



Appendix C: Microwave Connectivity

Public Safety Communications System Assessment and Design

Broome County, New York

Engineering Report

June 28, 2012



Blue Wing

Public Safety Communications System Assessment and Design

Broome County, New York
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1 Introduction

Path profiles interconnecting Broome County existing and proposed transmitter sites are created and detailed in this memorandum. The frequency of operation is 6.1 GHz or 11 GHz depending on path length, antenna heights are 125 feet (38.1 meters), and tree heights are 110 feet (34 meters). The analysis is a first pass at determining whether a microwave link between sites is feasible.



2 County Sites

The sites employed in the path profiles are given in Table 2-1.

Site	Latitude	Longitude	Elevation (feet)
Andrews Rd	42 04 51.90 N	076 01 07.20 W	1480.73
Deposit	42 04 00.60 N	075 27 16.00 W	1903.39
Doraville	42 10 20.30 N	075 34 27.50 W	1548.63
Dunbar	42 06 49.50 N	075 44 38.60 W	1809.51
Ely Park	42 07 09.70 N	075 55 10.20 W	1399.55
Gulf Summit	42 01 39.70 N	075 30 47.90 W	1764.3
Hawkins Hill	42 12 24.70 N	075 45 43.50 W	1705.92
Ingraham	42 03 43.00 N	075 56 34.50 W	1700.15
Kirkwood	42 02 40.00 N	075 48 00.00 W	857.24
Lester (O)	42 02 52.40 N	075 44 02.20 W	1785.7
Popple Hill	42 20 36.90 N	076 07 03.90 W	1603.37
Lisle Park	42 23 05.60 N	076 01 06.70 W	1459.67
Maine	42 12 09.10 N	076 01 36.50 W	1477.64
N. Sanford	42 07 44.90 N	075 25 46.20 W	1931.63
Old State Road	42 08 11.10 N	075 52 33.20 W	1514.22
Pease Hill	42 17 49.00 N	075 57 02.00 W	1560.15
Port Crane (O)	42 10 21.00 N	075 50 52.00 W	1347
Round Top	42 05 21.10 N	076 04 16.10 W	1062.05
Sanford	42 08 05.50 N	075 30 31.60 W	1777.37
Tuscarora (O)	42 03 43.00 N	075 34 12.00 W	1826.12
Union	42 09 00.70 N	076 02 07.20 W	1450.16
Vestal	42 00 08.50 N	076 02 00.20 W	1741.89
Vestal (O)	42 02 59.00 N	076 02 53.00 W	1386.01
Windsor	42 04 33.00 N	075 36 20.70 W	1775.85
911 Center	42 07 55.56 N	075 54 59.90 W	906.6

Table 2-1: Sites



3 Path Profiles

The path profiles created and the results are given in Table 3-1 along with its corresponding Figure number. Within the “Path Status” Column given is whether the path is clear or obstructed by terrain or trees.

Site	Site	Path Status	Figure #
All	All	Clear- Blue Solid Line, Obstructed Terrain- Red Solid Line, Obstructed Trees – Green Solid Line	1
Popple Hill	Lisle Park	Clear	2
Popple Hill	Maine	Clear	3
Union	Maine	Clear	4
Round Top	Union	Clear	5
Round Top	Andrews Rd	Clear	6
Vestal	Andrews Rd	Clear	7
Vestal	Ingraham	Obstructed - Trees	8
Ingraham	Ely Park	Clear	9
Ely Park	Old State Road	Clear	10
Old State Road	Dunbar	Obstructed - Trees	11
Dunbar	Windsor	Clear	12
Windsor	Gulf Summit	Obstructed - Trees	13
Gulf Summit	Deposit	Clear	14
Deposit	N. Sanford	Obstructed - Trees	15
Hawkins Hill	N. Sanford	Obstructed - Trees	16
Pease Hill	Hawkins Hill	Obstructed - Trees	17
Lisle Park	Pease Hill	Clear	18
Vestal (O)	Andrews Rd	Clear	19
Old State Road	Port Crane (O)	Obstructed - Trees	20
Old State Road	Kirkwood	Obstructed - Trees	21
Dunbar	Lester (O)	Obstructed - Trees	22
Dunbar	Doraville	Obstructed - Trees	23
Sanford	N. Sanford	Obstructed - Trees	24
Tuscarora (O)	Deposit	Obstructed - Trees	25
911 Center	Old State Road	Clear	26

Table 3-1: Path Status

3.1 Path Profile Images



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The path profile images are shown in the Figures that follow.

Shown in Figure 3-1 are all paths investigated. The thicker solid lines show the proposed ring configuration and dashed lines show proposed spurs.

