

ENGINEERING STATEMENT

The engineering data contained herein have been prepared on behalf of HAWAII CATHOLIC TV, INC., licensee of full-power digital television station KUPU-DT, Channel 15 in Waimanalo, Hawaii, in support of this Application for Construction Permit to modify the existing distributed transmission system (DTS) authorized in BLCDT-20121203AYU. It is proposed herein to operate the DTS-1 node at a new site, with a new antenna and effective radiated power, and to change the antenna and effective radiated power of the DTS-2 node as well as correct its site coordinates and height.

Below are operating parameters for the main (DTS-1) and DTS-2 facilities:

KUPU-DT MAIN TRANSMITTER SITE (REFERENCE SITE)

Site Name : Pu'u Papa'a

Site Coordinates (NAD83) : 21-25-19.6 N, 157-45-27.1 W

Tower ASRN : 1246610

Ground Elevation : 141.7 meters

Overall Tower Height Above Ground : 35.4 meters

Antenna Radiation Center Above Ground : 25.9 meters

Antenna Radiation Center Above Mean Sea Level : 167.6 meters

Effective Radiated Power : 8.2 kW (H-only)

Antenna Make/Model : Aldena US-Peanut

FCC Antenna ID : 1007391

Type : Horizontally Polarized, Directional

Electrical Beam Tilt : 0 degrees

Orientation : 0 degrees true

Main Lobes of Radiation : 0 and 180 degrees true

EXHIBIT A

KUPU-DT DTS-2 TRANSMITTER SITE

Site Name : Mauna Kapu

Site Coordinates (NAD83) : 21-24-11.0 N, 158-05-52.4 W

Tower ASRN : none

Ground Elevation : 822.3 meters

Overall Tower Height Above Ground : 20.4 meters

Antenna Radiation Center Above Ground : 17.0 meters

Antenna Radiation Center Above Mean Sea Level : 839.3 meters

Effective Radiated Power : 29.6 kW

Antenna Make/Model : Aldena 6-bay

FCC Antenna ID : 1008174

Type : Horizontally Polarized, Directional (Very Narrow Cardioid Pattern)

Electrical Beam Tilt : 0 degrees

Orientation : 100 degrees true

Main Lobe of Radiation : 100 degrees true

Exhibit B-1 is a map upon which the predicted service contours of the proposed KUPU-DT DTS-1 node are plotted. As shown, the community of Waimanalo is completely encompassed by the 48 dBu city-grade service contour of the main (reference) KUPU-DT facility. Exhibit B-2 is a map upon which the predicted service contours of the newly proposed DTS-2 facility are plotted. Exhibit B-3 is a map which shows the combined coverage of the main and DTS-2 facilities.

As shown in Exhibit B-4, the entire coverage of the KUPU-DT DTS facility proposed herein lies within the allowable 103-kilometer FCC Table of Distances arc extending from the KUPU-DT reference site.

EXHIBIT A

Elevation and azimuth pattern information for the KUPU-DT DTS-1 and DTS-2 antennas are provided in Exhibits C-1 and C-2, respectively.

We conducted a TVStudy interference study for the proposed DTS facility, using a cell size of 2 kilometers and increment spacing of 1.0 kilometer. The results are provided in Exhibit D. It concludes that the proposed KUPU-DT DTS facility on Channel 15 meets the Commission's *de minimis* interference criteria to all co-channel and adjacent-channel full-power and Class A facilities.

Power density calculations for both the main (reference) site and the DTS-2 sites appear in Exhibit E.

As a result of these showings, it is believed that the proposed facility meets all of the requirements of Section 73.626(f) of the Commission's DTS Rules as follows:

- (1) The combined coverage from the two DTS transmitters covers all of the presently authorized KUPU-DT service area.
- (2) All of the DTS facilities coverage is contained within the KUPU-DT F(50,90) Table of Distances area defined by the allowable 103-kilometer arc from the reference site.
- (3) Each DTS transmitter's coverage overlaps that of another DTS transmitter's coverage.
- (4) The coverage from one or more DTS transmitter(s) is shown to provide principal community coverage over Waimanalo, Hawaii, as required by FCC Rules
- (5) The combined field strength of all the DTS transmitters in the network does not cause interference to another station in excess of the criteria specified in § 73.616.
- (6) Each DTS transmitter is located within the KUPU-DT Table of Distances area and/or its authorized service area.

EXHIBIT A

A loss area analysis is provided in Exhibit F. It shows that any loss area created by this proposal is adequately served by five or more full-power television station contours.

I declare under penalty of perjury that the foregoing statements and the attached exhibits, which were prepared by me or under my immediate supervision, are true and correct to the best of my knowledge and belief.

A handwritten signature in blue ink, appearing to read "K. T. Fisher". The signature is stylized with a large "K" and a long horizontal stroke at the end.

KEVIN T. FISHER

May 16, 2023

CONTOUR POPULATION (2020 U.S. CENSUS DATA)
48 DBU (CITY GRADE) : 512,253 (212,636 HOUSEHOLDS)
N/L SERVICE : 601,423 (241,683 HOUSEHOLDS)

