Pali Tunnel Communication site

BENJAMIN J. CAYETANO
GOVERNOR

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTORS
JERRY M. MATSUDA
GLENN M. OKIMOTO

RECEIVED
'97 MAR -4 A9:02
OFC. OF QUALITY CONTR

IN REPLY REFER TO:
HWY-RM
3.71653

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

FEB 27 1997

TO: MR. GARY GILL, DIRECTOR
OFFICE OF ENVIRONMENTAL QUALITY CONTROL

FROM: KAZU HAYASHIDA, DIRECTOR OF TRANSPORTATION

SUBJECT: FINDING OF NO SIGNIFICANT IMPACT AND FINAL ENVIRONMENTAL ASSESSMENT FOR A COMMUNICATION SITE PALI TUNNEL, PALI HIGHWAY

We have reviewed the comments received during the 30-day public comment period which began on November 23, 1996. We have determined that this project will have no significant environmental impact and request that you publish this FONSI and the Final Environmental Assessment in your next OEQC Bulletin.

We enclose a completed OEQC Bulletin Publication Form and four copies of the Final Environmental Assessment. If you have any questions, please call Michael Amuro at 587-2023.

Enclosures(4)

27

1997-03-23-OA-FEA- Pali Tunnel
Communication Site

PHONE (BUS): (808) 536-5695
PHONE (RES): (808) 732-7261
FAX: (808) 599-1553

apc
ANALYTICAL PLANNING CONSULTANTS, INC.
84 N. KING STREET•HONOLULU, HI 96817

January 28, 1997

Mr. Kazu Hayashida, Director
Department of Transportation
State of Hawaii
869 Punchbowl Street
Honolulu, Hi 96813

Dear Mr Hayashida

PrimeCo Personal Communications LP, Pocket Communications Inc., Western PCS II Inc., Honolulu Cellular Telephone Co., GTE Moblenet, and Hawaii Wireless Inc., are applying to the State Department of Transportation for permission to co-locate a transmitter/receiver site for cellular PCS telephone and paging services at the Honolulu side of the Pali Tunnel. The proposed installation is on state land therefore Chapter 343 HRS requires that an Environmental Assessment (EA) must be submitted for publication in the OEQC Bulletin. Accordingly, a draft EA was submitted to the Department of Transportation and published in the November 23, 1996 OEQC Bulletin.

Comments were received from the Office of Environmental Quality Control.

The final EA, which includes responses to the comments on the draft EA, is being submitted at this time. The applicants are requesting the Department of Transportation to issue a negative declaration or FONSI and to submit the final EA for publication in the OEQC Bulletin.

If there are any questions please contact me at 536-5695.

Sincerely,

Donald Clegg
President

FINAL ENVIRONMENTAL ASSESSMENT FOR A COMMUNICATIONS SITE ON THE HONOLULU SIDE OF THE PALI TUNNELS

BACKGROUND

The applicants are PrimeCo Personal Communications L.P., Pocket Communications Inc., Western PCS II Inc., Honolulu Cellular Telephone Co., GTE Moblenet, and Hawaii Wireless Inc. They are proposing to construct a transmitter/receiver installation between the entrance and exit bores on the Honolulu side of the Pali Tunnels. The installation will be used to facilitate PCS and Cellular wireless telephone communications, and paging on the Honolulu approach to the Tunnel and within the tunnel its self.

The applicants had approached the State Department of Transportation (DOT) individually for permission to locate their sites to serve the tunnel area. It was decided, jointly with the DOT, that a single application should be made that included all the companies involved. This approach would better minimize any environmental and visual aesthetic impacts that might be caused by the installation. The companies have been meeting with the DOT for several months and are proposing the design which is the subject of this Environmental Assessment (EA).

DESCRIPTION OF THE PROPOSED PROJECT

The installation will be located on an area above and between the two bores on Honolulu side of the first tunnel, which extend beyond the face of the hill. Six grid paraflector antennas, 68 inches wide and 36 inches high will be placed on the top 28 feet of a 90 foot tower. An AM/FM antenna to be used by the State will be placed at the 50 foot level.

The tower will be a self supporting, triangular lattice structure three feet on a side.

Communication inside the tunnels will be provided by four "yagi" antennas three feet long with an approximate width of six inches. These antennas will be mounted in a row in the upper corner of each bore pointing towards Kaneohe. The bores will serve as a "wave guide" and direct the transmissions through the tunnel.

There will be no permanent access to the tower from the roadway or surrounding area. Any maintenance on the tower structure will require that special rigging to be brought to the site.

The equipment cabinets will be located on the first and second floors of the existing control building. this is a secure building and there will be no public access.

The installation is located on State land in the highway right of way.

AFFECTED ENVIRONMENT

The tower structure will be located above the existing ground between the two bores on the Honolulu side of the first tunnel. The areas affected are the exterior face of the hill side area between the two tunnel bores, the approach and exit lanes, and to some extent the interior of the tunnels.

IMPACTS AND ALTERNATIVES CONSIDERED

a. Impacts

The primary impact of the installation will be the visual impact of the tower structure with the six paraflecter antennas. This will be visible only to occupants of cars approaching the tunnel from Honolulu. Occupants of automobiles exiting the tunnel Honolulu bound will be beyond the tower structure by the time they are able to see it.

The area above and between the bores is generally flat, however some grubbing and leveling will be needed to accommodate the tower structure.

Some concerns have been expressed about the effect of the electromagnetic radiation from the antennas. There is no impact as the radiation exclusion distance for the panel antennas is 7.2 feet. This contour is well above the height of any vehicles utilizing the tunnels.

b. Alternatives

Other possible sites for the antenna installation along the side of the highway were reviewed. They were rejected in favor of the proposed site for the following reasons:

1. They were in the conservation district outside of the highway right of way.

2. They were in the right of way but would have been more visually intrusive.

3. Electrical power was not readily available.

4. A land line telephone connection into the Hawaiian Telephone system was not readily available.

5. Communication services could not be supplied inside the tunnels.

6. None of the other locations provided the opportunity for all the companies to co-locate, thereby minimizing the cumulative impact of multiple installations.

If the project is not constructed it will not be possible for the six applicant companies to supply continuous communications coverage as users transition from Windward Oahu to Honolulu and from Honolulu to Windward Oahu through the Pali tunnels. There would also be signal degradation on the Honolulu approach to the tunnels.

The telephone systems involved serve a community function as public utilities by supplying needed portable communications for public use. In addition to assisting the general public and businesses the systems will provide essential communications in the event of disaster.

The ability for real time portable communications for occupants of cars transiting the Pali Highway will assist greatly in providing a safe environment for the residents of Oahu. Travelling over the Pali at night can be frightening and dangerous in the event of a breakdown. The ability to call for assistance immediately without leaving the car will contribute to the physical and mental well being of those who must travel this road at night.

MITIGATION MEASURES

The proposed structure is replacing an existing antenna tower. Like the existing tower, the new tower will be a lattice structure and the antennas will be a grid design. Both of these designs present a "see through" appearance such that the trees behind the structures will be seen through the lattice of the tower and the grid of the antennas. The tower and the antennas will be painted to match the background. This together with the "see through" design will largely mitigate any visual impacts.

All construction will be done utilizing "best management practices". This means that there will be no runoff from the small amount of grubbing and grading that will be required to prepare the site for the new tower. If any interruption of the traffic flow is required during construction, the applicants will follow standard DOT practices.

The existing entrance to the two bores presently consists of a number of structures. A brick wall extends across the entire face of the tunnel entrance. There is a control building located between the two bores. In front of the control building are a number of light standards, signs, a grassed median strip, and concrete barriers. The addition of the structures described in this EA, which are designed to blend in with the existing

environment, will not materially impact the current visual impression of the tunnel entrance.

All equipment cabinets will be placed inside the control building, hence will not be visible to the public.

The installation itself will be secured from the public and will only be accessible to maintenance personnel.