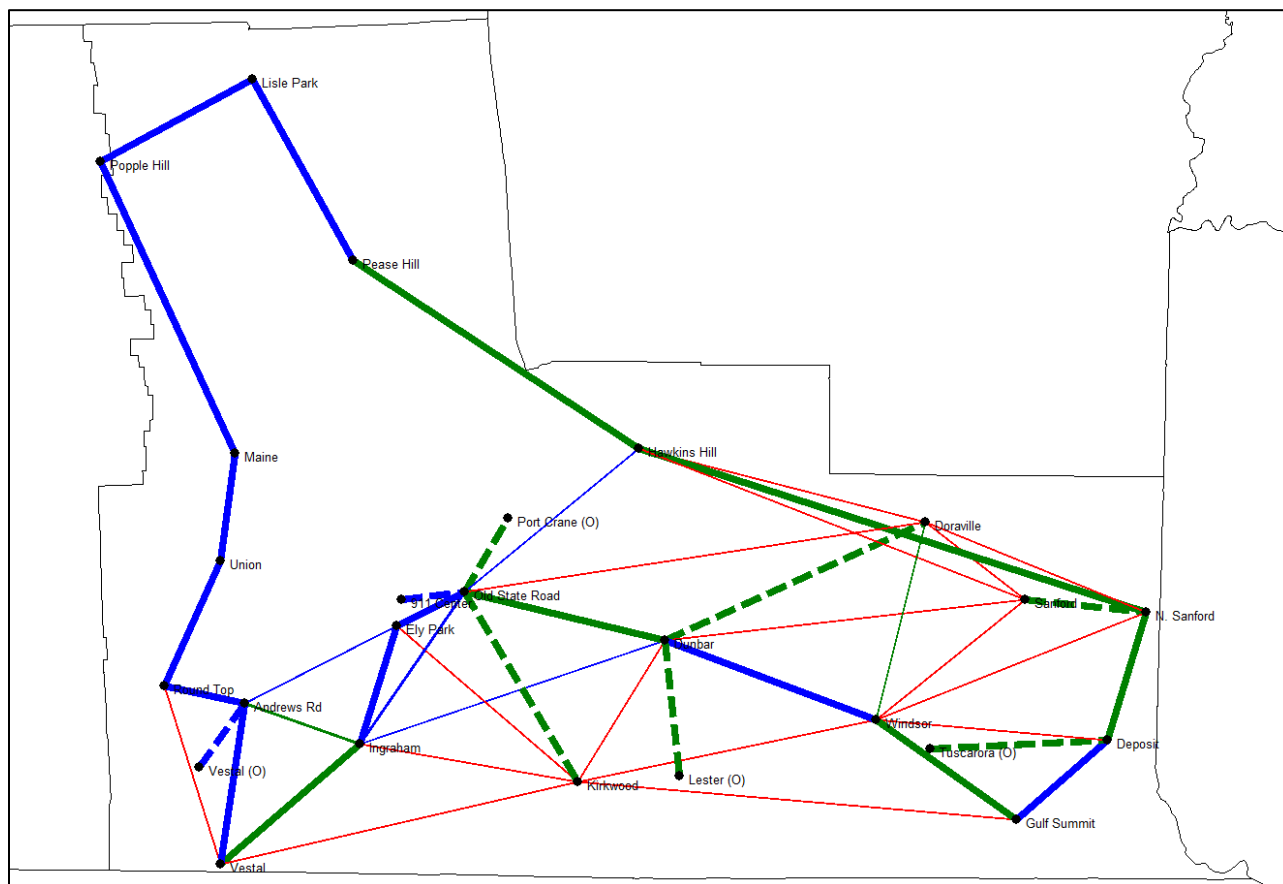


Figure 3-1: Path Profile Status



Blue Wing

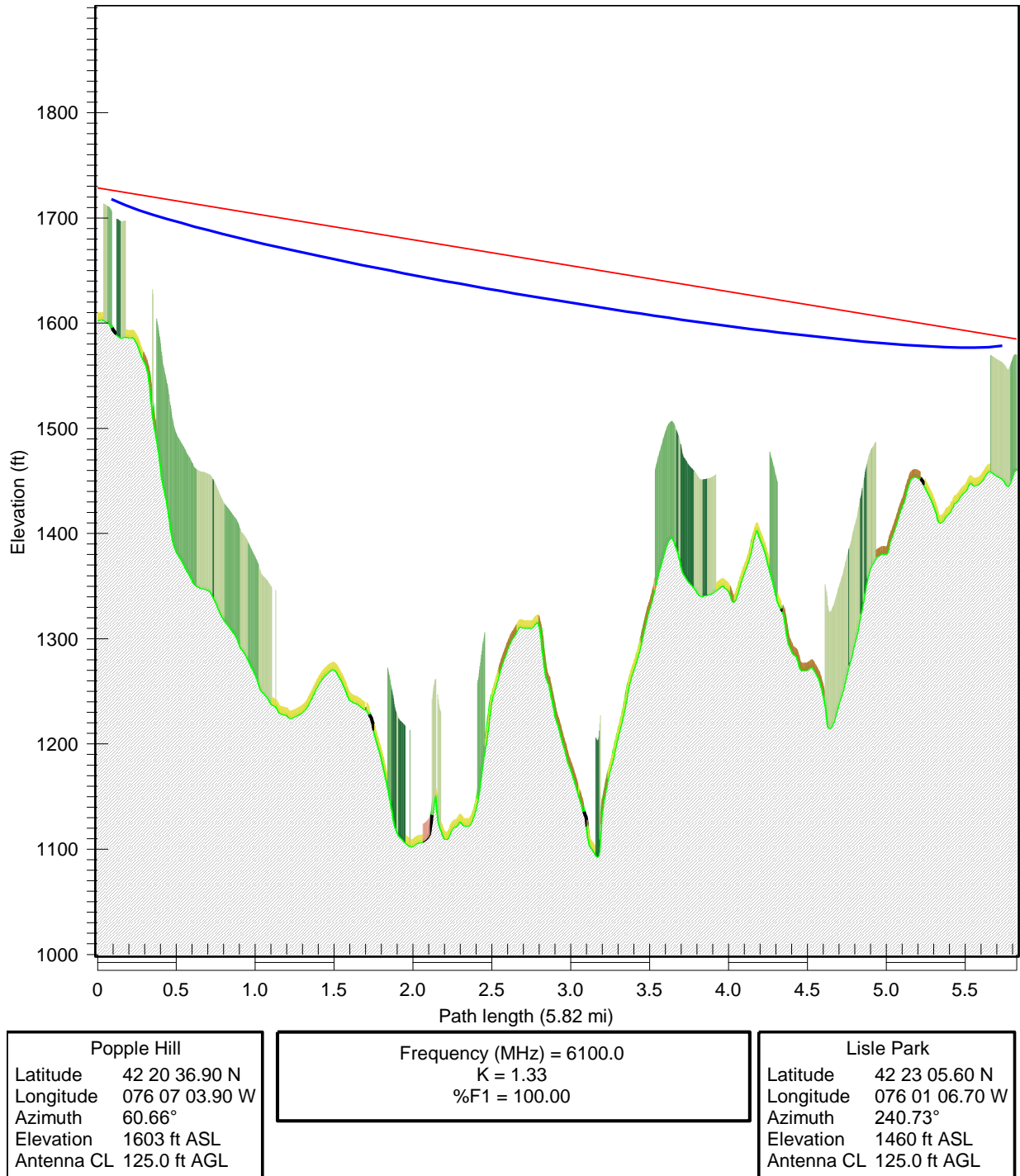


Figure 3-2: Popple Hill to Lisle Park



Blue Wing

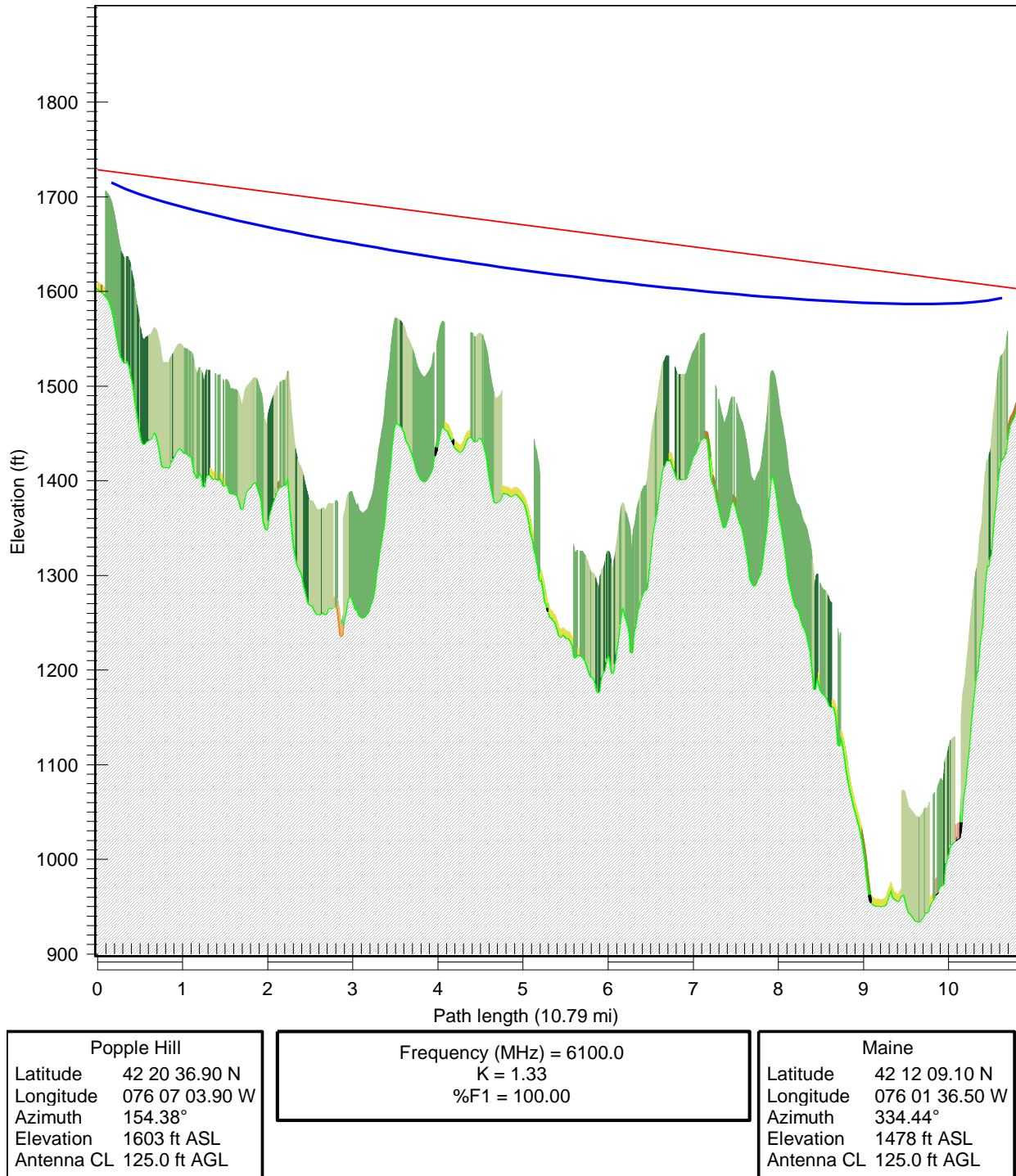


Figure 3-3: Popple Hill to Maine



Blue Wing

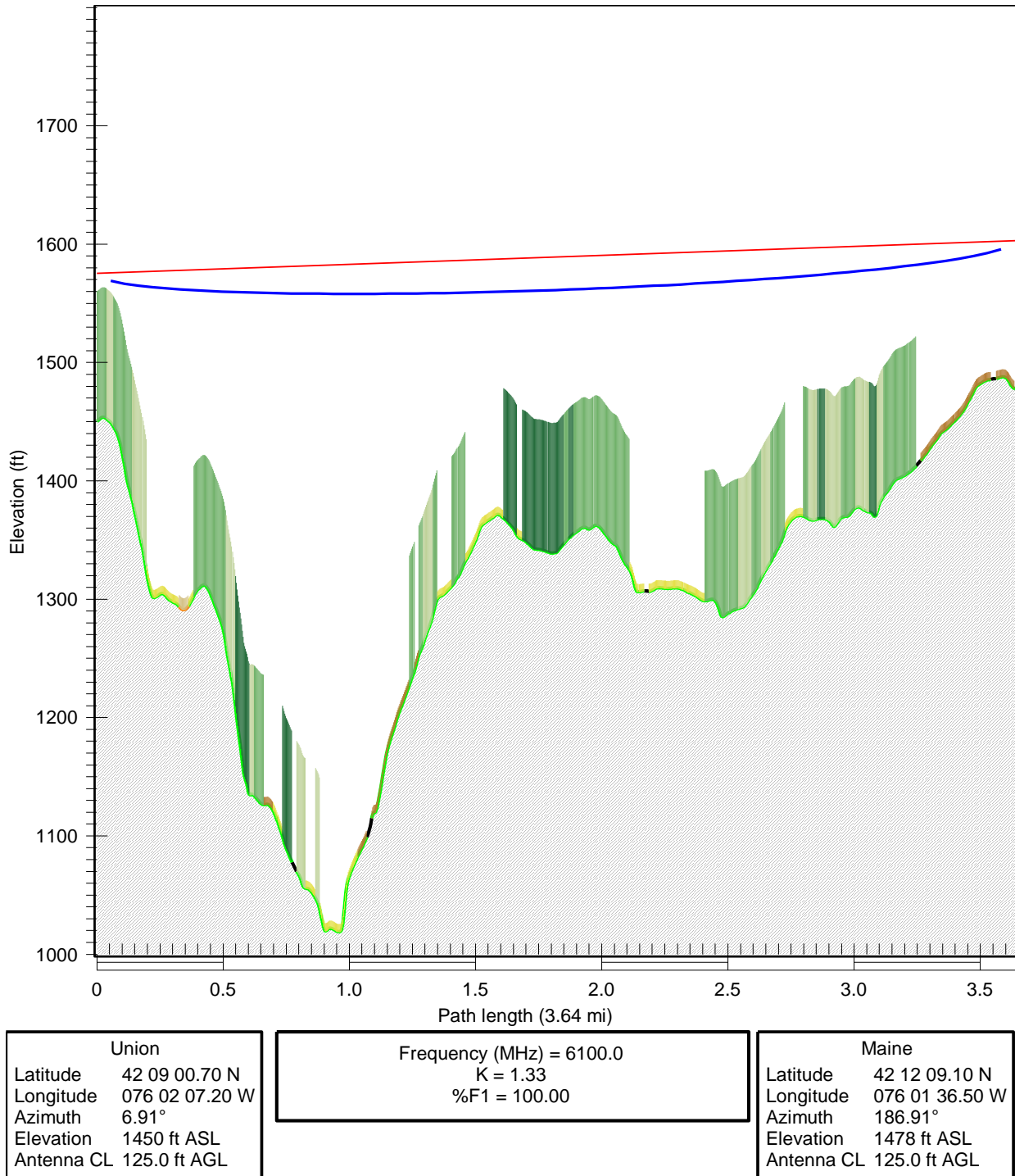
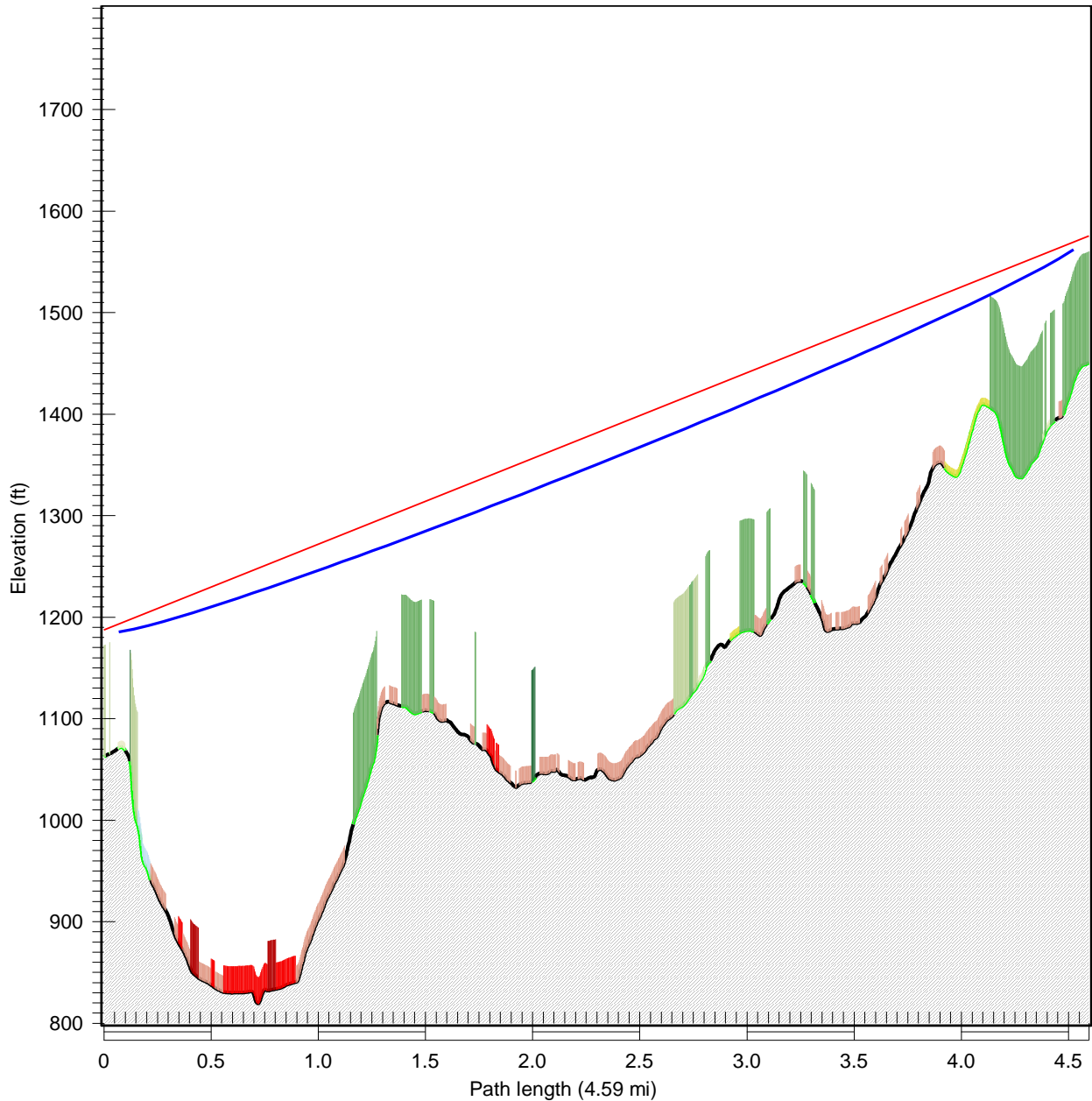


Figure 3-4: Union to Maine



Blue Wing



Round Top	
Latitude	42 05 21.10 N
Longitude	076 04 16.10 W
Azimuth	23.59°
Elevation	1062 ft ASL
Antenna CL	125.0 ft AGL

Frequency (MHz) = 6100.0
K = 1.33
%F1 = 100.00

Union	
Latitude	42 09 00.70 N
Longitude	076 02 07.20 W
Azimuth	203.62°
Elevation	1450 ft ASL
Antenna CL	125.0 ft AGL