SMITH AND FISHER, LLC

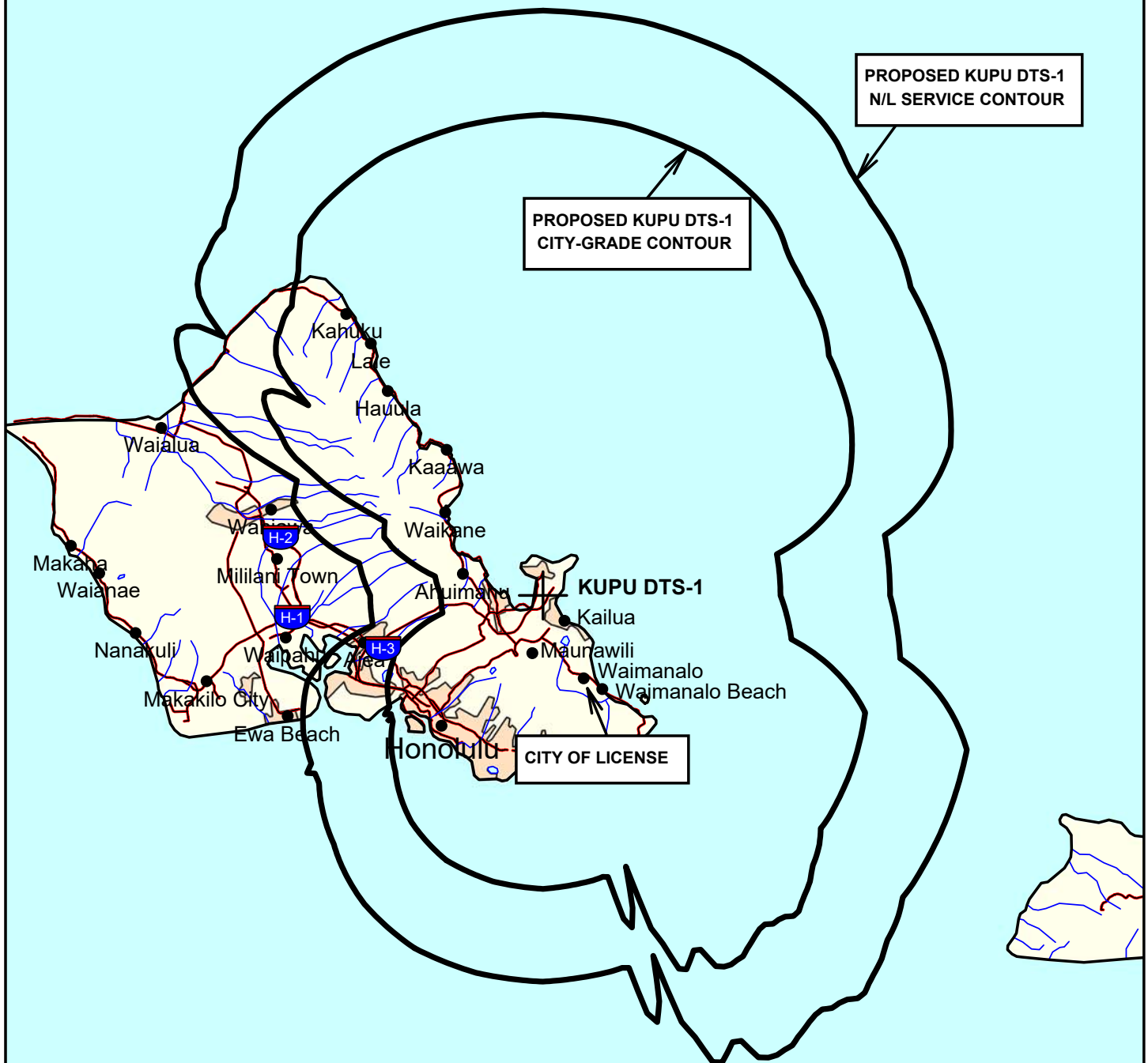


EXHIBIT B-1
PREDICTED SERVICE CONTOURS
PROPOSED DTS-1 NODE
CHANNEL 15 - WAIMANALO, HAWAII

CONTOUR POPULATION (2020 U.S. CENSUS DATA)
48 DBU (CITY GRADE) : 1,011,688 (368,651 HOUSEHOLDS)
N/L SERVICE : 1,016,839 (371,160 HOUSEHOLDS)

SMITH AND FISHER, LLC

PROPOSED KUPU DTS-2
N/L SERVICE CONTOUR

PROPOSED KUPU DTS-2
CITY-GRADE CONTOUR

KUPU DTS-2

Waianae

Nanakuli

Ewa Beach

Honolulu

CITY OF LICENSE

Lake

Hauula

Kaaawa

Waikane

Kaneohe

Waimanalo Beach

Kualapuu

Kaunakakai

Scale 1:800,000

0 6 12 18 mi

EXHIBIT B-2
PREDICTED SERVICE CONTOURS
PROPOSED DTS-2 NODE
CHANNEL 15 - WAIMANALO, HAWAII

PROPOSED KUPU DTS-1
N/L SERVICE CONTOUR

PROPOSED KUPU DTS-2
N/L SERVICE CONTOUR

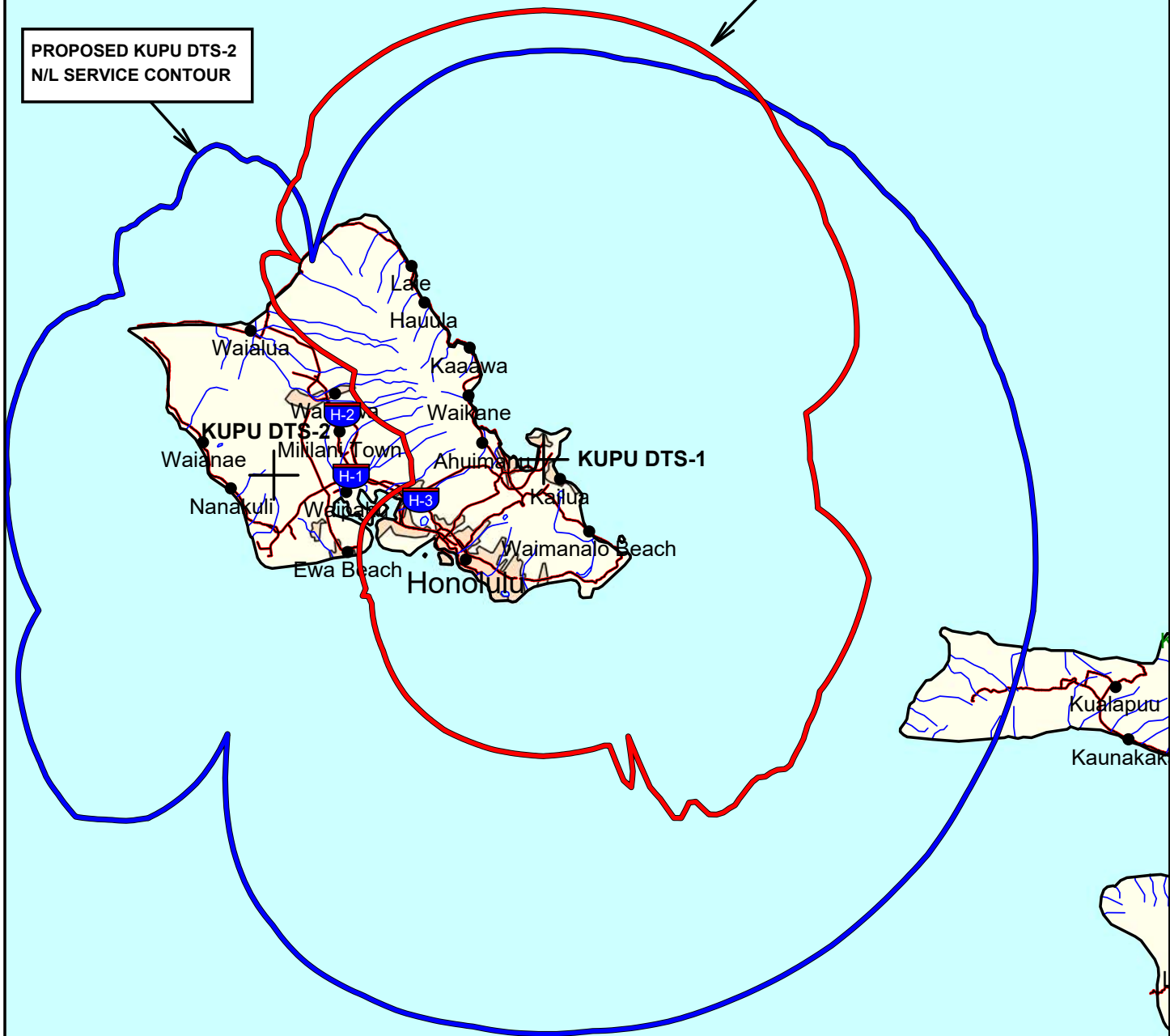


EXHIBIT B-3
COMBINED DTS-1 AND DTS-2 COVERAGE
PROPOSED KUPU-DT FACILITY
CHANNEL 15 - WAIMANALO, HAWAII

FCC 103-KM F(50,90)
TABLE OF DISTANCES
ARC FOR UHF DTS FACILITIES

PROPOSED KUPU DTS-1
N/L SERVICE CONTOUR

PROPOSED KUPU DTS-2
N/L SERVICE CONTOUR

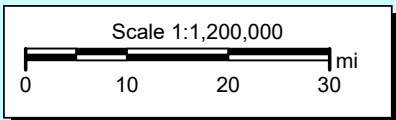
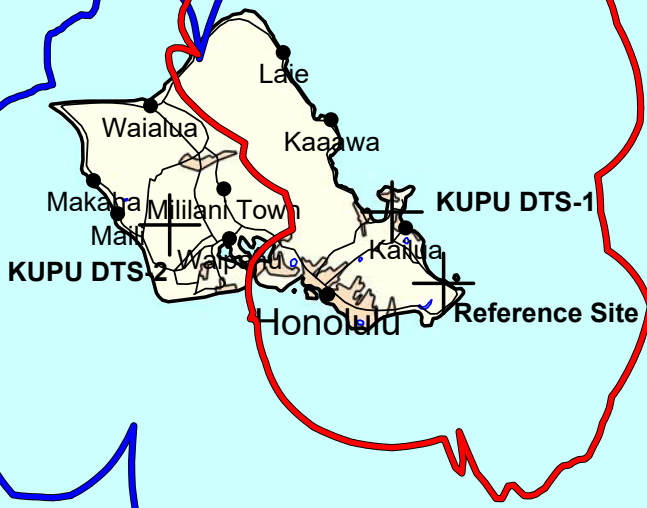


EXHIBIT B-4
PROPOSED KUPU DTS COVERAGE
WITHIN 103-KM TABLE OF DISTANCES ARC
CHANNEL 15 - WAIMANALO, HAWAII

TX station: KUPU DTS-1
Frequency: 479.00 MHz Gain solid
integration : enabled

Locality: US - Peanut

Antennas arrays data

Note: calculation of single antennas arrays data (without taking into account mutual effects)

