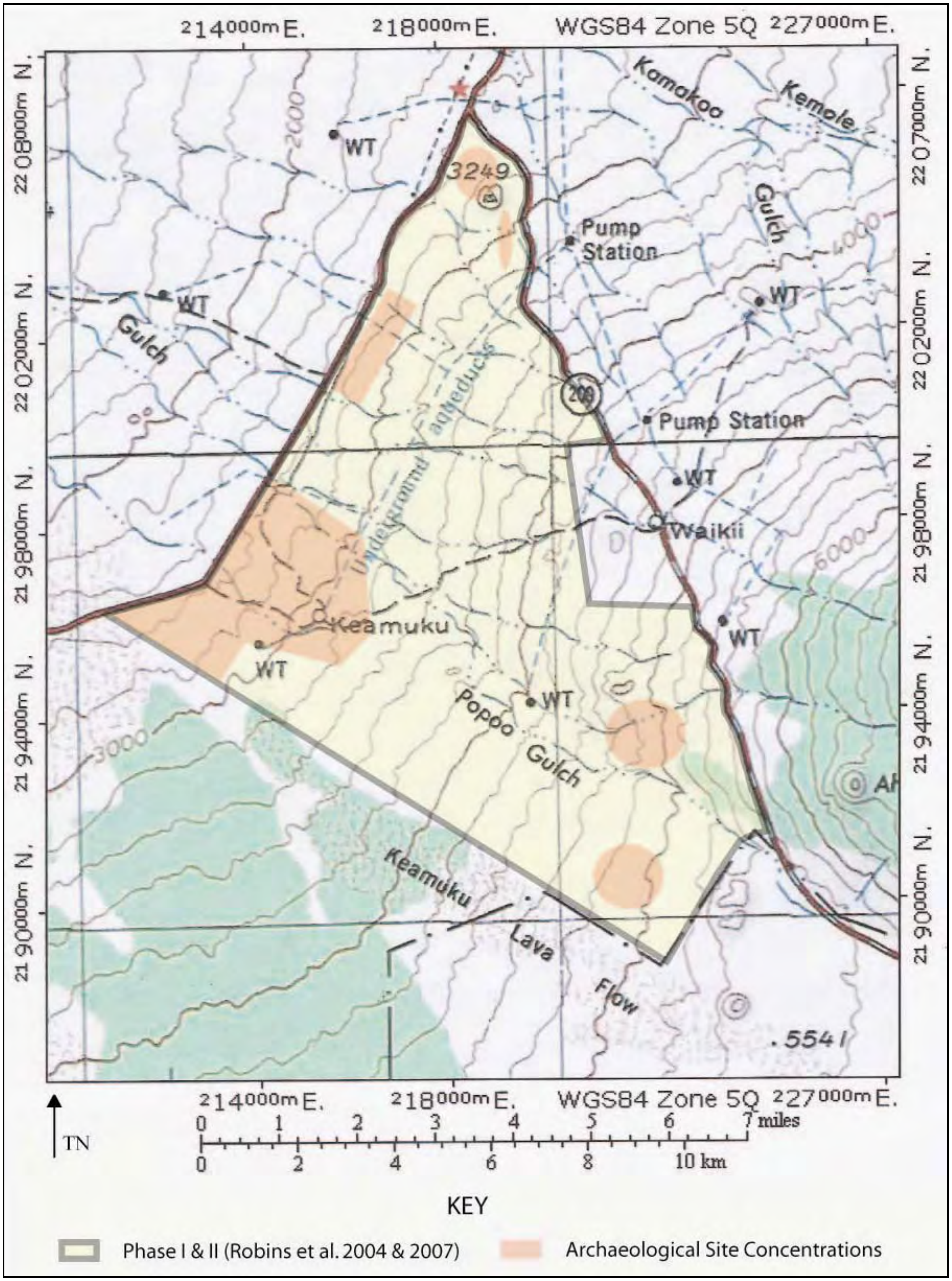


Figure 17: Archaeological Site Concentrations on the Keʻāmuku Station.

Phase II archaeological investigations at the Parker Ranch Keʻāmuku Station work and living area (Escott 2006; Johnson and Escott 2009 draft) suggest the station was first established during the mid-19th century as an early sheep ranching enterprise, combined with bullock hunting and the earliest attempts to domesticate wild cattle. Living quarters, processing facilities, walls, and corrals were constructed during this period. Early ranch layout, building construction techniques, material culture, and dietary regime suggest a synthesis of Hawaiian, Japanese, and Western cultures.

The sheep ranch facilities underwent further transformation and renovation after 1904 to accommodate cattle ranching, as reflected in the remains of fences, corrals, and dietary changes in the archaeological record. One of the major problems that confronted early ranchers at the Ke'āmuku Sheep and Cattle Station was the availability of water and changing rainfall patterns, both seasonally and annually. The ability to tap distant groundwater sources and to transport water to the ranch after 1908 enabled it to become one of the most fertile sections of Parker Ranch.

Features at the Ke'āmuku Sheep and Cattle Station were grouped into three activity areas: the Upper Corral Area, The Lower Corral Area, and the Ke'āmuku House Area. Excavations suggest that the Upper Corral Area was likely one of the earliest locations used at the ranch. The Lower Corral and Shear Barn Area was the processing center for sheep and cattle during the height of the ranching industry. The shear barn was later used to store saddle, tack, and tools after 1918 when the sheep were moved to the Humuʻula section of Parker Ranch.

EXPECTED ARCHAEOLOGICAL RESOURCES

Based on historical accounts, oral interviews, and previous archaeological studies, SCS expected that post-Contact rock mounds and other survey and boundary markers will be located within the study corridor. Although the land within the present study corridor has been previously surveyed (Robins *et al*. 2004), the thick cover of fountain grass might have concealed smaller features such as rock mounds. It is unlikely that larger features associated with ranching and habitation, such as rock walls, platforms and enclosures will be identified during the present study.

ARCHAEOLOGICAL INVENTORY SURVEY RESULTS

Three previously identified archaeological sites and four new sites were located in the present study corridor (Figure 18), including five rock mounds (SIHP Sites 50-10-21-23528, 50-10-21-26875, 50-10-21-26876, 50-10-21-26877, and 50-10-21-26878), a segment of the old Waimea-Kona Belt Road (SIHP Site 50-10-21-20855), and remnants of a ranching-era fence (SIHP Site 50-10-21-23452). Four of the rock mounds (Sites 23528, 26875, 26877, and 26878) correspond roughly to the boundary between the Keʻāmuku cattle station lands and ranch lands to the southwest. This area is also the boundary between Waikōloa and Puʻuanahulu *ahupuaʻa*. Site 26875 contained a Kalopa Soda Works bottle and a roll of galvanized fence wire in its construction. A fifth rock mound (Site 26878) appears to mark a possible hunting spot. Another rock mound (Site 26876) marks the intersection of two ranch roads along the southeast side of the Keʻāmuku cattle station lands. The ranching-era fence (Site 23452) appears to have been used early in the history of sheep and cattle ranching at Keʻāmuku. The original fence wire has been removed and it passes through the middle of several more recently fenced paddocks.

SITE 50-10-21-20855

FORM	Old Waimea-Kona Belt Road
FUNCTION:	Transportation
AGE:	Historic (1916-1922)
DIMENSIONS:	Length: 500.0m (E/W); Width: 6.0m; Height: 1.73m (max)
CONDITION:	Good
SURFACE ARTIFACTS:	None
EXCAVATION:	None

SITE 20855

Site 20855 is located at station 9+00, between the station left (LT) and station right (RT) boundary of the proposed corridor, at an elevation of 2,540ft (774m) amsl (see Figure 18). The site is the Old Waimea-Kona Belt Road surface and two causeways (Features 1 and 2). The road surface is oriented northeast/southwest, is approximately 4.0 meters wide, and is bare dirt. The road surface appears unaltered and is in good condition.

<u>Feature 1</u> is a causeway located along the east edge (Station 9+00 LT) of the study corridor (Figure 19). The road is constructed into the side of a northward sloping hill (Figure 20). Portion of the hillside south of the road have been removed to form a level road bed. The causeway is constructed under the north edge of the road to prevent it from collapsing down slope.

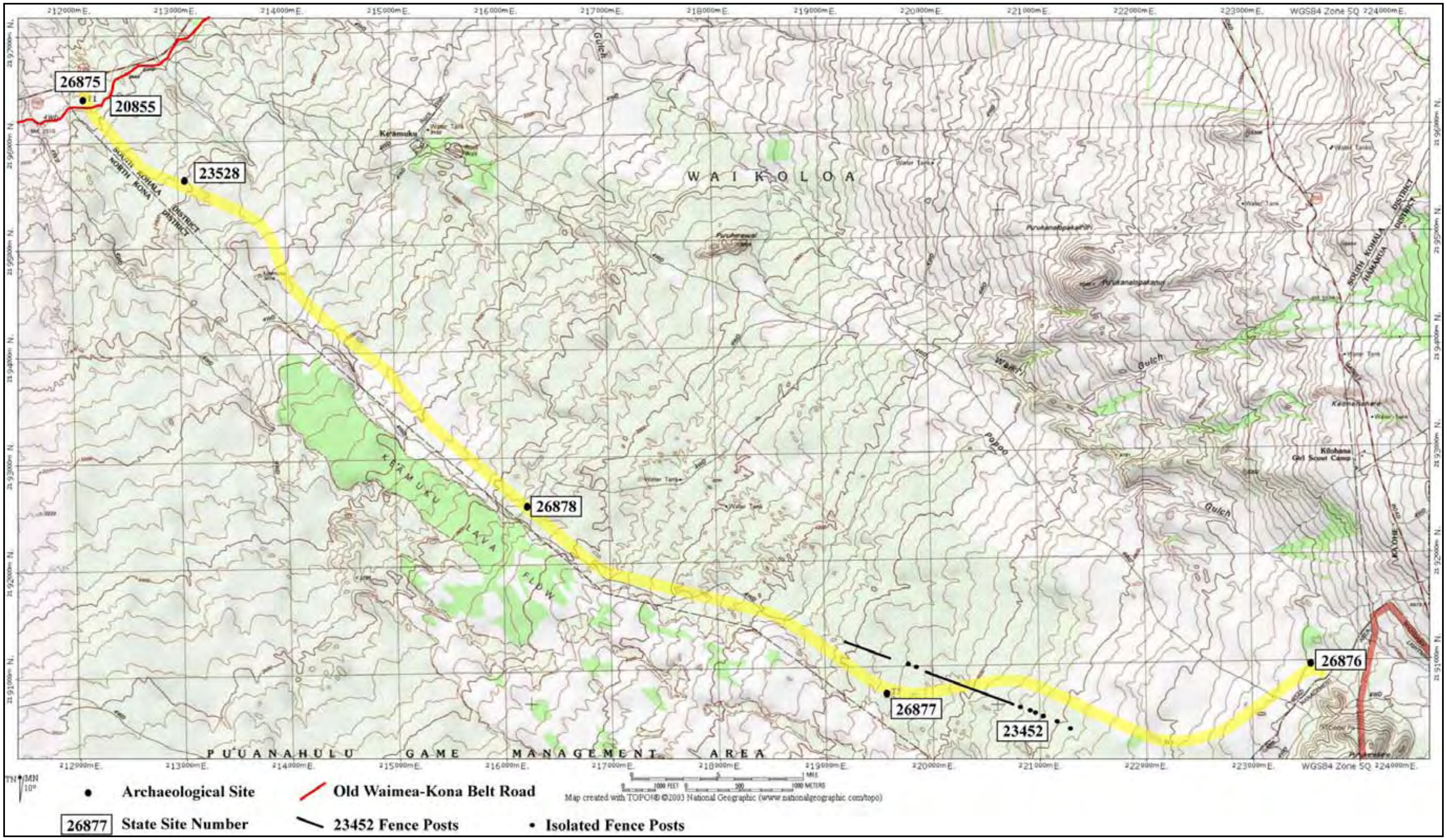


Figure 18: Location of Sites on USGS Topo Map.

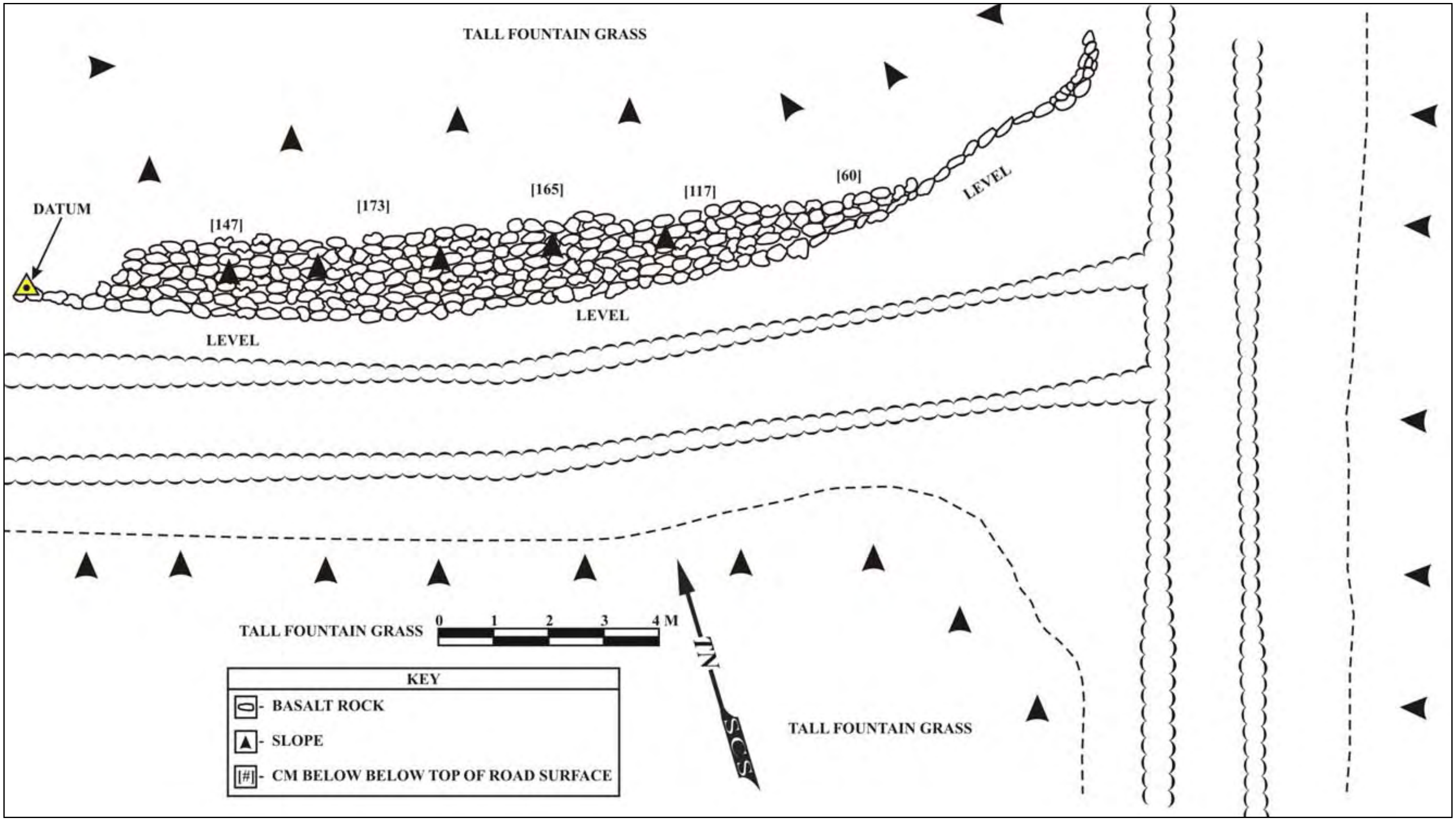


Figure 19: Site 20855 Feature 1 Planview.

Feature 1 is 20.40m long (east/west) by 6.0m wide, and is 1.73m high (maximum). The causeway is constructed of angular and subangular large cobbles and small boulders stacked one to six courses high along the north edge of the road (Figure 21). The rocks are well-fitted, well-faced, and slope outward away from the road edge (Figure 22). Feature 1 appears to be unaltered and is in good condition. Feature 1 is in the study corridor but is not in the proposed construction corridor, and will not be impacted by road construction.

Figure 20: Site 20855 Feature 1, View to East (1m scale).

Feature 2 is a causeway located along a two to three meter high elevation break at the west edge (Station 9+00 RT) of the study corridor (Figure 23). The causeway is constructed under the north edge of the road to prevent it from collapsing down slope. Feature 2 is approximately 50.0m long (east/west) by 6.0m wide, and is 1.50m high (maximum). The causeway is constructed of angular and subangular large cobbles and small boulders stacked one to eight courses high along the north edge of the road (Figure 24). The rocks are well-fitted, well-faced, and slope outward away from the road edge. There is a drainage culvert constructed under the road surface to allow water to pass under the road (Figure 25). The road surface is built up with pebbles and cobbles along its north edge (Figure 26). Feature 2 appears to be unaltered and is in good condition. Approximately 9.0m of Feature 2 are in the study corridor but not in the proposed construction corridor, and the causeway will not be impacted by road construction.

Figure 21: Site 20855 Feature 1, View to Southeast (1m scale).

Figure 22: Site 20855 Feature 1 Construction, View to Southeast (1m scale).

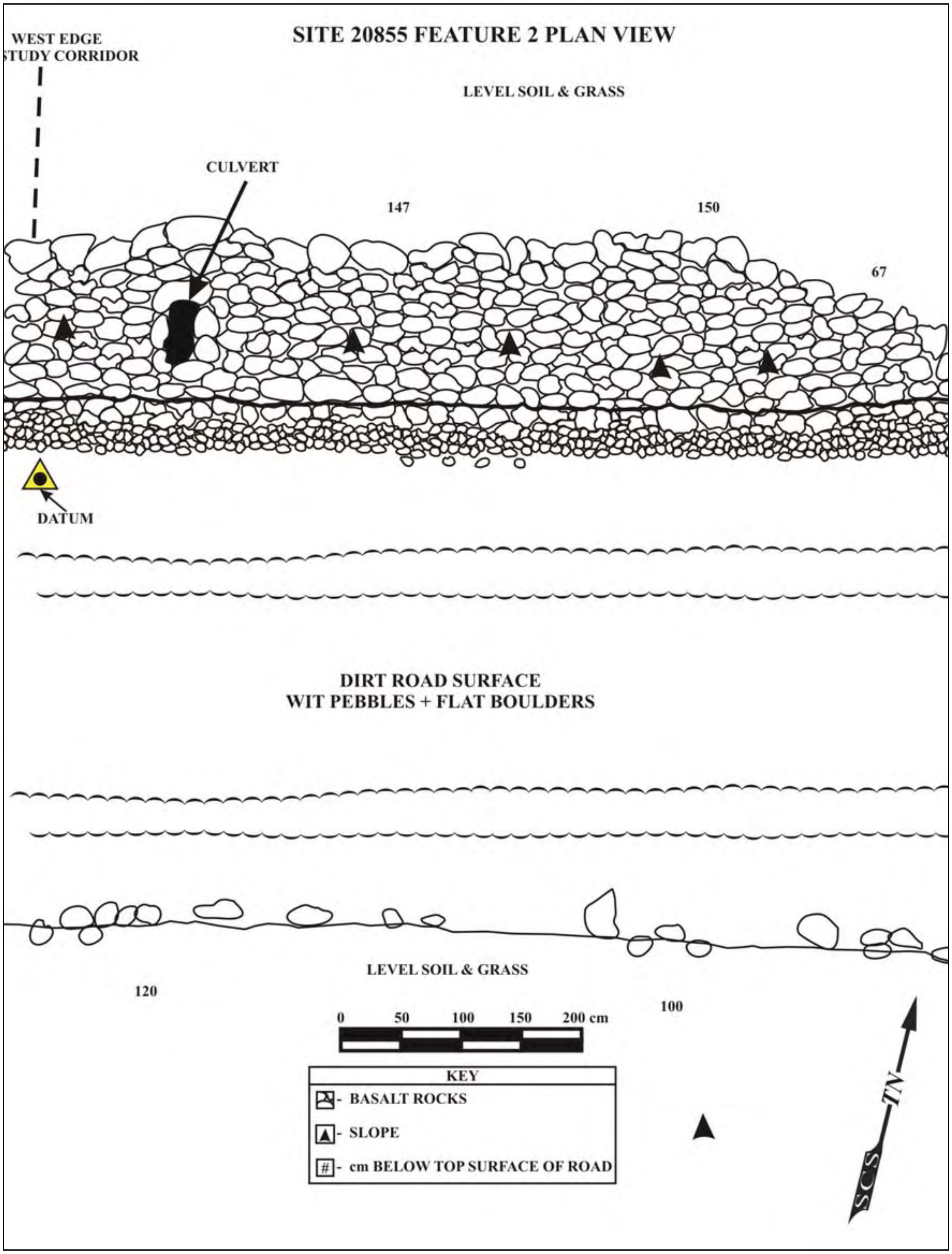


Figure 23: Site 20855, Feature 2 Planview.

Figure 24: Site 20855, Feature 2, View to Southwest (1m scale).

Figure 25: Site 20855, Feature 2 Culvert, View to South.

Figure 26: Site 20855, Feature 2 Road Surface, View to Southwest (20cm scale).

The original road was a wagon track, and this section of the Old Waimea-Kona Belt Road (Site 20855) was built on top of the wagon road in about 1920 (Langlas *et al*. 1999:81). The section of road documented in this study was constructed by prison laborers who were housed at a camp *makai* of the modern Saddle Road and Mamalahoa Highway intersection. Portions of the road east of Feature 1 up to the modern Saddle Road intersection were paved (*ibid*.). This portion is not paved. The Old Waimea-Kona Belt was approximately 63 km long. Numerous remnant segments of the road are evident on either side of the modern Mamalahoa Highway between Puʻuanahulu and Saddle Road.

Langlas recommended data recovery and interpretation for the portions of Site 20855 his study looked at (Langlas et al. 1999:147). An interpretive sign will be placed at a pull out constructed by the site near Features 1 and Feature 2 though they are outside of the construction corridor. Monitoring is recommended along the entire length of the proposed construction corridor during ground disturbance activities associated with this project.

SITE 50-10-21-23452

FORM	Fence Posts
FUNCTION:	Boundary marker/Fence in Ranch Animals
AGE:	Historic
DIMENSIONS:	Length: 0.9m (E/W); Width: 0.8m; Height: 0.65m (max)
CONDITION:	Fair
SURFACE ARTIFACTS:	None
EXCAVATION:	None

SITE 23452 (Previously Recorded by PTA Cultural Resources Staff)

Site 23452 is a remnant segment of ranching-era fence posts situated at 110˚/290˚ and located between station 339+00 LT and station 349+00 RT at an elevation of roughly 4,600 ft (1,402m) amsl (see Figure 18). The documented segments of the fence line are situated from the eastern boundary of the U.S. Army Pōhakuloa Training Area (PTA) to an area west of the current study corridor within the Keʻāmuku property (Figure 27).

The segment of fence line that crosses the present study corridor consists of fence posts of cut natural logs, either whole or halved, or quartered, and set into the ground surface. The log posts vary from 15cm to 20cm in diameter, and are roughly 120cm to 140cm above the modern ground surface (Figures 28, and 29). The fence wire has been removed, but there are some heavy gauge galvanized metal staples in the posts, that once held the wire to the posts. There are twenty fence posts standing in the study corridor and one post in the corridor that has fallen down.

Site 23452 is documented in many places within PTA, where it is in better condition. In some places along the fence line on PTA, there are signs stating that the fence marks the boundary of a game management area and no hunting is allowed. It is possible that the fence is related to early attempts to fence in cattle within owned property to keep them separate from the King's cattle. It might have later been used to separate private sheep and cattle land from state owned land (a game management area) to the south.

The fence line within the study corridor no longer has any wire and consists of fence posts only. It has been altered by ranching activity and is in poor condition.

Figure 27: Location of Site 23452 Fence Remnants on USGS Topo.

Figure 28: Site 23452 Representative Fence Post 1.

Figure 29: Site 23452 Representative Fence Post 2.

SITE 50-10-21-23528

FORM	Circular Rock mound
FUNCTION:	Boundary marker
AGE:	Historic
DIMENSIONS:	Length: 0.9m (E/W); Width: 0.8m; Height: 0.65m (max)
CONDITION:	Fair
SURFACE ARTIFACTS:	None
EXCAVATION:	None

SITE 23528 (Previously Recorded, Robins *et al*. 2004)

Site 23528 is located at station 48+00, between the centerline (CL) and the left (LT) boundary of the proposed corridor, at an elevation of 2,862ft (872.3m) amsl (see Figure 18). The site consists of a single circular rock mound situated at the top of a low ridge oriented 140˚ /320˚ (Figure 30 and 31). The ridge is approximately 15 to 20ft (4.5 to 6.0m) above the surrounding ground surface, in an area of rolling ridges and knolls with no panoramic view. The ridge surface is predominantly silt, with intermittent bedrock outcrops. The rock mound measures 0.9m (E/W) by 0.8m, is 0.65m in height, and is constructed of a large cobble and four small boulders stacked two courses high on a small boulder bedrock outcrop (Figure 32). The rock mound appears to be unaltered and is in good condition.

Figure 30: Site 23528, View to Northeast (20cm scale).