Figure 3-5: Round Top to Union

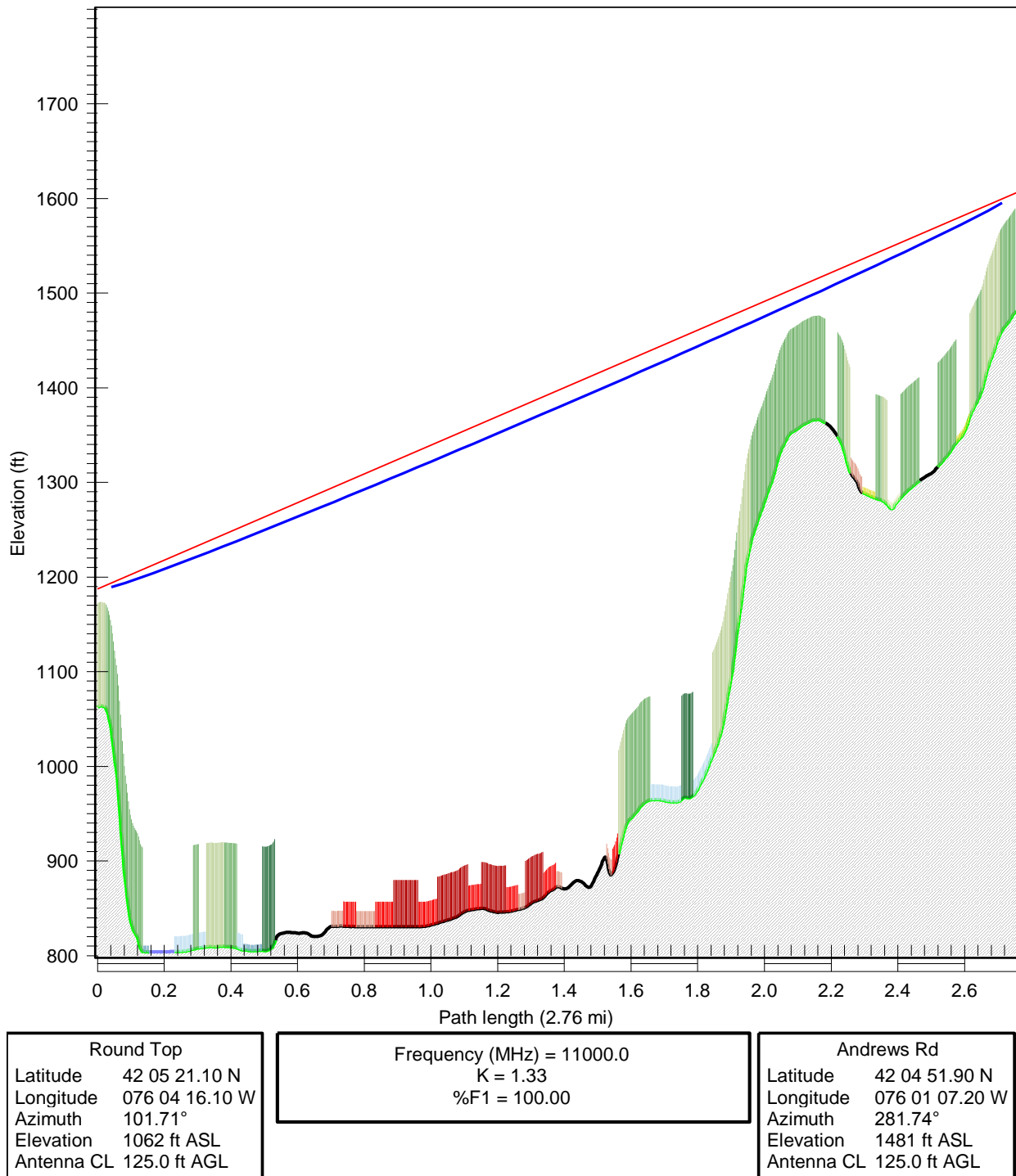


Figure 3-6: Round Top to Andrews Road



Blue Wing

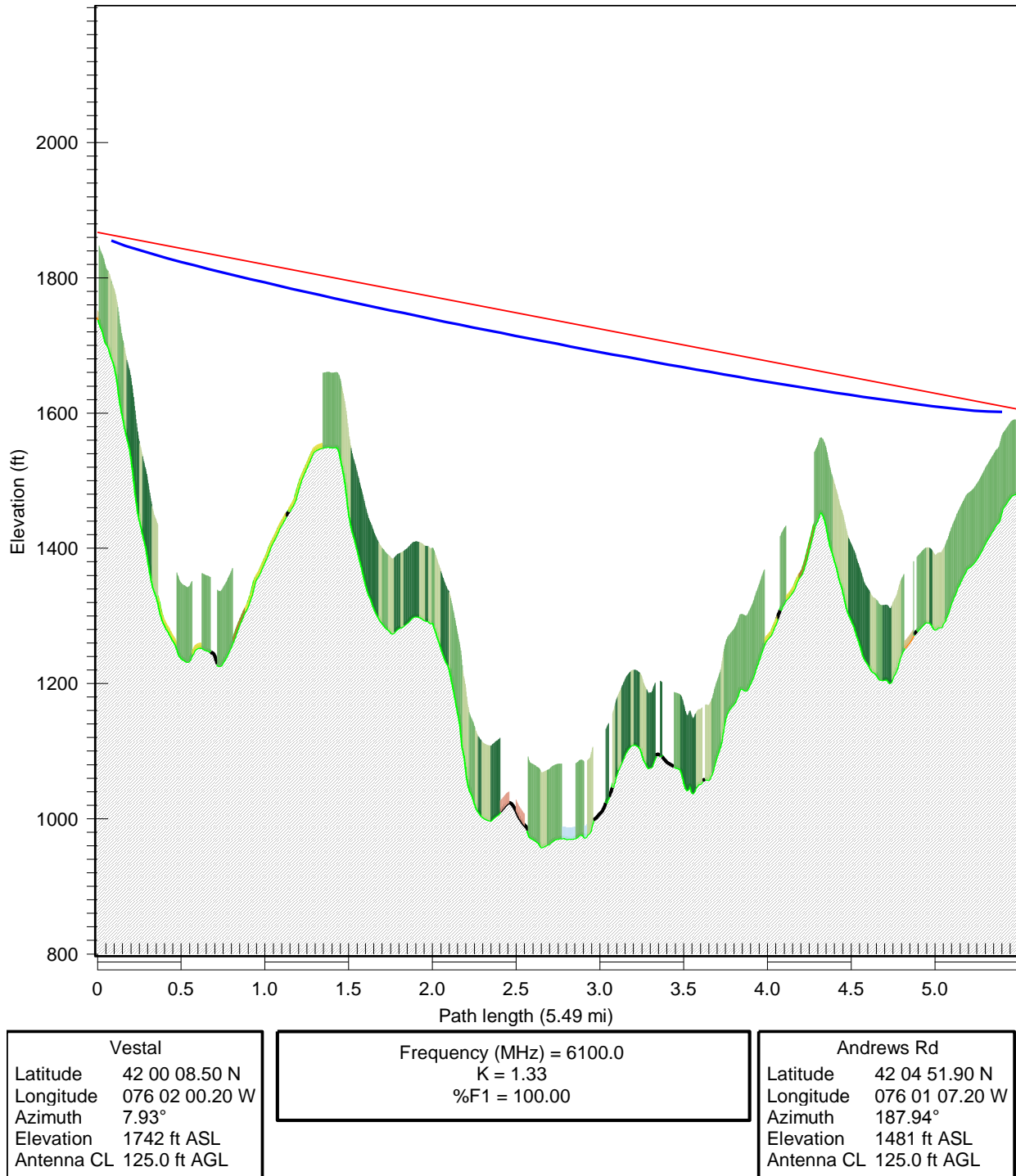


Figure 3-7: Vestal to Andrews Road



Blue Wing

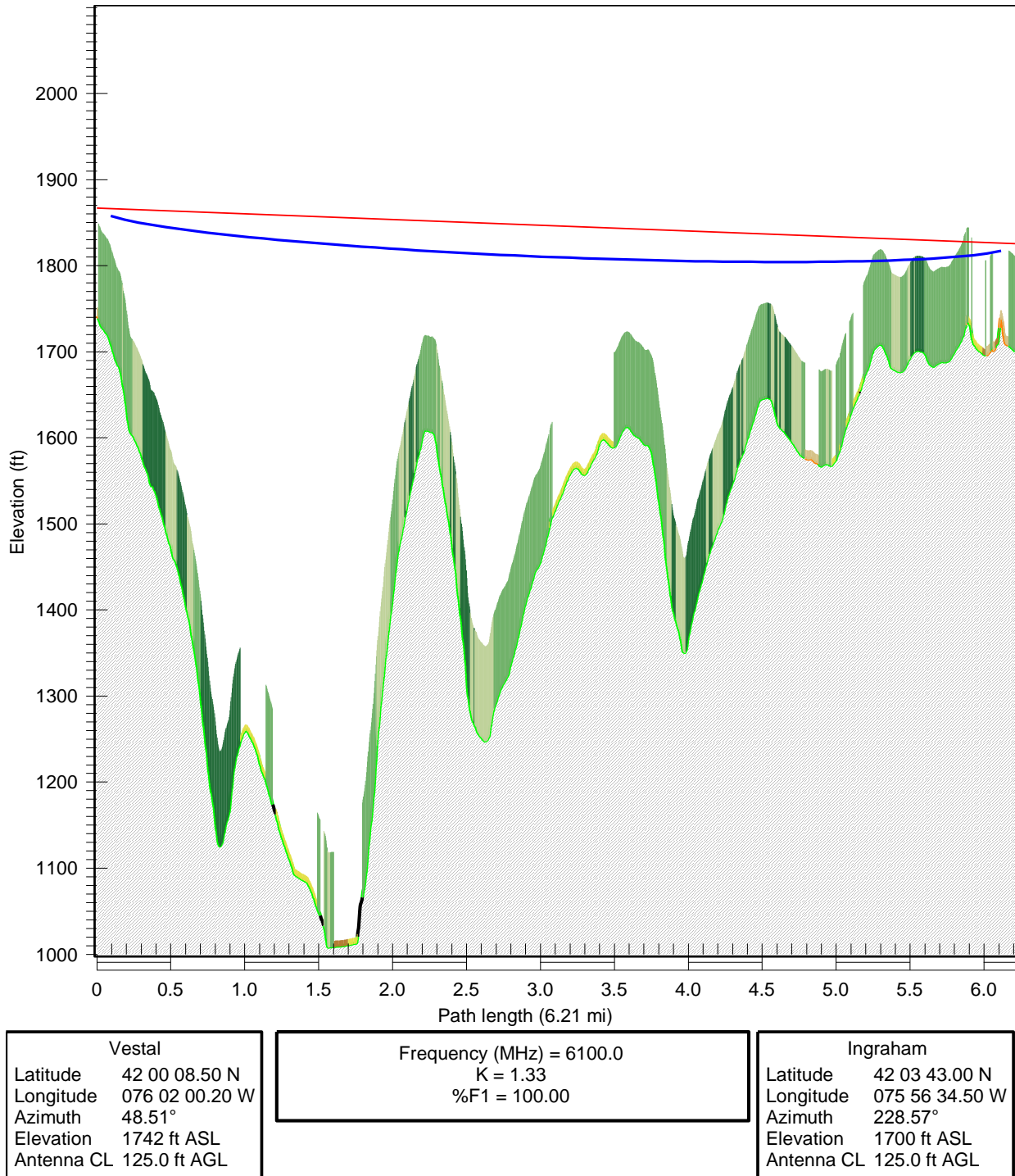