A. Antennas array azimuth (°/N)	0	180
B. Number of antennas	4	4
C. Nominal power supply (W)	0.50	0.50
D. Losses (addit. + cables) (dB)	0.0	0.0
E. Effective power supply (W)	0.50	0.50
F. Theor. maximum gain (dBd)	16.62	16.62
G. Distribution losses (dB)	0.00	0.00
H. Nominal max gain F - G (dBd)	16.62	16.62
I. Compensation losses (dB)	0.00	0.00
J. Effec. max gain H - I (dBd)	16.62	16.62
K. Effec. max gain (times)	45.90	45.90
L. Effec. max power E * K (KW)	0.0229	0.0229
M. Max power depr. angle (°)	0.0	0.0
N. Max power az. angle (°)	0	180

Diagram in dBK calculated at horizon

Az. (°/N)	dBK	Az. (°/N)	dBK	Az. (°/N)	dBK	Az. (°/N)	dBK
0	-15.8	90	-36.4	180	-15.8	270	-36.4
10	-16.1	100	-35.1	190	-16.1	280	-35.1
20	-16.9	110	-27.6	200	-16.9	290	-27.6
30	-18.8	120	-26.6	210	-18.8	300	-26.6
40	-21.9	130	-25.9	220	-21.9	310	-25.9
50	-25.1	140	-21.9	230	-25.1	320	-21.9
60	-26.6	150	-18.8	240	-26.6	330	-18.8
70	-29.1	160	-17.0	250	-29.1	340	-17.0
80	-36.4	170	-16.2	260	-36.4	350	-16.2

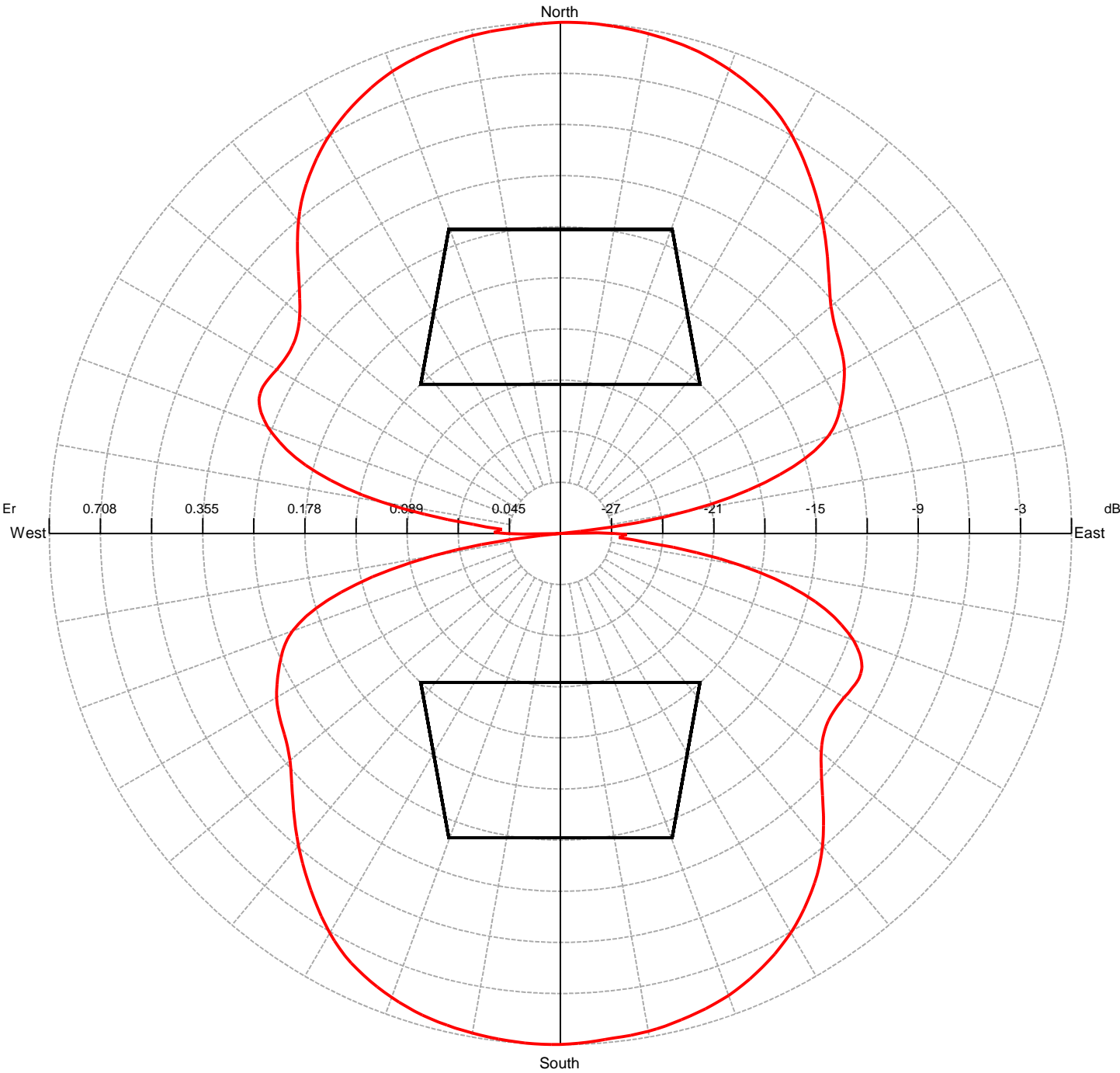
Diagram in dBK calculated at horizon
(without -20dB\’s lower limit vs maximum power)

Az. (°/N)	dBK	Az. (°/N)	dBK	Az. (°/N)	dBK	Az. (°/N)	dBK
0	-15.8	90	-42.6	180	-15.8	270	-42.6
10	-16.1	100	-35.1	190	-16.1	280	-35.1
20	-16.9	110	-27.6	200	-16.9	290	-27.6
30	-18.8	120	-26.6	210	-18.8	300	-26.6
40	-21.9	130	-25.9	220	-21.9	310	-25.9
50	-25.1	140	-21.9	230	-25.1	320	-21.9
60	-26.6	150	-18.8	240	-26.6	330	-18.8
70	-29.1	160	-17.0	250	-29.1	340	-17.0
80	-38.2	170	-16.2	260	-38.2	350	-16.2

TX station: KUPU DTS-1
Frequency: 479.00 MHz Gain solid
integration : enabled

Locality: US - Peanut

Horizontal diagram at 0.0° depres. (Total Antenna)