Site 23528 is in close proximity to several rock mounds along the southwest property boundary (Figure 33). Sites 23491, 23468 (not shown in Figure 33), 23513, 23514, 23528, 23529, 23530, 23531, 23532, 23533, 23536, 23537, 23538, 26875, 26876, and 26878 are either right along the southwest property boundary to roughly 500m northeast of it. This property boundary is also the boundary between Waikōloa and Puʻuanahulu ahupuaʻa, and North Kona and South Kohala. It is most likely that the rock mounds are the result of several early Historic to late Historic efforts to survey and record and mark these boundaries.

Figure 31: Site 23528, View to South (20cm scale).

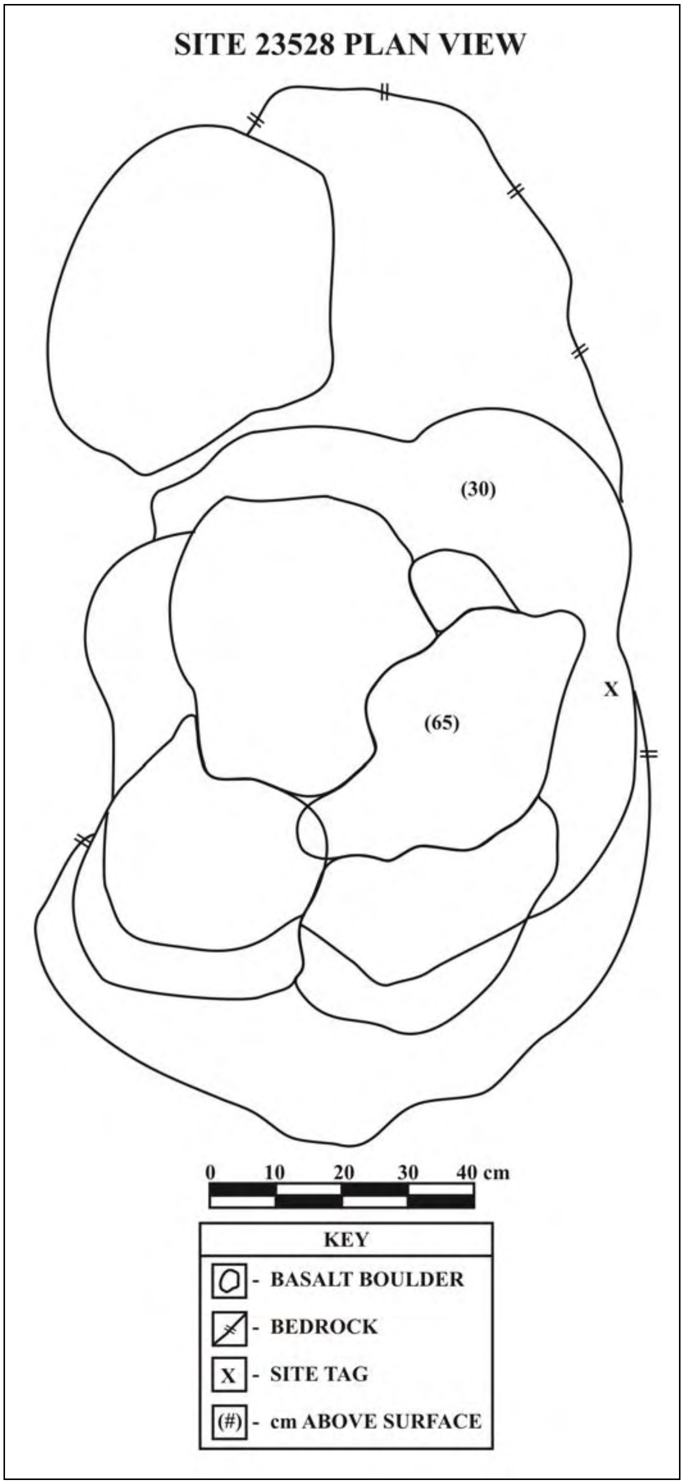


Figure 32: Site 23528 Planview.

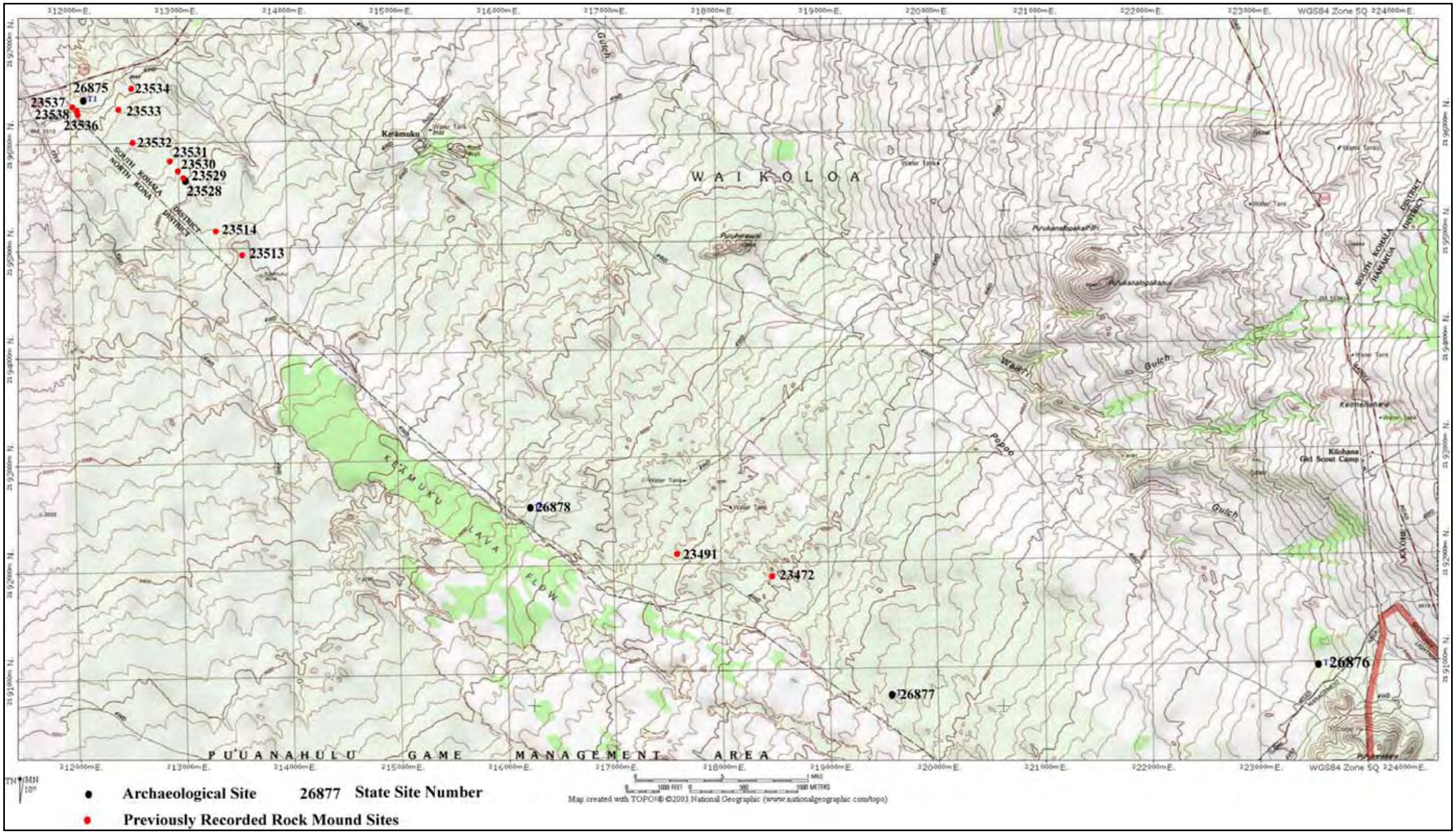


Figure 33: Rock Mound Boundary Sites Along SW Boundary of Ke'āmuku Parcel.

SITE 50-10-21-26875

FORM	Circular Rock mound
FUNCTION:	Boundary marker
AGE:	Historic
DIMENSIONS:	Length: 1.64m (56˚/236˚); Width: 1.30 m; Height: 0.58m (max)
CONDITION:	Fair
SURFACE ARTIFACTS:	Fence wire
EXCAVATION:	1m by 1m test-unit

Site 26875 (SCS Temporary Site 1)

Site 26875 is located 15.5m at 153˚ from station 6+00 RT, at an elevation of 2,530ft (771m) amsl (see Figure 18). The site consists of a circular rock mound situated at the top of a ridge (Figure 34). The ridge is approximately 100ft (30.48m) above the surrounding ground surface and is oriented 160˚/340˚. The rock mound measures approximately 1.64m (56˚/236˚) by 1.30m, and is 0.58m in height (Figure 35). It is constructed of a small subangular boulder resting on four small boulders of lesser size. The top boulder measures 0.59m x 0.42m. Directly beneath it along its northern periphery is a short roll of 1/8 inch heavy gauge galvanized fence wire (Figure 36).

Figure 34: Site 26875, View to East (20cm scale).

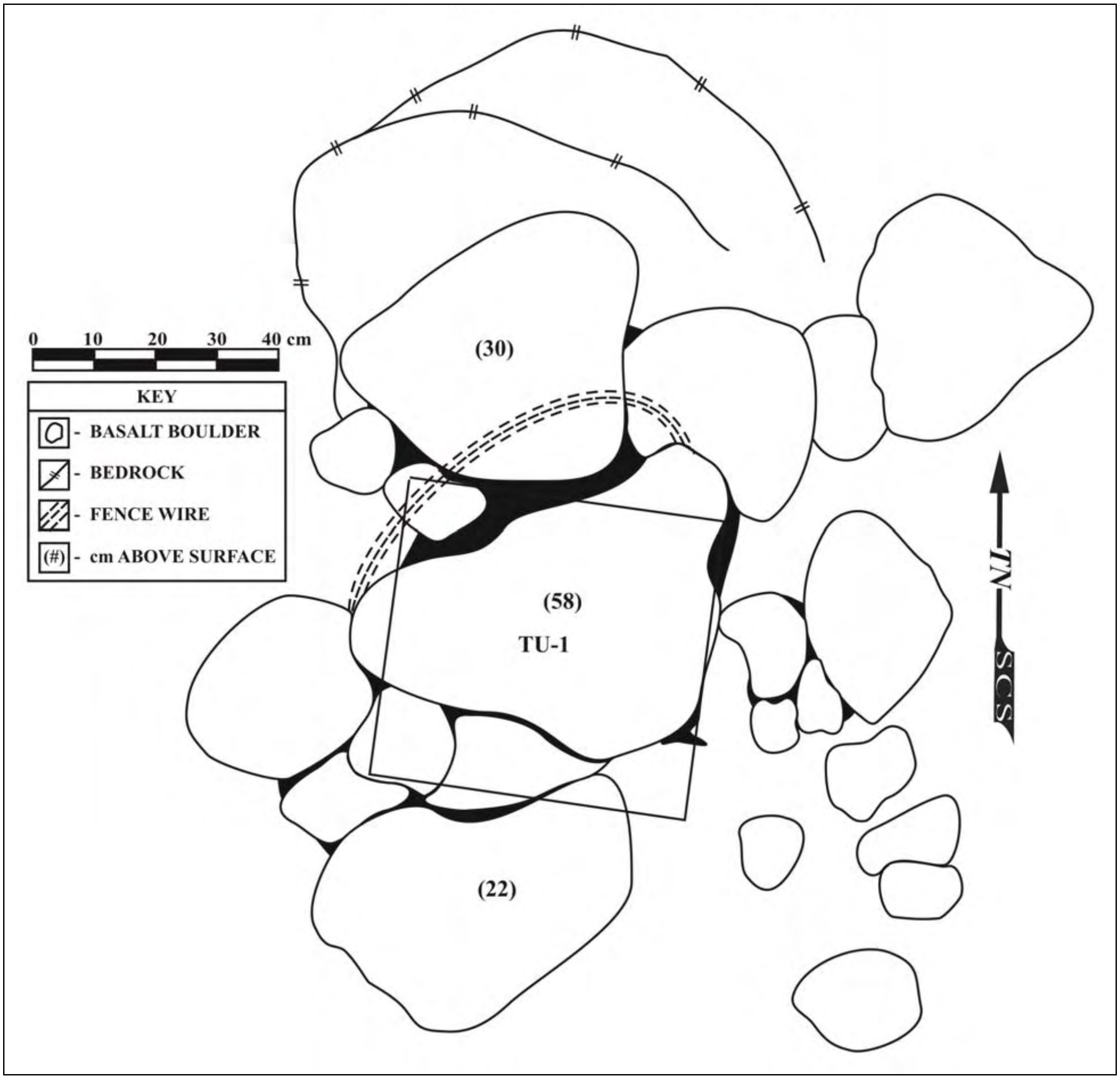


Figure 35: Site 23875 Planview.

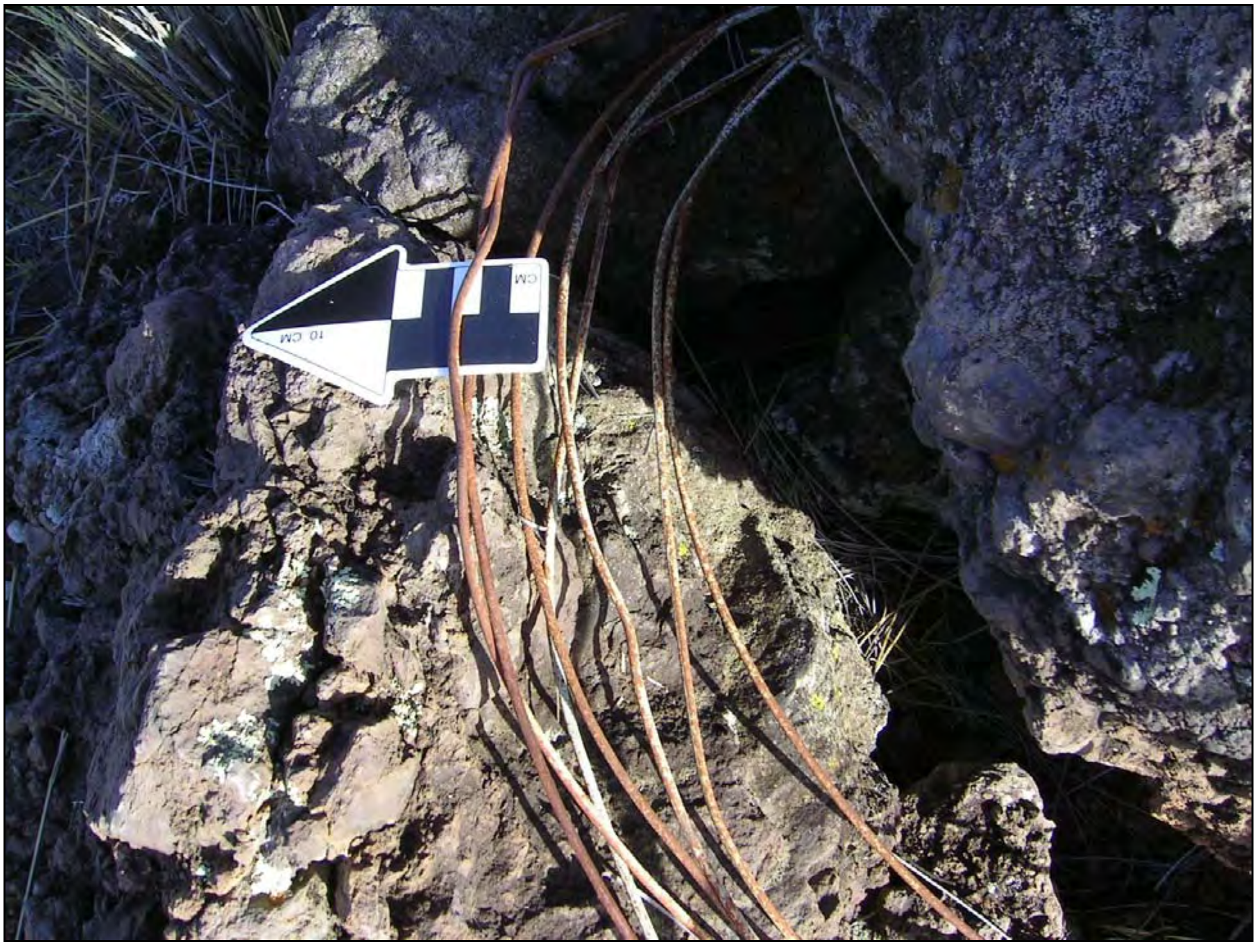


Figure 36: Site 26875 Close Up of Fence Wire, View to East (20cm scale).

Site 26875 Test-Unit 1 Excavation Description

A single 50cm by 50cm test-unit (TU-1) was excavated in the center of the rock mound at Site 26875. TU-1 contained an architectural layer and three stratigraphic layers, was excavated as six roughly 10cm levels, and terminated on bedrock at 50cm below the modern ground surface (Figure 37).

Architectural Layer (0-58cm above modern ground surface) contained five angular and subangular basalt small boulders resting approximately 5cm deep in loose sandy silt (Layer I). A rolled up length of heavy gauge galvanized fence wire and a Kalopa Soda Works bottle (Figure 38) were recorded in the Architectural Layer.

Layer I/1 (0-10cmbs) was very dark grayish brown (10YR3/2) loose, aeolian sand and silt with five angular and subangular basalt small cobbles and pebbles, and 1% small grass roots. Layer I did not contain cultural material.

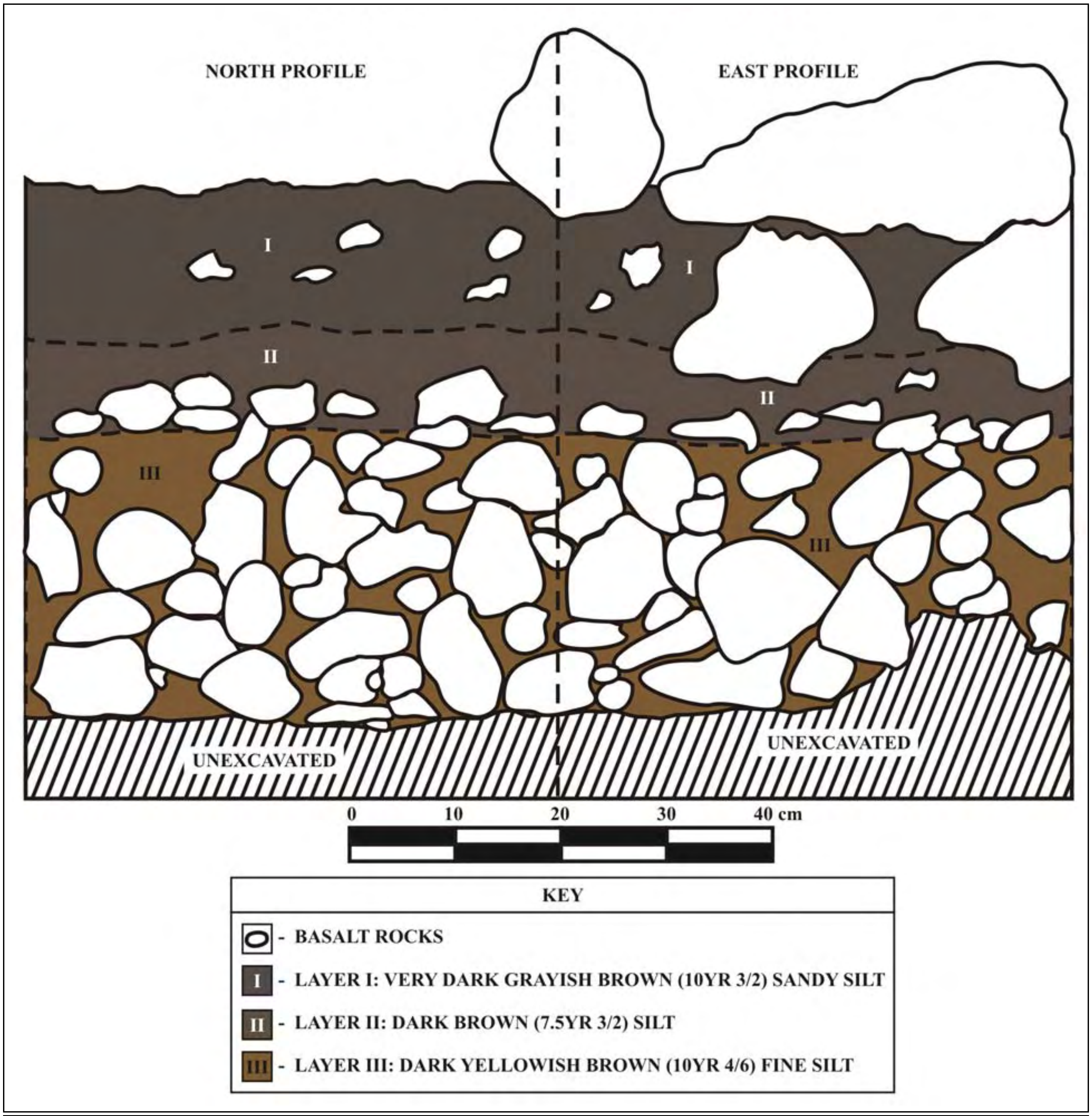


Figure 37: Site 26875, Feature 1, Test-Unit 1 North and East Profiles.

Layer I/2 (10-15cmbs) was similar to Layer I/1 and did not contain cultural material.

Layer II/1 (15-25cmbs) was dark brown (7.5YR3/2) loose to soft, coarse to fine sand and silt with 30% small to large angular and subangular basalt cobbles and 10% small grass roots. Layer II/1 did not contain cultural material.

Figure 38: Kalopa Soda Works Bottle (TU-1).

<u>Layer III/1</u> (25-35cmbs) was very dark yellowish brown (10YR4/6) soft, fine sandy silt with 50% small to large angular and subangular basalt cobbles and 5% small grass roots. The basalt cobbles appear to be the top of an ‘a‘a lava flow. Layer III/1 did not contain cultural material.

<u>Layer III/2</u> (35-45cmbs) was similar to Layer III/1 and did not contain cultural material.

<u>Layer III/3</u> (45-50cmbs) was similar to Layer III/2 material and is predominantly ‘a‘a lava bedrock with a small amount (25%) of dark yellowish brown silt. Layer III/3 did not contain artifacts and terminated on bedrock.

Site 26875 Summary

A length of fence wire and a Kalopa Soda Works bottle were the only artifacts recovered from Site 26875, TU-1. The bottle is an automatic bottle mchine (ABM) type bottle likely manufactured after 1920. The rocks that make up the architecture of the rock mound appear to be roughly 5cm to 7cm below the modern ground surface. The small amount of deposition and the historic artifacts indicate that the rock mound was constructed during the Historic era.

Site 26875 is in close proximity to several rock mounds along the southwest property boundary (see Figure 33). Sites 23491, 23468 (not shown in Figure 33), 23513, 23514, 23528, 23529, 23530, 23531, 23532, 23533, 23536, 23537, 23538, 26875, 26876, and 26878 are either right along the southwest property boundary to roughly 500m northeast of it. This property boundary is also the boundary between Waikōloa and Pu‘uanahulu ahupua‘a, and North Kona and South Kohala. It is most likely that the rock mounds are the result of several early Historic to late Historic efforts to survey and record and mark these boundaries.

SITE 50-10-21-26876

FORM	Rectangular Rock mound
FUNCTION:	Marker
AGE:	Historic
DIMENSIONS:	Length: 2.0m (E/W); Width: 1.5m; Height: 0.75m (max)
CONDITION:	Fair
SURFACE ARTIFACTS:	None
EXCAVATION:	1m by 1m test-unit

SITE 26876 (Temporary Site 2)

Site 26876 is located 45.0m at 234˚ from station 460+00 LT, at an elevation of 5,200ft (1584.96m) amsl (see Figure 18). The site consists of a single rock mound situated on a low rise at the east (*mauka*) edge of a relatively level swale area within close proximity to three modern ranch roads (Figure 39). The rise is approximately 20m (E/W) by 10m, and 1to 2m in height.

Figure 39: Site 26876, Feature 1 Rock Mound, View to Northeast (10cm scale).

The swale surface is composed predominantly of loose silt with intermittent bedrock outcrops. Fountain grass and *ʻaʻāliʻi* are also present. The rock mound measures approximately 2.0m (E/W) by 1.5m and is 0.75m in height (Figure 40). It is constructed of angular slabby *pahoehoe* large cobbles and small boulders piled on the ground with no formal construction elements. There is no formal stacking or facing evident in the rock mound construction. The slabby *pahoehoe* rocks are piled onto a segment of bedrock outcrop measuring 1.9m in length and 0.55m above the surrounding ground surface.

Site 26876 Test-Unit 1 Excavation Description

A single 1.0m by 1.0m test-unit (TU-1) was excavated in the center of the rock mound at Site 26876. TU-1 contained an architectural layer and five stratigraphic layers, was excavated as eleven roughly 10cm levels, and terminated on bedrock at 110cm below the modern ground surface (Figure 41).

<u>Architectural Layer</u> (0-75cm above modern ground surface) contained angular slabby basalt small boulders and large cobbles resting approximately 5cm to 7cm deep in loose sandy silt (Layer I). No artifacts or cultural material was recovered from the architectural layer.

<u>Layer I</u> (0-4cmbs) was very dark grayish brown (10YR2/2) loose, coarse aeolian sand and organic detritus with 5% small angular and subangular basalt cobbles and 1% small grass roots. Layer I is an “O” Horizon organic duff material. Layer I did not contain cultural material.