Figure 3-8: Vestal to Ingraham



Blue Wing®

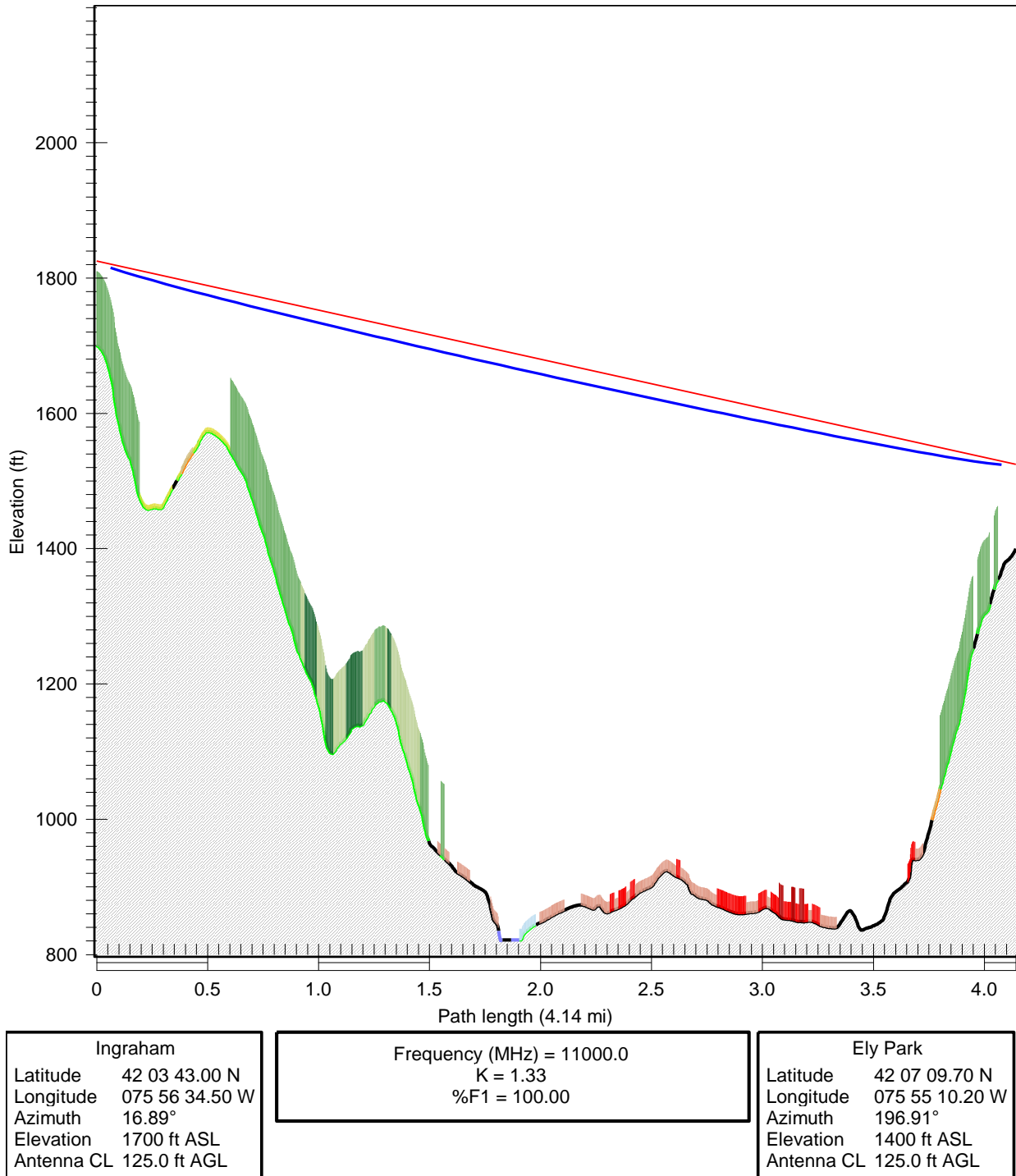


Figure 3-9: Ingraham to Ely Park



Blue Wing

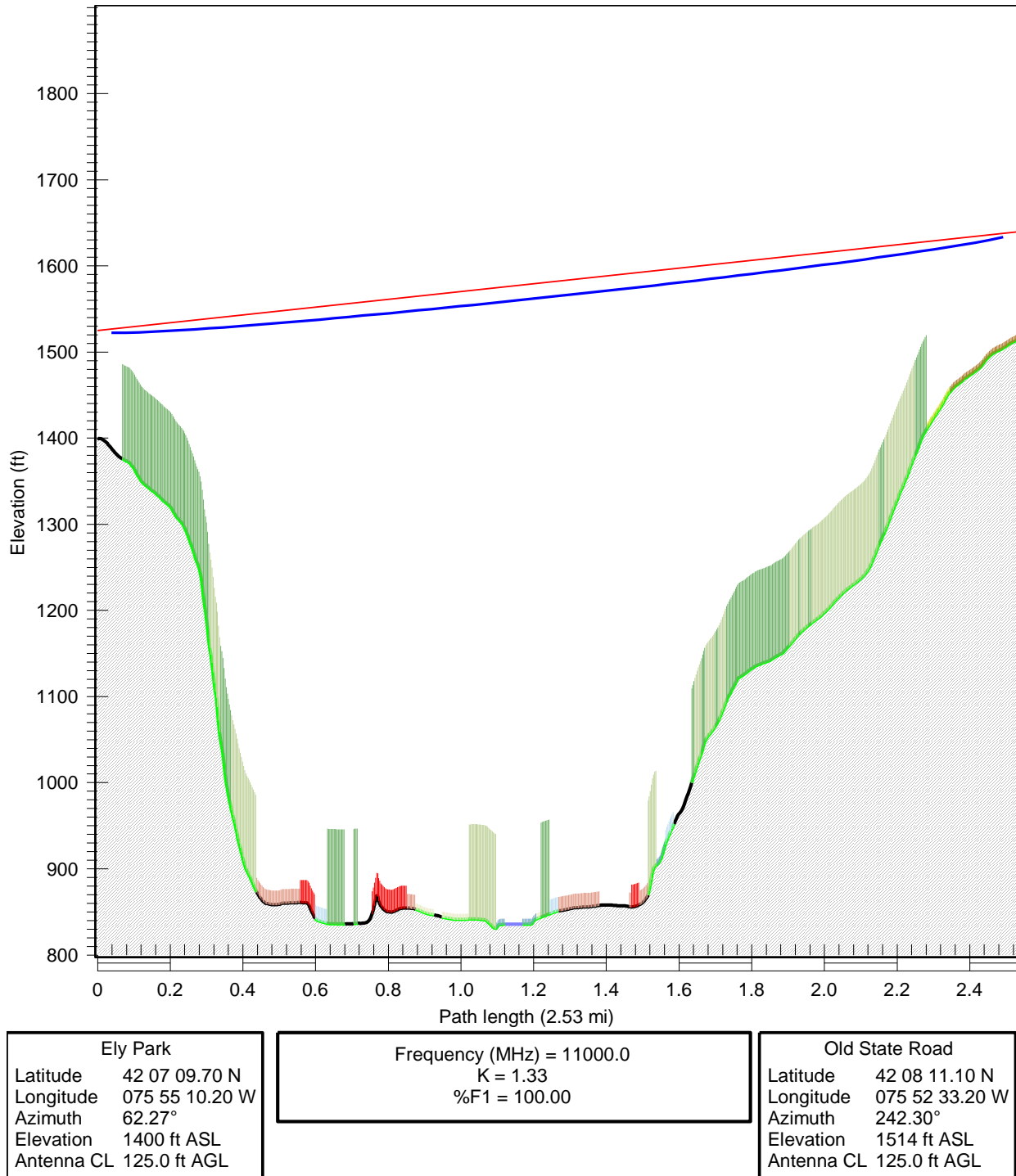
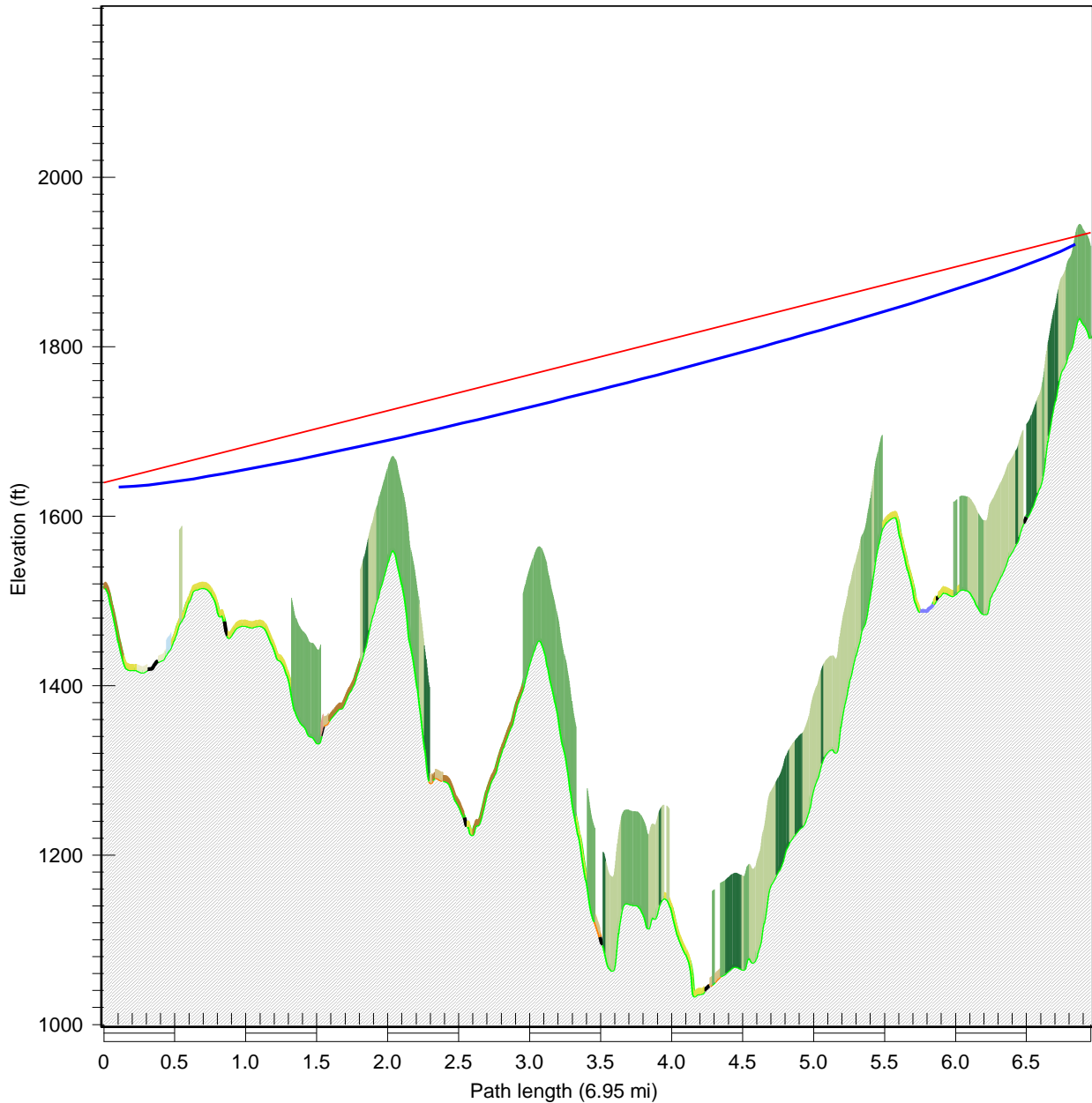