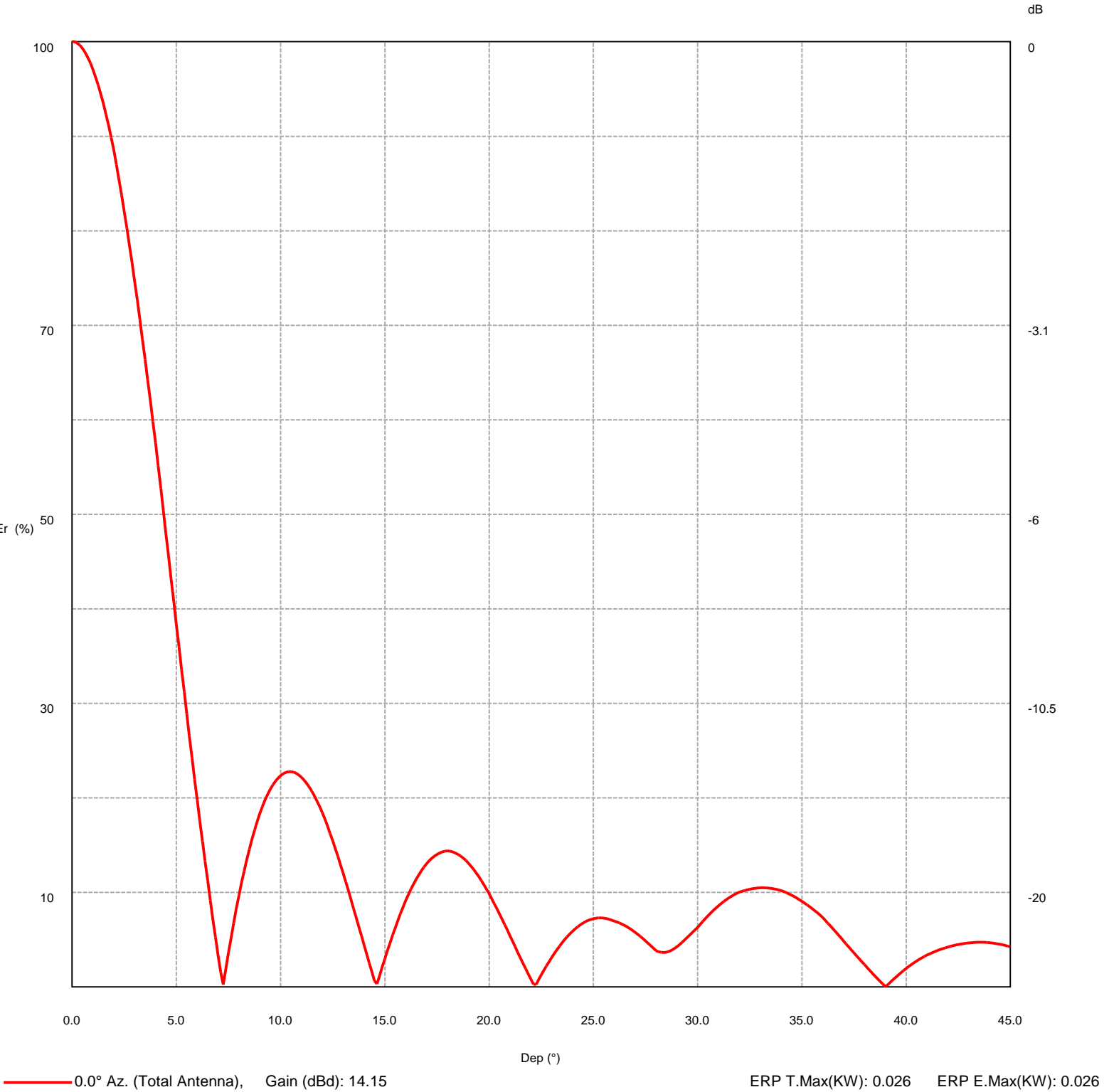


0.0° depres. (Total Antenna), Gain (dBd): 14.16 ERP T.Max(KW): 0.026 ERP E.Max(KW): 0.026

TX station: KUPU DTS-1
Frequency: 479.00 MHz Gain solid
integration : enabled

Locality: US - Peanut

Vertical diagram at an azimuth of 0.0° degrees

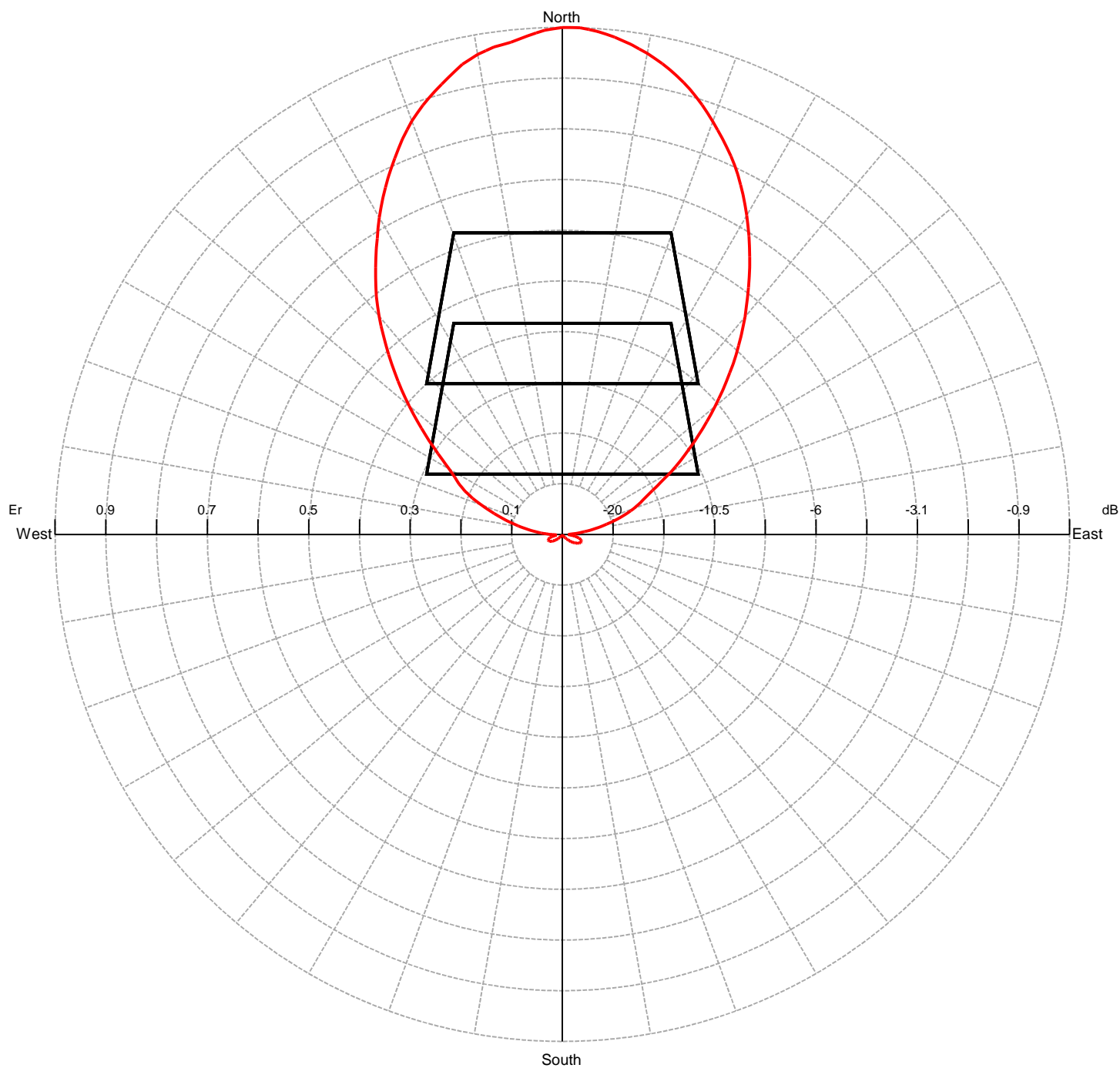


TX station: KUPU DTS-2

Frequency: 479.00 MHz Gain solid
integration : enabled

Locality: Very Narrow Cardioid - 6 bay

Horizontal diagram at 0.0° depres. (Total Antenna)