<u>Layer II/1</u> (4-15cmbs) was very dark brown (10YR2/2) soft, coarse to fine sand and silt with 40% small to large angular and subangular basalt cobbles and 10% small grass roots. The base of the rock mound terminated at roughly 8cmbs in Layer II/1. Layer II/1 did not contain cultural material.

<u>Layer II/2</u> (15-25cmbs) was similar to Layer II/1 and contained only 60% small to large angular and subangular basalt cobbles and 5% small grass roots. Layer II/2 did not contain cultural material.

<u>Layer III/1</u> (25-35cmbs) was dark brown (7.5YR3/4) soft, fine sandy silt with 70% small to large angular and subangular basalt cobbles and 1% small grass roots. Layer III/1 did not contain cultural material.

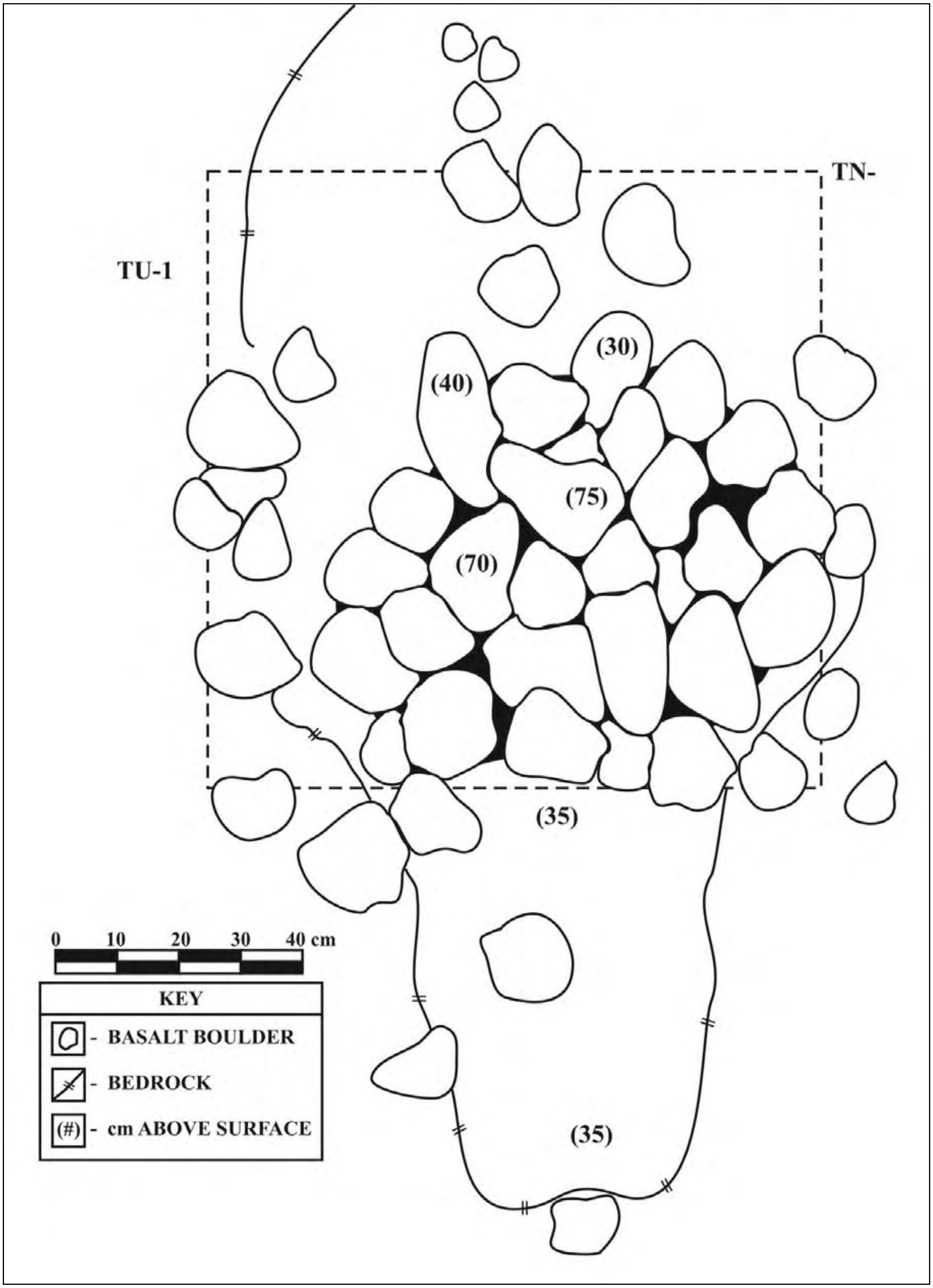


Figure 40: Site 26876, Feature 1 Planview.

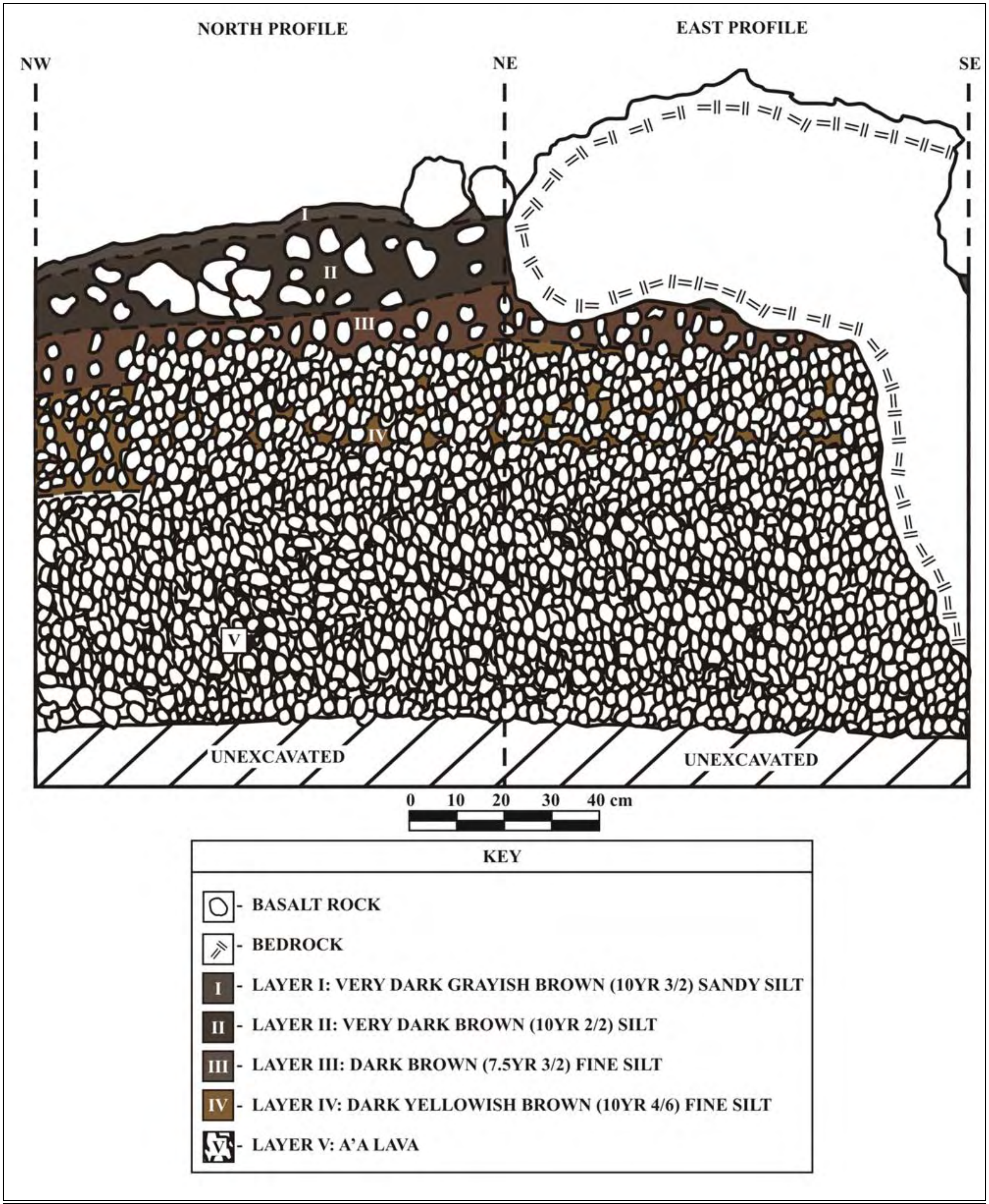


Figure 41: Site 26876, Feature 1, TU-1 North and East Profiles.

Layer IV/1 (35-45cmbs) was dark yellowish brown (10YR4/6) soft, very fine sandy silt with 81% small to large angular and subangular basalt cobbles and pebbles, and no roots. Layer IV/1 did not contain artifacts.

Layer IV/2 (45-55cmbs) was similar in composition to Layer IV/1 and did not contain artifacts.

Layer V (55-110cmbs) was 100% *ʻaʻa* lava flow bedrock excavated in five 10 cm levels. Layer V did not contain any sediment, did not contain artifacts, and terminated on bedrock.

Site 26876 Summary

The rock mound at Site 26876 appears to be a ranch feature associated with the three dirt ranch roads that intersect nearby. The rock mound is located on a low rise visible from two of the ranch roads near where they intersect. It is possible it marks that intersection. The rock mound does not appear to be altered and is in good condition.

SITE 50-10-21-26877

FORM	Rectangular Rock mound
FUNCTION:	Boundary marker
AGE:	Historic
DIMENSIONS:	Length: 1.04m (E/W); Width: 0.9m; Height: 0.6m (max)
CONDITION:	Fair
SURFACE ARTIFACTS:	None
EXCAVATION:	1m by 1m test-unit

SITE 26877 (Temporary Site 3)

Site 26877 is located 85m at 300 ˚ from station 324+00 CL, at an elevation of 4,500ft (1371.6m) amsl (see Figure 18). The site consists of a single rock mound at the top of a hill (Figure 42). The hill measures approximately 100m (N/S) by 25m and is 15m in height. The mound is situated near the peak of the hill, and is most visible from the west (*makai*), and the east (*mauka*), but is less visible from the north. The rock mound measures 1.04m (E/W) by 0.9m and is 0.6m in height (Figure 43). It is composed predominantly of small boulders with a few large cobbles filling in the gaps, and although there is no stacking or facing it is relatively well constructed. The mound rests on a boulder bedrock outcrop.

Figure 42: Site 26877, Feature 1, View to NE.

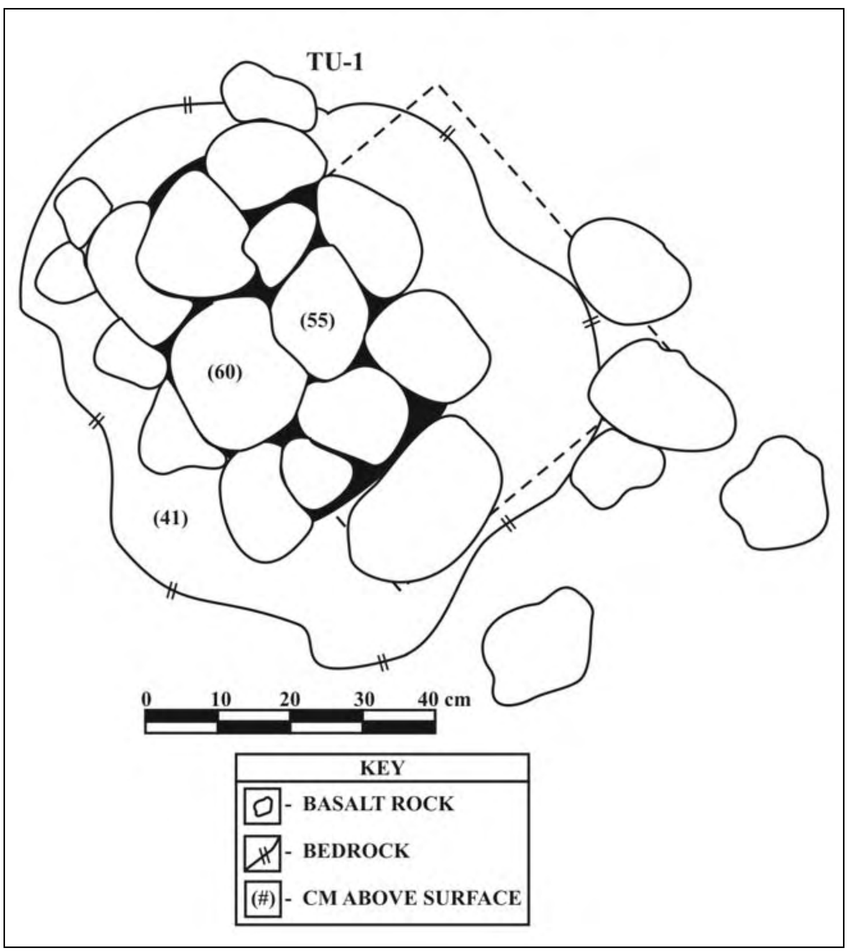


Figure 43: Site 26877, Feature 1 Planview.

Site 26877 Test-Unit 1 Excavation Description

A single 50cm by 50cm test-unit (TU-1) was excavated in the center of the rock mound at Site 26877. TU-1 contained an architectural layer and three stratigraphic layers, and terminated on bedrock at 25cm below the modern ground surface (Figure 44).

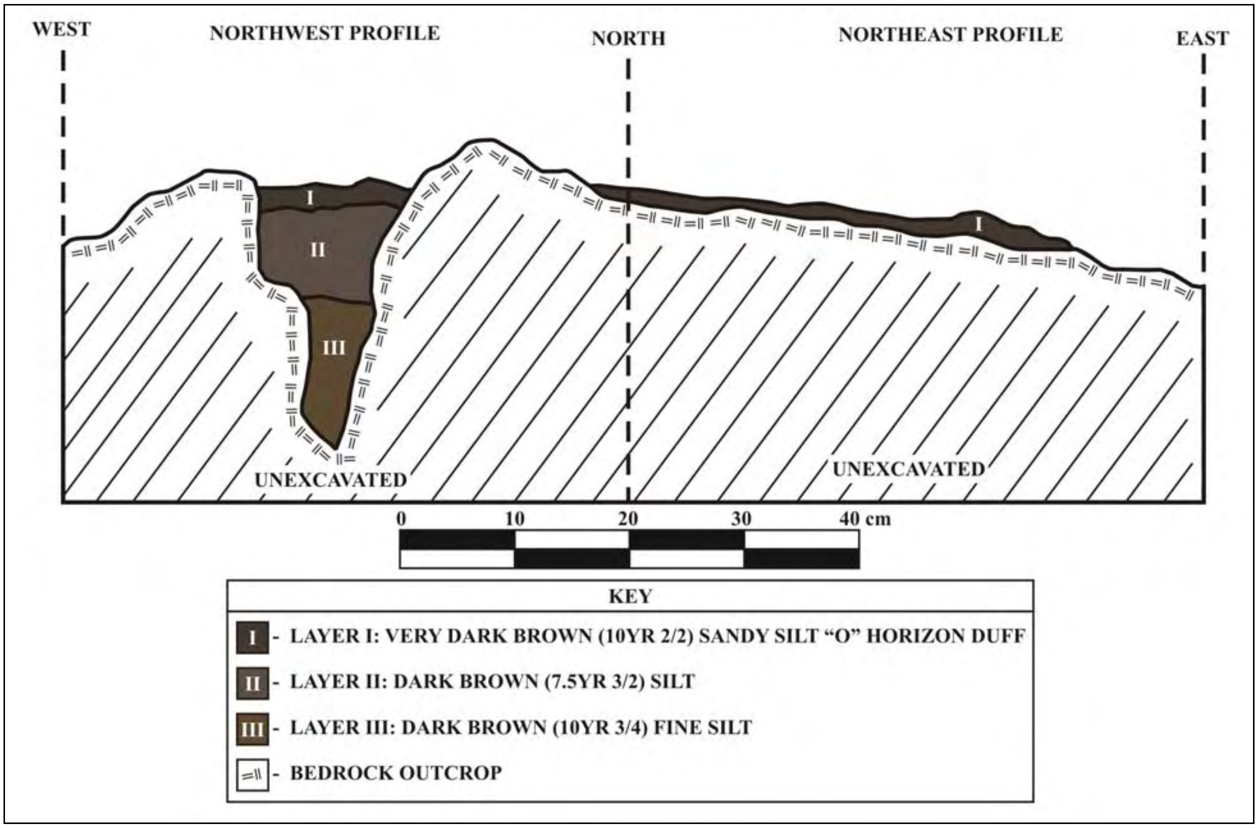


Figure 44: Site 26877, Feature 1, TU-1 Northwest and Northeast Profiles.

Architectural Layer (0-60cm above modern ground surface) contained 14 angular and subangular basalt small boulders and large cobbles resting approximately 5cm deep in loose sandy silt (Layer I) on a bedrock outcrop. The Architectural Layer did not contain artifacts.

Layer I (0-2cmbs) was very dark grayish brown (10YR2/2) loose, aeolian sand and organic detritus with no inclusions or roots. Layer I was a classic "O" Horizon and did not contain cultural material. Layer I terminated at the top of a boulder bedrock outcrop in TU-1, except for the presence of a Layer II material in a northwest/southeast oriented crevice through the center of the bedrock boulder.

Layer II (2-10cmbs) was dark brown (7.5YR3/2) loose to soft, fine sand and silt with no inclusions and no roots. Layer II did not contain cultural material.

<u>Layer III</u> (10-25cmbs) was dark brown (10YR3/4) soft, fine silt with no inclusions and no roots. Layer III/1 did not contain cultural material and terminated on bedrock.

Site 26877 Summary

Site 26877 is in close proximity to several rock mounds along the southwest property boundary (see Figure 33). Sites 23491, 23468 (not shown in Figure 33), 23513, 23514, 23528, 23529, 23530, 23531, 23532, 23533, 23536, 23537, 23538, 26875, 26876, and 26878 are either right along the southwest property boundary to roughly 500m northeast of it. This property boundary is also the boundary between Waikōloa and Puʻuanahulu ahupuaʻa, and North Kona and South Kohala. It is most likely that the rock mounds are the result of several early Historic to late Historic efforts to survey and record and mark these boundaries.

SITE 50-10-21-26878

FORM	Oval Rock mound
FUNCTION:	Boundary marker
AGE:	Historic
DIMENSIONS:	Length: 1.25m (140˚/320˚); Width: 1.0m; Height: 0.45m (max)
CONDITION:	Fair
SURFACE ARTIFACTS:	Modern trash
EXCAVATION:	1m by 1m test-unit

Site26878 (Temporary Site 5)

Site26878 is located 13m at 60˚ from station 195+00CL, at an elevation of 3700ft (1127.76m) amsl (see Figure 18). The site consists of a single rock mound at the top of a hill (Figure 45). The hill is 15 to 20m high with unobstructed views in all directions (Figure 46). The rock mound is situated near the western perimeter of the hill top, within close proximity to two olive trees. The rock mound measures 1.25m (140˚/320˚) by 1.0m and is 0.45m in height (Figure 47). It is constructed of angular and subangular large cobbles and small boulders, loosely piled (two courses high) on a bedrock outcrop. The mound has the appearance of having been disturbed by ungulates and humans, an indication that at one time it may have been greater in height. An abundance of trash, i.e. food, beverage and tobacco containers are present on the ground surface immediately west of the rock mound.

Figure 45: Site 26878, View to West (10cm scale).

Figure 46: View to West from Site 26878 Hillside.

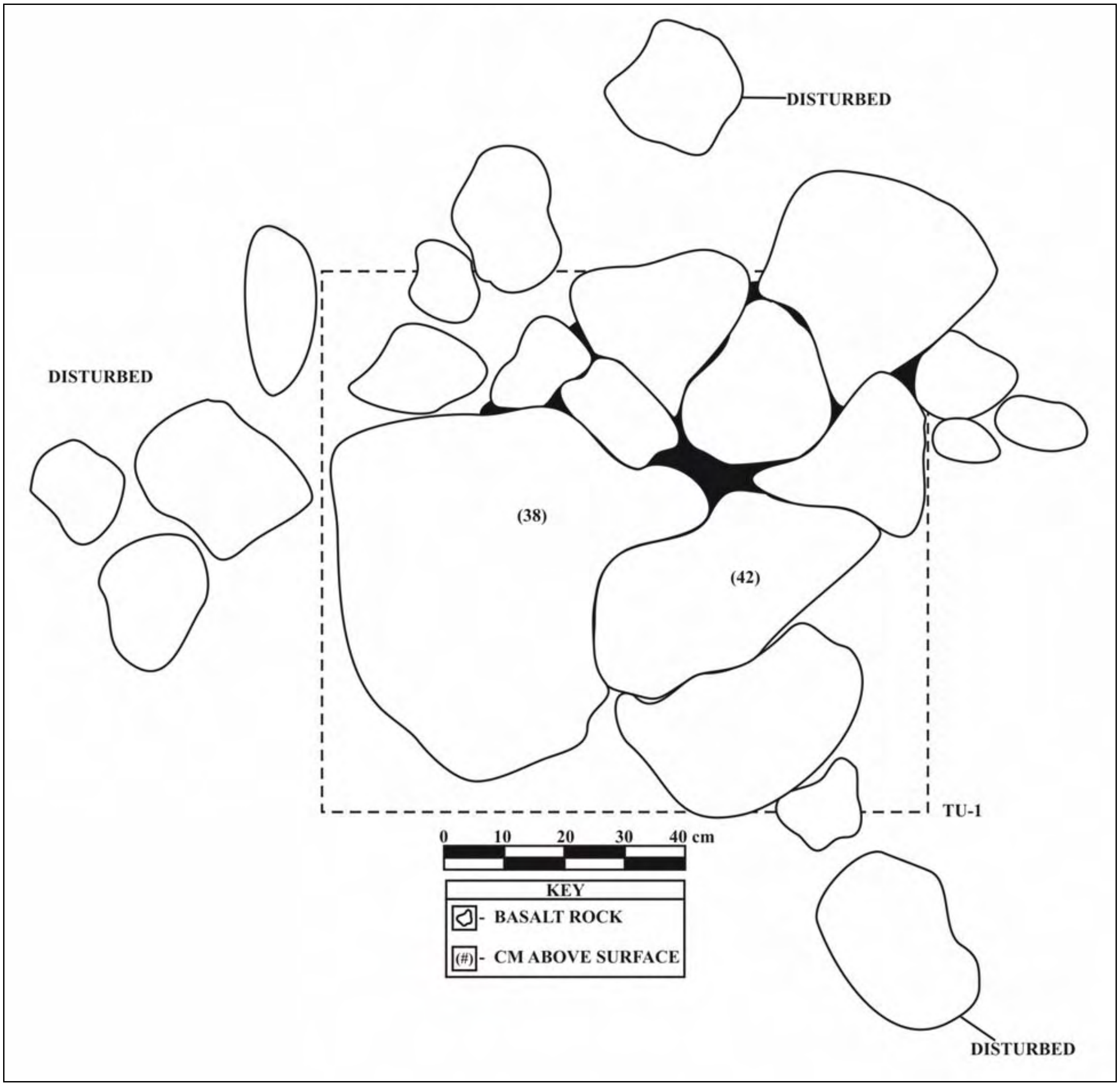


Figure 47: Site 26878 Planview.

Site 26878 Test-Unit 1 Excavation Description

A single 1.0m by 1.0m test-unit (TU-1) was excavated in the center of the rock mound at Site 26878. TU-1 contained an architectural layer and three stratigraphic layers, and terminated on bedrock at 30cm below the modern ground surface (Figure 48).