COMMENTS RECEIVED ON THE DRAFT ENVIRONMENTAL ASSESSMENT

The draft EA was published in the November 23, 1996 OEQC Bulletin. Copies of the EA were submitted for review and comment to the State Department of Transportation, City and County of Honolulu Planning Department, City and County Department of Land Utilization, and State Historic preservation Division of the Department of Land and Natural Resources.

The following comments were received:

1. Office of Environmental Quality Control

   (a) "If this project is in the conservation district list the status of the Conservation district Use Permit."

   COMMENT

   The project is in the Highway right of way and not subject to a CDUP.

   (b) "The anticipated start and completion dates of this project"

   COMMENT

   Construction will start as soon after the negative declaration or FONSI is issued as building permits can be obtained from the city. Plans must first be approved by the State Department of Transportation. It is estimated that construction could start by February 28, 1997. Construction time will not exceed two weeks. A reasonable completion date, given the uncertainties of permit approvals, is estimated to be March 15, 1997.

2. No other comments have been received.

DETERMINATION AND REASONS SUPPORTING THE DETERMINATION

The proposed project would not have a significant effect on the environment and therefore preparation of an environmental impact

statement is not required. The "significance criteria," Section 12 of Hawaii Administrative Rules Title 11, Chapter 200, "Environmental impact Statement Rules," were reviewed and analyzed. Based on the analysis, the following were concluded:

1. No irrevocable commitment to loss or destruction of any natural or cultural resource would result.

   All construction is located in previously disturbed land and no natural of cultural resources are present.

2. The action would not curtail the range of beneficial uses of the environment.

   The project will occupy only a very small area of land non of which is currently in any significant environmental use.

3. The proposed action does not conflict with the state's long term environmental goals and guidelines.

   Conservation of natural resources and enhancement of the quality of life are the two broad policies of the "State Environmental Policy" in Chapter 344 of the Hawaii Revised Statutes. The proposed project does not consume any natural resources. It will enhance the quality of life by enabling residents to communicate by telephone while transiting the Koolau's via the Pali Highway. The system will provide essential communications in the event of disaster and provide for emergency communications for stranded motorists. The ability to call for assistance will contribute to the safety, and the physical and mental well being of those who must travel over the Pali Highway, especially at night.

4. The economic or social welfare of the community or state would not be substantially affected.

   The economic and social well being of the community will be enhanced by the increase in communication services that will be provided by these systems.

5. The proposed action does not substantially affect public health.

   There is no public health impact caused by these systems. The radiated power for the antenna systems will range between 60 to 100 watts. This is equivalent to the radiation emitted by standard household electric light bulbs. The exclusion distance for the Land Use Ordinance (LUO) allowable power for human contact of

0.1 milliwatts per square centimeter is 7.2 feet. No automobiles will be within 7.2 feet of a transmitting antenna. Further, the Federal standards for human radiation tolerance is 0.5 milliwatts per square centimeter which is five times greater than that allowed by the LUO.

6. No substantial secondary impacts, such as population changes or effects on public facilities, are anticipated.

   Provision of the communication services made possible by this installation will have no impact on population changes or public facilities.

7. No substantial degradation of environmental quality is anticipated.

   No degradation of the environment is anticipated. The project area has already been extensively altered during construction of the tunnels.

8. The proposed action does not involve a commitment to larger actions, nor would cumulative impacts result in considerable impacts on the environment.

   The project is self contained and independent of any other installations.

9. No rare, threatened or endangered species or their habitats would be affected.

   The area involved with this project is very small and previously has been extensively altered. There are no endangered of threatened species or their habitats on the property.

10. Air quality, water quality, or ambient noise levels would not be detrimentally affected.

    Operation of this facility does not impact air quality, does not use water, and does not generate any noise.

11. The project would not affect environmentally sensitive areas, such as flood plains, tsunami zones, erosion-prone areas, geologically hazardous lands, estuaries, fresh waters or coastal waters.

    The project area is not on, or near any of the above areas of concern.

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FAX: (808) 599-1553

apc
ANALYTICAL PLANNING CONSULTANTS, INC.
84 N. KING STREET•HONOLULU. HI 96817

December 24, 1996

Mr. Don Hibbard, Administrator
State Historic Preservation Division
Department of Land and Natural Resources
State of Hawaii
33 So. King Street, 6th Floor
Honolulu, HI 96813

Dear Mr. Hibbard:

PrimeCo Personal Communications LP, Pocket Communications Inc., Western PCS II Inc., Honolulu Cellular Telephone Co., GTE Moblenet, and Hawaii Wireless Inc., are applying to the State Department of Transportation for permission to co-locate a transmitter/receiver site for cellular PCS telephone and paging services on the Honolulu side of the Pali Tunnels.

The proposed installation is on state land therefore Chapter 343 HRS requires that an Environmental Assessment (EA) must be submitted for publication in the OEQC Bulletin. Accordingly, the draft EA was submitted by the State Department of Transportation and has been published.

As a part of their comments, the OEQC has requested that the applicant consult with the State Historic Preservation Division of the Department of Land and Natural Resources. Enclosed is a copy of the draft EA for your review. If there are any questions please contact me at 536-5695.

Sincerely,

Donald Clegg

Donald Clegg
President

PHONE (BUS): (808) 536-5695
PHONE (RES): (808) 732-7261
FAX: (808) 599-1553

apc
ANALYTICAL PLANNING CONSULTANTS, INC.
84 N. KING STREET • HONOLULU, HI 96817

December 24, 1996

Mr. Patrick Onishi, Director
Department of Land Utilization
City and County of Honolulu
650 So. King St. 7th Floor
Honolulu, HI 96813

Dear Mr. Onishi,

PrimeCo Personal Communications LP, Pocket Communications Inc., Western PCS II Inc., Honolulu Cellular Telephone Co., GTE Moblenet, and Hawaii Wireless Inc., are applying to the State Department of Transportation for permission to co-locate a transmitter/receiver site for cellular PCS telephone and paging services on the Honolulu side of the Pali Tunnels.

The proposed installation is on state land therefore Chapter 343 HRS requires that an Environmental Assessment (EA) must be submitted for publication in the OEQC Bulletin. Accordingly, the draft EA was submitted by the State Department of Transportation and has been published.

As a part of their comments, the OEQC has requested that the applicant consult with the Department of Land Utilization. Enclosed is a copy of the draft EA for your review. If there are any questions please contact me at 536-5695.

Sincerely,

Donald Clegg

Donald Clegg
President

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apc

ANALYTICAL PLANNING CONSULTANTS, INC.
84 N. KING STREET • HONOLULU, HI 96817

December 24, 1996

Ms. Cheryl Soon
Chief Planning Officer
Planning Department
City and County of Honolulu
650 So. King Street, 8th Floor
Honolulu, HI 96813

Dear Ms. Soon

PrimeCo Personal Communications LP, Pocket Communications Inc., Western PCS II Inc., Honolulu Cellular Telephone Co., GTE Moblenet, and Hawaii Wireless Inc., are applying to the State Department of Transportation for permission to co-locate a transmitter/receiver site for cellular PCS telephone and paging services on the Honolulu side of the Pali Tunnels.

The proposed installation is on state land therefore Chapter 343 HRS requires that an Environmental Assessment (EA) must be submitted for publication in the OEQC Bulletin. Accordingly, the draft EA was submitted by the State Department of Transportation and has been published.

As a part of their comments, the OEQC has requested that the applicant consult with the Honolulu Planning Department. Enclosed is a copy of the draft EA for your review. If there are any questions please contact me at 536-5695.

Sincerely,

Donald Clegg
President

BENJAMIN J. CAYETANO
GOVERNOR

GARY GILL
DIRECTOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL

220 SOUTH KING STREET
FOURTH FLOOR
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185
FACSIMILE (808) 586-4186

November 19, 1996

Kazu Hayashida, Director
Department of Transportation
869 Punchbowl St.
Honolulu, HI 96813

Attn: Bob Itagaki

Dear Mr. Hayashida:

Subject: Draft Environmental Assessment (EA) for Pali Tunnel Communication Site, Honolulu

Please include the following in the final EA:

1. *Agency consultations*: Consult the City & County of Honolulu Planning Department and the Department of Land Utilization; consult the State Historic Preservation Division of the Department of Land & Natural Resources; contact all affected neighborhood boards. List these and all other agencies and community groups contacted and include copies of all correspondence.