Figure 3-10: Ely Park to Old State Road



Blue Wing



Old State Road	
Latitude	42 08 11.10 N
Longitude	075 52 33.20 W
Azimuth	102.96°
Elevation	1514 ft ASL
Antenna CL	125.0 ft AGL

Frequency (MHz) = 6100.0
K = 1.33
%F1 = 100.00

Dunbar	
Latitude	42 06 49.50 N
Longitude	075 44 38.60 W
Azimuth	283.05°
Elevation	1810 ft ASL
Antenna CL	125.0 ft AGL

Figure 3-11: Old State Road to Dunbar



Blue Wing®

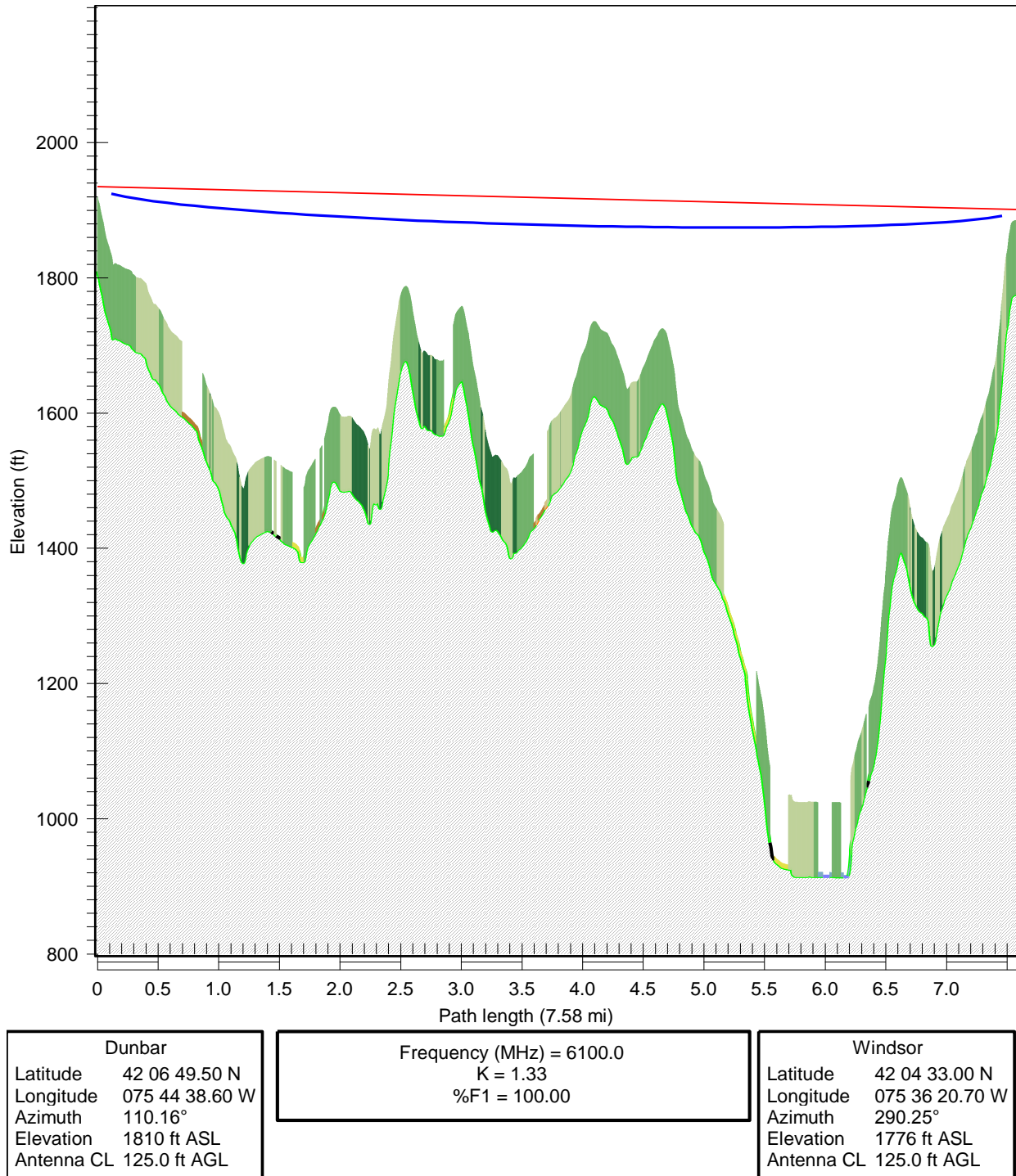


Figure 3-12: Dunbar to Windsor



Blue Wing

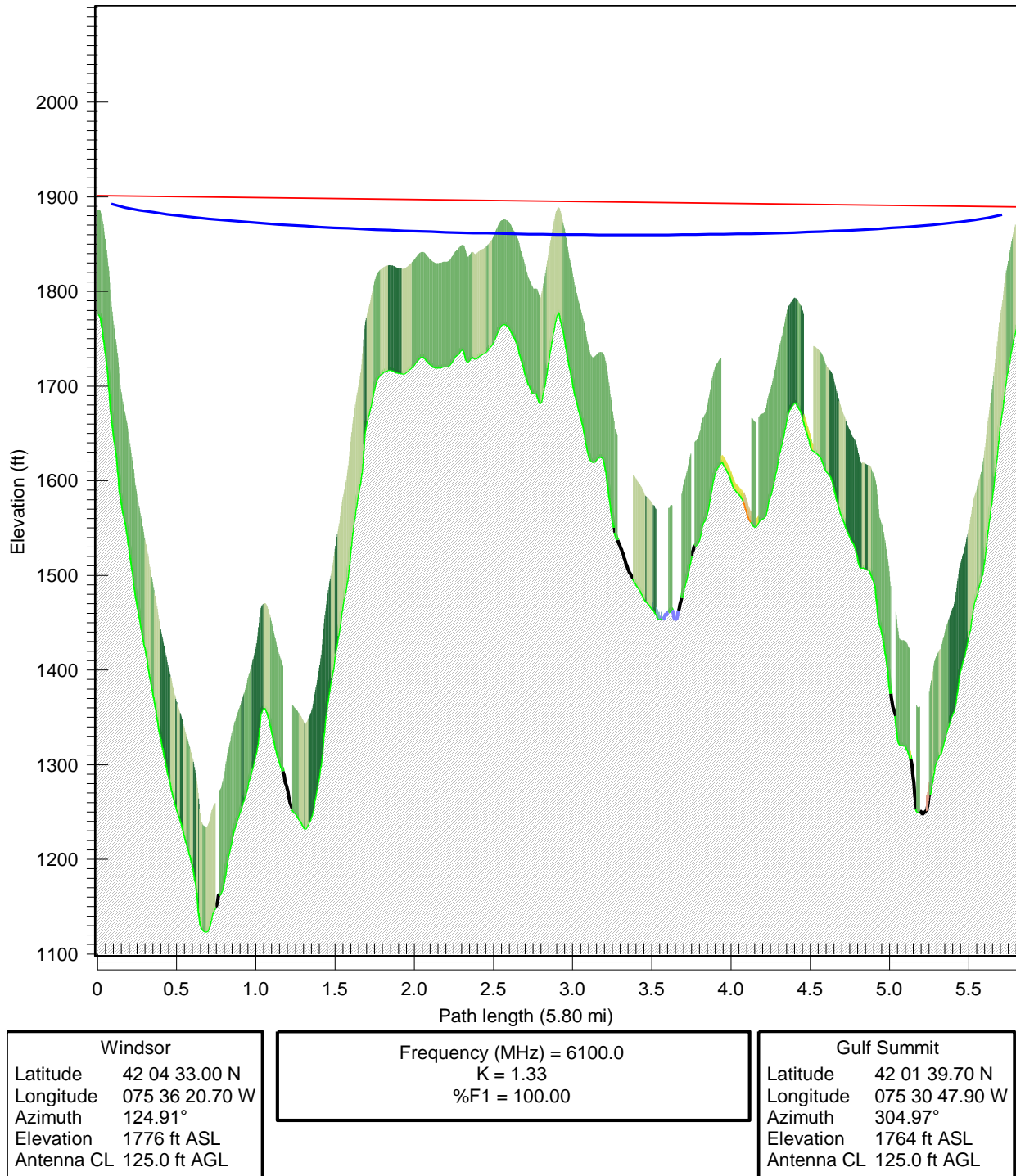


Figure 3-13: Windsor to Gulf Summit



Blue Wing

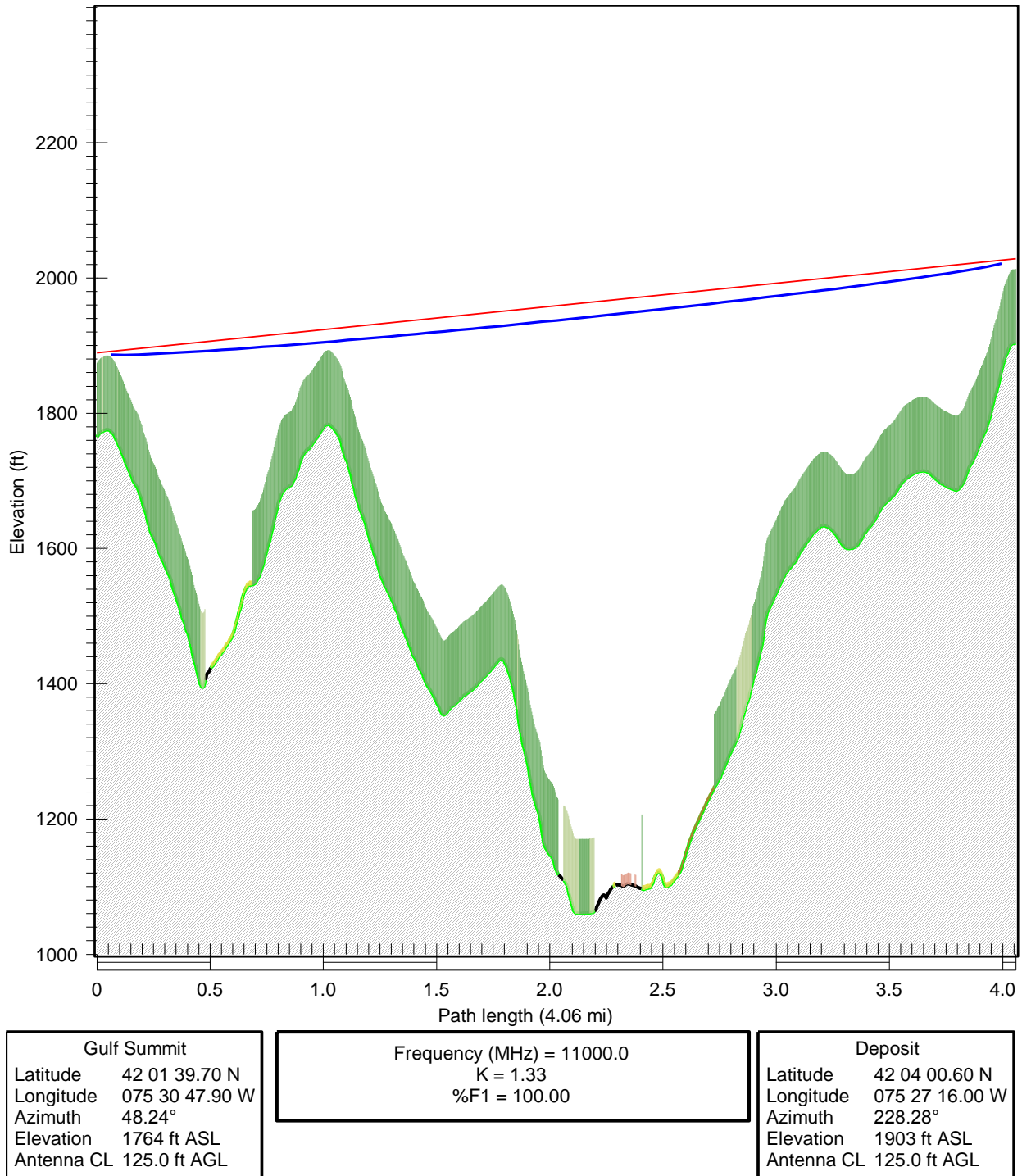


Figure 3-14: Gulf Summit to Deposit



Blue Wing

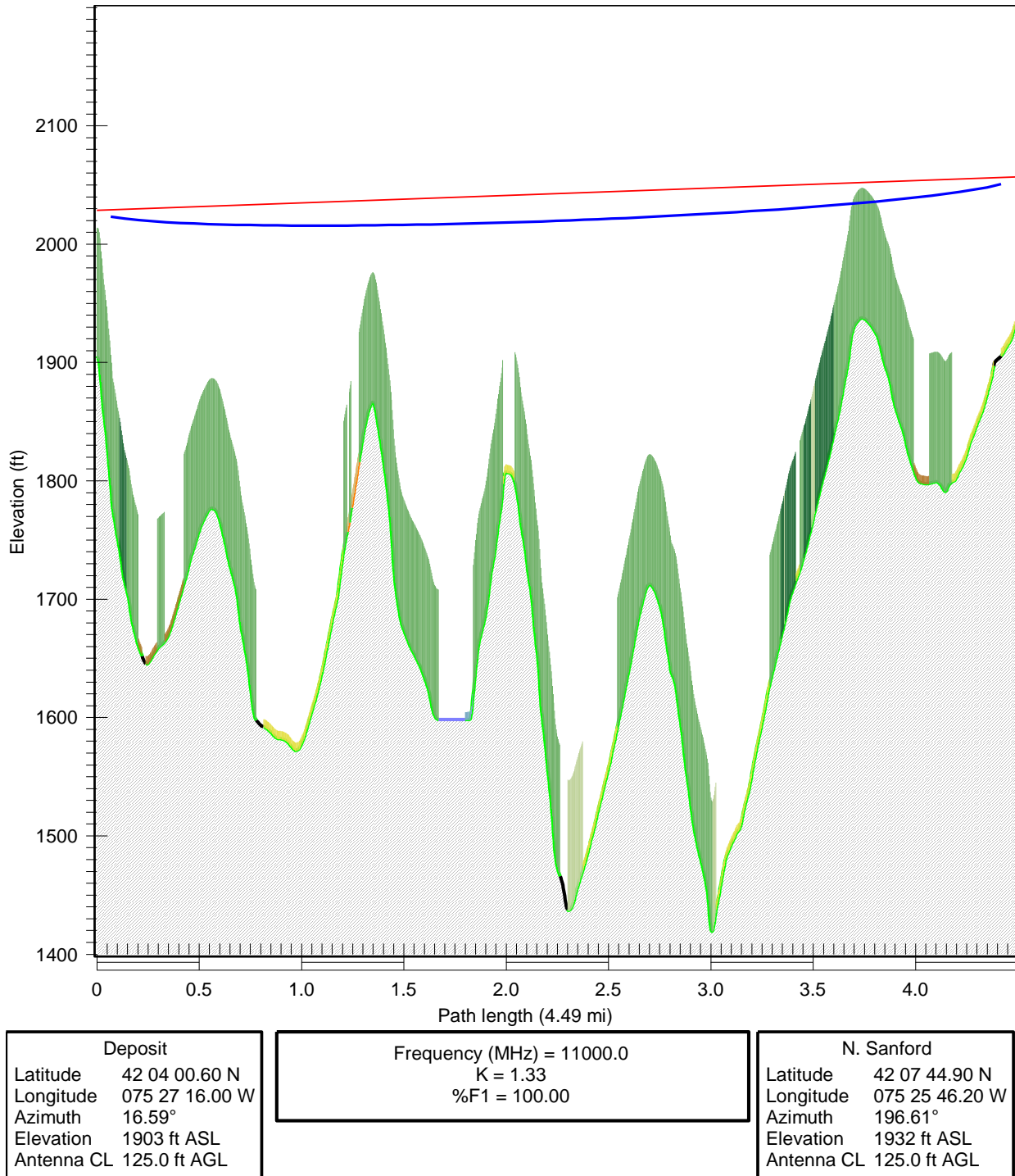