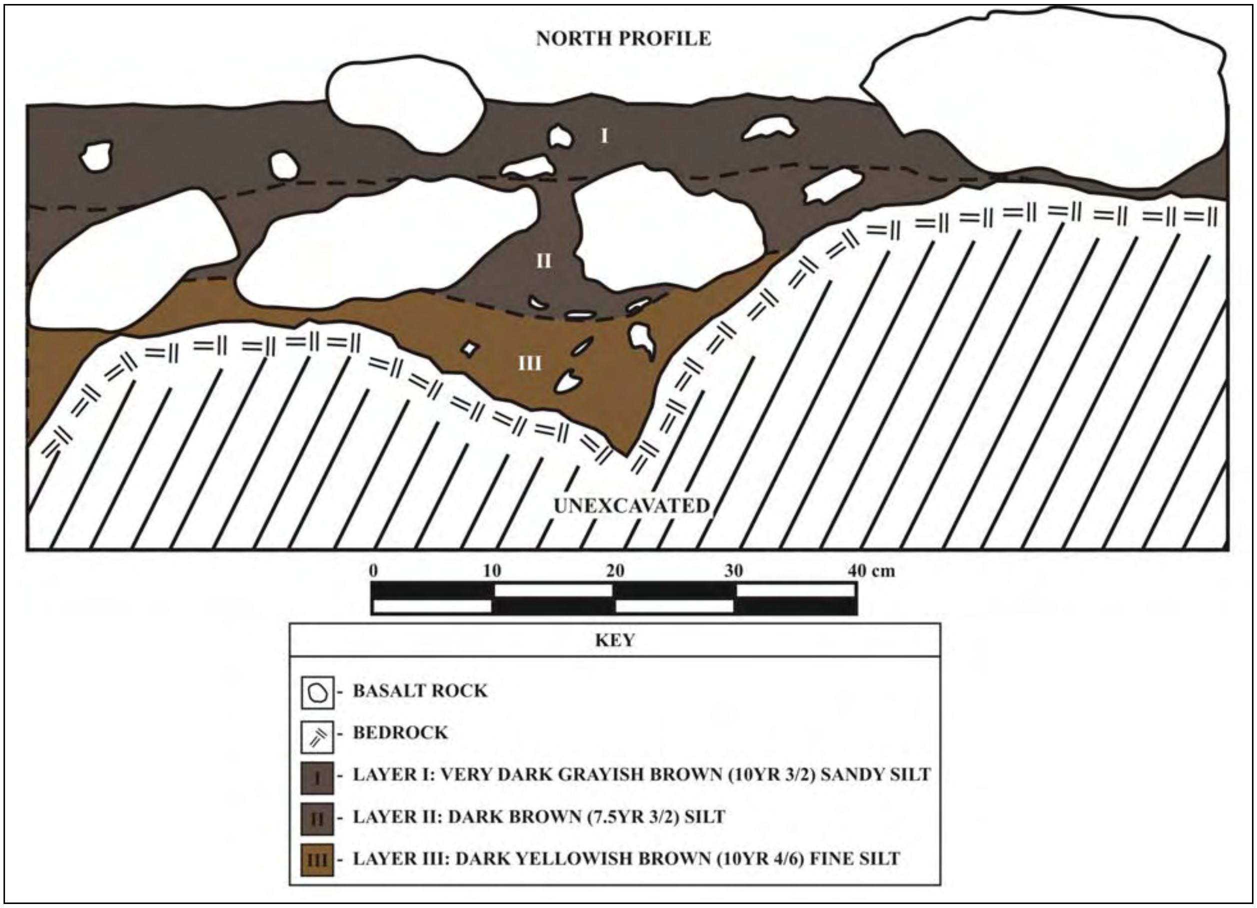


Figure 48: Site 26878, Feature 1, TU-1 North Profile.

Architectural Layer (0-42cm above modern ground surface) contained seven angular and subangular basalt small boulders and large cobbles resting approximately 5cm to 7cm deep in loose sandy silt (Layer I). The Architectural Layer did not contain artifacts.

Layer I (0-10cmbs) was very dark grayish brown (10YR2/2) loose, aeolian sand and fine silt with 10% pebbles and small cobbles, and 20% fine grass roots. Layer I did not contain cultural material.

Layer II (10-20cmbs) was dark brown (7.5YR3/2) loose, fine sand and silt with 30% pebbles to large cobbles and 10% fine grass roots. Layer II did not contain cultural material.

Layer III (20-30cmbs) was dark yellowish brown (10YR4/6) soft, fine silt with 30% pebbles to large cobbles and 10% fine grass roots Layer III/1 did not contain cultural material and terminated on bedrock.

Site 26878 Summary

Site 26878 is in close proximity to several rock mounds along the southwest property boundary (see Figure 33). Sites 23491, 23468 (not shown in Figure 33), 23513, 23514, 23528, 23529, 23530, 23531, 23532, 23533, 23536, 23537, 23538, 26875, 26876, and 26878 are either right along the southwest property boundary to roughly 500m northeast of it. This property boundary is also the boundary between Waikōloa and Puʻuanahulu ahupuaʻa, and North Kona and South Kohala. It is most likely that the rock mounds are the result of several early Historic to late Historic efforts to survey and record and mark these boundaries.

There was also a moderate amount of modern trash (soda and food cans, and a plastic snuff tobacco tin) scattered on the ground surface at the site. It is likely that the area was used as a hunting spot, and/or lunch spot in the recent past. The hillside allows good views to the west and the two olive trees provide shade and cover.

CONCLUSION

Three previously identified archaeological sites and four new sites were located in the present study corridor, including five rock mounds (SIHP Sites 50-10-21-23528, 50-10-21-26875, 50-10-21-26876, 50-10-21-26877, and 50-10-21-26878), a segment of the old Waimea-Kona Belt Road (SIHP Site 50-10-21-20855), and remnants of a ranching-era fence (SIHP Site 50-10-21-23452). Four of the rock mounds (Sites 23528, 26875, 26877, and 26878) correspond roughly to the boundary between the Keʻāmuku cattle station lands and ranch lands to the southwest. This area is also the boundary between Waikōloa and Puʻuanahulu *ahupuaʻa*. Site 26875 contained a Kalopa Soda Works bottle and a roll of galvanized fence wire in its construction. The rock mound at Site 26878 appears to also mark a possible hunting spot. A fifth rock mound (Site 26876) marks the intersection of two ranch roads along the southeast side of the Keʻāmuku cattle station lands. The ranching-era fence (Site 23452) appears to have been used early in the history of sheep and cattle ranching at Keʻāmuku. The original fence wire has been removed and it passes through the middle of several more recently fenced paddocks.

DISCUSSION

All of the sites recorded within the current study area corridor are Historic era ranching features, and a road. They are primarily boundary markers (rock mounds and a fence line). This makes sense since they are located along the edge of a traditional boundaries—that of private land divisions between Parker Ranch land and the Hind family ranch to the south; the boundary between North Kona and South Kohala: and the boundary between Waikoloa and Puʻuanahulu *ahupuaʻa*. The rock mounds, and even fence Site 23452, are roughly from along the modern boundary up to 500m north of the modern boundary. Given methods of surveying during the mid 1800s to early 1900s these differences are not unexpected. The single archaeological site unrelated to ranching is the Old Waimea-Kona Belt Road built in the 1920s.

REFERENCES CITED

Andrews, L.
2003 *A Dictionary of the Hawaiian Language*. Island Heritage Publishing. Waipahu.

Barrera, W. Jr.
1971 *Anaeho‘omulu: An Hawaiian Oasis*. Pacific Anthropological Records No. 15, Dept. of Anthropology, Bishop Museum. Honolulu.

Barrère, D.
1971 Anaehoomalu-A Reconstruction in History. In *Anaeho‘omulu: An Hawaiian Oasis*, ed. by W. Barrera. Pacific Anthropological Records No. 15, Dept. of Anthropology, Bishop Museum. Honolulu.

1983 “Notes of the lands of Waimea and Kawaihae”. In: *Archaeological Investigations of the Mudlane-Waimea-Kawaihae Road Corridor*, *Island of Hawai`i*. Jeffery Clark and Patrick Kirch (eds). Dept. of Anthropology, Report 83-1. Bishop Museum.

Beaglehole, J.C.
1967 *The Journals of Captain James Cook*. Hakluyt Society. Cambridge.

Bergin, Dr. B.
2004 *Loyal to the Land:The Legendary Parker ranch, 750-1950*. University of Hawaii Press. Honolulu.

Bevacqua, R.F.
1972 *Archaeological Survey of Portions of Waikoloa, South Kohala District, Island of Hawaii*. Departmental Report Series 72-4. Dept. of Anthropology, Bishop Museum. Honolulu.

Bird, I.
1998 *Six Months in the Sandwich Islands*. Charles E. Tuttle Co. Rutland, Vermont.

Boundary Commission Book for Hawai‘i Vol. A, 6, 10 and Vol. B:64 and 74. Microfilm at University of Hawaii at Hilo Library.

Bowser, G. (compiler)
1880 *The Hawaiian Kingdom Statistical and Commercial Directory and Tourist Guide*. Bowser and Co. Honolulu.

Brennen, J.
1972 *The Parker Ranch of Hawaii: The Saga of a Ranch and a Dynasty*. The John Day Company. New York.

Chinen, J.J.
1961 *Original Land Titles in Hawaii*.

Ching, F.
1971 *The Archaeology of South Kohala and North Kona: Surface Survey, Kailua-Kawaihae Road Corridor*. Hawaii State Archaeological Journal 71-1. DLNR. Kapolei.

Clark, J.
1981 Archaeological Survey of the Proposed Lalamilo Agricultural Park, South Kohala, Island of Hawaii. Bishop Museum. Honolulu.

Clark, J.T. and P.V. Kirch
1983 *Archaeological Investigations of the Mudlane-Waimea-Kawaihae Road Corridor*. Report 83-1. Dept. of Anthropology. Bishop Museum. Honolulu.

Collins, George
1951 *The Story of Young and Davis. Essay to Social Science Association*, 3 December 1951. Honolulu.

Cordy, R.
1987 *ʻAnaehoʻomalu's Ahupuaʻa Alter Ke Ahu A Lono (HA-E1-63): An Archaeological and Archival Overview, South Kohala, Hawaiʻi*. DLNR. Kapolei.

1994 The Ala Kahakai Trail – Or the Ala Loa: An Archaeological & Historical Preservation Perspective (ms.).

2000 *Exalted Sits the Chief: The Ancient History of Hawaiʻi Island*. Mutual Publishing. Honolulu.

Cox, D.
1983 *Site Visit and Archaeological Reconnaissance Survey of the Firebreak Route Along Puu Kulua Road, Pohakuloa Training Area (PTA), Island of Hawai*i. Submitted to U.S. Army Corps of Engineers, Pacific Ocean Division by David W. Cox, Archaeological Technician, Corps of Engineers, Honolulu District.

Doyle, E.L.
1953 *Makua Laiana, The Story of Lorenzo Lyons*. Advertiser Publishing Co. Honolulu.

Ellis. W.
1963 *Narative of a Tour of Hawaii, or Owhyhee*. Advertiser Publishing. Honolulu.

1969 *Journal of William Ellis*. Honolulu Advertiser Publishing Co., Ltd, Honolulu.

Escott, G.E.

2006 *Phase II Archaeological Investigations at State Sites 50-10-21-23499, 50-10-21-23515, 50-10-21-23516, 50-10-21-23517, and 50-10-21-23539 on Lands of the Keʻāmuku Sheep and Cattle Station Located in the Ahupuaʻa of Waikōloa, South Kohala District, Island of Hawaiʻi [TMK (3) 6-7-001:09]*. DLNR. Kapolei.

Fornander, A.

1996 *Ancient History of the Hawaiian People to the Times of Kamehameha I*.

Frigiola, Jim

2002 *International Ammunition Association, Inc. Journal* number 426, July/August, 2002.

Gerrish, G.

2003 V*egetation Study for Saddle Road Extension*. Prepared for DMT Consultant Engineers, Hilo.

Hommon, R.

1982 *Archaeological Data Recovery at Site 342, Kalahuipuaʻa*. Science Management, Inc. Prepared for Mauna Lani Resorts.

Jensen, P.M.

1988 *Archaeological Data Recovery and Intensive Survey, Resort Expansion Area and Selected Undeveloped Resort Parcels, Waikoloa Beach Resort, Lands of Waikoloa and Anaehoomalu, South Kohala, Island of Hawaii*. PHRI Report 371-031488. Prepared for Transcontinental Development Company. DLNR. Kapolei.

1989b *Archaeological Inventory Survey, Waikoloa Beach Resort Parcels 20, 21, 22, and 23, Land of Waikoloa, South Kohala District, Island of Hawaii*. PHRI Report 512-022289. Prepared for Prepared for Transcontinental Development Company. DLNR. Kapolei.

1990a *Archaeological Data Recovery and Site Preservation. Undeveloped Portions of Lots 22 and 23 of File Plan 1562 and the Strip Between Lot 23 and Kiholo Puako Trail. Waikoloa Beach Resort. Land of Anaehoomalu, South Kohala District, Island of Hawaii.* PHRI Report. DLNR, Kapolei.

1990b *Archaeological Data Recovery Program. Lots 1, 2, 6, 7, 17, 24, Waikoloa Beach Resort. Land of Anaehoomalu, South Kohala District, Island of Hawaii.* PHRI Report. DLNR, Kapolei.

Johnson, K. and G.E. Escott

2009 Additional *Phase II Archaeological Investigations at State Sites 50-10-21-23499, 50-10-21-23515, 50-10-21-23516, 50-10-21-23517, and 50-10-21-23539 on Lands of the Keʻāmuku Sheep and Cattle Station Located in the Ahupuaʻa of Waikōloa, South Kohala District, Island of Hawaiʻl [TMK (3) 6-7-001:09]*. Draft.

Kalakaua, D.
1990 *The Legends and Myths of Hawaii*. Mutual Publishing. Honolulu.

Kamakau, S.
1961 R*uling Chiefs of Hawaii*. The Kamehameha School Press. Honolulu.

Kame`eleihiwa, L.
1992 *Native Land and Foreign Desires: Pehea La E Pono Ai?* Bishop Museum Press. Honolulu.

Kelly, M.
1983 *Nā Māla o Kona: Gardens of Kona*. Dept. of Anthropology Report Series 83-2. Bishop Museum. Honolulu.

Kelly, M., B. Nakamura, and D. Barrèrre
1981 *Hilo Bay: A Chronological History, Land and Water Use in the Hilo Bay Area, Island of Hawai'i*, Bishop Museum, Honolulu.

Kinny, H.W.
1913 *The Island of Hawaii*. Hilo Board of Trade. Hilo.

Kirch, P.V.
1975 *Preliminary Report on Phase II Archaeological Investigations at Kalahu`ipua`a, South Kohala, Hawaii Island, Dept*. Of Anthropology, B.P. Bishop Museum. Prepared for Mauna Loa Land, Inc.

1979 *Marine Exploitation in Prehistoric Hawaii: Archaeological Excavations at Kalahuipua'a, Hawaii Island*. Pacific Anthropological Anthropological Records, 29. Department of anthropology, Bishop Museum. Honolulu.

Kirch, P.V. and M. Sahlins
1992 *Anahulu*. Vol. 1 and 2. University of Chicago Press. Chicago.

Kuykendall, R.S.
1938 *The Hawaiian Kingdom*. Vol. 1. University of Hawaii Press. Honolulu.

Langlas, C., T.R. Wolforth, and J. Head
1999 *The Saddle Road Corridor: An Archaeological Inventory Survey and Traditional Cultural Property Study for the Hawai'i Defense Access Road A-AD-6(1) and Saddle Road (SR200) Project*. Prepared for Okahara and Associates, Inc.

Macrae, James
1972 *With Lord Byron at the Sandwich Islands in 1825: Being Extracts from the MS Diary of James Macrae, Scottish Botantist*. Petroglyph Press. Hilo.

Malo, D.
1951 *Hawaiian Antiquities*. Bishop Museum Press. Honolulu.

Maly, K.
1999 *Pu‘uwa‘awa‘a and Pu‘uanahulu (Nāpu‘u), at Kekeha-Kona, Hawai‘i*. Prepared for Pu‘uanahulu ‘Ohana. Kamuela, Hawai`i.

Maly, K. and O. Maly
2002 *He Wahi Mo‘olelo No Ka‘Āina A Me Nā ‘Ohana O Waiki‘i Ma Waikōloa (Kalana O Waimea, Kohala), A Me Ka ‘Āina Mauna: A Collection of Traditions and Historical Accounts of the Lands and Families of Waiki‘i at Waikōloa (Waimea Region, South Kohala), and the Mountain Lands, Island of Hawai‘i (TMK Overview Sheet 6-7-01)*. Kumu Pono Associates. Hilo.

McEldowney, H.
1979 *Archaeological and Historical Literature Search and Research Design: Lava Flow Control Study, Hilo,* Hawai, Department of Anthropology, Bishop Museum. Prepared for the U.S. Army Engineer District, Pacific Ocean.

Moffat, R.M. and G. L. Fitzpatrick
1995 *Surveying the Māhele*. An Editions Limited Book. Hong Kong.

Parker Ranch Office Account Books and Rainfall Data Various Years.
Office accounts and data from ranch stations sent to the Weather Bureau of the United States Department of Commerce in Honolulu, and the Pineapple Research Institute and Experiment Station H.S.P.A. Collected at H.P.A. and stored with Dr. Billy Bergin at Waimea.

Pukui, M.K., S. Elbert and E. Mookini
1976 *Place Names of Hawaii*. University of Hawaii Press. Honolulu.

Robins, J.J., K.A. Desilets, and A.L. González
2007 *Final: Intensive Phase II Survey for Significance Determinations of Cultural Resources, Ke‘āmuku Land Acquisition Area (WPAA) for the Stryker Brigade Combat TEAM (SBCT), U.S. Army Pōhakuloa Training Area, Hawai‘I Island, Hawai‘I (TMK: 3-6-7-001:03)*. SHPD Kapolei.

Robins, J.J., T. Torres, and S. Williams
2001 Archaeological Reconnaissance Survey and Monitoring in Support of the Defense Environmental Restoration Program of Formerly Used Defense Sites (DERP FUDS) Activities at Former Waikoloa Manuever Area, Ahupua‘a of Kawaihae 2, ‘Ouli, Lalamilo, Waikoloa and Pu‘ukapu, South Kohala District, Hawaii Island, Hawaii. Submitted to U.S. Army Engineer District, Honolulu by Ogden Environmental and Energy Services, Inc. Honolulu.

Rosendahl, P.H.
1972 *Archaeological Salvage of the Hauna-Anaehoomalu Section of the Kailua-Kawaihae Road (Queen Ka'ahumanu Highway), Island of Hawaii*. Dept. Report Series 75-5. Dept. of Anthropology, Bishop Museum. Honolulu.

Sato, H., W. Ikeda, R. Paeth, R. Smythe, and M. Takehiro Jr.
1973 *Soil Survey of Island of Hawaii, State of Hawaii.* United States Department of Agriculture Soil Conservation Service. Washington D.C.

Smart, R.
1965 *Paka Paniolo*. September Newsletter. Waimea.

Stewart, C.
1970 *Journal of a Residency in the Sandwich Islands, During the Years 1823, 1824, and 1825*. University of Hawai'i Press. Honolulu.

Tera Tech, Inc.
2003 *Draft Environmental Impact Statement: Transformation of the 2nd Brigade, 25th Infantry Division (L) to a Stryker Brigade Combat Team in Hawai'I, Vol. 2*. Tera Tech, Inc. Honolulu, HI.

U.S. Department of the Interior
1991 *How to Apply the National Register Criteria for Evaluation*. National Register Bulletin 15. National Park Service, USDI, Washington, D.C.

Vancouver, G.
1967 *A Voyage of Discovery to the North Pacific Ocean, and Around the World*. Robinson and Edwards. London.

Wakayama, A.
1983 Oral history Interview with John Spencer (JS), January 27, 1983, Kamuela, Hawaii (ms). Waimea Oral History Project. Waimea.

Wellmon, B.B.
1969 The Parker ranch: A History. Ph.D. Dissertation, Texas Christian University. University Microfilms.

Wells, T.
1998 Nail Chronology: The Use of Technologically Derived Features. *Historical Archaeology* 1998, 32(2): 78-99.

Wilkes, C.
1970 *Narrative of the United States Exploring Expedition During the Years 1938-1842.* Vols. 1-5 and Atlas. Lea & Blanchard. Philadelphia.

Wolfe, E.W., and J. Morris
1994 Geological Map of the Island of Hawai‘i. U.S.G.S. Miscellaneous Investigations Series. Department of the Interior. Washington, D.C.

Wolforth, T., G. Escott, and L. McGerty
2006 *Inventory Survey for the Saddle Road Extension*: *Investigations into Resource Extraction in the Middle Elevations of Waikōloa Ahupua‘a in Kohala, and Pu‘uanahulu Ahupua‘a in Kona*. Prepared for Okahara and Associates, Inc.

[This page intentionally left blank]

SADDLE ROAD (STATE ROUTE 200)
Mamalahoa Highway (State Route 190) to Milepost 41
County of Hawai‘i, State of Hawai‘i
FHWA Project No. 200(00)

SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

Submitted Pursuant to Section 42 U.S.C. 4332(2)(c)
and Chapter 343, Hawai‘i Revised Statutes by the

U.S. DEPARTMENT OF TRANSPORTATION
Federal Highway Administration (FHWA)
Central Federal Lands Highway Division
and
STATE OF HAWAI‘I
Department of Transportation (HDOT)
Highways Division

<u>Cooperating Agencies</u>
U.S. Army Garrison, Hawai‘i

Appendix F2
Section 106 Correspondence and
List of Section 106 Consulted Parties

[This page intentionally left blank]

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, CO 80228

October 26, 2009

In Reply Refer To:
HFPD-16

Ms. Theresa Donham
State Historic Preservation Division
40 Po'okela Street
Hilo, HI 96720

Dear Ms. Donham:

We are contacting you at this time to continue consultation on the Saddle Road (SR 200) highway improvement project. As you know the Federal Highway Administration (FHWA) and the Hawaii Department of Transportation (HDOT), with the cooperation of the Department of the Army, plans to reconstruct and pave Saddle Road from the Mamalahoa Highway (SR 190) easterly to mile post 6 of Saddle Road, Island of Hawaii.

In 2006, the Department of the Army purchased a property known as the Ke'āmuku parcel for training which included most of Section I of the proposed Saddle Road. In order to provide a safe separation of civilian transportation and military training, the U.S. Army has requested the Federal Highway Administration and the Hawaii Department of Transportation to relocate the alignment for this section of the Saddle Road to near the southern boundary of Ke'āmuku. A Draft Supplemental Environmental Impact Statement (DSEIS) is being prepared to address this realignment. This DEIS presents the action alternatives and the No Action Alternative and evaluates the impacts associated with the proposed improvement of Section I (as defined in the original EIS) of the Saddle Road, which extends from Mamalahoa Highway (SR 190) to Milepost 42 near the western end of the existing Saddle Road improvements completed to date. Most of the length of Sections II and III of the Saddle Road, which extends between Mileposts 42 and 9, have already been completed, are under construction, or are in the final design stage of development as described in the Final EIS for the entire project completed in 1999.

The two alternatives under consideration are; W-3, the Recommended Alternative in the Final EIS for the project in 1999 and the other, W-7 is a new alternative. The No Action Alternative would continue use of the existing alignment. The No Action Alternative, which was not selected in the 1999 EIS for reasons of safety for motorists and non-motorized traffic, circulation, and land use impacts, would continue use of the existing alignment. As it has already been rejected, the No Action Alternative is not under consideration in this SEIS and is referenced for baseline purposes only, as is W-3. If it is not feasible to construct W-7, FHWA and DOT expect to build W-3, the alternative selected in the 1999 ROD.

Both alternatives would build a new two-lane roadway with shoulders and a uphill climbing lane and a design speed of 55 to 62 miles per hour. In Section I, the existing Saddle Road is a narrow, winding, two-lane road with steep grades, sharp curves, poor pavement, and no shoulders. The existing road connects Mamalahoa Highway (State Highway 190) with the U.S. Department of the Army's Pohakuloa Training Area (PTA), and within PTA at Milepost 42 it connects to a section of the Saddle Road that is undergoing or has undergone improvement and realignment as far as Milepost 19. Both Alternatives would improve pavement condition, increase safety and capacity, improve quality of traffic flow, decrease cross-island travel times, and stimulate economic growth and development. Only W-7, however, would minimize conflict between civilian motorists and military training units.

The Hawai'i Department of Transportation (HDOT), with the assistance of the Federal Highway Administration (FHWA), Central Federal Lands Highway Division, has contracted with DMT Consultant Engineers to prepare a Supplemental Environmental Impact Statement (SEIS) for the proposed W-7 Alternative that traverses lands of the former Parker Ranch Ke'āmuku cattle station in the Ahupua'a of Waikōloa, South Kohala District, Island of Hawai'i, TMK: (3) 6-7-001:09. The W-7 Alternative extends approximately ten miles from the existing Saddle Road near Kilohana (mile post 42) to the Mamalahoa Highway at the border of North Kona and South Kohala (6 miles south of Waimea). Scientific Consultant Services, Inc. (SCS) surveyed a 600-acre cultural resource inventory study corridor (roughly 10 miles by 500 feet wide) to identify and evaluate historic properties. The survey corridor extends 150 feet beyond both sides of the 200-foot wide area of potential effects (APE) which is the actual width of the right-of way/construction corridor. This was done to allow for avoidance of identified historic properties where feasible through preliminary highway design.

There are seven archaeological sites documented in the study corridor, including five rock mounds (SIHP Sites 50-10-21-23528, 50-10-21-26875, 50-10-21-26876, 50-10-21-26877, and 50-10-21-26878), a segment of the old Waimea-Kona Belt Road (SIHP Site 50-10-21-20855), and remnants of a ranching-era fence (SIHP Site 50-10-21-23452). Four of the rock mounds (SIHP Sites 50-10-21-23528, 50-10-21-26875, 50-10-21-26877, and 50-10-21-26878) correspond roughly to the boundary between the Ke'āmuku cattle station lands and ranch lands to the southwest. This area is also the boundary between Waikōloa and Pu'uanahulu Ahupua'a. Site SIHP 50-10-21-826875 contained a Kalopa Soda Works bottle and a roll of galvanized fence wire in its construction. Site 50-10-21-26878 appears to mark a possible hunting spot. Site 50-10-21-26876 marks the intersection of two ranch roads along the southeast side of the Ke'āmuku cattle station lands. The ranching-era fence (Site 50-10-21-23452) appears to have been used early in the history of sheep and cattle ranching at Ke'āmuku. The original fence wire has been removed and it passes through the middle of several more recently fenced paddocks. A copy of the report entitled *An Archaeological Inventory Survey Report for 600 acres Located in lands of Ke'amuku, Waikoloa Ahupuua'a, south Kohala district, Hawai'I [TMK (3) 6-7-001:09]* is enclosed.