2. If this project is in the *Conservation District*, list the status of the Conservation District Use Permit.

3. The anticipated *start and completion dates* of this project.

4. A discussion of findings and reasons, according to the *significance criteria* listed in HRS Title 11-200-12, that support the anticipated Finding of No Significant Impact (FONSI) determination.

If you have any questions, call Nancy Heinrich at 586-4185.

Sincerely,

GARY GILL
Director

c: Harvey Luke, Western PCS II
Donald Clegg, Analytical Planning Consultants

SCALA

PROFESSIONAL ANTENNA SYSTEMS FOR BROADCAST AND COMMUNICATIONS

PR-850

PARAFLECTOR® ANTENNA

17 dBd gain

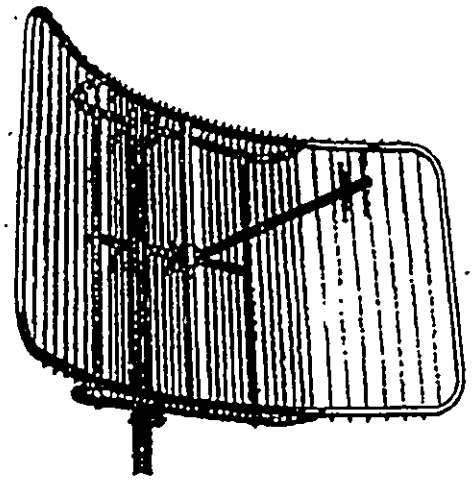
806–896 MHz (broadband)

The Scala Paraflector is a high-gain half-parabolic antenna used in professional broadcast and communications systems around the world. The unique design combines high performance and long-term reliability with low cost and very convenient transportation. The Paraflector offers gain comparable to a parabolic grid or dish yet the lower weight and surface area result in less tower loading and less expensive installation costs.

The Paraflector is fabricated from seamless drawn aluminum pipe and tubing and heavy aluminum castings, gold anodized for corrosion protection, plus stainless steel hardware and fastenings. The result is a lightweight but extremely rugged antenna that will provide many years of service in the most demanding environments. The foam-filled broadband feed assembly requires no pressurization and it can be easily replaced if necessary.

The PR-850 features:

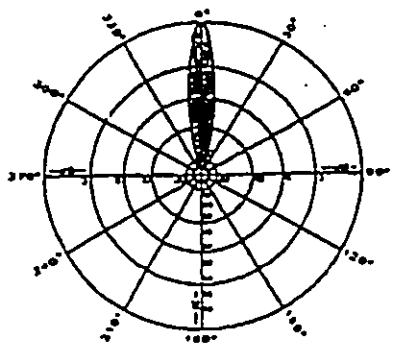
- High gain and high front-to-back ratio for cellular repeaters and trunking control.
- Compact packaging for quick and economical shipment via UPS or Federal Express.



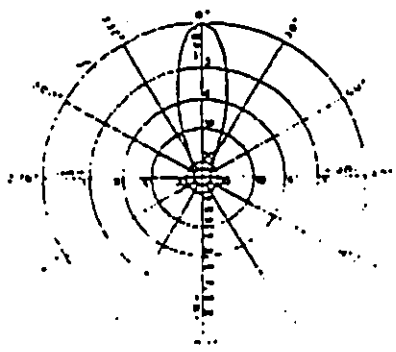
(Shown vertically polarized)

Specifications:

Frequency range	806–896 MHz (broadband)
Gain	17 dBd
Impedance	50 ohms
VSWR	< 1.5:1
Polarization	Horizontal or vertical
Front-to-back ratio	>25 dB
Maximum input power	100 watts
H-plane beamwidth	12 degrees (half-power)
E-plane beamwidth	24 degrees (half-power)
Termination	N female
Weight	38 lb (17.2 kg)
Dimensions	68 x 36 x 18 inches (1727 x 914 x 457 mm)
Equivalent flat plate area	4.4 ft² (.41 m²)
Wind survival rating	100 mph (160 kph)
Shipping dimensions	40 x 36 x 7 inches (1016 x 914 x 178 mm)
Shipping weight	45 lb (20.4 kg)
Mounting	Mounting kits available for masts of 2.375 to 4.5 inches (60 to 114 mm) OD.



H-plane
Horizontal pattern – V-polarization
Vertical pattern – H-polarization



E-plane
Horizontal pattern – H-polarization
Vertical pattern – V-polarization

Order Information:

Model	Stock Code
PR-850	94051-001
Replacement feed assembly (806–896 MHz)	94351-001

Note: Specify a mounting kit when ordering (see listing on reverse).

SCALA ELECTRONIC CORPORATION
Post Office Box 4580
Medford, OR 97501 (USA)
Phone. (503) 779-6500
Fax (503) 779-3991

PARAFLECTOR – [illegible]

Astern Wireless
DCR
PRIMECO

GRID ANTENNAS
1850-2300 MHz

SPECIFICATIONS
- Wind loading characteristics to 45% of comparable size solid parabolas.
- Cross polarization discrimination response better than solids.
- Survival: 125 MPH with 1/2 inch radial ice.

Diameter	Model Number	U.S. FCC Category	Gain (dBi) Low	Mid	High	Half Power Beam Width (Degrees)	F/B Ratio (dB)	Max VSWR Std.	Low	Windthrust 100 MPH (Pounds)
		Part 94	**1850-1990 MHz**							
3'	P-18A36G	-	22.5	22.8	23.1	11.5	24	1.5	-	97
4'	P-18A48G	-	25.5	25.8	26.1	8.4	31	1.3	1.15	250
6'	P-18A72G	B	28.7	28.9	29.2	5.4	36	1.2	1.10	500
8'	P-18A96G	A	31.1	31.4	31.7	4.2	39	1.1	1.06	800
10'	P-18A120G	A	32.8	33.1	33.4	3.4	42	1.1	1.06	1300
12'	P-18A144G	A	34.2	34.5	34.8	2.8	44	1.1	1.06	1500
15'	P-18A180G	A	36.4	36.7	37.0	2.4	46	1.1	1.06	2700
		Part 74	**1990-2110 MHz**							
3'	P-19A36G	-	23.1	23.3	23.6	10.8	25	1.5	-	97
4'	P-19A48G	-	25.6	25.8	26.0	8.4	36	1.3	1.15	250
6'	P-19A72G	B	29.2	29.3	29.5	5.6	38	1.2	1.10	500
8'	P-19A96G	A	31.7	31.8	32.0	4.2	40	1.1	1.06	800
10'	P-19A120G	A	33.5	33.8	34.1	3.4	42	1.1	1.06	1300
12'	P-19A144G	A	35.0	35.3	35.5	2.7	44	1.1	1.06	1500
15'	P-19A180G	A	37.0	37.2	37.5	2.25	46	1.1	1.06	2700
		Part 94	**1700-2100 MHz**			**Specify 200 MHz Bandwidth For GL, GF & GN**				
3'	P-20A36G	-	21.7	22.7	23.6	11.7	30	1.5	-	97
4'	P-20A48G	-	24.7	25.7	26.6	8.7	31	1.3	1.15	250
6'	P-20A72G	B	27.8	28.8	29.7	5.8	36	1.3	1.10	500
8'	P-20A96G	A	30.3	31.3	32.2	4.4	39	1.1	1.06	800
10'	P-20A120G	A	32.0	33.0	33.9	3.4	42	1.1	1.06	1300
12'	P-20A144G	A	33.5	34.5	35.4	2.8	44	1.1	1.06	1500
15'	P-20A180G	A	35.2	36.2	37.0	2.3	46	1.1	1.06	2700
		*Part 21-Part 94/74**	**2110-2200 MHz**							
3'	P-21A36G	-	-	23.6	23.8	24.0	10.2	26	1.5	-	97
4'	P-21A48G	Yes	B	26.5	26.7	26.9	6.9	36	1.3	1.15	250
6'	P-21A72G	Yes	B	29.7	29.9	30.1	5.0	38	1.2	1.10	500
6' CAT A	PA-21B72G	Yes	A	29.7	29.9	30.1	4.9	40	1.2	1.10	500
8'	P-21A96G	Yes	A	32.2	32.4	32.6	4.0	40	1.1	1.06	800
10'	P-21A120G	Yes	A	34.0	34.2	34.4	3.2	42	1.1	1.06	1300
12'	P-21A144G	Yes	A	35.3	35.5	35.7	2.6	44	1.1	1.06	1500
15'	P-21A180G	Yes	A*	37.3	37.5	37.7	2.1	46	1.1	1.06	2700
		*Part 21-Part 94/74**	**1900-2300 MHz**			**Specify 200 MHz Bandwidth For GL, GF & GN**				
3'	P-22A36G	-	-	23.8	23.5	24.2	9.4	24	1.5	-	97
4'	P-22A48G	Yes	-*	25.8	26.2	26.8	8.0	36	1.3	1.15	250
6'	P-22A72G	Yes	B*	28.9	29.5	30.1	5.4	38	1.3	1.10	500
8'	P-22A96G	Yes	A*	31.4	32.0	32.6	4.1	40	1.1	1.06	800
10'	P-22A120G	Yes	A	33.2	34.1	34.7	3.2	42	1.1	1.06	1300
12'	P-22A144G	Yes	A	35.0	35.5	36.1	2.6	44	1.1	1.06	1500
15'	P-22A180G	Yes	A*	36.7	37.5	38.1	2.1	46	1.1	1.06	2700