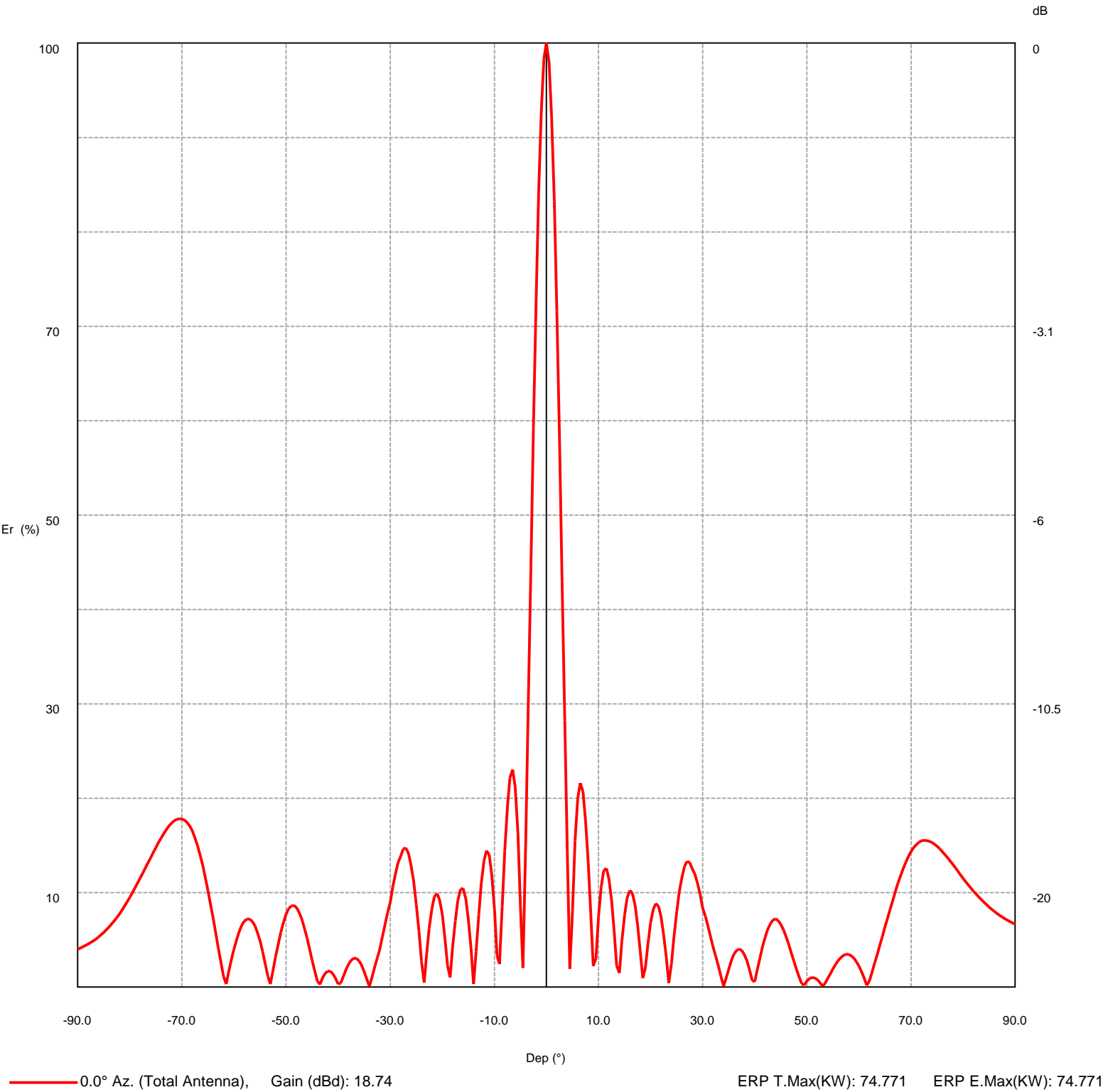
0.0° depres. (Total Antenna), Gain (dBd): 18.74

ERP T.Max(KW): 74.774 ERP E.Max(KW): 74.774

TX station: KUPU DTS-2
Frequency: 479.00 MHz Gain solid
integration : enabled

Locality: Very Narrow Cardioid - 6 bay

Vertical diagram at an azimuth of 0.0° degrees



TVSTUDY INTERFERENCE ANALYSIS RESULTS
PROPOSED KUPU-DT
CHANNEL 15 – WAIMANALO, HAWAII

Study created: 2023.05.17 12:02:43

Study build station data: LMS TV 2023-04-28

Proposal: KUPU D15 DD LIC WAIMANALO, HI

File number: BLCDT20121203AYU

Facility ID: 89714

Station data: User record

Record ID: 153

Country: U.S.

Zone: II

Ref. lat.: 21 19 11.50 N

Ref. long.: 157 40 43.10 W

DTS sites: 2

Stations potentially affected by proposal:

IX	Call	Chan	Svc	Status	City, State	File Number	Distance
Yes	KOGG	D16	DT	LIC	WAILUKU, HI	BLCDT20090123ACH	155.4 km

No non-directional AM stations found within 0.8 km

No directional AM stations found within 3.2 km

Record parameters as studied, DTS site # 1:

Channel: D15

Latitude: 21 25 19.60 N (NAD83)

Longitude: 157 45 27.10 W

Height AMSL: 167.6 m

HAAT: 76.3 m

Peak ERP: 8.20 kW

Antenna: Aldena Peanut 0.0 deg

Elev Pattn: Generic

38.8 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	8.20 kW	166.8 m	58.5 km
45.0	1.44	165.8	50.1
90.0	0.071	167.6	34.7
135.0	1.34	154.4	49.0
180.0	8.20	-10.3	38.9
225.0	1.44	-67.1	31.3
270.0	0.071	-107.1	17.5
315.0	1.34	140.4	48.0

Record parameters as studied, DTS site # 2:

Channel: D15

Latitude: 21 24 11.00 N (NAD83)

Longitude: 158 5 52.40 W

Height AMSL: 839.3 m

HAAT: 687.5 m

Peak ERP: 30.1 kW

Antenna: Aldena Very Narrow Cardioid 0.0 deg

Elev Pattn: Generic

38.8 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	0.027 kW	406.3 m	40.1 km
45.0	3.08	579.4	75.2
90.0	27.7	748.6	98.7
135.0	12.5	791.6	92.7
180.0	0.147	763.8	58.5
225.0	0.019	784.9	45.1
270.0	0.003	787.9	33.3
315.0	0.003	637.5	31.3

Database HAAT does not agree with computed HAAT

Database HAAT: 688 m Computed HAAT: 687 m

DTS proposal coverage is within reference facility and distance limit

Distance to Canadian border: 4195.4 km

Distance to Mexican border: 4151.1 km

**Proposal is within coordination distance of FCC monitoring station

**Proposal exceeds field strength limit at FCC monitoring station

Conditions at FCC monitoring station: Waipahu HI

DTS site # 2 Bearing: 105.8 degrees Distance: 11.0 km

ERP: 28.7 kW HAAT: 795.3 m Field strength: 84.5 dBu, 16.7 mV/m

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:

DTS site # 1 Bearing: 54.7 degrees Distance: 5339.1 km

DTS site # 2 Bearing: 54.7 degrees Distance: 5369.1 km

No land mobile station failures found

Study cell size: 2.00 km

Profile point spacing: 1.00 km

Maximum new IX to full-service and Class A: 0.50%

Maximum new IX to LPTV: 2.00%

No IX check failures found.

POWER DENSITY CALCULATION

PROPOSED KUPU-DT DTS FACILITY
CHANNEL 15 – WAIMANALO, HAWAII

Since the FCC considers the possible biological effects of RF transmissions in its environmental determinations, we have studied the matter with respect to this Waimanalo facility. Below are the calculations for the DTS-1 and DTS-2 sites:

DTS-1 Site (Pu'u Papa'a)

Employing the methods set forth in OET Bulletin No. 65 and considering a main-lobe effective radiated power of 40.0 kW, an antenna radiation center 25.9 meters above ground, and a vertical relative field value of 10 percent at the steeper elevation angles for the proposed Aldena panel antenna, maximum power density two meters above ground of 0.0047 mW/cm^2 is calculated to occur near the northern southern base of the tower. Since this is only 1.5 percent of the 0.32 mW/cm^2 reference for uncontrolled environments (areas with public access) surrounding a facility operating on Channel 15 (476-482 MHz), a grant of this proposal may be considered a minor environmental action with respect to public and occupational exposure to non-ionizing electromagnetic radiation.

Further, the station owner will take whatever precautionary steps are necessary, such as reducing power or leaving the air temporarily, to ensure that workers operating in the vicinity of the antenna are not exposed to excessive non-ionizing radiation.