The five rock mounds and historic fence line are within the study corridor, but are located outside of the APE, and will be avoided with the current preliminary highway design. We have enclosed preliminary highway design plan sheets that document avoidance of the five rock mounds and historic fence line.

The Waimea-Kona Belt Road (SIHP Site 50-10-21-20855) was previously determined eligible for the National Register of Historic Places under criterion "d" by the FHWA following the cultural resource survey of the W-3 Alternative. The Hawai'i SHPO concurred with the FHWA's determination and signed a Memorandum of Agreement (MOA) with the FHWA and the Office of Hawaiian Affairs to mitigate adverse effects to Site 50-10-21-20855. Mitigation consists of preparation of a mitigation plan which provides for a pull off and interpretive sign to be constructed adjacent to the Site.

In accordance with 36 CFR 800.4(d) (1) and for the purposes of Section 106 of the National Historic Preservation Act, it is the finding of the FHWA, as lead agency, that Sites 50-10-21-23528, 50-10-21-26875, 50-10-21-26876, 50-10-21-26877, 50-10-21-23452,and 50-10-21-26878 are outside of the APE and will not be affected by the proposed W-7 Alignment. Since they are outside of the APE, they will not be evaluated for National Register of Historic Places eligibility. In addition, it is the finding of the FHWA that Site 50-10-21-20855, the Waimea-Kona Belt Road, cannot be avoided by the proposed W-7 Alternative and will be adversely affected. The FHWA will notify the Advisory Council on Historic Preservation of the adverse effect and amend the existing Memorandum of Agreement to provide mitigation for the adverse effect to Site 50-10-21-20855. In accordance with the existing MOA for the Saddle Road Project, the FHWA will continue to provide a full time Archaeological monitor for all clearing, grubbing, and excavation activities during project construction. We ask for your concurrence with our finding of "no historic properties affected" for the six sites that are outside of the APE and our finding of adverse effect for Site 50-10-21-20855, the Waimea-Kona Belt Road.

If you have any questions, please call Mr. Stephen Hallisy, Archeologist/Environmental Protection Specialist, at (720) 963-3685 or write to the above address, Attention: Environment HFHD-16.

Sincerely yours,

David Gedeon

David Gedeon, P.E.
Project Manager

Enclosure

cc with enclosure:

Office of Hawaiian Affairs, 711 Kapi'olani Blvd., Ste. 500, Honolulu, HI 96813

Mr. Ken Tatsuguchi, State Department of Transportation, Highways Division, Planning Branch, 869 Punchbowl Street, Honolulu, HI 96813

Colonel Matthew T. Margotta, Department of the Army, US Army Installation Management Command, Pacific Region, Headquarters, United States Army Garrison, Hawaii, 851 Wright Avenue, Wheeler Army Airfield, Schofield Barracks, Hawaii 96857-5000

Mr. Alvin Char, Chief, Environmental Division, Directorate of Public Words, United States Army Garrison, 948 Santos Dumont Avenue, Sheeler Army Airfield, bldg. 105, Schofield Barracks, HI 96857-5013

LIST OF NATIVE HAWAIIAN ORGANIZATIONS BEING CONSULTED AS PART OF SECTION 106 CONSULTATION

Clyde Nāmuʻo, Administrator
Office of Hawaiian Affairs
711 Kapiolani Blvd., Suite 1250
Honolulu HI 96813

Ruby McDonald
Office of Hawaiian Affairs
75-5706 Hanama Place, Ste. 107
Kailua-Kona HI 96740

Lukella Ruddle
OHA, Hilo Office
162 A Baker Avenue
Hilo HI 96720-4869

Aliʻi ʻAimoku Paul K. Neves, Chairperson
Royal Order of Kamehameha I
1162 Kalanianaole Ave
Hilo HI 96720

Chairperson
Association of Hawaiian Civic Clubs
P.O. Box 1135
Honolulu HI 96807

President
Council on Native Hawaiian Advancement
33 South King Street, Suite 513
Honolulu HI 96813

Hawaiʻi Island Burial Council
74-383 Kealakehe Parkway
Kailua-Kona HI 96740

Hawaiʻi Maoli
P.O. Box 1135
Honolulu HI 96807

Ike ʻAina Native Hawaiian Trust
P.O. Box 4192
Honolulu HI 96812

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

January 6, 2010

David Gedeon, P.E., Project Manager
US Department of Transportation, FHA
Central Federal Lands Highway Division
12300 West Dakota Avenue
Lakewood, Colorado 80228

LOG NO: 2009.4195
DOC NO: 1001MD05
Archaeology

Dear Mr. Gedeon:

SUBJECT: National Historic Preservation Act (NHPA) Section 106 Review – West Saddle Road Highway Improvement Project Ke`amuku & Waikoloa Ahupua`a, South Kohala District, Island of Hawaii TMK: (3) 6-7-001:009

Thank you for the opportunity to comment on the aforementioned undertaking, which we received on December 4, 2009. We have reviewed and accepted the archaeological inventory survey (AIS) for this undertaking (*Escott and Keris 2009*). No further work is required and the report has been accepted as final (*Log No. 2010.0025, Doc No. 1001MD04*).

We do have one issue to raise. In your letter to us you cited the proposed mitigation to site 20855 (the Waimea-Kona Belt Road) which was determined to be eligible under criterion "d" during the assessment of the W-3 alternative; you also note that the W-3 would present an adverse affect to site 20855 and mitigation would include a pullout and sign along the new road. However, the AIS was prepared for alternative W-7, which according to the report would bypass site 20855 and not have an adverse or other affect; in this case, should you choose W-7 then no adverse affect will be caused by this undertaking. We understand that the proposed mitigation to 20855 was part of an MOA between FHWA and the Office of Hawaiian Affairs; we are not suggesting a change to agreed-upon commitments but are simply raising the issue that it appears choosing alternative W-7 would avoid the adverse impact. Please contact Morgan Davis at (808) 896-0514 or morgan.c.davis@hawaii.gov if you have any questions or concerns regarding this letter.

Aloha,

Nancy A. McMahon

Nancy McMahon, Deputy SHPO/State Archaeologist
and Historic Preservation Manager
State Historic Preservation Division

Cc: Office of Hawaiian Affairs, 711 Kapiolani Blvd., Honolulu Hawaii 96813-5278

LINDA LINGLE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

January 19, 2010

David Gedeon, P.E., Project Manager
US Department of Transportation, FHA
Central Federal Lands Highway Division
12300 West Dakota Avenue
Lakewood, Colorado 80228

LOG NO: 2009.4195
DOC NO: 1001MD19
Archaeology

Dear Mr. Gedeon:

SUBJECT: **National Historic Preservation Act (NHPA) Section 106 Review –**
REVISED West Saddle Road Highway Improvement Project
Ke`amuku & Waikoloa Ahupua`a, South Kohala District, Island of Hawaii
TMK: (3) 6-7-001:009

This letter is a correction to our earlier comments (Doc No. 1001MD05). We previously reviewed and accepted the archaeological inventory survey (AIS) for this undertaking (*Escott and Keris 2009*). No further work is required and the report has been accepted as final (*Log No. 2010.0025, Doc No. 1001MD04*).

One site, SIHP 20855 (the Waimea-Kona Belt Road) was previously determined to be eligible under criterion "d" during the assessment of the W-3 alternative; the W-3 would present an adverse affect to site 20855 and mitigation would include a pullout and sign along the new road. We concur that the new proposed alternative W-7 will have the same adverse affect to this historic property as the previously reviewed W-3 alternative. We concur that this **adverse affect will be mitigated** as detailed in the MOA.

Please contact Morgan Davis at (808) 896-0514 or morgan.e.davis@hawaii.gov if you have any questions or concerns regarding this letter.

Aloha,

Nancy A. McMahon

Nancy McMahon, Deputy SHPO/State Archaeologist
and Historic Preservation Manager
State Historic Preservation Division

Cc: Office of Hawaiian Affairs, 711 Kapiolani Blvd., Honolulu Hawaii 96813-5278

MEMORANDUM OF AGREEMENT
Among the
ADVISORY COUNCIL ON HISTORIC PRESERVATION
and
FEDERAL HIGHWAY ADMINISTRATION
and
HAWAI'I STATE HISTORIC PRESERVATION OFFICER

Regarding the Saddle Road (SR 200) and
Hawai'i Defense Access Road (A-AD-6-1) Improvement Project on the
Island of Hawai'i, Hawai'i

WHEREAS, the Federal Highway Administration (FHWA) has determined that the proposed Saddle Road (SR 200) Improvement Project from Kaumana (at Milepost 6 on Saddle Road) to the intersection of Saddle Road with the Mamalahoa Highway will have an effect on 20 historic properties (Final Environmental Impact Statement, Section 3.19) which by consensus determination appear to meet the criteria for listing on the National Register of Historic Places (NRHP), and have consulted with the Hawai'i State Historic Preservation Office (SHPO) and the Advisory Council on Historic Preservation (Council) pursuant to 36 CFR Part 800 regulations implementing Section 106 of the National Historic Preservation Act (16 U.S.C. 470f); and

WHEREAS, the Hawai'i SHPO has reviewed and concurred with the evaluations and recommendations provided in the report entitled *The Saddle Road Corridor: An Archaeological, Historical, and Traditional Cultural Property Inventory Survey, Evaluation and Assessment for the Hawai'i Defense Access Road A-AD-6(1) and Saddle Road (SR 200) Project* and with the *Supplemental Traditional Cultural Properties Assessment* prepared to address issues presented in the *Draft Environmental Impact Statement, Saddle Road (State Route 200), Mamalahoa Highway (State Route 190) to Milepost 6, Technical Appendix Volume V, Social Impact Assessment, Appendix B: Indigenous Hawaiian Cultural Values,* and;

WHEREAS, the Hawai'i SHPO has acknowledged that data recovery of the portions of the seven linear archaeological sites impacted by the recommended alternative (Attachment 1) is appropriate mitigation, and;

WHEREAS, Mauna Kea, as described in the Supplemental Traditional Cultural Properties Assessment to The Saddle Road Corridor: An Archaeological, Historical, and Traditional Cultural Property Inventory Survey, Evaluation and Assessment for the Hawai'i Defense Access Road A-AD-6(1) and Saddle Road (SR 200) Project appears to meet the criteria for placement on the NRHP as a Traditional Cultural Property (TCP) as defined by National Register Bulletin Number 38, *Guidelines for Evaluating and Documenting Traditional Cultural Properties*, U.S. Department of the Interior, National Park Service, and;

WHEREAS, the effects of the Saddle Road Project on Mauna Kea are indirect, and mitigation of any potential effects can best be addressed as part of the University of Hawai'i's (UH) new management plan for Mauna Kea, and;

WHEREAS, the State of Hawai'i Department of Transportation (HDOT) and the Office of Hawaiian Affairs (OHA) have been consulted in preparation of this Memorandum of Agreement (MOA), and concur with the stipulations contained herein;

NOW, THEREFORE, the Council, FHWA, and SHPO agree that the undertaking shall be implemented in accordance with the following stipulations in order to take into account the effects of the undertaking on historic properties.

STIPULATIONS

FHWA shall ensure that the following measures are carried out:

1. FHWA shall develop and implement an archaeological Data Recovery Plan for those sites indicated on Attachment 1 that is consistent with the Secretary of the Interior's *Standards and Guidelines for Archaeological Documentation* (48 CFR 44734-37) and takes into account the Council publication, *Treatment of Archaeological Properties*, and the SHPO minimal standards for archaeological data recovery and interim protection. The Data Recovery Plan will:

- Identify sites that require data recovery (see Attachment 1),
- Present research context and questions to be addressed during data recovery, with an explanation of their relevance and importance,
- Specify methods to be used, with reference to their relevance to the research questions,
- Establish how and to what agencies and interested organizations or individuals the plan will be distributed,
- Provide procedures for consideration of comments on the plan from those to whom it was distributed,
- Specify procedures for interim protection through archaeological monitoring of work during construction, as applicable to specific sites,
- Itemize contents of the Data Recovery Report (Report),
- Indicate Report review procedures to be followed,
- Provide a Report completion date,
- Establish procedures by which agencies and interested organizations or individuals will be provided with a summary of the Report findings and how they will be notified when the work is beginning.

FHWA shall submit the Data Recovery Plan to the SHPO and OHA for a 30 day review period. Unless the SHPO has specific concerns to procedures, methods, and treatments outlined in the plan within 30 days after receipt and responds in writing, the FHWA may assume SHPO concurrence. If SHPO objects to the Data Recovery Plan within 30 days of receiving the plan, it shall be revised as applicable and submitted for another 30 day review period. OHA shall provide written comments on the plan to the FHWA within the 30 day review period. FHWA will consult with OHA as necessary to address all comments. In the absence of comments received by the FHWA from OHA within the 30 day review period, the FHWA may assume concurrence by this agency.

2. FHWA shall ensure that all archaeological materials and records are curated by an institution acceptable to the SHPO in accordance with 36 CFR Part 79.

3. FHWA shall develop and implement a Treatment Plan for interpretative mitigation of designated sites (Attachment 1). Efforts will be made to design the proposed roadway footprint to minimize impact to the sites. Portions of the sites that cannot be avoided during construction will be included within the data recovery activity and incorporated into the Data Recovery Plan outlined above. The Treatment Plan shall include:

- A list of agencies and interested organizations or individuals to whom the plan will be distributed for review,
- Procedures for consideration of comments on the plan from those to whom it was distributed,
- A brief description of the project location and roadway design in the site vicinity,
- A brief summary of previous archaeological research performed in the vicinity,
- Schematic maps locating the site and depicting the roadway design and treatments, and
- Separate subsections describing the scope of the treatment methods for data recovery, interim protection by archaeological monitoring as applicable, preservation methods foı remaining site features as applicable, and roadway design features and interpretive aid applicable to enhancing the site.

FHWA shall submit the Treatment Plan to the SHPO and OHA for a 30 day review period. Unless the SHPO has specific concerns to procedures, methods, and treatments outlined in the plan within 30 days after receipt and responds in writing, the FHWA may assume SHPO concurrence. If SHPO objects to the Treatment Plan within 30 days of receiving the plan, it shall be revised as applicable and submitted for another 30 day review period. OHA shall provide written comments on the plan to the FHWA within the 30 day review period. FHWA will consult with OHA as necessary to address all comments. In the absence of comments received by the FHWA from OHA within the 30 day review period, the FHWA may assume concurrence by this agency.

4. The Federal Highway Administration agrees to cooperate with the UH in planning for access restriction facilities or signage at the intersection of Mauna Kea Access Road and Saddle Road by providing design or Right-of-Way accommodations as might be reasonably considered part of the Saddle Road Project at the time the project is advanced.

5. If a previously unknown archaeological site is encountered during project construction, the FHWA shall notify the Hawaii SHPO and OHA immediately. The FHWA shall ensure that all work ceases in the area of the discovery and in any adjacent areas where associated resources are likely to be encountered. The FHWA, Hawai'i SHPO and OHA shall then consult on the potential significance of the resource and appropriate treatment measures. The Hawai'i SHPO and OHA shall participate in such consultation in an expedited manner consistent with the timely advancement of the project with the intent of minimizing construction delays. When agreement has been reached on data recovery, interim protection, preservation, or interpretive measures and such measures have been implemented, construction may proceed in the area of the discovery.

6. Should any signatory or concurring party to this agreement object to a proposed Data Recovery Plan or Treatment Plan within the 30 day review period pursuant to this agreement, the FHWA shall consult with the objecting party to resolve the objection. If the FHWA determines that the objection cannot be resolved, the FHWA shall forward all documentation relevant to the

dispute to the Council. Within 30 days after receipt of all pertinent documentation, the Council will:

- Provide the FHWA with recommendations to be considered in reaching a final decision regarding the dispute, or
- Notify the FHWA that it will comment pursuant to 36 CFR 800.6(b), and proceed to comment.

Any Council comment provided in response to such a request will be considered by the FHWA in accordance with 36 CFR 800.6(c)(2) with reference to the subject of the response. Any recommendations or comments provided by the Council will be understood to pertain to the subject of the dispute; however, the FHWA's responsibility to carry out all actions under this agreement that are not subject to dispute will remain unchanged.

7. Any party to this MOA may request that it be amended, where upon the parties will consult in accordance with 36 CFR 800 to consider such amendment.

Execution of the MOA and the implementation of its terms evidence that the FHWA afforded the Council an opportunity to comment on the Saddle Road (SR 200) Improvement Project and it effects on historic properties, and that the FHWA has taken into account the effects of the undertaking on historic properties.

ADVISORY COUNCIL ON HISTORIC PRESERVATION

(for) By: ______ Executive Director Date: 5/19/99

FEDERAL HIGHWAY ADMINISTRATION

By: ______ Date: 5/11/99

STATE OF HAWAI'I HISTORIC PRESERVATION OFFICER

By: ______ Date: 5/3/99

CONCUR:

OFFICE OF HAWAIIAN AFFAIRS

By: ______ Date: April 29-99

HAWAI'I DEPARTMENT OF TRANSPORTATION

By: ______ Date: 4/30/99

ATTACHMENT 1

Mitigation for NRHP Eligible Archaeological Sites and Associated Significance Criteria for Site Segments within the A.P.E. of the Recommended Alternative for the Saddle Road Improvement Project

SHIP #	DESCRIPTION	CRITERIA	IMPACT	MITIGATION
20852	Burial[1]	D	no	Avoid
20854	Ranching - Habitation & Animal Enclosures	D	yes	Data Recovery Only
20855	Transportation- Old Waimea-Kona Rd.	D[3]	yes	Data Recovery, Interpretation
5002	Ranching-Ka'ohe Wall[1]	D	no	Avoid
5003	Temporary Habitation[1]	D	no	Avoid
14638	Temporary Habitation[1]	D	no	Avoid
20862	Ranching- Linear Wall	D	yes	None[2]
20865	Ranching- Linear Post Fence	D	yes	None[2]
20877	Ranching- Linear Wall	D	yes	None[2]
21150	Transportation- Humu'ula Wagon Trail	D[3]	yes	Data Recovery, Interpretation
7119	Ranching-Humu'ula Sheep Station Walls	D[3]	yes	Data Recovery, Interpretation
10309	Transportation- Pu'u 'O'o Volcano Trail	D[3]	yes	Data Recovery, Interpretation
20856	Paving	D	yes	None[1]
20878	Transportation- Hilo Pu'u 'O'o Trail	D[3]	yes	Data Recovery, Interpretation
20864	Transportation- Old Saddle Road	D[3]	yes	Interpretation[2]
20869	Survey Marker	D	no	None[2]
20870	Agriculture- 'Ola'a Flume	D[3]	yes	Interpretation[2]
20872	Recreation- Hilo Country Club	D	no	None[2]
20873	Habitation- Senator Kimi's House	D	no	None[2]
TCP	Mauna Kea[1]	TCP	indirect	Avoid: defer to Univ.of Hawai'i Management Plan study

1. Not within the Recommended Alternative APE but identified as eligible during alternate alignment investigations.
2. Data Recovery has been completed, either as part of this project or other independent surveys.
3. Additional Significance Criteria may apply outside of road corridor crossing.

[This page intentionally left blank]

SADDLE ROAD (STATE ROUTE 200)
Mamalahoa Highway (State Route 190) to Milepost 41
County of Hawai‘i, State of Hawai‘i
FHWA Project No. 200(00)

SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

Submitted Pursuant to Section 42 U.S.C. 4332(2)(c)
and Chapter 343, Hawai‘i Revised Statutes by the

U.S. DEPARTMENT OF TRANSPORTATION
Federal Highway Administration (FHWA)
Central Federal Lands Highway Division
and
STATE OF HAWAI‘I
Department of Transportation (HDOT)
Highways Division

Cooperating Agencies
U.S. Army Garrison, Hawai‘i

Appendix G
Section 7 ESA Correspondence

[This page intentionally left blank]

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Lakewood, CO 80228

October 28, 2009

In Reply Refer To:
HFPM-16

Loyal Mehrhoff, PhD.
Field Supervisor
U.S. Fish and Wildlife Service
300 Ala Moana Blvd, Room 3-122
Honolulu HI 96813

Subject: Saddle Road (State Route 200) Improvement Project: Māmalahoa Highway (State Route 190) to Milepost 6 Project. Reinitiation of Section 7 Consultation for the West Side W-7 Alignment. US Fish & Wildlife Service (USFWS) Log # 1-2-98-F-01.

Dear Dr. Merehoff,

The Federal Highway Administration (FHWA), Central Federal Lands Highway Division is seeking concurrence from your office that the proposed action will not likely adversely affect any listed species known from the Island of Hawai'i.

The limits of the W-7 alignment extend from Milepost (MP) 42 located just to the east of the Department of the Army's Pōhakuloa Training Area's (PTA) Ke'āmuku parcel eastern boundary to the projects western terminus along Māmalahoa Highway (State Route 190) (Figure 1).

General Project Description

The purpose of the Saddle Road Improvement Project is to provide a safe and efficient route for access along the entire route and for cross-island traffic between East and West Hawai`i. The proposed improvements will address five general types of needs: roadway deficiencies, conflicts with and hazards of military training operations, capacity, safety, social demand and economic development. Upon completion, the improved 48-mile long Saddle Road will meet the current American Association of State Highway and Transportation Officials (AASHTO) design standards for rural arterials and provide adequate capacity to handle anticipated traffic volumes for the next 20 years.

A Final Environmental Impact Statement and Record of Decision for the Saddle Road improvements were completed in 1999. As part of the EIS process, twelve action alternatives incorporating use of the existing alignment and potential new alignments were considered. The project was divided into four different sections (Sections I, II, III, and IV) for purposes of alternative development and selection, as well as project scheduling (Figure 2).

In the intervening years since the release of the EIS, the Department of the Army has purchased a large section of land in the Keʻāmuku area from Parker Ranch. This development has caused the originally selected alignment, W-3, in Section I to less adequately fulfill one of the key purposes and needs of the proposed improvement project, namely the separation of military training activity from the general driving public using the Saddle Road. Another alignment, W-7, has been proposed and studied to fulfill the need to separate civilian traffic from military training activities. A supplemental environmental impact statement SEIS is being prepared to address this new alignment.

The W-7 alignment gently slopes from east to west, from an elevation of ~ 5800-feet, above mean sea level (ASL), along the existing Saddle Road, down slope to where it will intersect the existing Māmalahoa Highway at ~ 2493-feet ASL. The alignment is roughly 10.3 miles long, with approximately 8.9 miles of the route located within TMK: 6-7-001:041: and the remaining 1.4 miles of the alignment going through a portion of the main PTA training area (Figure 1).

FHWA is proposing to build a two-lane hot asphalt concrete paved roadbed, two 12-foot travel lanes with two 8 foot paved shoulders, and a 6-foot wide ditch in locations where the new roadway will be cut. Because of the grades, an uphill passing lane would be provided for most of the length of W-7, as it passes through the Keʻāmuku parcel and is illustrated as Typical Section A (Figure 3). The road will be designed to accommodate 60 mile an hour traffic speeds, a minimum curve radius of 230-meter (754 foot), an 8 percent maximum super elevation, simple curves with 67 percent of runoff on tangent, and an 8 percent maximum grade.

Project Area

The project area is on the west-facing slope of Mauna Kea, on the leeward side of the island. Annual rainfall is in the neighborhood of 20-inches a year, with the upper reaches somewhat drier. The terrain present along the alignment is composed of a mix of *ʻaʻā* and *pāhoehoe* lava flows disgorged from Mauna Kea more than 14,000 and 65,000 years ago during the Pleistocene Age. Additionally there are surficial alluvial deposits in many areas, which were washed down from Mauna Kea at the end of the last ice age. Along the southern boundary of the area several small fingers of *ʻaʻā* from the Keʻāmuku flow, deposited by Mauna Loa between 200 and 750 years ago overlay portions of the older Mauna Kea flows (Wolfe and Morris 1996).

The vast majority of the site has been extensively altered by decades of cattle grazing and is now largely a pasture of introduced grasses with scattered shrubs and very few trees. The vegetation between the eastern terminus of the project and approximately the 4200 foot level is dominated by fountain grass (*Pennisetum setaceum*), with sparse amounts of *ʻaʻalilʻi* (*Dodenea viscosa*), and numerous other alien grasses and Madagascar ragwort (*Senecio madagascariensis*). At the lower elevations in this section there are also pockets of buffelgrasss (*Cenchrus ciliaris*), Guinea grass (*Panicum maximum*), and Kikuyu grass (*Pennisetum clandestinum*). Between the 4300 foot and 4600 foot elevation the makeup of the vegetation is similar to that found in the lower section, except that in this zone the native species are dominate, with large dense stands of *ʻaʻaliʻi* making up to 50% of the ground cover. Between the 4300-foot elevation and the boundary of the Keʻāmuku parcel and PTA proper the habitat is similar to the previously described ones, but with varying densities of the component species, as is to be expected in pastureland that is grazed on a rotational basis. Between approximately 5200-feet ASL and the eastern terminus of the project the substrate is markedly different than that found lower on the alignment, in this area is made up of alluvial and colluvial sand and gravel deposited by the erosion of Mauna Kea by the melting of the last ice cap. On this substrate the dominate plant is the endemic shrub *'aheahea* (*Chenopodium oahuense*).