PLEASE USE THE PROPER SUFFIX WHEN ORDERING.

G = Pressurized, 7/8" EIA Termination
GL = Pressurized, 7/8" EIA Termination, Low VSWR
GF = Non Pressurized, 7/8" EIA Termination
GN = Non Pressurized, N Female Termination

RADIO FREQUENCY CALCULATED LEVELS

PREPARED FOR: Hawaii Department of Transportation
SITE: Pali Tunnel

BY: DAMIAN AMEEN
ACC
92-1002 Makakilo Drive
Suite 45
Kapolei, HI 96707
808-672-5478

Statement of Damian Ameen, Consulting Engineer

The firm of Ameen Communications Company, Inc., Consulting Engineers, has been retained by the consortium of six CMRS (Commercial Mobile Radio Services) wireless carriers (Western Wireless, Primeco, Pocket Communications, Hawaii Wireless, GTE Mobilenet, and Honolulu Cellular) and an existing broadcast transmitter to evaluate the CMRS telephone base station and antennas constructed on *Pali Tunnel*, in the Nuuanu Valley area of Oahu, Hawaii, for compliance with appropriate guidelines for limiting human exposure to radio frequency electromagnetic fields.

Prevailing Exposure Standards

In General Docket 79-144, the Federal Communications Commission adopted the radio frequency protection guide of the American National Standards Institute Standard C95.I-1982, "Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 300 kHz to 100 6Hz." The effective date for applying this standard to FCC licensees was January 1, 1986, and a summary of the limits of the ANSI Standard is shown in Figure 1A. The most restrictive limit applies at frequencies between 30 and 300 MHz, where FM and VHF television stations operate, the limit is higher at UHF and CMRS frequencies, as shown. The exposures are to be averaged over some interval of time (six minutes in C95.I-1982), as it is the rate of absorption of radio frequency ("RF") energy that ANSI is limiting, rather than the peak exposure at any one moment.

In 1992. the American National Standards Institute published ANSI/IEEE Standard C95.I-1992 ("ANSI"). a summary of which is shown in Figure 1B. This revision of C95.I-1982 defines "controlled" and "uncontrolled" environments, setting for the latter more restrictive exposure limits but longer periods for time averaging. Although there are a number of changes from the 1982 Standard. the controlled *(i.e.,* occupational) limits are approximately the same, while uncontrolled *(i.e.'* public) limits are generally five times more restrictive.

Although the FCC has not yet acted on its expected adoption of the revised standard, the most restrictive criteria of either standard are used in this report to evaluate the exposure conditions at the proposed CMRS site. The limit for continuous exposure to RF energy at 1800 MHz. the lowest frequency assigned for CMRS PCS base station use, is 5 mW/cm^2 (milliwatts per square centimeter) for occupational exposure situations and 1.28 mW/cm^2 for public exposure situations. Cellular frequencies are permitted to operate at higher power densities (Cellular and SMR frequencies limits are at 2.6 mW/cm^2 to 2.8 mW/cm^2). The limiting factor in this installation is the level of power density of the PCS facilities.

The proposed facility is to be located on top of the Pali Tunnel in the Nuuanu area of Oahu in Honolulu County. The site appears to have a view towards the town side of the Pali Tunnels. The facility proposed for this site will consist of multiple CMRS carriers, each with its own

transmitting antennas. Each antenna grouping will consist of a paraflector type.

Each antenna in the sector is a curved grid panel (paraflector) with dimensions of approximately mounted on a self supporting tower structure centered between the two tunnel ports. Since directional antennas are used the ERP towards the road directly below is less than 500 watts. These powers are for the maximum number of channels to be installed. The figures for maximum effective radiated power were used in this study, additional channels could be added later, so long as the maximum ERP does not exceed the values indicated in the Study Results section. Technical specifications for the site have been provided participating carriers.

CMRS Facility Requirements

Because of the short wavelength of the frequencies assigned for cellular, PCS and ESMR use, the antennas require line-of-sight paths for their signals to propagate. Therefore, they will generally be mounted above nearby buildings, terrain, and vegetation. The tower location is above most of the surrounding terrain and roadways to the south. The Pali Cliffs rise directly behind the tower preventing and propagation to the north. The nearest distance that the general public can approach the radiating elements is 79 feet. The energy directed toward any accessible location nearby will be limited by height of the antennas on the tower, restricted access to the area, antenna orientation away from the road below towards the horizon, and the narrow beamwidth of the antenna elevation pattern.

When an additional cell site or sector is added to an existing wireless network (all the systems share some of the same fundamental design characteristics) the operating powers of the surrounding cells are reduced and the power of the modified site is itself low, in order not to create interference between adjacent cells. Because of the low power alone it is generally not possible for exposure conditions to approach the ANSI *limits* without being physically very near the antennas.

Modeling Method

The FCC has provided direction to the telecommunications industry on determining compliance with ANSI in the Office of Science and Technology Bulletin No.65, "Evaluating Compliance With FCC-Specified Guidelines for Human Exposure to Radio Frequency Radiation," dated October 1985. We have developed techniques for applying the formulas given in that Bulletin to calculate both ground level and on-building power densities at radio transmitting Sites. This method of evaluating expected exposure conditions is accepted by the FCC, and its accuracy has been verified by numerous field tests.

Study Results

The highest "worst case" exposure occurs directly below the antennas on the side of the roadway. (the nearest the general public can approach the antennas) where the fields are predicted to be 0.035 mW/cm^2. The antennas are to be installed so as to be shielded from

view at street level by the surrounding foliage. This arrangement will also significantly attenuate the fields from the site at publicly-accessible areas. It should be emphasized these calculated values represent several "worst case assumptions, including that of all transmitters on the air continuously and at full power. Such conditions are rarely, if ever, achieved in practice. Measured ground-level fields at operating CMRS sites are typically 10-1,000 times less than the calculated "worst case" values.

The calculations also show that the facility could "build out" and still remain below 5% of the most restrictive ANSI limit at accessible locations. Areas in front of the antenna are not accessible due to the significant drop to ground level. They do however meet all applicable standards. Levels within the building will be 100-1,000 times less due to the distance and attenuation caused by the building structure.