EXHIBIT E

KUPU-DT DTS-2 Site (Mauna Kapu)

Employing the methods set forth in *OET Bulletin No. 65* and considering a main-lobe effective radiated power of 30.1, an antenna radiation center 17 meters above ground, and the specific elevation pattern of the proposed Aldena 6-bay very narrow cardioid antenna, maximum power density two meters above ground of $0.0.098 \text{ mW/cm}^2$ is calculated to occur 5 meters east-southeast of the base of the tower. Since this is only 30.6 percent of the 0.32 mW/cm^2 reference for uncontrolled environments (areas with public access) surrounding a facility operating on Channel 15 (476-482 MHz), a grant of this proposal may be considered a minor environmental action with respect to public exposure to non-ionizing electromagnetic radiation.

Further, the station owner will take whatever precautionary steps are necessary, such as reducing power or leaving the air temporarily, to ensure that workers operating in the vicinity of the antenna are not exposed to excessive non-ionizing radiation.

LOSS AREA ANALYSIS

We have analyzed the area and population that is presently located within the licensed KUPU-DT DTS service contours and located outside the proposed DTS service contours. This will be referred to as “contour-based loss area”.

Exhibit F-2 is a map upon which we have plotted the 38.83 dBu noise-limited, dipole-adjusted digital service contours of the licensed KUPU DTS facility in relation to those proposed herein. As shown, there is a small loss area located on the island of Molokai at the eastern boundary of the licensed DTS-1 contour. Exhibit F-3 is a detailed map showing the loss area. According to the 2020 U.S. Census, there are 2,450 people living within the contour-based loss area.

In Exhibit F-4, we show the combined Longley-Rice-based 38.83 dBu coverage of the proposed DTS facilities within the area surrounding and within the loss area. The orange portion of the loss area that does not receive a predicted 38.83 dBu service (or better) from the proposed DTS facilities contains 581 people, according to the 2020 U.S. Census data.

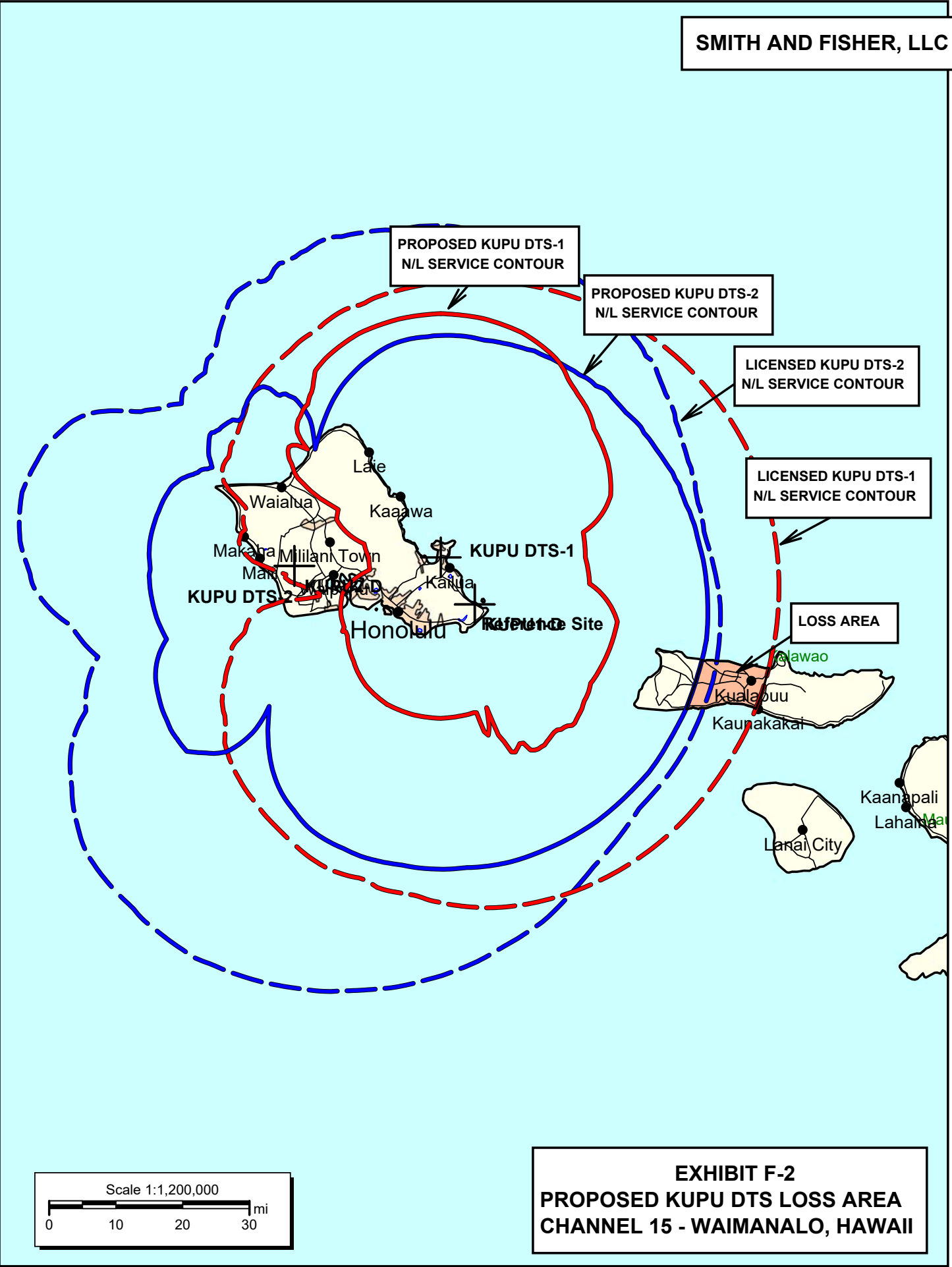
In Exhibit F-5, we show the results from the same combined Longley-Rice-based coverage analysis for the licensed KUPU DTS facilities. The number of people that receive a 38.83 dBu signal (or better) from the licensed DTS facilities that do not receive the same from the proposed DTS facilities is 85, according to the 2020 Census. This is a de minimis value according to the FCC standards.

Exhibit F-6 is a map upon which we have plotted the noise-limited service contours of all full-power stations that overlap some or all of the contour-based loss area. Exhibit F-7 is a list of the stations used in our study.

EXHIBIT F-1

In Exhibit F-6, note that we have shown the contour-based loss area in detail and have counted the number of other television stations within each “pocket” of that area. Through this study, we have determined that the entire loss area lies within at least five other television station contours, and in some cases, significantly more than five service contours.

As a result of the loss area being covered by the service contours of at least five other full-power stations, the Commission considers the loss area created by the KUPU DTS proposal to be “adequately served” by other stations, thus minimizing the impact to viewers regarding the change in operation.



Scale 1:1,200,000

A horizontal scale bar with a black outline. It is divided into four equal segments by three vertical tick marks. Below the bar, the numbers 0, 10, 20, and 30 are placed at the corresponding tick marks. The unit 'mi' is placed at the far right end of the bar.