Consultation History

The history of FHWA's consultation with the USFWS beginning in 1990 and culminating in the issuance of a BO on July 27, 1998 is detailed on pages 1 through 5 of that BO (USFWS Log #1-2-98-F-01). Since the original BO was completed, FHWA and its consultants have had numerous meetings with the USFWS to discuss ongoing issues over the implementation of the conditions included in the original BO. Additionally, FHWA reinitiated Section 7 consultation with the USFWS in July 2009 to address additional species and Critical Habitat that were listed and designated between the issuance of the original BO in 1998 and the present. These issues pertained to Sections II, III and IV as defined in the EIS. That consultation was concluded with the issuance of a BO on September 11, 2009 (USFWS Log #2009-F-0314).

FHWA, HDOT, project consultants and USFWS met on August 27, 2009 to discuss the new W-7 alignment, view maps, and discuss the findings of the biological surveys that were completed as part of the NEPA process for this new alignment. The parties met again on October 15, 2009 to discuss the Section 7 consultation, at which time the FHWA informed the USFWS that they have determined that by implementing the minimization measures outlined in this document that the proposed action is not likely to adversely affect any listed species and is therefore seeking concurrence from the USFWS of this determination. At that meeting and through subsequent discussions with the Service it was agreed that the FHWA would consult with the Service over potential project impacts to Blackburn's sphinx's moth (*Manduca blackburni*), Nēnē (*Branta sandvicensis*), Hawaiian Hawk (*Buteo solitarius*) Hawaiian Petrel (*Pterodroma sandwichensis*), Newell's Shearwater (*Puffinus auricularis newelli*), Hawaiian hoary bat (*Lasiurus cinereus semotus*) and *Haplostachys haplostachya*. The moth, Nēnē, petrel bat and haplostachys are listed as endangered species and the shearwater as a threatened species.

Biological Surveys and Results

Prior to the onset of field surveys both the project botanist and zoologist consulted with the design team to alert them of any historically known issues with endangered species within the general proposed area of the W-7 alignment that will need to be avoided during development of the design. There were no known real issues with avian and mammalian species, though botanical studies conducted within the Ke'āmuku parcel in 2002, found three endangered plant species near the southern border of the Ke'āmuku property (Arnett 2002). These three, *Haplostachys haplostachya,* (common name: *honohono*) a perennial mint with showy white flowers; *Stenogyne angustifolia* (no common name) a twining mint, and *Vigna o-wahuensis* (no common name) which is a very rare legume vine. Prior to 2002, *Haplostachys* and *Stenogyne* were only known to exist within PTA and nowhere else. Arnett (2002) recorded and mapped the location of over 8,000 *Haplostachys,* 11 *Stenogyne*, and 74 *Vigna* within Ke'āmuku. The proposed W-7 alignment was carefully designed to avoid all of the known locations of these endangered species.

Biological surveys were conducted on the W-7 alignment in 2008 and 2009. Botanical surveys were conducted in September 2008, and an additional botanical survey searching for

Haplostachys haplostachya, Stenogyne angustifolia, and *Vigna o-wahuensis* was mounted in May 2009 (Garrish 2009). Avian and mammalian surveys were conducted in June 2009 (David 2009).

No avian, mammalian or botanical species currently listed as endangered, threatened or proposed for listing under either federal or State of Hawai'i endangered species were detected within the W-7 alignment corridor (David 2009, Gerish 2009).

Potential Impacts to Protected Species

The principal potential threat that the development of the W-7 alignment poses to Blackburn's sphinx moth is if clearing and grubbing activities associated with construction of the roadway were to remove host plants used by this species. During the course of the biological surveys conducted for the project none of the native host plants used by this species were found, nor was the alien host plant, tree tobacco (*Nicotiana glauca*) encountered (Gerrish 2009).

Although not detected during the course of the faunal surveys the endangered Nēnē have been recorded in small numbers within the Ke'āmuku parcel in the recent past (David 1996, Lena Schnell, personal communication 2009). Nēnē nest at the Big Island Country Club and at Pu'uwa'awa'a, which are located some 7 and 10 miles respectively south of the southwestern terminus of the W-7 alignment. Nēnē have been recorded being attracted to some roadways especially during the non-breeding season at other locations on the island. Birds have been observed loafing, feeding on short grass and other plants, walking on the roadways, and taking gravel from the side of the road. If a population develops within the Ke'āmuku parcel there is the potential that birds could be attracted to the roadway at some as yet unidentified location and put at risk of being hit by motorists.

The principal potential threat that the development of the project poses to Hawaiian Hawks is if vegetation-clearing activities were to remove an active hawk-nesting tree. Hawaiian Hawks are not known from the Ke'āmuku area, and furthermore there are no suitable nest trees within, or close to the W-7 alignment (David 2009).

The principal potential threat that the development and operation of the proposed project poses to Hawaiian Petrels and Newell's Shearwaters are associated with birds potentially being downed after becoming disoriented by lights associated with night time construction, and following build-out by street lights that may be required for public safety. With that said, it should be stated that very few downed seabirds have been documented on the leeward side of the island over the past 35 years.

The principal potential impact that the development of the proposed project poses to Hawaiian hoary bats is during the clearing and grubbing phases of construction. Clearing woody vegetation greater than 15-feet tall (the preferred size of roost trees) during the pupping season could potentially cause harm to bats. As bats use multiple roosts within their home territories the potential disturbance resulting from the removal of the vegetation is likely to be minimal. During the pupping season, females carrying their pups may be less able to rapidly vacate a roost site as the vegetation is cleared; additionally, adult female bats may leave their pups in the roost tree while they themselves forage, leaving very small pups unable to flee a tree that is being felled. Potential adverse effects from such disturbance can be avoided or minimized by not clearing such vegetation (i.e., clearing of trees taller than 15-feet tall) between April 15 and August 15, the period in which bats are potentially at the greatest risk of being harmed by roost tree removal. Fortunately there is no suitable bat roosting habitat within the ROW.

The principal potential impact that the development of the proposed project poses to the haplostachys population located south of the proposed roadway, and immediately adjacent to the eastern boundary of the Keʻāmuku parcel is that an unplanned wildfire started by a catalytic converter, discarded lit cigarette or other roadway-associated perturbation could spread into the Army's haplostachys enclosure.

Potential Impacts to Critical Habitat

There is no federally delineated Critical Habitat for any listed species within the project corridor, as such - the construction and operation of the W-7 alignment will not result in modification or deleterious impacts to any delineated Critical Habitat units.

Proposed Minimization Measures

The project proposes to implement the following minimization measures to ensure that the construction and operation of the proposed W-7 alignment does not result in adverse impacts to any listed species:

- To minimize collateral damage to areas outside of the ROW, the Special Contract Requirements will mandate that all construction activity shall be restricted to within the clearly delineated ROW and that entry and exit into the ROW by all construction personnel and equipment shall be at previously identified and marked non-sensitive areas.
- Special Contract Requirements will be incorporated into the construction documents directing the contractor's work consistent with specific minimization commitments that are outlined in this section and in the BO for the project. The Contract Officer will have the authority to shut down construction should violations of Special Contract Requirements be detected; furthermore, the project engineer will be responsible for ensuring compliance with all environmental restrictions and minimization measures.
- A comprehensive manual outlining and discussing the environmental commitments contained in the original ROD, BO and Special Contract Requirements will be prepared. This document will be prepared by the FHWA in accordance with their environmental team policy, which ensures that the environmental team closely follows the entire project to its completion.
- If nighttime work will be required in conjunction with the development of the project, all lights will be shielded and, or directed at the ground to reduce the potential for interactions of nocturnally flying Hawaiian Petrels and Newell's Shearwaters with external lights and man-made structures.
- No nighttime construction will occur during the peak seabird fallout period, namely between September 15 and December 15 annually.
- Any streetlights that may be installed, as part of this action will be shielded. This minimization measure would serve the dual purpose of minimizing the threat of

disorientation and downing of Hawaiian Petrels and Newell's Shearwaters, while at the same time complying with the Hawaii County Code §14 – 50 *et seq.* which requires the shielding of exterior lights so as to lower the ambient glare caused by unshielded lighting to the astronomical observatories located on Mauna Kea.

- No smoking will be permitted during construction within the construction site, nor will any fires be permitted within the project corridor.

- These measures and in some cases prohibitions will be included as part of Special Contract Requirements, which will be incorporated in the construction contract documents.

- To reduce the potential threat of wildfires being started by careless smokers or drivers driving or parking on grassy verges on the north side of the roadway between mile marker 41 and the eastern boundary of the Ke'āmuku parcel an expanded and modified typical section for the roadway that will both reduce the likelihood of accidental ignition from unintentional road sources (car fires, catalytic converters, cigarettes, etc.) and assist in creating a firebreak and fuelbreak on the north side of the roadway will be constructed in this section. This section is illustrated as Typical Section B (Figure 4). This expanded Typical Section will consist of:

    - Two 12-foot travel lanes with 8-foot paved shoulders.
    - An 8-foot strip of pavement on the north side of the highway, which would serve as a firebreak, with a four-inch high curb on the outside.
    - At the outside edge of the firebreak a wire fence with metal posts would be constructed to a height of four feet on the edge of the pavement to discourage off pavement travel by motorists.

- As W-7 enters Ke'āmuku and descends towards Māmalahoa Highway, the primary wildfire concern shifts towards preventing fires from Saddle Road spreading southwards, towards the western boundary of the *Haplostachys haplostachya* exclosure. The Typical Section between the Ke'āmuku parcel boundary towards Māmalahoa Highway is illustrated in Figure 4 as Typical Section C, and would consist of the following features:

    - Three 12-foot travel lanes with a paved 8-foot shoulders, with a four-inch high-extruded asphalt curb at the outside of the shoulder on the south side of the road. This would create a 52-foot wide paved surface that would serve as a firebreak, as well as a curb to protect against thrown cigarette butts or other thrown material and will prevent motorists from driving off of the roadway onto grassy areas.

It should be borne in mind that the proposed road will be located within the PTA training facility, which has an extensive fire minimization and mitigation program in place in accordance with the Biological Opinions that have been issued at the conclusion of the two Section 7 consultations that the US Army has recently completed. The proposed W-7 alignment will create an additional firebreak within the PTA, which will be between 40 and 52 feet wide. This road will also allow very rapid response by PTA and County of Hawai'i firefighting personnel in the event that a fire does occur within the general project area. To put that statement into perspective of fire responsiveness, the center of the W-7 alignment is approximately 10 miles from the PTA fire station, and approximately the same distance from the Waikoloa fire station. As the new road will be designed to accommodate 60 mile an hour traffic, both fire stations could respond in a very short period of time to any wildfire that might occur within the general project area. These areas would otherwise be extremely difficult to access from the existing Saddle Road, thus result in extremely long response times. Additionally, the Army is currently constructing five firefighting dip tanks within the Keʻāmuku parcel to provide onsite water to be used to fight any wildfires that may ignite within the general area.

- At the current time there is no known conflict between Nēnē and the proposed W-7 alignment. At such time as such a conflict arises FHWA plans to address the issue with a multi-pronged approach mimicking the measures that have been agreed to, to minimize vehicle Nēnē interactions along a portion of the recently constructed Saddle Road that are detailed in the September 11, 2009 BO. The measures fall into the following categories, and may well be augmented following field trials with measures that are being implemented between approximately the 29 and 30.2-mile markers (not within the scope of this consultation). These measures, if determined to be necessary, will include the following:

    - The erection of a permanent fence along both the north and south sides of the roadway within any section that appears to attract Nēnē on a regular basis. The fence will be placed as close to the roadside as is permissible under ASHTO federal safety guidelines.
    - Vegetation will be removed between the aforementioned fence and the edge of the roadway, this will be accomplished either by the use of herbicides, or by paving the area.
    - The loose gravel along the roadside in any such identified area will be secured with a tacking agent, or asphalt paving, so that Nēnē are unable to gather gravel for use in their crops.
    - FHWA will install enhanced Nēnē crossing and traffic advisory signs to warn motorists of the potential danger they pose to Nēnē along any such identified roadway section.

We look forward to working with you and your staff toward a successful consultation on these important issues. In summation, we are seeking concurrence from your office that by implementing the proposed minimization measures presented above that the proposed action is not likely to adversely affect the listed species discussed above. If you require any additional information or have questions regarding this submittal, please contact Dave Gedeon at 720-963-3723, Melissa Dickard at 720-963-3691, or Reggie David, Rana Biological Consulting, Inc. at 808-329-9141.

Sincerely yours,

Rick Suarez, P.E.
Division Engineer

cc:
Mr. Brennon Morioka, HDOT
Mr. Glenn Yasui, HDOT
Mr. Alvin Char CIV USA IMCOM

bcc:
Mr. Donald Okahara, Okahara & Associates, Inc.
Mr. Reggie David, Rana Biological Consulting, Inc.
A. Wong, FHWA - Hawaii
R. Suarez
D. Zanetell
E. Hammontree
S. Hallisy
M. Dickard
D. Gedeon

Literature Cited

Arnett, M. 2002. Report of survey for rare plants on the Ke'amuku parcel, Island of Hawaii. Prepared for: U.S. Army Corps of Engineers by Center for Environmental Management of Military Lands, Colorado State University. Fort Collins, Colorado.

David, R. E. 1996. Ornithological and Mammalian Surveys of the Proposed Improvement and Realignment Corridors of the Saddle Road (State of Hawaii Route 200), Island of Hawai'i, Hawaii. Prepared for: Rust E&I & The Federal Highways Administration, Central Federal Lands Highway Division. 99pp.

David, R. E. 2009. Avian And Terrestrial Mammalian Species Surveys Conducted on The W-7 Alignment of the, Hawai'i State Route 200 - Māmalahoa Highway to Milepost 6 Saddle Road Realignment Project, North Kona District, Island Of Hawai'i. Prepared for DMT & associates, and the Federal Highways Administration, Central Federal Lands Highway Division.

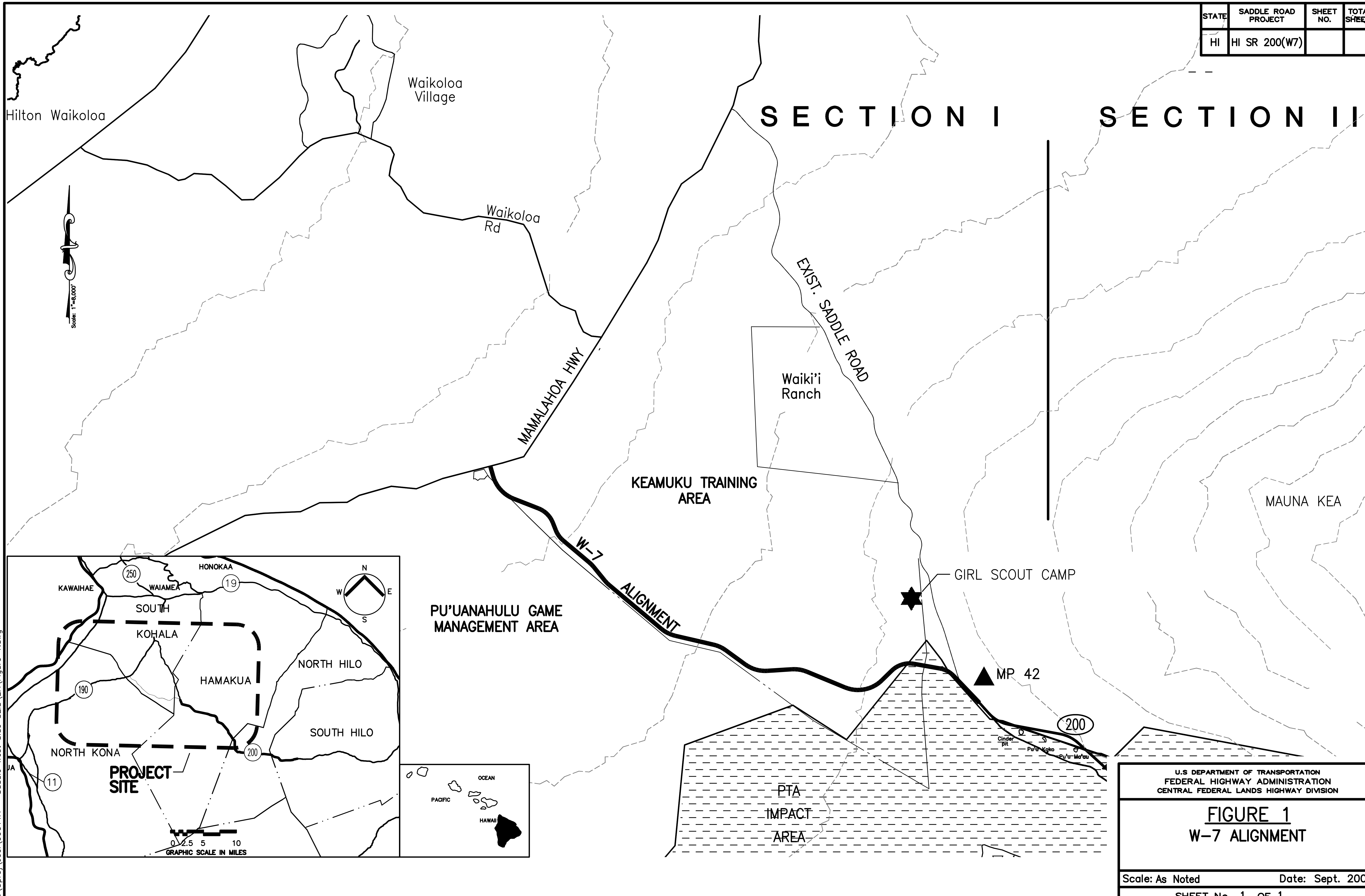
Gerrish, G. 2009. Botanical Study for Proposed Alignment W-7 for the Realignment of Saddle Road (State Route 200). Prepareed for: DMT Associates, Inc.

U.S. Department of Transportation, Federal Highway Administration, Central Federal Lands Highway Division and Hawai'i Department of Transportation (FHWA *et al.*) 1999. Environmental Impact Statement, Saddle Road (State Route 200) Mamalahoa Highway (State Route 19) to MP 6, County of Hawaii, State of Hawaii, FHWA Project No. A-AD-6(1).

U.S. Fish and Wildlife Service 1998. Biological Opinion of the U.S. Fish and Wildlife Service for the Saddle Road Realignment and Improvement Project. July 27, 19998.

U.S. Fish and Wildlife Service 2009. Biological Opinion of the U.S. Fish and Wildlife Service for Reinitiation Saddle Road Realignment and Improvement Project Section 7 Consultation for Saddle Road (State Route 200) Improvement Project: the East Side, Milepost 6-42, Hawaii. September 11, 2009.

[This page intentionally left blank]



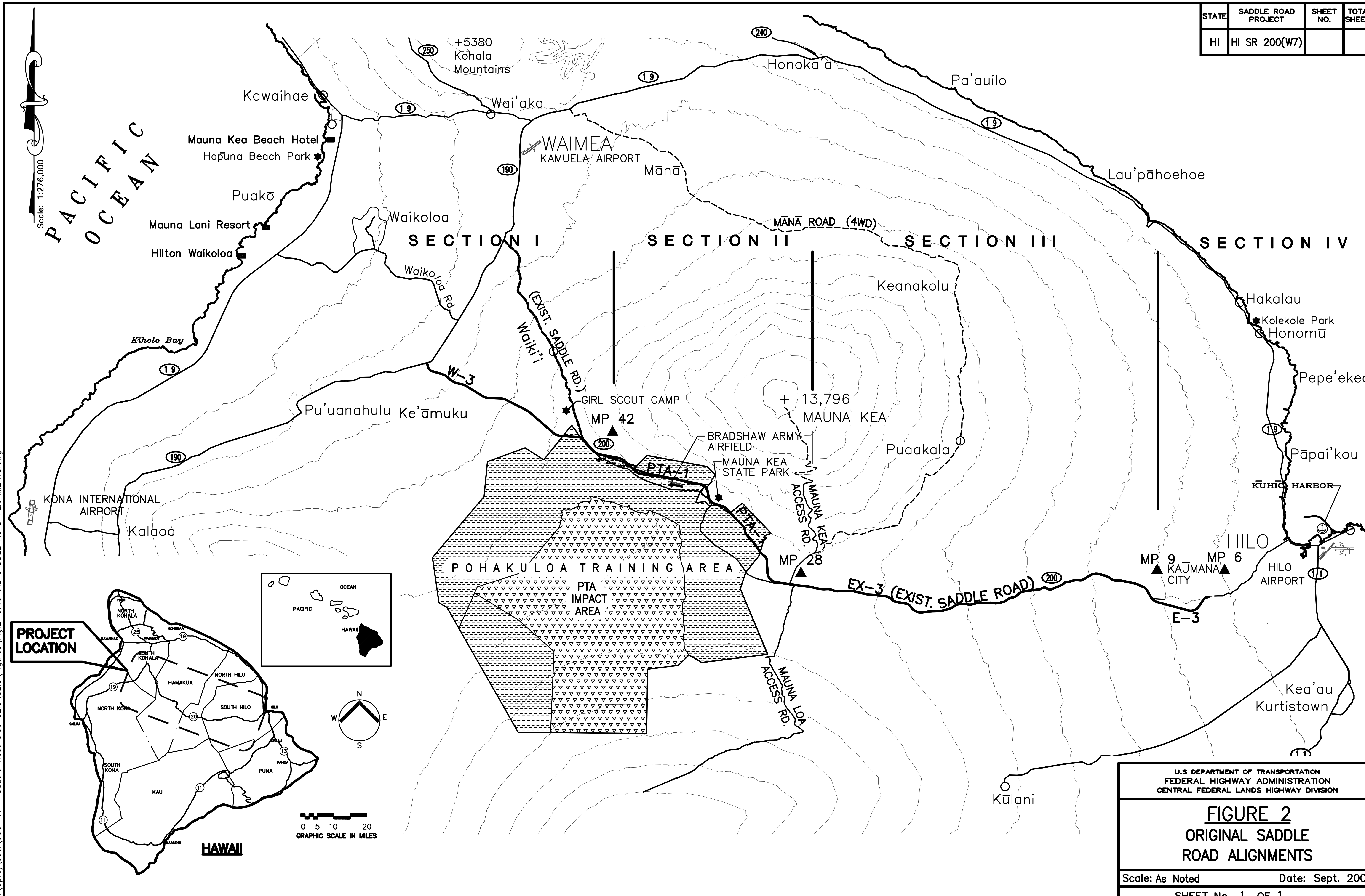
U.S DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

FIGURE 1
W-7 ALIGNMENT

Scale: As Noted Date: Sept. 2009

SHEET No. 1 OF 1

O:\Oproj\Joel\99011A – Saddle West Side SEIS\BA\Figure 1.dwg



STATE	SADDLE ROAD PROJECT	SHEET NO.	TOTAL SHEETS
HI	HI SR 200(W7)		

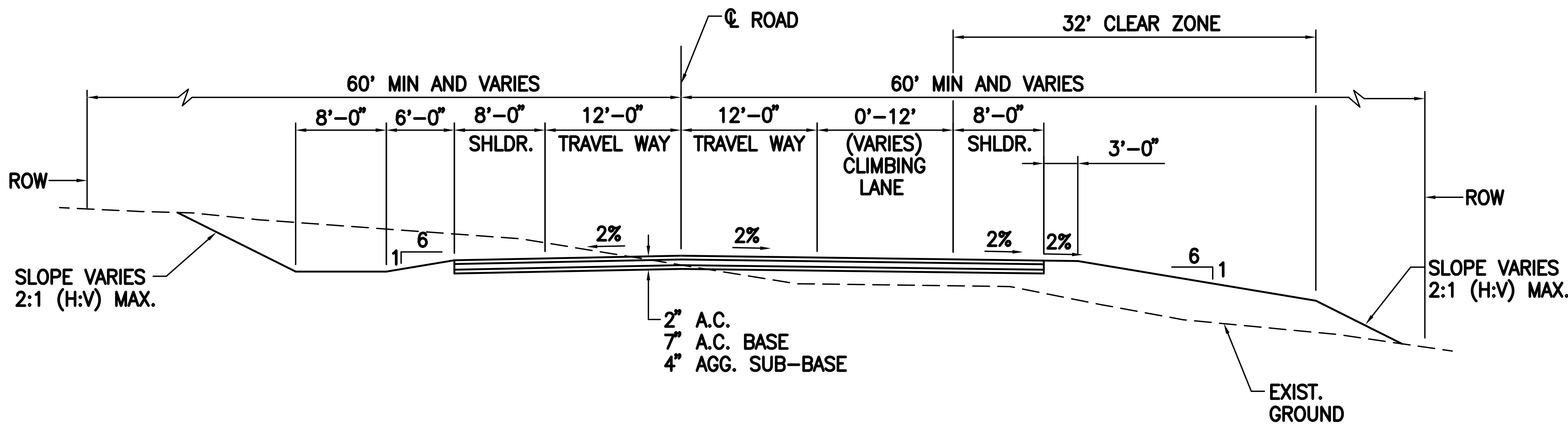
U.S DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

FIGURE 2
ORIGINAL SADDLE ROAD ALIGNMENTS

Scale: As Noted Date: Sept. 2009

SHEET No. 1 OF 1

STATE	SADDLE ROAD PROJECT	SHEET NO.	TOTAL SHEETS
HI	HI SR 200(W7)		



TYPICAL SECTION INSTALLED FROM HWY 190 TO STATION 340+00.
AUXILIARY LANES FOR THE INTERSECTION IS NOT SHOWN.