Conclusion

Based on the information and analysis above, it is my professional opinion that the wireless facilities installed at Pali Tunnel will comply with the prevailing standards for limiting human exposure to radio frequency energy and, therefore, will not for this reason cause a significant impact on the environment. The maximum fields in all ground-level and roadway areas are calculated to be less than 1% of the prevailing standards. This finding is consistent with measurements at operating wireless facilities where typical fields are well below the standards.

List of Figures

In carrying out these engineering studies, the following attached figures were prepared by me or under my direct supervision:

1. Summary of ANSI C95.I-1982 and C95.I-1992 Standards
2. Technical specifications of proposed operation
3. RFR.GROUND calculation methodology

State of Hawaii County of Honolulu
Damian Ameen, being first duly sworn upon oath, deposes and says:

1. That he is a qualified Radio Engineer, and is the Vice President of Engineering of Ameen Communications Company, Inc., with offices located near the city of Honolulu, Hawaii and Livermore, California.

2. That he graduated from Newark Collage of Engineering, in 1984, with a Bachelor of Science degree in Electrical Engineering and Computer Science, was an electronics engineer with the Motorola Communications, RAM Communications, Honolulu Cellular, with specialization in the areas of radio system design, microwave communications systems, public safety networks, cellular, paging, and CMRS systems, and has been the Vice President of Ameen Communications Company, Inc., since July 1993,

3. That the firm of Ameen Communications Company, Inc., has been retained by the Western PCS II ("Western PCS II") to provide information regarding the compliance of the CMRS transmitting facility located on Pali Tunnel, in the Nuuanu Valley area of Oahu, Hawaii, for compliance with appropriate guidelines for limiting human exposure to radio frequency electromagnetic fields,

4. That he has carried out such engineering work and that the results thereof are attached hereto and form a part of this affidavit, and

5. That the foregoing statement and the report regarding the aforementioned engineering work are true and correct of his own knowledge except such statements made therein on information and belief and, as to such statements, he believes them to be true.

Damian John Ameen

Subscribed and sworn to before me this 28th day of February, 1995

ANSI C95. 1-1982 Radio Frequency Protection Guide

Frequency Range (MHz)	Electric Field Squared (V^2/m^2)	Magnetic Field Squared (A~/m2)	Equivalent Far-field Power Density (mW/cm^2)
0.3- 3	400,000	2.5	100
3 - 30	4,000 x (900−P)	0.025 x ($900/f^2$)	900/f2
30 - 300	4,000	0.025	1.0
300 - 1,500	4,000 x (f1300)	0.025 x (f1300)	f1300
1,500- 100,000	20,000	0.125	5.0

note: *f = frequency* (MHz)

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) 1991

C95.1-1991 RADIO FREQUENCY PROTECTION GUIDE **Table 1**

FREQUENCY RANGE (MHz)	ELECTRIC FIELD STRENGTH E^2 (V^2/m^2)	MAGNETIC FIELD STRENGTH H^2 (A^2/m^2)	POWER DENSITY (mW/cm^2)
0.3-3.0	400,000	2.5	100
3-30	4,000 ($900/f^2$)	0.025	$900/f^2$
30-300	4,000	0.025	1.0
300-1500	4,000 (f/300)	0.025	f/300
1500-100,000	20,000	0.125	f/1500

NOTE: f = Frequency in megahertz (MHz)

E^2 = Electric field strength squared

H^2 = Magnetic field strength squared

V^2/m^2= Volts squared per meter squared

A^2/m^2= Amperes squared per meter squared

mW/cm^2= Milliwatts per centimeter squared

Note: f is frequency of emission. in MHz.

RFR.GROUND Calculation Methodology Determination by Computer of ANSI Compliance Conditions

The U.S. Congress has required of the FCC that it evaluate its actions for possible significant impact on the environment. In General Docket 79-144, the FCC adopted the American National Standards Institute Standard C95.I-1982, "American National Standard Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 300 kHz to 100 GHz." The guidelines in this Standard are now applicable to all FCC-licensed broadcast stations. The most restrictive guideline is I $mWkm^2$, *applying at FM and VHF* television frequencies: at UHF television and CMRS telephone frequencies, the guideline increases with increasing frequency, up to 5 mW/cm^2, applying at microwave frequencies and above. The exposure guideline at AM frequencies is 100 mW/cm^2. Exposures are to be averaged over a six-minute period, allowing, for example, a two-minute exposure to fields three times the limit if the remainder of the six-minute period does not include any significant exposure.

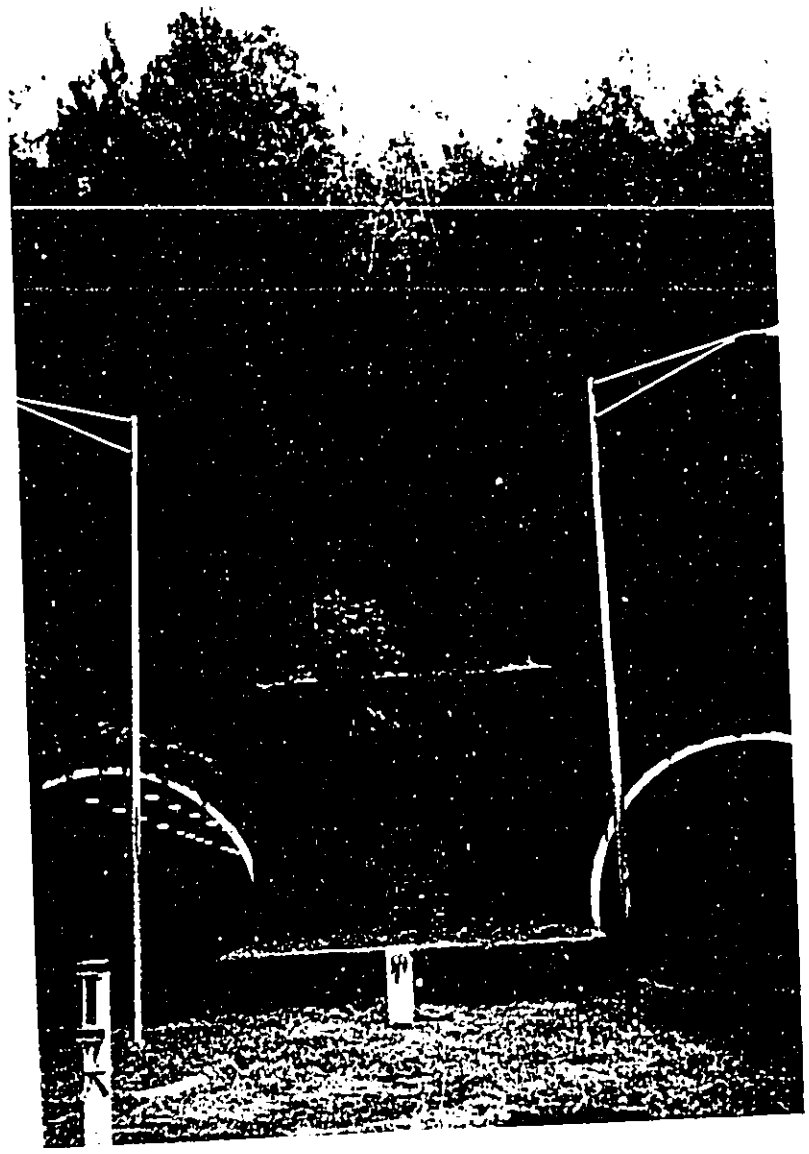
The FCC Office of Science and Technology Bulletin No.65 (October 1985) gives the formula for calculating power density from an individual radiation source:

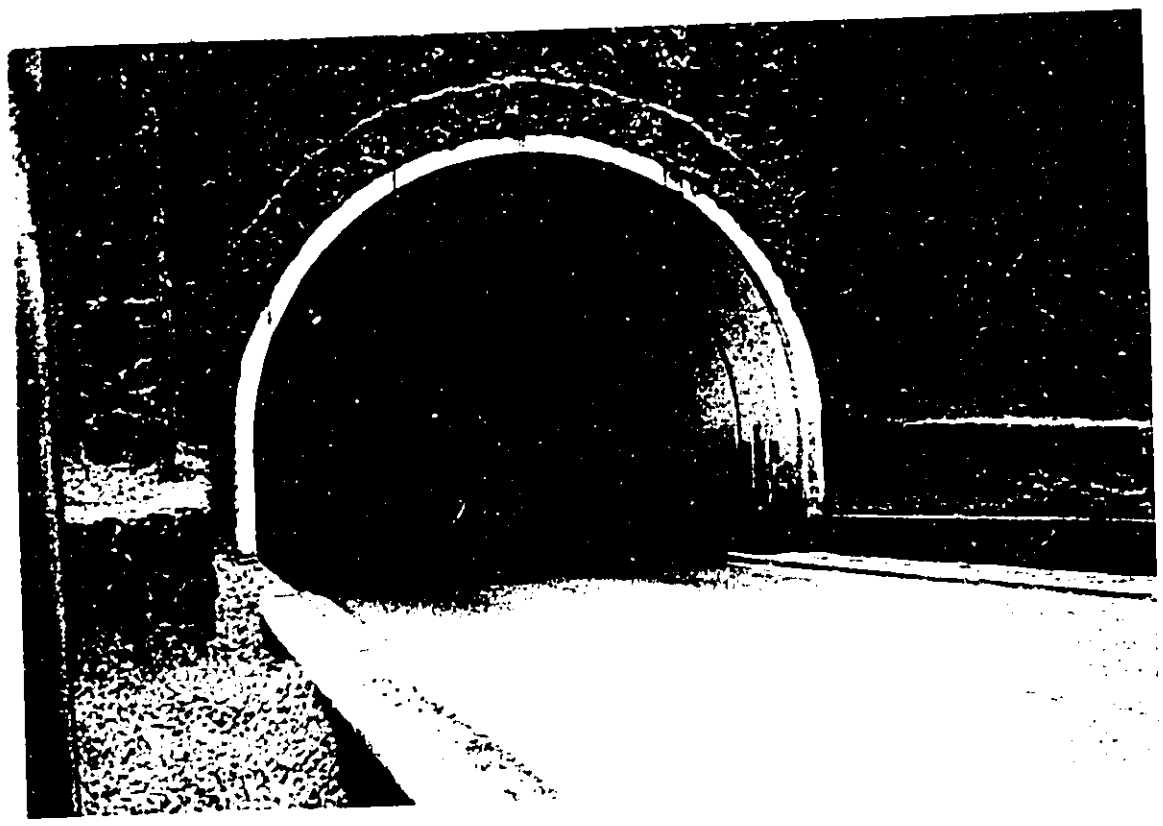
$$\text{power density } \mathbf{S} = \frac{2.56 \times 1.64 \times 100 \times RFF^2 \times [0.4 \times VERP + AERPi}{4\Pi D^2} \text{, in mW/cm2,}$$

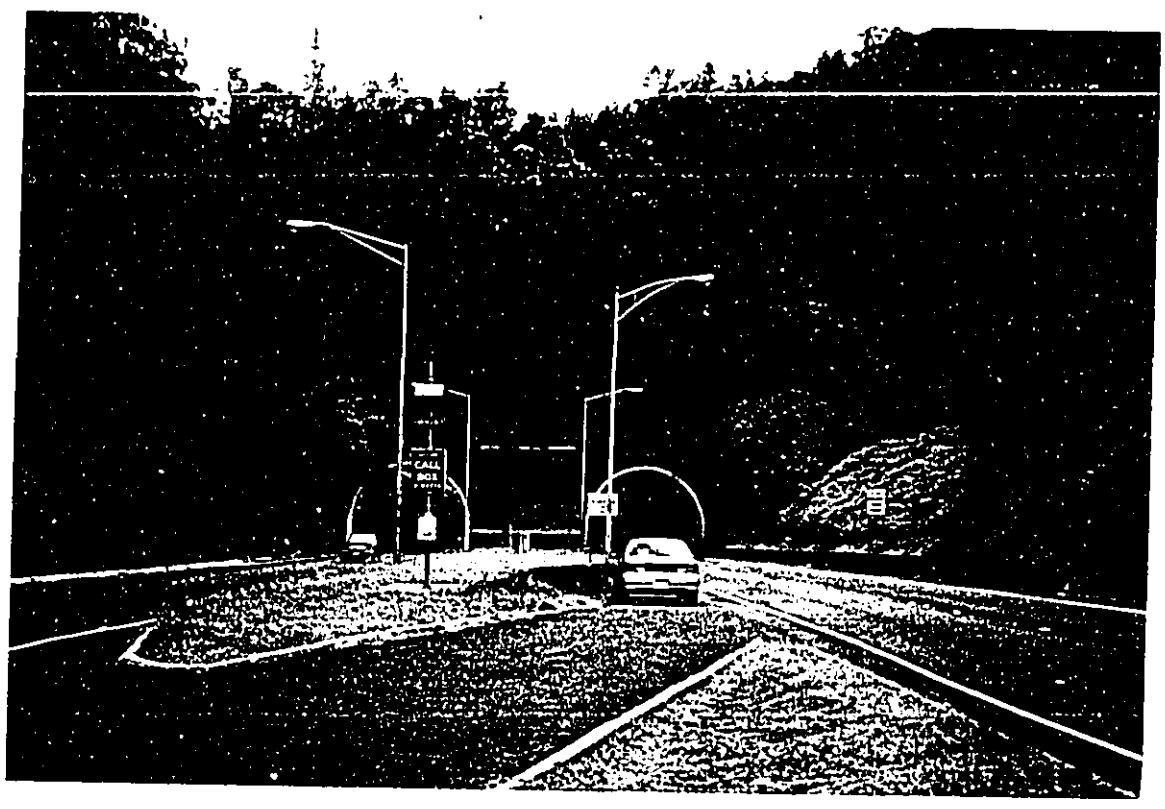
where VERP = total peak visual ERP (all polarization's), in kilowatts, AERP = total aural ERP (all polarization's), in kilowatts.

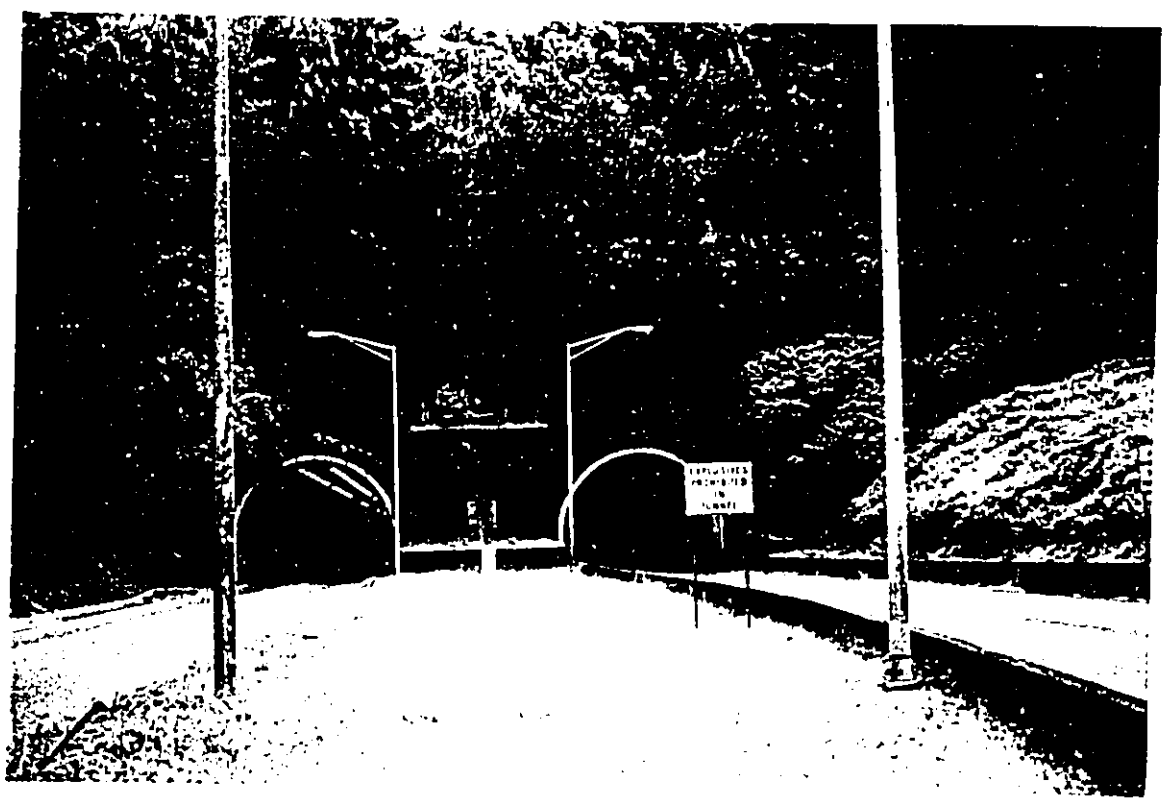
RFF = relative field factor at the direction to the actual point of calculation, and D = distance from the center of radiation to the point of calculation, in meters.