EXHIBIT F-2
PROPOSED KUPU DTS LOSS AREA
CHANNEL 15 - WAIMANALO, HAWAII

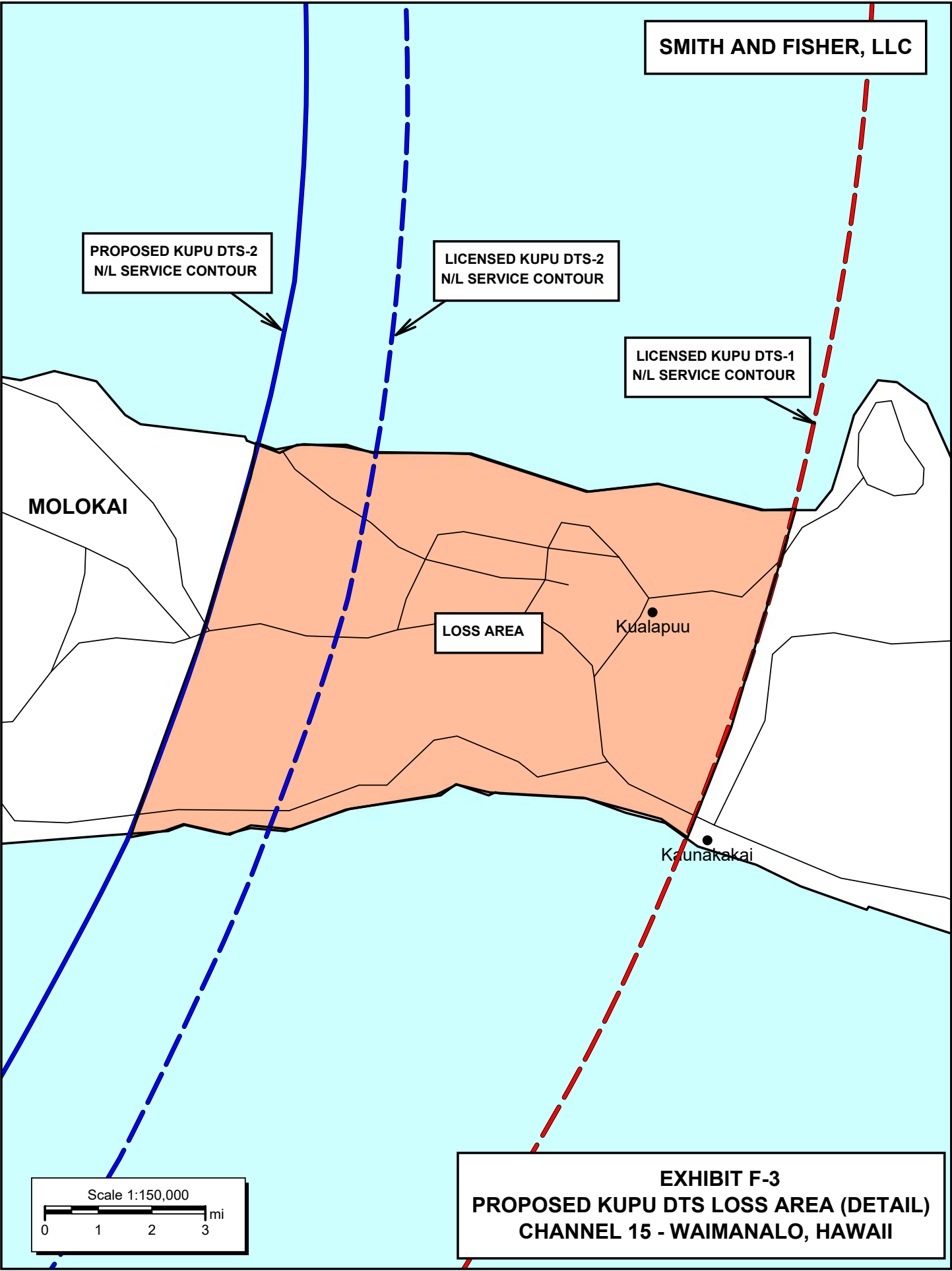
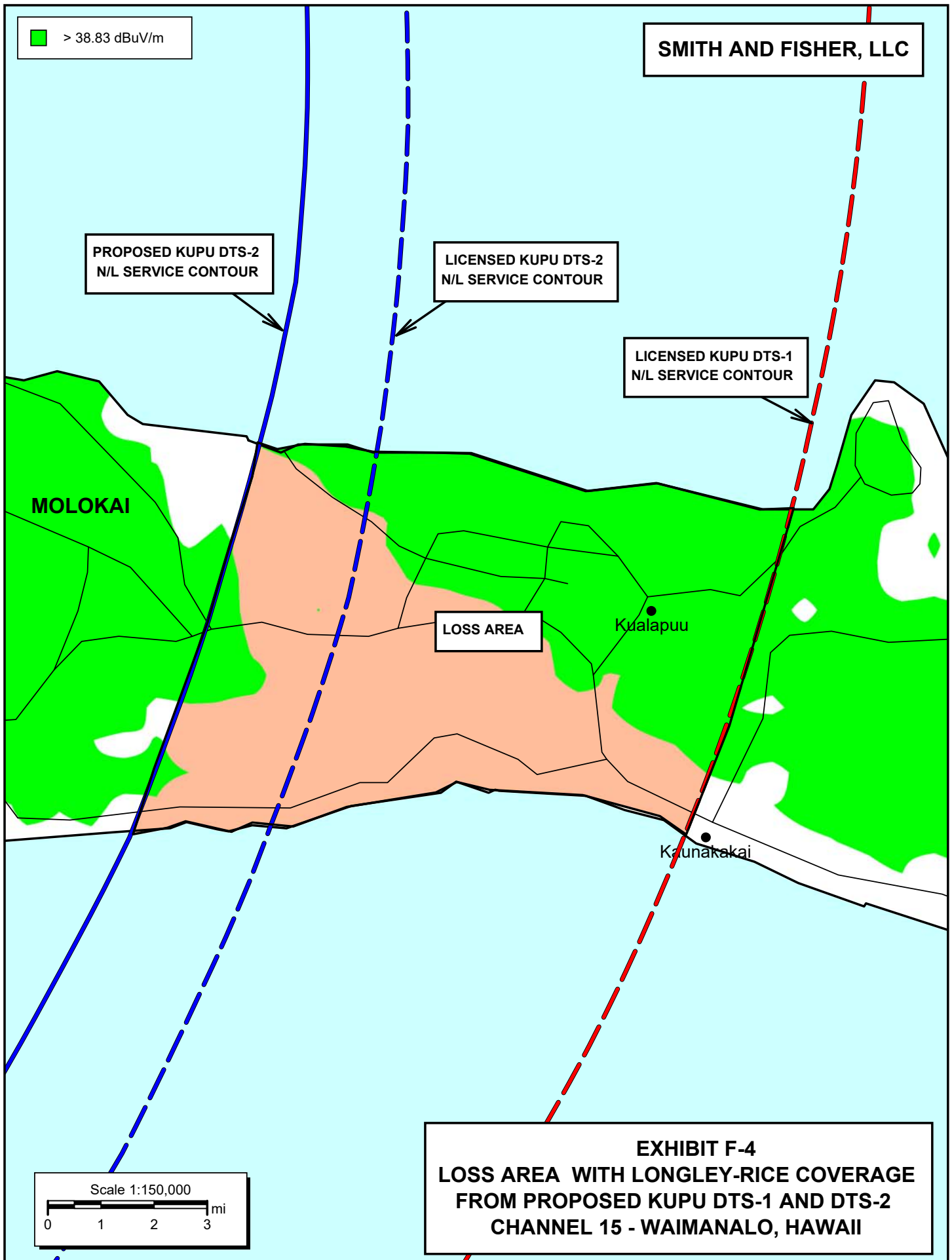
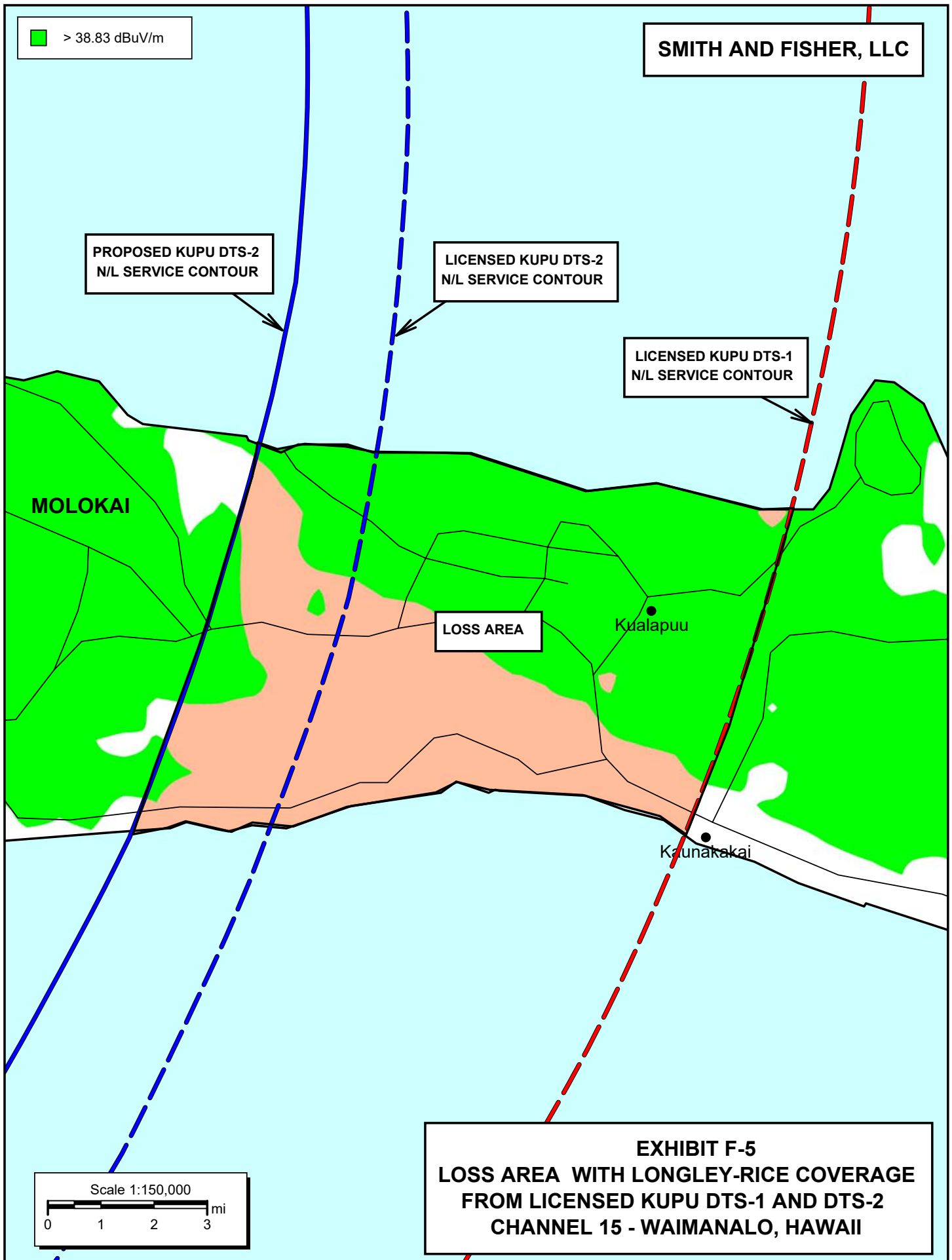
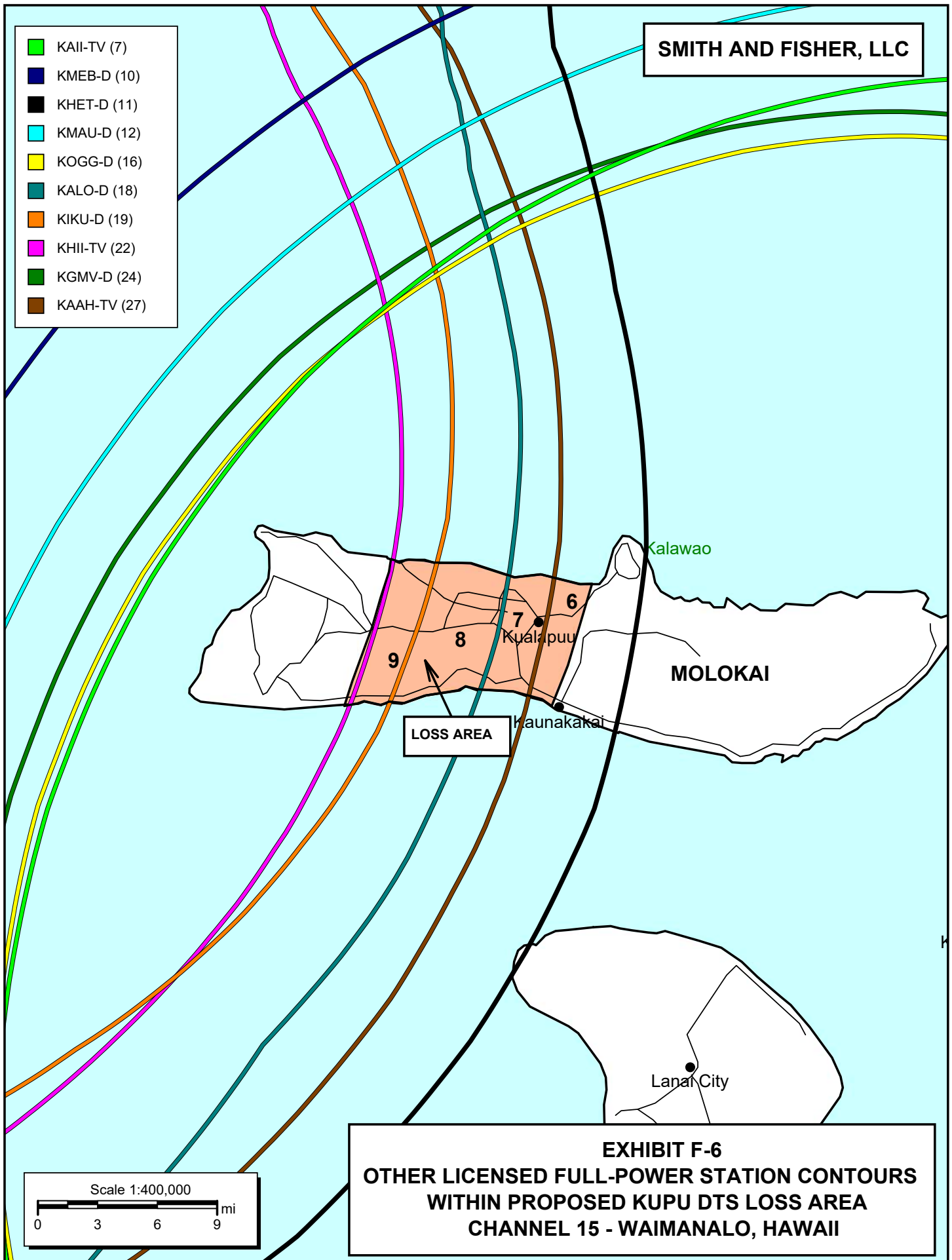