TYPICAL SECTION A

NOT TO SCALE

U.S DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

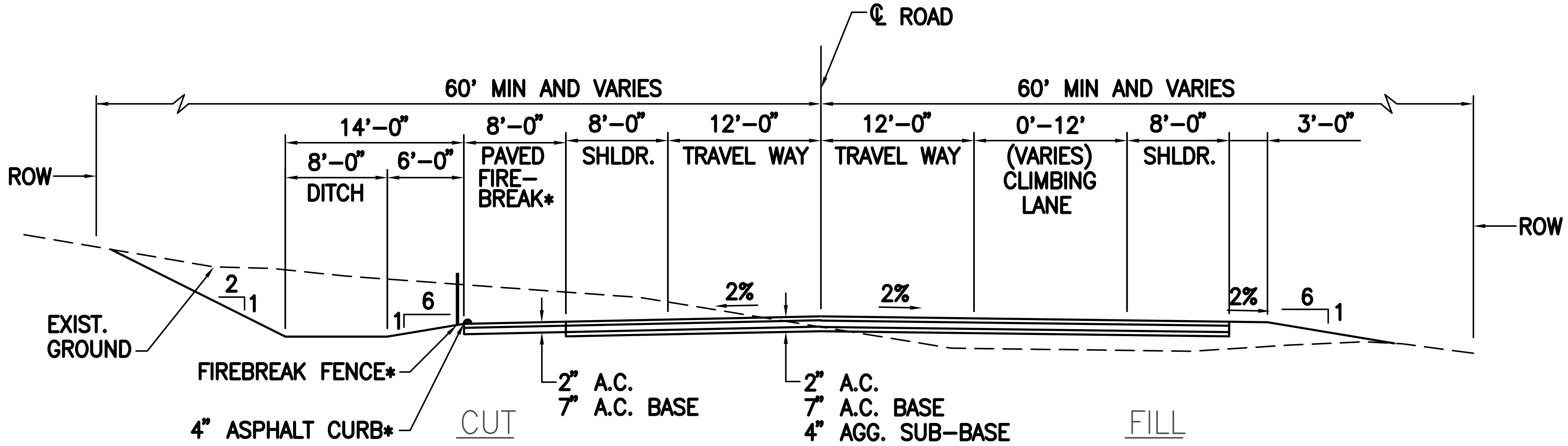
FIGURE 3
ROAD TYPICAL SECTION A

Scale: N.T.S. Date: Sept. 2009

SHEET No. 1 OF 1

O:\Oproj\Joel\99011A-Saddle West Side SEIS\BA\Figure 3.dwg

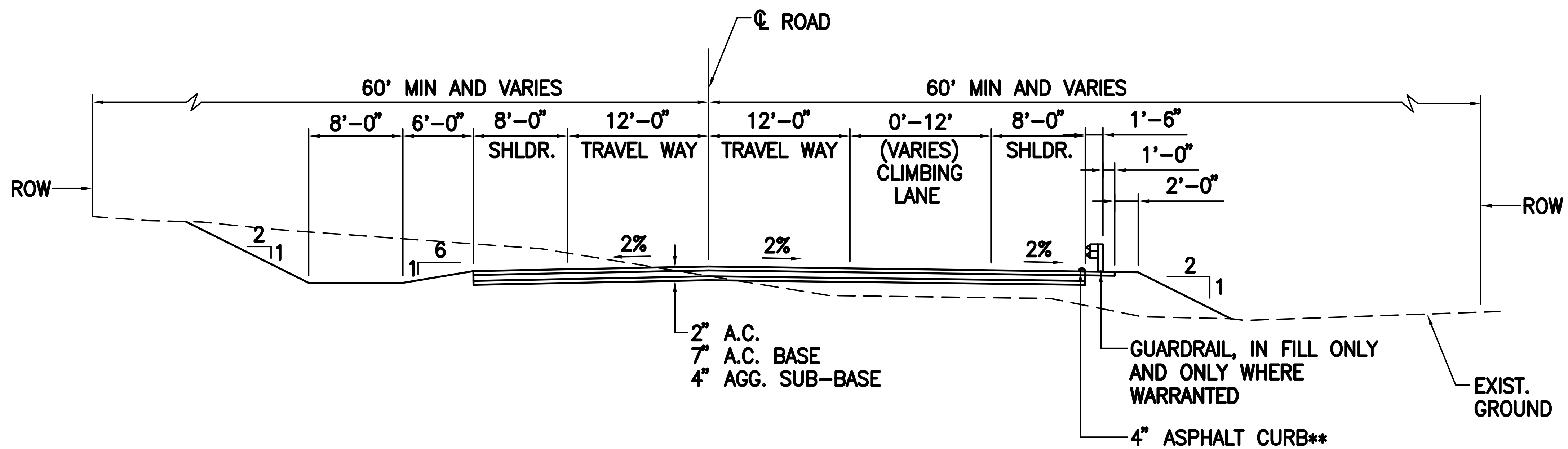
STATE	SADDLE ROAD PROJECT	SHEET NO.	TOTAL SHEETS
HI	HI SR 200(W7)		



*PAVED FIREBREAK, ASPHALT CURB, AND FIREBREAK FENCE INSTALLED ON NORTH SIDE FROM STATION 467+00 TO THE NEW SADDLE ROAD NEAR MP 41 (STATION 544+37).

TYPICAL SECTION B

NOT TO SCALE



**ASPHALT CURB INSTALLED ON SOUTH SIDE FROM STATION 340+00 TO 466+00 IN CUT AND FILL CONDITIONS.

TYPICAL SECTION C

NOT TO SCALE

U.S DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

FIGURE 4

ROAD TYPICAL SECTIONS B & C

Scale: N.T.S. Date: Sept. 2009

SHEET No. 1 OF 1

O:\Oproj\Joel\99011A–Saddle West Side SEIS\BA\Figure 4.dwg

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawaii 96850

TAKE PRIDE IN AMERICA

In Reply Refer To:
2010-F-0040

JAN 29 2010

Rick Suarez, P.E.
Division Engineer
Federal Highway Administration
Central Federal Lands Highway Division
12300 West Dakota Avenue, Suite 340
Lakewood, Colorado 80228

Subject: Reinitiation of Section 7 Consultation for the West Side W-7 Alignment, Saddle Road (State Route 200) Improvement Project between Mamalahoa Highway (State Route 190) to Milepost 6, Hawaii

Dear Mr. Suarez:

This Biological Opinion responds to your request for reinitiation of the 1998 Biological Opinion for the Saddle Road Realignment and Improvement Project (1-2-98-F-0l (kwr)) (1998 Saddle Road Biological Opinion) with the U.S. Fish and Wildlife Service (Service) pursuant to the Endangered Species Act of 1973, as amended (Act). Consultation was reinitiated with the Federal Highway Administration (FHWA) on January 8, 2010, to address modifications to the 1998 Saddle Road Biological Opinion. In this Biological Opinion, we address impacts from this project that may adversely affect the endangered plant *Haplostachys haplostachya* (honohono). The 1998 Biological Opinion addressed impacts of realigning and improving Saddle Road on the endangered bird palila (*Loxioides bailleui*), palila critical habitat, and the threatened plant species *Silene hawaiiensis,* in accordance with section 7(a)(2) of the Act.

Reinitiation of the 1998 Biological Opinion is necessary, pursuant to 50 CFR §402.16, as new information reveals modifications of the project may affect listed species in a manner or to an extent not considered in the original opinion. A Final Environmental Impact Statement (EIS) and Record of Decision (ROD) for the Saddle Road improvements were completed in 1999. As part of the EIS process, twelve action alternatives incorporating use of the existing alignment and potential new alignments were considered. The project was divided into four different sections (Sections I, II, III, and IV) for purposes of alternative development and selection, as well as project scheduling (Figure 1). In the intervening years since the release of the EIS, the Department of the Army has purchased a large section of land in the Keamuku area from Parker Ranch. The W-3 alignment (Section I) roughly passes though the middle of the Keamuku Parcel.

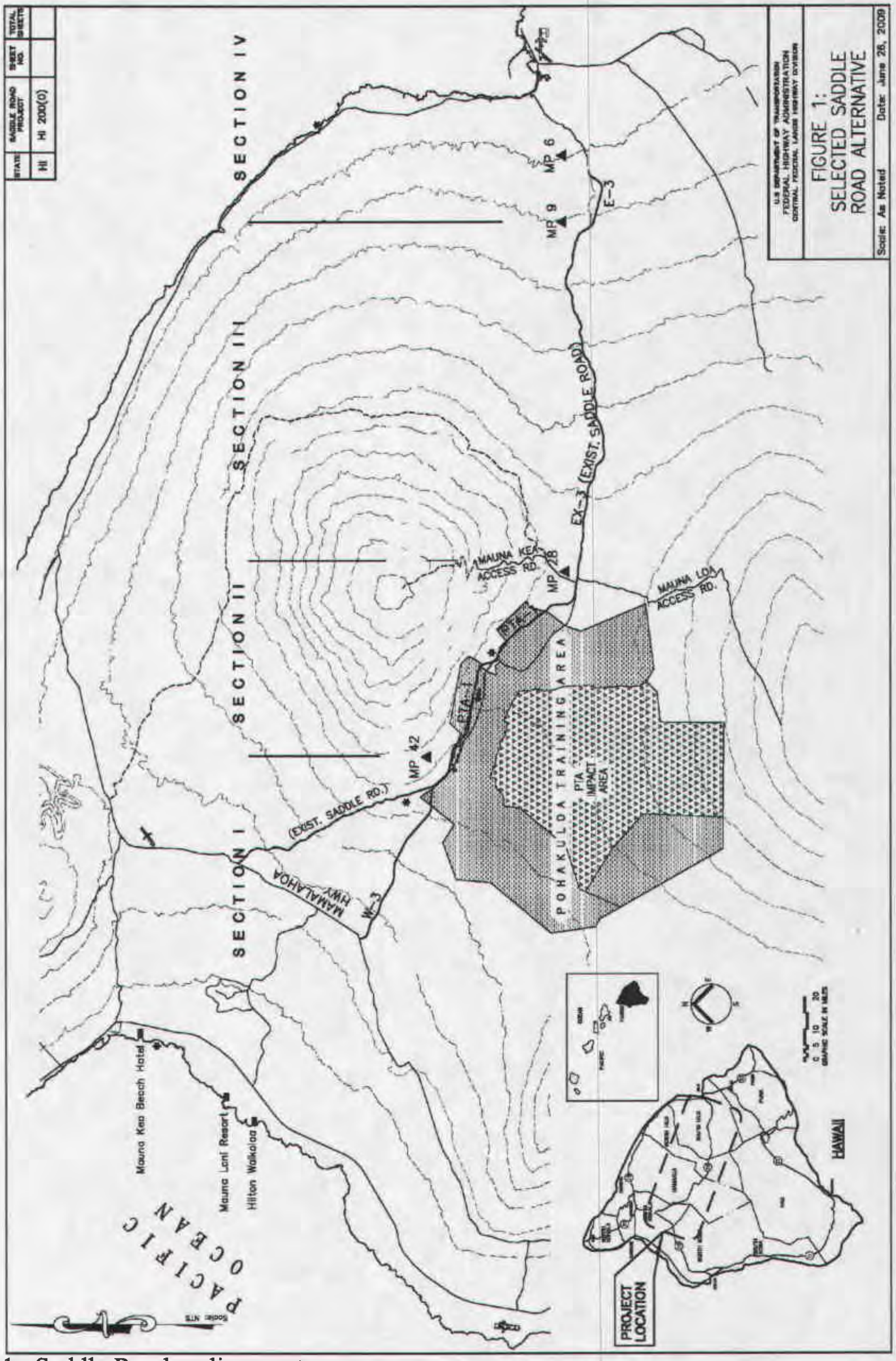


Figure 1. Saddle Road realignment.

This alignment does not fulfill one of the key purposes and needs of the proposed improvement project, namely separation of military training activity from the general driving public using the Saddle Road. Another alignment, W-7, has been proposed and studied to fulfill the need to separate civilian traffic from military training activities (Figure 2). A Supplemental Environmental Impact Statement (SEIS) was prepared to address this new alignment. This reinitiation covers FHWA actions associated with the construction of the realigned and improved Saddle Road between Mamalahoa Highway (State Route 190) to Milepost (MP) 6.

All other information within the 1998 Biological Opinion and the 2009 Reinitiation (Service file 2009-F-0314) remains in effect, except for the new actions described above. The findings and recommendations in this reinitiation are based on the following:

1. The above referenced 1998 Biological Opinion;
2. Final Environmental Impact Statement, Saddle Road (State Road 200) Mamalahoa Highway (State Route 190) to MP 6, County of Hawaii, State of Hawaii, FHWA Project No. A-AD-6(1) (1999);
3. U. S. Department of Transportation, Federal Highway Administration, Record of Decision, Saddle Road (State Road 200) Mamalahoa Highway (State Route 190) to MP 6, County of Hawaii, State of Hawaii (1999);
4. The FHWA request for reinitiation of section 7 consultation for the West Side W-7 Alignment (2009);
5. Meetings, a site visit, reports, electronic mail (email), phone calls (see Consultation History); and
6. Other information in our files.

A complete administrative record of this consultation is on file at the Service's Pacific Islands Fish and Wildlife Office.

The overall Saddle Road Realignment and Improvement Project extends from Mamalahoa Highway (State Route 190) to MP 6 (see Figure 1). The limits of the W-7 alignment extend from MP 42 located just to the east of the Department of the Army's Pohakuloa Training Area's (PTA) Keamuku Parcel eastern boundary to the project's western terminus along Mamalahoa Highway (State Route 190) (see Figure 1). The alignment is roughly 10.3 miles (mi) (16.6 kilometers (km) long, with approximately 8.9 mi (14.3 km) of the route located within TMK: 6-7-001:041(the Keamuku Parcel) and the remaining 1.4 miles of the alignment going through a portion of the main PTA training area (see Figure 2).

CONSULTATION HISTORY

August 27, 2009: Steve Hallisy (FHWA), Dave Gedeon (FHWA), Melissa Dickard (FHWA), Reginald David (FHWA consultant), Patrice Ashfield (Service) and Jeff Zimpfer (Service) met to discuss the new W-7 alignment, view maps, and discuss the findings of the biological surveys that were completed as part of the National Environmental Policy Act (NEPA) process for this new alignment.

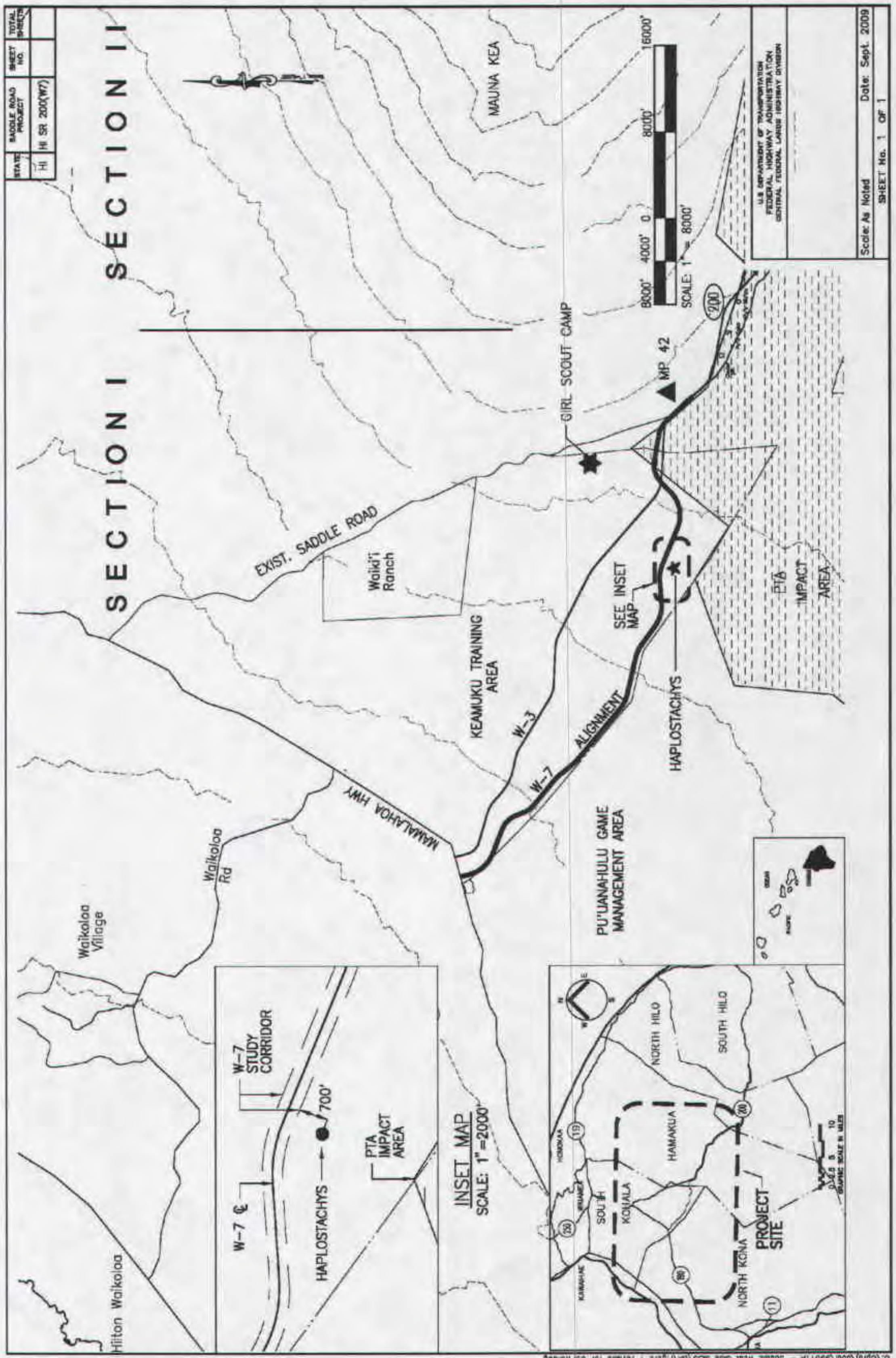


Figure 2. W-7 alignment.

September 11, 2009: The Service completed our consultation titled Reinitiation Saddle Road Realignment and Improvement Project Section 7 Consultation for Saddle Road (State Route 200) Improvement Project: the East Side, MP 6-42, Hawaii.

October 15, 2009: Melissa Dickard (FHWA), Reginald David (FHWA consultant) and Jeff Zimpfer (Service) met again to discuss the section 7 consultation. The FHWA informed the Service that based on the conservation measures in this document, they had determined that the proposed action is not likely to adversely affect Blackburn's sphinx's moth (*Manduca blackburni*), Hawaiian goose (*Branta sandvicensis*), Hawaiian hawk (*Buteo solitarius*), Hawaiian petrel (*Pterodroma sandwichensis*), Newell's shearwater (*Puffinus auricularis newelli*), Hawaiian hoary bat (*Lasiurus cinereus semotus*), and *Haplostachys haplostachya*. FHWA informed the Service they would be requesting our concurrence with their determination.

November 4, 2009: The Service received a request from FHWA for concurrence on their determination that the proposed West side W-7 alignment was not likely to adversely affect listed species.

November 13, 2009: Jeff Zimpfer (Service) and Lena Schnell (Natural Resource Coordinator for Pohakuloa Training Area), participated in a site visit to the *Haplostachys haplostachya* population in the Army's Keamuku Parcel that occurs near the proposed W-7 alignment. The site visit resulted in finding seven plants along a 300-foot (ft) (100-meter (m)) transect through a portion of the *H. haplostachya* population. The site is heavily dominated by fountain grass (*Pennisetum setaceum*). Based on the findings during the site visit, the Service recommended FHWA enter into formal consultation for potential adverse affects to the plant from wildfire.

January 8, 2010: FHWA requested formal consultation on the West Side Saddle Road Improvement Project for potential impacts to *Haplostachys haplostachya*.

SPECIES CONCURRENCE STATEMENT

As described in the above consultation history, FHWA has determined that the above proposed project is not likely to adversely affect Blackburn's sphinx's moth, Hawaiian goose, Hawaiian hawk, Hawaiian petrel, Newell's shearwater, and Hawaiian hoary bat. Biological surveys for the host plants of the Blackburn's sphinx moth were not detected in the proposed right-of-way for the project. Based on the lack of available habitat or the presence of Blackburn's sphinx moth in the action area, we concur with your determination that the proposed project may affect, but is not likely to adversely affect, the Blackburn's sphinx moth.

Although not detected during the course of the biological surveys for this project, a few Hawaiian geese have been recorded within the Keamuku Parcel in the recent past (David 1996, Lena Schnell, personal communication 2009). Hawaiian geese nest at the Big Island Country Club and at Puuwaawaa, which are located 7 and 10 mi (11 and 16 km) respectively south of the southwestern terminus of the W-7 alignment. Since Hawaiian geese are not known to occur within the action area, we concur with your determination that the proposed project may affect, but is not likely to adversely affect, the Hawaiian goose.

Hawaiian hawks are not known to occur in the Keamuku area and no suitable nest trees are within, or close to, the W-7 alignment. Based on the lack of suitable nesting trees for Hawaiian hawks, the Service concurs with your determination this proposed project may affect, but is not likely to adversely affect the Hawaiian hawk.

Because the known distribution of nesting colonies of listed Hawaiian petrels on the island of Hawaii is on the southwest flanks of Mauna Loa, and known breeding colonies of Newell's shearwaters occur in East Hawaii, it is unlikely large numbers of listed seabirds will transit the project area. This, combined with the implementation of the conservation measures listed below, we concur with your determination that this proposed project may affect, but is not likely to adversely affect the Hawaiian petrel or Newell's shearwater.

As described in the Action Area Description above, habitat within the right-of-way consists of low-statured vegetation and is not suitable Hawaiian hoary bat roosting habitat. Based on the lack of suitable habitat, the Service concurs with your determination this proposed project may affect, but is not likely to adversely affect the Hawaiian hoary bat.

Biological Opinion

Summary of the 1998 Project Description

Saddle Road, which was built in 1942, is a narrow, winding, two-lane road with steep grades, sharp curves, poor pavement, and substandard drainage. This is the only paved road serving PTA, the Mauna Kea telescope complex, Waikii Ranch, upper Kaumana, Mauna Kea State Recreation Area, Kilohana Girl Scout Camp and several major hunting areas. It is also an important cross-island link for business travel, the transport of goods and services, tourism, recreation, shopping, and commuting. Military traffic on Saddle Road going to and from PTA involves transportation of ammunition, water, training equipment and troops.

The FHWA Saddle Road improvements include upgrading and modernizing approximately 48 mi (78 km) of the road, from the Mamalahoa Highway (State Road 190) to MP 6, near Hilo, Hawaii (see Figure 1). The purpose of the Saddle Road Improvement Project is to provide a safe and efficient route for travel between east and west Hawaii. The proposed improvements will address five general types of needs: roadway deficiencies, conflicts with and hazards of military training operations, capacity, safety, social demand and economic development. Upon completion, the improved 48-mile long Saddle Road will meet the American Association of State Highway and Transportation Officials design standards for rural arterials and provide adequate capacity to handle anticipated traffic volumes for the next 20 years. The FHWA estimates that the Average Daily Traffic (ADT) on Saddle Road in 1994 was 900 vehicles. By the year 2014, in its present condition, Saddle Road is expected to accommodate an ADT of 4,400 vehicles. Projected figures, based on increased usage associated with commuter traffic, residential development at both ends of the road, tourism and recreation, agriculture, military operations, the Mauna Kea telescope complex, and increasing congestion along alternative cross-island routes, estimate that Saddle Road will need to accommodate an ADT of 14,000 vehicles in the year 2014.

An EIS and ROD for the Saddle Road improvements were completed in 1999. Construction of the entire 48 mi (77 km) project is being phased; the first phase from MP 19 to 42 (Section II plus a portion of Section III (see Figure 1)) is nearing completion. The next construction project will improve Saddle Road between MP 11 and 19. The scheduling of the remaining construction phases is dependent on the future appropriation of Federal funding. A full description of the project's background, purpose and need, and specific design characteristics is contained in the Executive Summary of the Final EIS (FHWA 1999). The Service's 1998 Biological Opinion also contains a complete description of the project and evaluation of impacts to listed species and critical habitat. For the portion of the project addressed in this consultation, we evaluate the impacts to listed species that will result from the proposed changes from the original alignment. The proposed roadway engineering and construction activities remain the same as do the conservation measures developed in our 1998 Biological Opinion. In addition to direct actions related to the actual construction of the road, FHWA committed to conservation measures as part of their project description in the 1998 Saddle Road Biological Opinion. These measures include lighting restrictions, minimization of increased fire threat, enhancement activities for endangered and threatened plants, minimizing the spread of invasive alien species, offsetting loss of palila critical habitat and avoiding impacts to the Hawaiian hawk.

2009 Project Description

Since the Service issued its original Biological Opinion for the Saddle Road project in 1998, the Department of the Army has purchased a large section of land in the Keamuku area from Parker Ranch. The originally selected alignment (W-3, in Section I) bisected this parcel and thus no longer met one of the key needs of the proposed improvement project, namely the separation of military training activity from the general driving public using the Saddle Road. The W-7 alignment has been proposed as the preferred alignment (see Figure 2).