The factor of 2.56 accounts for the increase in power density due to ground reflection, assuming a reflection coefficient of 1.6 (1.6 x 1.6 = 2.56). The factor of 1.64 is the gain of a half-wave dipole relative to an isotropic radiator. The factor of 0.4 converts peak visual ERP to an average RMS value: for FM and CMRS stations, of course, the value of VERP is zero. The factor of 100 in the numerator converts to the desired units of power density.

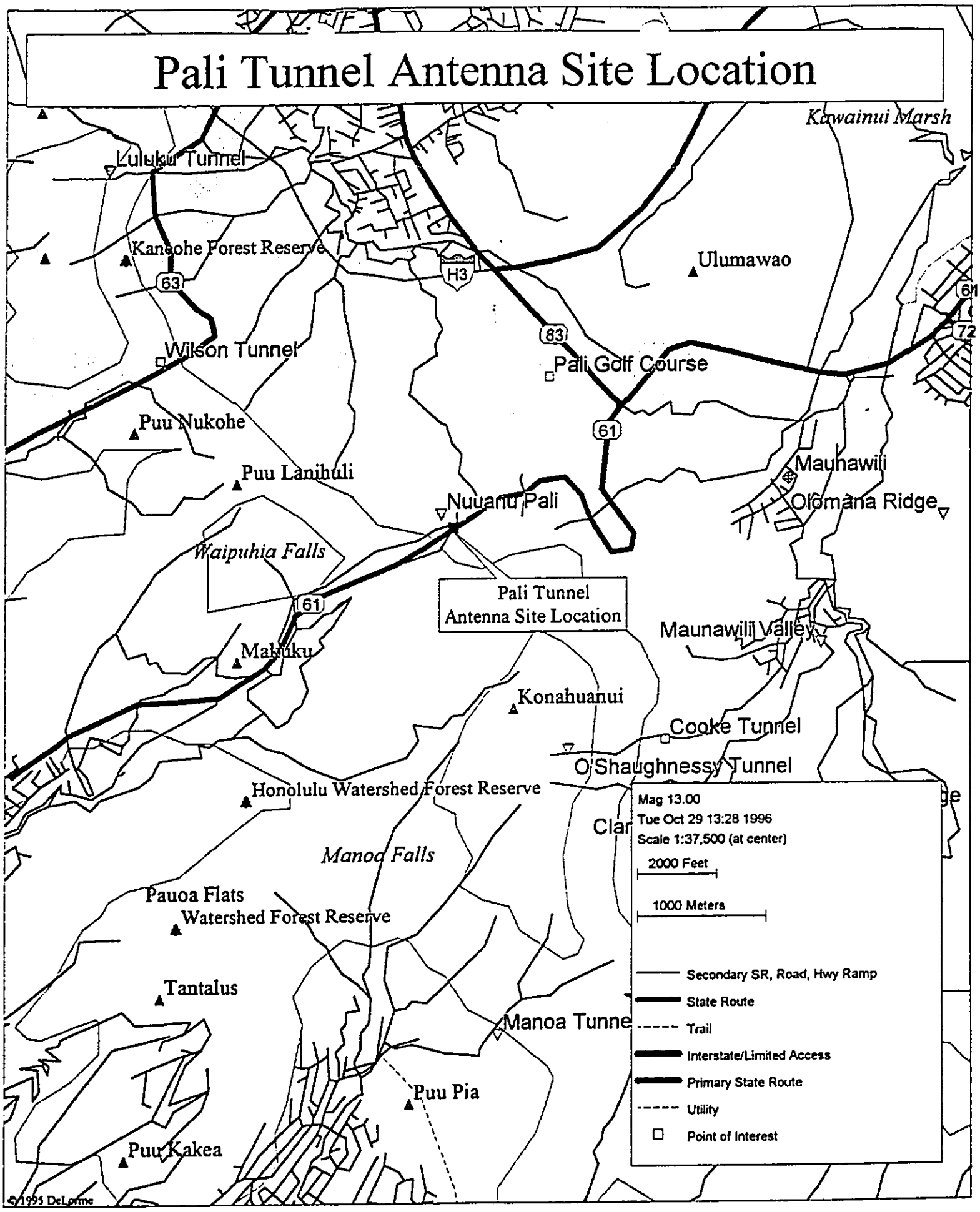




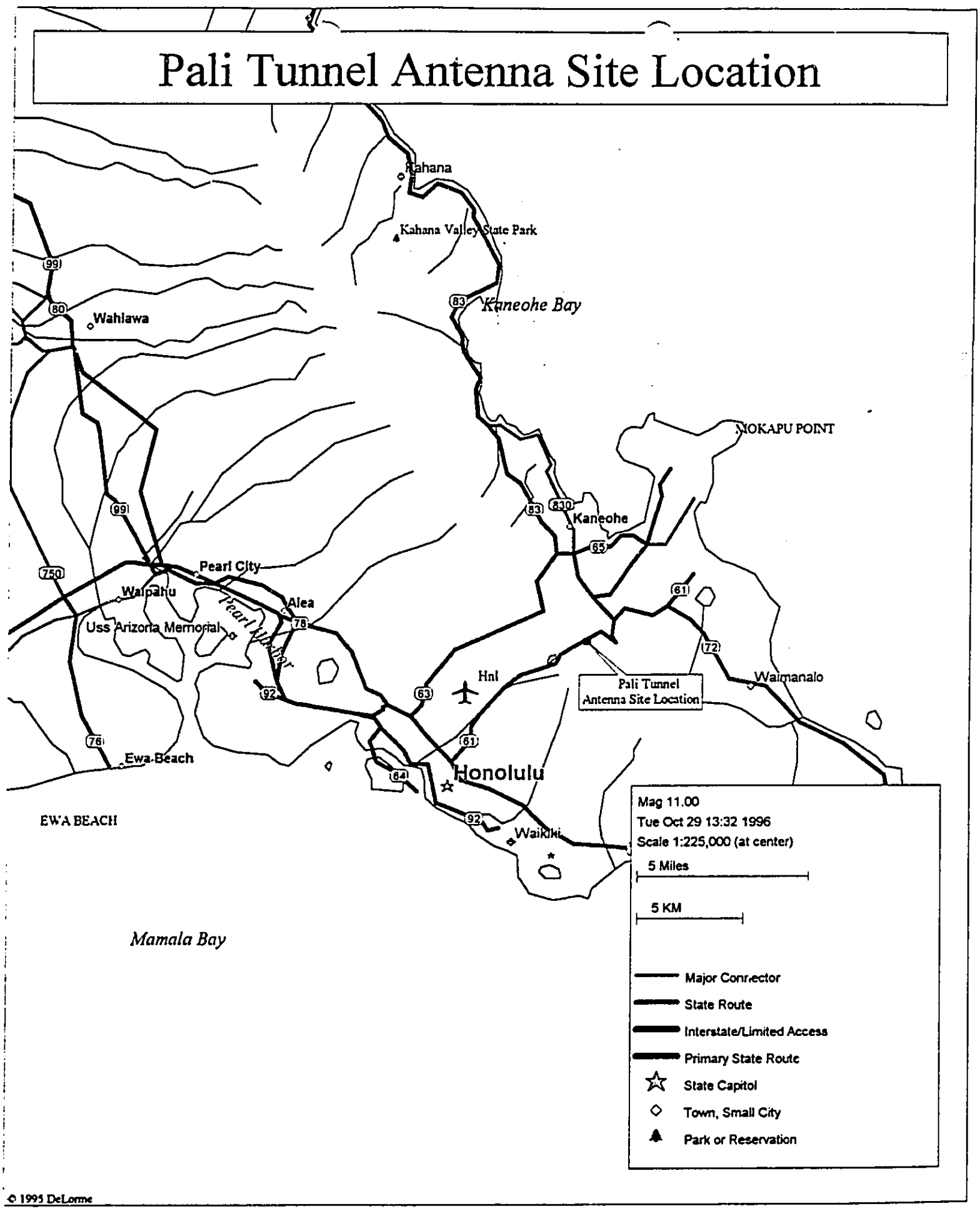




Pali Tunnel Antenna Site Location



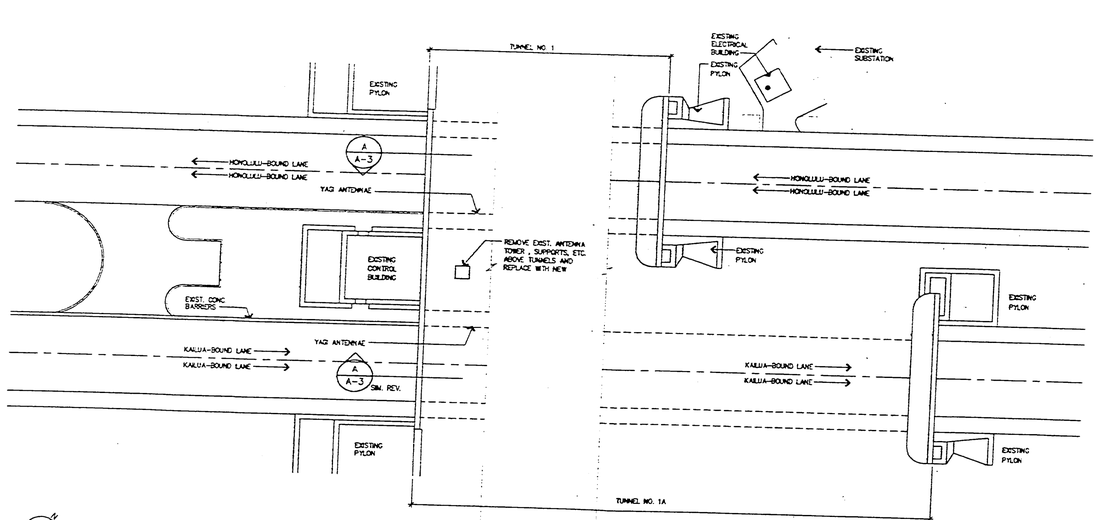
Pali Tunnel Antenna Site Location



OVERSIZED DRAWING/MAP

PLEASE SEE 35MM ROLL

0017



DETAIL SITE PLAN

SCALE: 1/16" = 1'-0"

0017

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PALI TUNNEL CELL SITE
PALI TUNNEL
PALI HIGHWAY
HONOLULU, HI

DETAIL SITE PLAN

I hereby certify that this plan was prepared by me or under my supervision and personal supervision of the project during its construction. I am a duly licensed