EXHIBIT F-3
PROPOSED KUPU DTS LOSS AREA (DETAIL)
CHANNEL 15 - WAIMANALO, HAWAII







OTHER FULL-POWER STATIONS CONSIDERED IN LOSS AREA ANALYSIS

PROPOSED KUPU-DT DTS FACILITY
CHANNEL 15 – WAIMANALO, HAWAII

Call Sign	Lic	Ch.	City	ST	DA	ERP(kW)	HAAT (m)	Fac.ID	File Number	Licensee
KAII-TV	LI	7	Wailuku	HI	Yes	3.69	753.0	4145	BLCDT-20090126ADW	Nexstar Media Inc.
KMEB-D	LI	1	Wailuku	HI	Yes	21.13	747.0	26428	BLEDT-20090701AAO	Hawaii Public Tel.Found.
KHET-D	LI	11	Honolulu	HI	Yes	15.7	625.0	26431	BLEDT-20090330ABT	Hawaii Public Tel.Found
KMAU-D	LI	12	Wailuku	HI	Yes	9.0	747.0	64551	BLCDT-20090127AAF	Kitv, Inc.
KOGG-D	LI	16	Wailuku	HI	Yes	50.0	818.0	34859	BLCDT-20090123ACH	Gray Television Lic., LLC
KALO-D	LI	18	Honolulu	HI	Yes	103.0	687.5	51241	LMS-0000129308	Kalo TV, Inc.
KIKU-D	LI	19	Honolulu	HI	Yes	60.7	606.4	34527	BLCDT-20030813AAU	Kitv, Inc.
KHII-TV	LI	22	Honolulu	HI	Yes	40.0	629.0	36917	LMS-0000201996	Nexstar Media Inc.
KGMV-D	LI	24	Wailuku	HI	Yes	77.0	755.0	36920	BLCDT-20090126ADX	Nexstar Media Inc.
KAAH-TV	LI	27	Honolulu	HI	Yes	262.0	580.0	3246	BLCDT-20061027AGR	Trinity Bcg. Of Texas