Site Description

FHWA Proposed Road Improvements
The W-7 alignment gently slopes from east to west, from an elevation of approximately 5,800 ft (1,800 m) above mean sea level (MSL) along the existing Saddle Road down slope to where it will intersect the existing Mamalahoa Highway at approximately 2,500 ft (750 m) MSL. The alignment is roughly 10.3 mi (16.6 km) long, with approximately 8.9 mi (14.3 km) of the route located within TMK 6-7-001:041, and the remaining 1.4 mi (2.25 km) of the alignment going through a portion of the main PTA training area (see Figure 2).

FHWA is proposing to build a two-lane hot asphalt concrete paved roadbed, two 12-ft (3.66-m) travel lanes with two 8-ft (2.4-m) paved shoulders, and a 6-ft (1.8-m) wide ditch in locations where the new roadway will be cut. Because of the grades, an uphill passing lane will be provided for most of the length of W-7, as it passes through the Keamuku Parcel and is illustrated as Typical Section A (Figure 3). The road will be designed to accommodate 60 MPH (96.5 KPH) traffic speeds with a minimum curve radius of 230-m (754 ft), an 8 percent maximum super elevation, simple curves with 67 percent of runoff on tangent, and an 8 percent maximum grade.

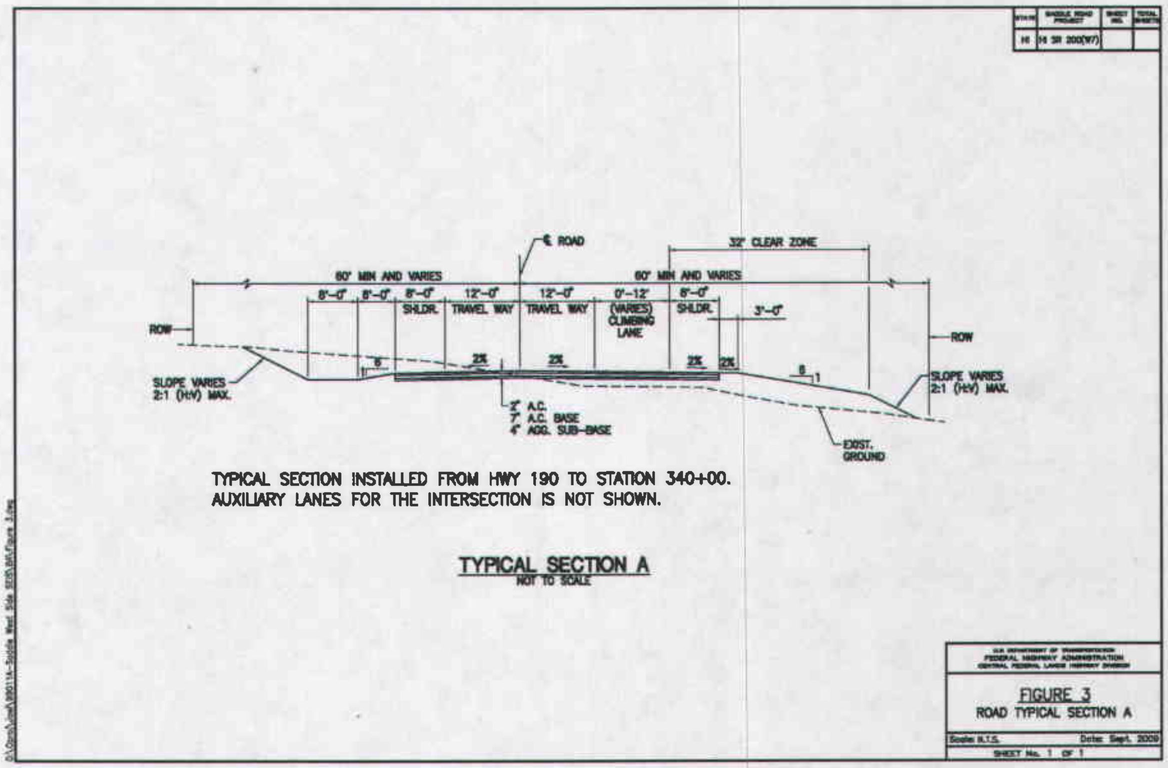


Figure 3. Typical section.

The project area is on the west-facing slope of Mauna Kea, on the leeward side of the island. Annual rainfall is approximately 20 inches (in) (50 centimeters (cm)) a year, with the upper reaches somewhat drier. The terrain along the alignment is composed of a mix of aa and pahoehoe lava flows disgorged from Mauna Kea between 14,000 and 65,000 years ago during the Pleistocene Age. Additionally there are surficial alluvial deposits in many areas, which were washed down from Mauna Kea at the end of the last ice age. Along the southern boundary of the area several small fingers of aa from the Keamuku flow, deposited by Mauna Loa between 200 and 750 years ago overlay portions of the older Mauna Kea flows (Sherrod et al. 2007).
The vast majority of the site has been extensively altered by decades of cattle grazing and is now largely a pasture of introduced grasses with scattered shrubs and very few trees. The vegetation between the eastern terminus of the project and approximately the 4,200-ft (1,300-m) elevation is dominated by fountain grass, with sparse amounts of *Dodenea viscosa* (aalili), and numerous other alien grasses and *Senecio madagascariensis* (Madagascar ragwort). At the lower elevations in this section there are also pockets of *Cenchrus ciliaris* (buffelgrasss), *Panicum maximum* (Guinea grass), and *Pennisetum clandestinum* (Kikuyu grass). Between the 4300-ft (1,300-m) and 4,600-ft (1,400-m) elevation, the makeup of the vegetation is similar to that found in the lower section, except that in this zone the native species dominate, with large dense stands of aalili making up to 50 percent of the ground cover. Between the 4,300-ft (1,300-m) elevation and the boundary of the Keamuku Parcel and PTA proper the habitat is similar to those previously described, but with varying densities of the component species, as is to be expected in pastureland that is grazed on a rotational basis. Between approximately the 5,200-ft (1,600-m)

elevation and the eastern terminus of the project, the substrate is markedly different than that found lower on the alignment; this area is made up of alluvial and colluvial sand and gravel deposited by the erosion of Mauna Kea by the melting of the last ice cap. On this substrate the dominate plant is the endemic shrub *Chenopodium oahuense* (aheahea).

The population of *Haplostachys haplostachya* tht occurs within the project site is in an area dominated by fountain grass and other alien vegetation.

Fire Minimization
The proposed W-7 alignment will be entirely located within the U.S. Army training facilities. These training facilities have an extensive fire minimization and mitigation program in place in accordance with the Service's 2003 (2003-F-002) and 2008 (2008-F-278) Biological Opinions for Army actions at PTA and the Keamuku Parcel. The proposed W-7 alignment will create an additional firebreak within the Army's Keamuku Parcel, which will be between 40 and 52 ft (12 and 16 m) wide. This road will also allow very rapid response by PTA and County of Hawaii firefighting personnel in the event that a fire does occur within the general project area. The center of the W-7 alignment is approximately 10 mi (16 km) from the PTA fire station, and approximately the same distance from the County of Hawaii Waikoloa fire station. As the new road will be designed to accommodate 60 MPH (100 KPH) traffic, both fire stations could respond in a very short period of time to any wildfire that might occur within the general project area. These areas would otherwise be extremely difficult to access from the existing Saddle Road, thus result in extremely long response times. Additionally, the Army is currently constructing five firefighting dip tanks within the Keamuku Parcel to provide onsite water to be used to fight any wildfires that may ignite within the general area.

Conservation Measures

The following conservation measures are designed to avoid and minimize effects to Blackburn's sphinx's moth, Hawaiian goose, Hawaiian hawk, Hawaiian petrel, Newell's shearwater, Hawaiian hoary bat and *Haplostachys haplostachya* and are considered part of the project descritption. When used in the context of the Act, "conservation measures" represent actions proposed by the Federal action agency that are intended to further the recovery of and/or minimize or compensate for project effects on the species under review. Because conservation measures are pledged in the Project Description by the action agency, their implementation is required under the terms of the consultation. The project proposes to implement the following measures to ensure that the construction and operation of the proposed W-7 alignment does not result in adverse impacts to listed species.

To reduce the construction related project footprint, FHWA has agreed to measures and or prohibitions that will be included as part of special contract requirements that will be incorporated in the construction contract documents:

1. To minimize damage to natural resources in areas outside of the right of way (ROW), special contract requirements will mandate that all construction activity shall be restricted to within the clearly delineated ROW and that entry and exit into the ROW by all

construction personnel and equipment shall be at previously identified and marked non-sensitive areas.

2. Special contract requirements will be incorporated into the construction documents directing the contractor's work to be consistent with specific minimization commitments that are outlined here and in the 1998 Biological Opinion for the project. The Contract Officer will have the authority to shut down construction should violations of special contract requirements be detected; furthermore, the project engineer will be responsible for ensuring compliance with all environmental restrictions and minimization measures.

3. A comprehensive manual outlining and discussing the environmental commitments contained in the original ROD, 1998 Biological Opinion and special contract requirements will be prepared. This document will be prepared by the FHWA in accordance with their environmental team policy, which ensures that the environmental team closely follows the entire project to its completion.

To avoid impacts to Hawaiian petrels and Newell's shearwater (listed seabirds), FHWA has agreed to the following:

1. If nighttime work is required, all lights will be shielded or directed at the ground to reduce the potential for interactions of nocturnally-flying listed seabirds with lights and man-made structures.

2. No nighttime construction will occur during the peak seabird fallout period, namely between September 15 and December 15, annually.

3. Any streetlights that may be installed as part of this action will be shielded. This minimization measure would serve the dual purpose of minimizing the threat of disorientation and downing of listed seabirds, while at the same time complying with the Hawaii County Code §14 – 50 *et seq,* which requires the shielding of exterior lights so as to lower the ambient glare caused by unshielded lighting to the astronomical observatories located on Mauna Kea.

To reduce the threat of wildfires FHWA has agreed to the following:

1. No smoking will be permitted during construction within the construction site, nor will any fires be permitted within the project corridor.

2. To reduce the potential threat of wildfires being started by careless smokers or drivers driving or parking on grassy verges on the north side of the roadway between mile marker 41 and the eastern boundary of the Keamuku Parcel, an expanded and modified typical section for the roadway will both reduce the likelihood of accidental ignition from unintentional road sources (car fires, catalytic converters, cigarettes, etc.) and assist in creating a firebreak and fuelbreak on the north side of the roadway. This section is illustrated as Typical Section B (Figure 4). This expanded Typical Section will consist of:

a. Two 12-ft (4-m) travel lanes with 8-ft (2.5 m) paved shoulders.
b. An 8-ft (2.5 m) strip of pavement on the north side of the highway with a 4-in (10-cm) high curb on the outside, which will serve as a firebreak.
c. At the outside edge of the firebreak a wire fence with metal posts will be constructed to a height of 4 ft (1.3 m) on the edge of the pavement to discourage off pavement travel by motorists.

3. As the W-7 alignment enters Keamuku and descends towards Mamalahoa Highway, the primary wildfire concern shifts towards preventing fires from Saddle Road spreading southwards, towards the western boundary of the *Haplostachys haplostachya* exclosure. The Typical Section between the Keamuku Parcel boundary towards Mamalahoa Highway is illustrated in Figure 5 as Typical Section C, and would consist of the three 12-ft (3.66 m) travel lanes with a paved 8-ft (2.4 m) shoulder, and a 4-in (10-cm) high-extruded asphalt curb at the outside of the shoulder on the south side of the road. This will create a 52-ft (16 m) wide paved surface that would serve as a firebreak, as well as a curb to protect against thrown cigarette butts or other thrown material and will prevent motorists from driving off of the roadway onto grassy areas.

There are no known or anticipated conflicts between Hawaiian geese and the proposed W-7 alignment. If a conflict arises between vehicles and Hawaiian geese, FHWA has agreed to reinitiate consultation with the Service.

To offset the potential loss of *Haplostachys haplostachya* individuals, FHWA has agreed to contribute $50,000 to Hawaii Volcanoes National Park's (Park) Natural Resources Management Program to sponsor the establishment of three populations *H. haplostachya* in protected areas within the Kahuku portion of the Park and within the estimated ecological range of this species.

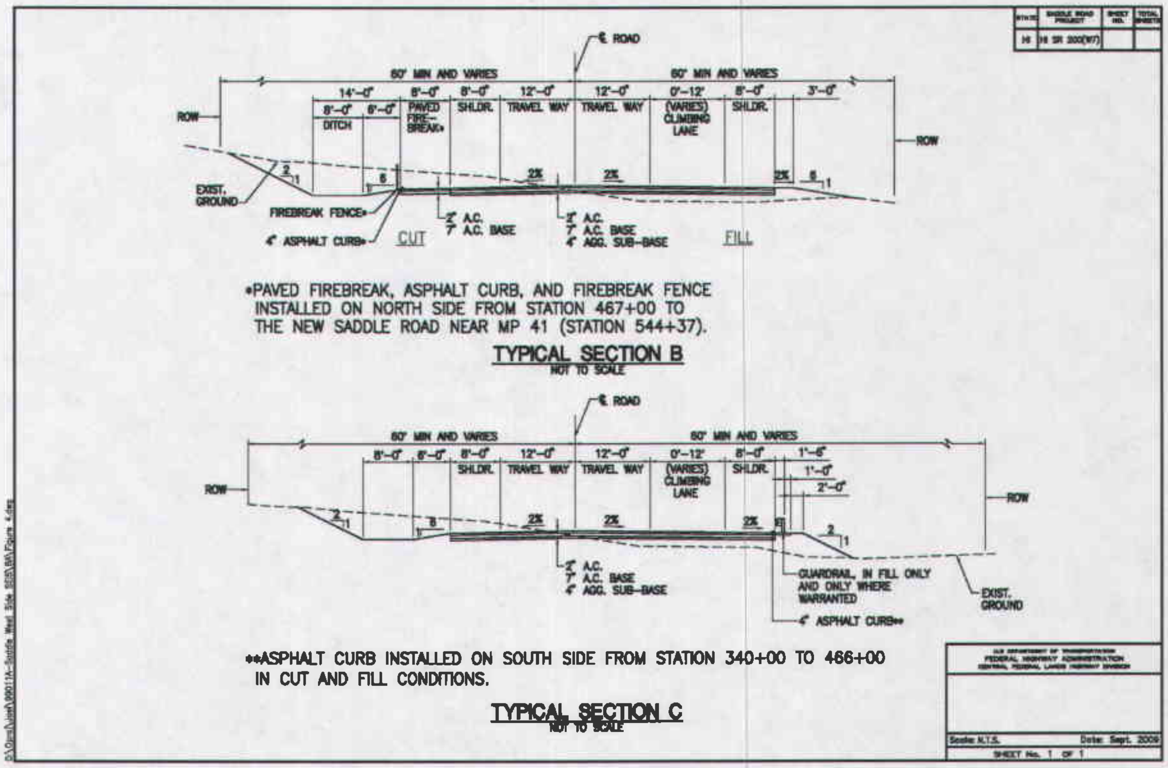


Figure 4. Typical section with fire minimization measures.

SPECIES AFFECTED

As described above in the consultation history of this opinion, the FHWA has determined that the proposed project may adversely affect *Haplostachys haplostachya* due to indirect effects from wildfire.

STATUS OF THE SPECIES

Honohono (*Haplostachys haplostachya*)

Haplostachys haplostachya is in the Lamiaceae, or mint family. It is an erect short-lived subshrub and grows from 12 to 24 in (30 to 60 cm) tall. The leaves are fleshy, narrowly cordate and the upper surface is green, rugose, and densely puberlent. Leaf lower surfaces are densely white tomentose. The inflorescence is a raceme with white and tubular flowers. Reproduction is by seed and basal sprouts. The taxon is distinguished by its densely white tomentose stems (Wagner 1999, p. 799).

Haplostachys haplostachya was federally and State-listed as an endangered species on October 30, 1979 (44 FR 62468). A recovery plan was drafted for this species in 1993 (Service 1993). *Haplostachys haplostachya* was once present on the islands of Kauai (mountains), Maui (sands of the low isthmus and at Kaula), and Hawaii (slopes of Mauna Kea, Nohonaohae cinder cone, and the plains of Waimea) (Wagner 1999, p. 799). Currently, the species is only known from 12 occurrences totaling approximately 17,000 individuals on the island of Hawaii (U.S. Army 2009, p. 11). All known, naturally-occurring populations of this species, occur on Army training areas (PTA and the Keamuku Parcel). The vast majority of individuals of this species (approximately 97 percent) are in ungulate-free fenced units the Army has constructed and maintains. Approximately 30 percent of the individuals of this species are in areas where the Army controls weeds. The Army has also outplanted 26 individuals of this species at Puuwaawaa in 2009 (U. S. Army 2009, p. 15).

Haplostachys haplostachya grows in dry exposed areas on ash-veneered lava, very stony, shallow soils, and lava outcrops. It often establishes in large cracks on rocky ridges and on cinder cones. On Hawaii island, *H. haplostachya* is found in *Chamaesyce* treeland, open *Metrosideros* treeland with dense shrub understory, open *Dodonaea* Shrubland, *Dodonaea* Mixed Shrubland, *Myoporum* Shrubland, and *Myoporum-Dodonaea* Shrubland vegetation types. The taxon occurs almost exclusively on old Mauna Kea flows, with one population on Mauna Loa pahoehoe lava.

Haplostachys haplostachya may be sensitive to drought. Plants can survive low and moderate intensity fires (*i.e.*, the plants appear to be fire resistant). The success of the species following fire is presumed to be due to its ability to resprout and its frequent location on rocky slopes. Fire in rocky areas tends to occur at low intensities because of low fuel load. However, fire coupled with drought appears to affect the species annual abundance. From year to year, there is considerable variability in the number of individuals in the populations of this species that are actively monitored.

The primary threats to *Haplostachys haplostachya* are browsing by feral sheep and goats; rooting by feral pigs; competition for light, space, and nutrients by fountain grass and other nonnative plants; and invasion by and conversion of habitat to a fire-based vegetation community. In addition, some populations that occur at PTA are impacted by Army training. Aphids and the introduction of mildew have been noted on the plants in the Keamuku Parcel and on plants in greenhouse conditions.

Environmental Baseline

Status of the Species in the Action Area
There is one *Haplostachys haplostachya* population within the action area for this project. This population is approximately 700 ft (200 m) from the proposed W-7 alignment and could be indirectly impacted by a wildfire originating from the realigned Saddle Road. The area is heavily invaded by fountain grass (Figures 5, 6 and 7). Based on personal observations, Army Natural Resource staff believe as fountain grass moves into an area, the fountain grass outcompetes *H. haplostachya* for moisture and nutrients. Based on personal observations, Army Natural Resource staff believe the abundance of *H. haplostachya* in the action area of this project has been reduced by more than 80 percent (Peter Peshut 2010, pers. comm.).

There have been no recent surveys of this population and no specific counts of individuals in the population were provided by FHWA. We estimate the size of the population that may be affected is approximately 10 ac (4 ha). Based on our biologist's observation of seven plants in a

300 ft (100 m) transect and the fact that the entire area has been completely invaded by fountain grass, we estimate the population that may be impacted by wildfire to be approximately 100 to 200 plants.

Effects of the Action

The W-7 alignment will bring Saddle Road within 700 ft (200 m) of the *Haplostachys haplostachya* population (see Figure 2), whereas the current alignment of Saddle Road is approximately 3 mi (5 km) away from the *H. haplostachya* population. The road will not directly affect *H. haplostachya* because no plants occur within the road alignment. To reduce the risk of wildfires to *H. haplostachya*, FHWA has agreed to the following conservation measures in the vicinity of *H. haplostachya* (eastern boundary of the Keamuku Parcel to Mamalohoa Highway):

- A 52-ft (16-m) wide paved surface that will serve as a firebreak.
- A four-inch (10-cm) high-extruded asphalt curb at the outside of the shoulder on the south side of the road will prevent thrown cigarette butts from coming in contact with dry grass and other vegetation material. The curb will also prevent motorists from driving off of the roadway onto grassy areas.

The entire proposed W-7 alignment will be located within Army training facilities, which has an extensive fire minimization and mitigation program. This road will also allow very rapid response by PTA and County of Hawaii firefighting personnel in the event that a fire does occur within the general project area. The *Haplostachys haplostachya* population that will be in close proximity to the W-7 alignment is located approximately 6 mi (10 km) by road from the PTA fire station. The new road will be designed to accommodate 60 MPH (100 KPH) traffic, both fire stations could respond in a short period of time to wildfire that might occur within the general project area. This area would otherwise be extremely difficult to access from the existing Saddle Road, and thus result in extremely long response times. Additionally, the Army is currently constructing five firefighting dip tanks within the Keamuku Parcel to provide onsite water to be used to fight wildfires that may ignite within the general area.

In addition, FHWA has agreed to contribute $50,000 to Hawaii Volcanoes National Park's (Park), Division of Resources Management. The Park will use these funds to establish three populations of *H. haplostachya* in areas of the Park which are believed to be within the ecological range of the species and within suitable habitat (Price and Jacobi, unpublished).

Figure 5. Monotypic stand of fountain grass between the proposed W-7 alignment and the nearby *Haplostachys haplostachya* population.

Figure 6. Monotypic stand of fountain grass within and surrounding the *Haplostachys haplostachya* population.

Figure 7. A typical *Haplostachys haplostachya* individual surrounded by dense fountain grass.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, local or private actions that are reasonably certain to occur within the area of action subject to consultation. Future Federal actions will be subject to the consultation requirements established in section 7 of the Act and, therefore, are not considered cumulative to the proposed action. The Service is unaware of any other future State, local, or private actions that are reasonably certain to occur within the action area covered in this Biological Opinion and that would not be subject to consultation under section 7 of the Act.

CONCLUSION

After reviewing the current status, the environmental baseline, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that implementation of the proposed action discussed herein will not jeopardize the continued existence of *Haplostachys haplostachya*. This conclusion is based on the following factors:

1. The population of *H. haplostachya* that may potentially be impacted by this project, represents less than one percent of the known total number of *H. haplostachya.* No plants occur within the road alignment itself.

2. While the road increases access and proximity to the listed plants which may increase the threat of fire, it also provides a more rapid response by firefighting personnel.

3. The proposed project will be located within Army training facilities which also have an extensive fire minimization and mitigation program which includes constructing fire fighting dip tanks that will provide onsite water.

4. The 52-ft (16-m) wide paved surface will serve as a firebreak and the 4-in (10-cm) curb will provide a barrier against cigarette butts.

All of these actions will reduce and minimize the impacts from wildfires. In addition, FHWA will sponsor an outplanting program of *H. haplostachya* at Hawaii Volcanoes National Park. Presently, this species has a very limited range, only occurring within the Saddle area of Hawaii island. Outplanting this species in an area where it does not presently occur, but within the predicted former range of the species, increases the likelihood this species will persist in the event the populations in the Saddle area of Hawaii island are decimated by a catastrophic event.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. Fountain grass has become a threat to this population of *Haplostachys haplostachya* that occurs within the action area. FHWA should fund the long-term eradication and management of alien grass to the benefit of *H. haplostachya.*

2. Fountain grass is a threat to native ecosystems across vast areas of West Hawaii. FHWA should fund research focusing on developing bio-control agents for controlling fountain grass.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION-CLOSING STATEMENT

This concludes formal consultation on the action outlined in the re-initiation request. As provided in 50 CFR § 402.16, reinitiation of consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if:

(1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operation causing such take must cease pending reinitiation. If you have any questions regarding this reinitiated Biological Opinion, please contact Dr. Jeff Zimpfer at (808) 792-9400.

Sincerely,

for Loyal Mehrhoff
Field Supervisor

REFERENCES

44 FR 62468 U.S. Fish and Wildlife Service. 1979. Endangered and Threatened Wildlife and Plants; Determination that Three Hawaiian Plants are Endangered Species. Department of the Interior, Fish and Wildlife Service, 50 CFR part 17, October 30, 1979. Federal Register 44 (211):62468.

David, R. 2009. Phone conversation concerning observing Hawaiian geese in the Keamuku Parcel. (August 25, 2009).

Federal Highway Administration, C.F.L.H.D. 1999. Final Environmental Impact Statement, Saddle Road (State Road 200) Mamalahoa Highway (State Route 190) to Milepost 6, County of Hawaii, State of Hawaii, FHWA Project No. A-AD-6(1) (1999).

Peter Peshut. Email communication concerning the status of *Haplostachys haplostachya* (January 28, 2010).

Sherrod, D. R., J. M. Sinton, S E. Watkins, and K. M. Brunt. 2007. Geologic Map of the State of Hawaii. http://pubs.usgs.gov/of/2007/1089/.

Schnell, l. Conversation concerning Hawaiian geese in the Keamuku Parcel. November 13, 2009

U.S. Army. 2009. Natural Resource Program, Annual Report, Pohakuloa Training Area, Island of Hawaii, January 2009 to September 2009. Prepared by the Department of Public Works, Environmental Division, In Cooperation with Center for the Environmental Management of Military Lands, Colorado State University.

U.S. Fish and Wildlife Service. 1993. Draft Recovery Plan for *Haplostachys haplostachya* and *Stenogyne angustifolia*. U.S. Fish and Wildlife Service, Portland, OR. 65 pp.

Wagner, W.L., D.R. Herbst, and S.H. Sohmer. 1999. Manual of the Flowering Plants of Hawaii. University of Hawaii Press and Bishop Museum Press, Honolulu. Bishop Museum Special Publication. 97:1-1919.

[This page intentionally left blank]