professional engineer under the laws of the State of Hawaii, holding License No. 16-10-2 or Hawaii Architect, Professional Engineers, Architects, Surveyors, and Landscape Architects.

Signature

Note: Contractor shall check and verify all dimensions at site before proceeding with work.

Designed by
Drawn by
Project No. 95237
Date 10-15-96
Sheet No.

A-1

of sheets

OVERSIZED DRAWING/MAP

PLEASE SEE 35MM ROLL

0017

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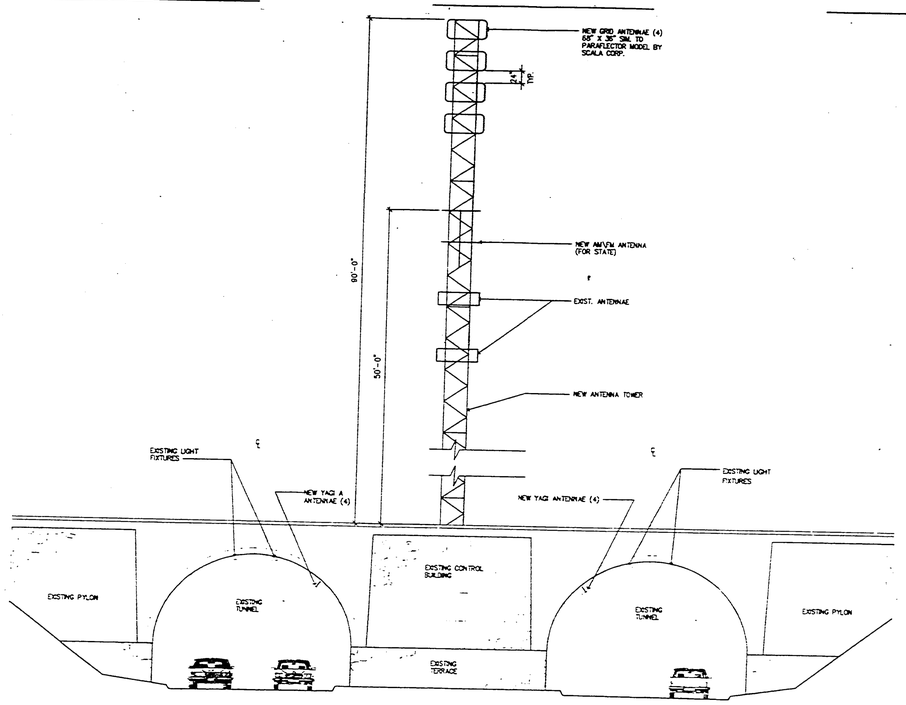
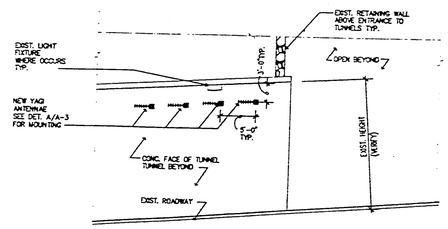
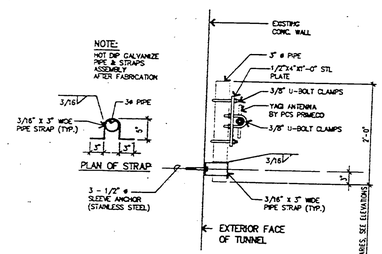


B / A-3 ANTENNA TOWER ELEVATION FROM HONOLULU APPROACH
SCALE: 1/8" = 1'-0"



A / A-3 PARTIAL SECTION AT HONOLULU SIDE OF TUNNELS
SCALE: 1" = 1'-0"



1 / A-3 YAGI ANTENNA MOUNTING DETAIL
SCALE: 1" = 1'-0"

D018

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PALI TUNNEL CELL SITE
PALI TUNNEL

PALI HIGHWAY · HONOLULU, HI

ANTENNA ELEVATION MOUNTING DETAIL PARTIAL SECTION

Designed by
Drawn by
Project No. 95237
Date 10-15-96
Sheet No.
A-3