Figure 3-15: Deposit to N. Sanford



Blue Wing

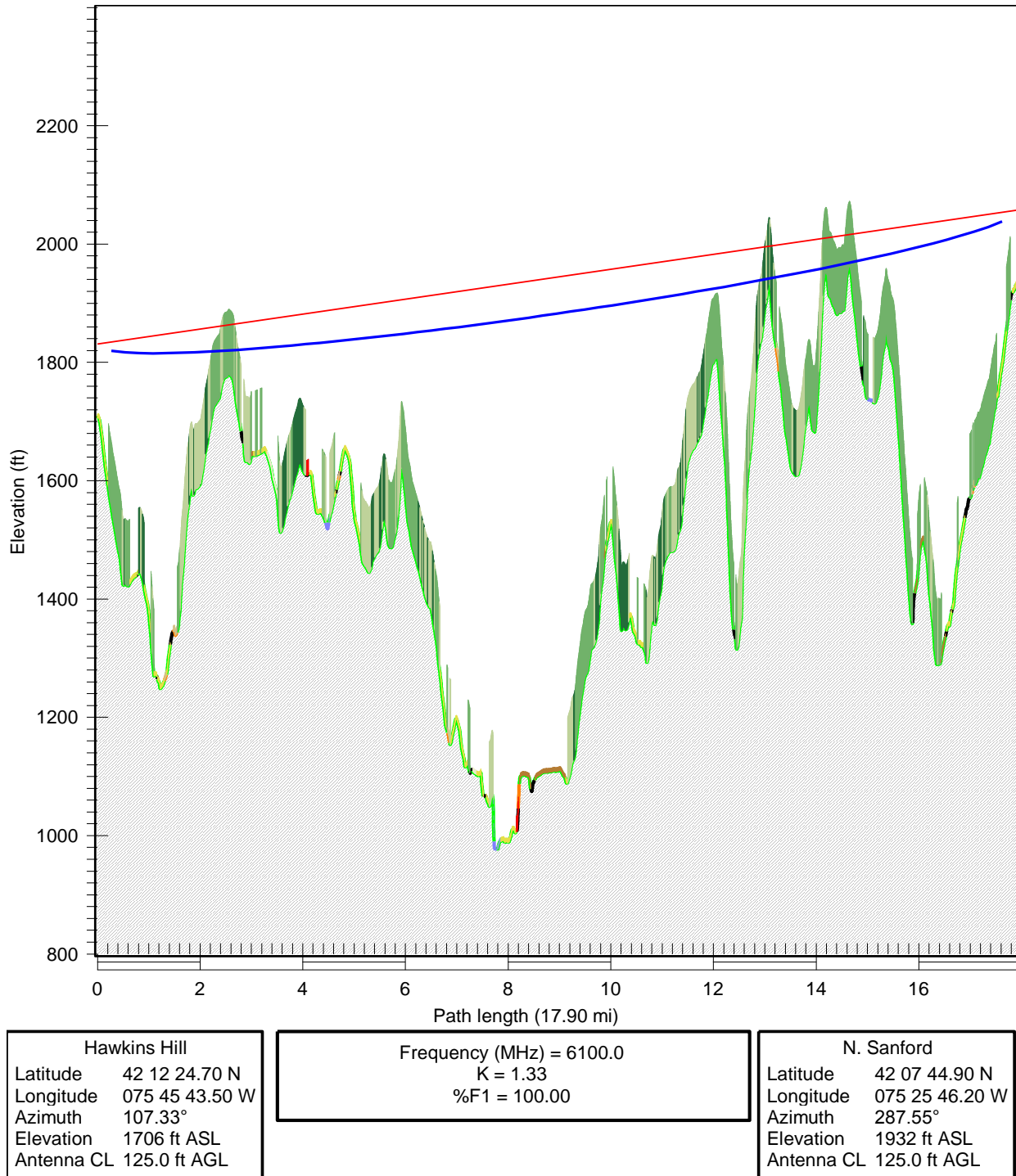


Figure 3-16: Hawkins Hill to N. Sanford



Blue Wing

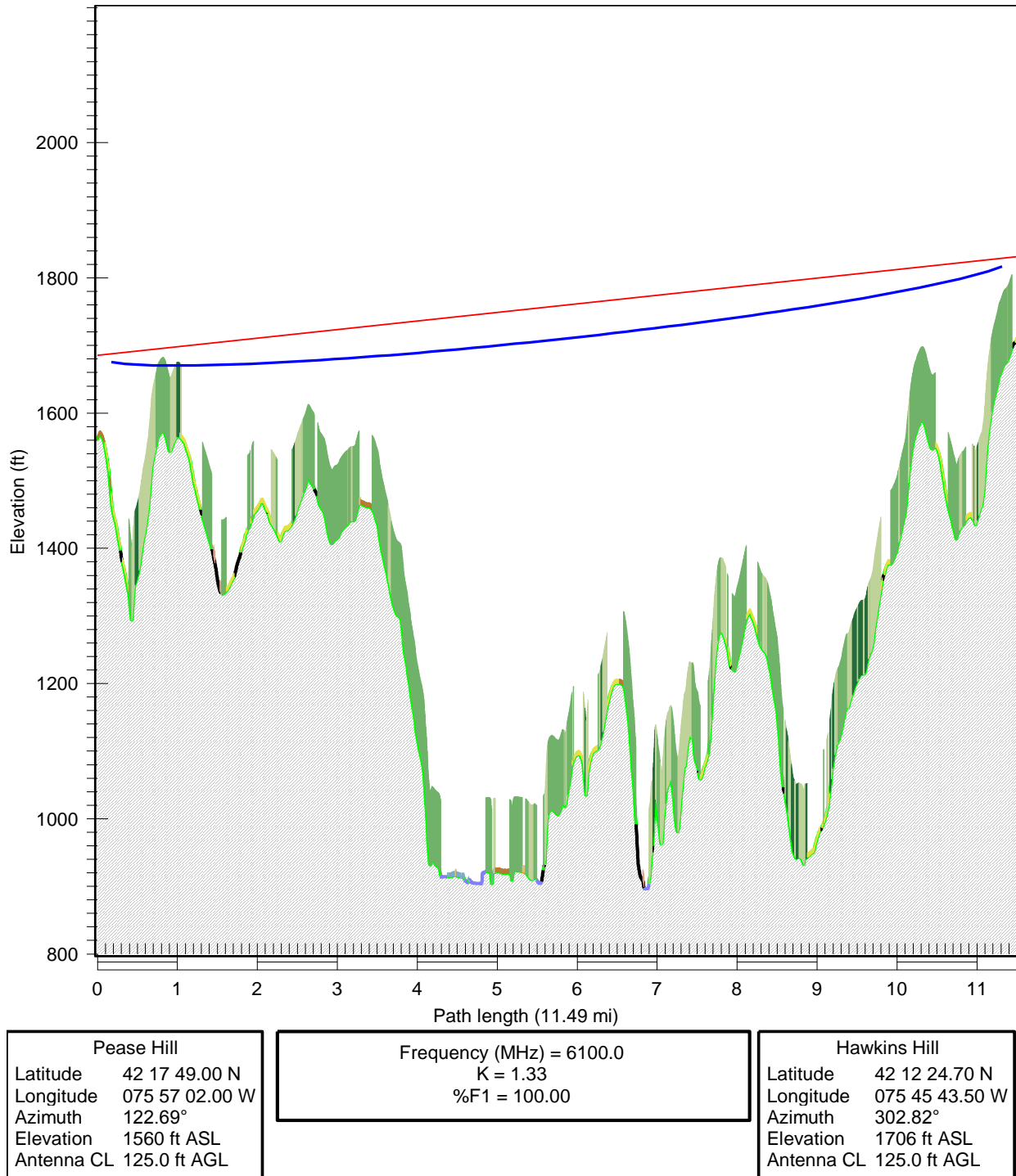


Figure 3-17: Pease Hill to Hawkins Hill



Blue Wing

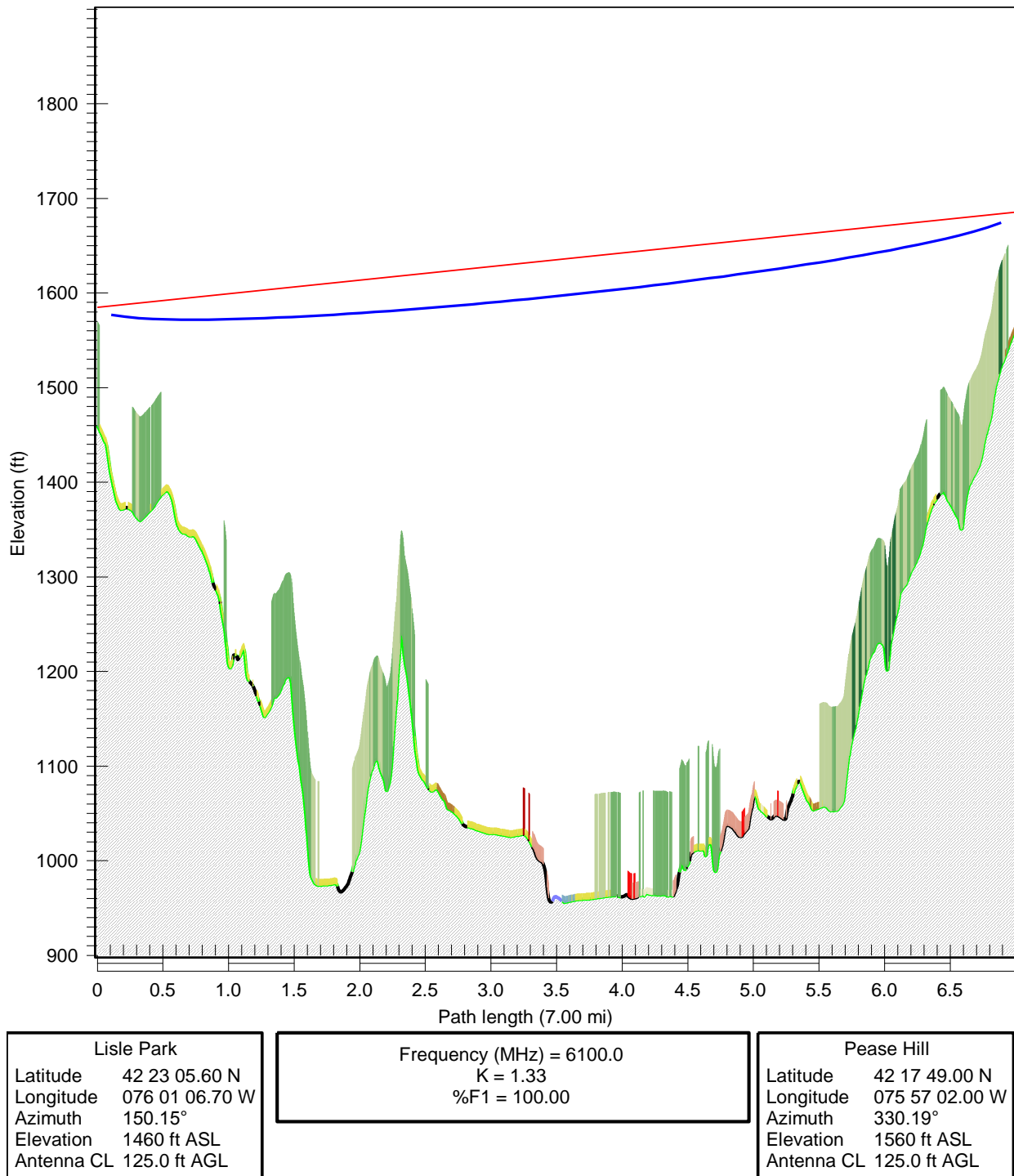


Figure 3-18: Lisle Park to Pease Hill



Blue Wing

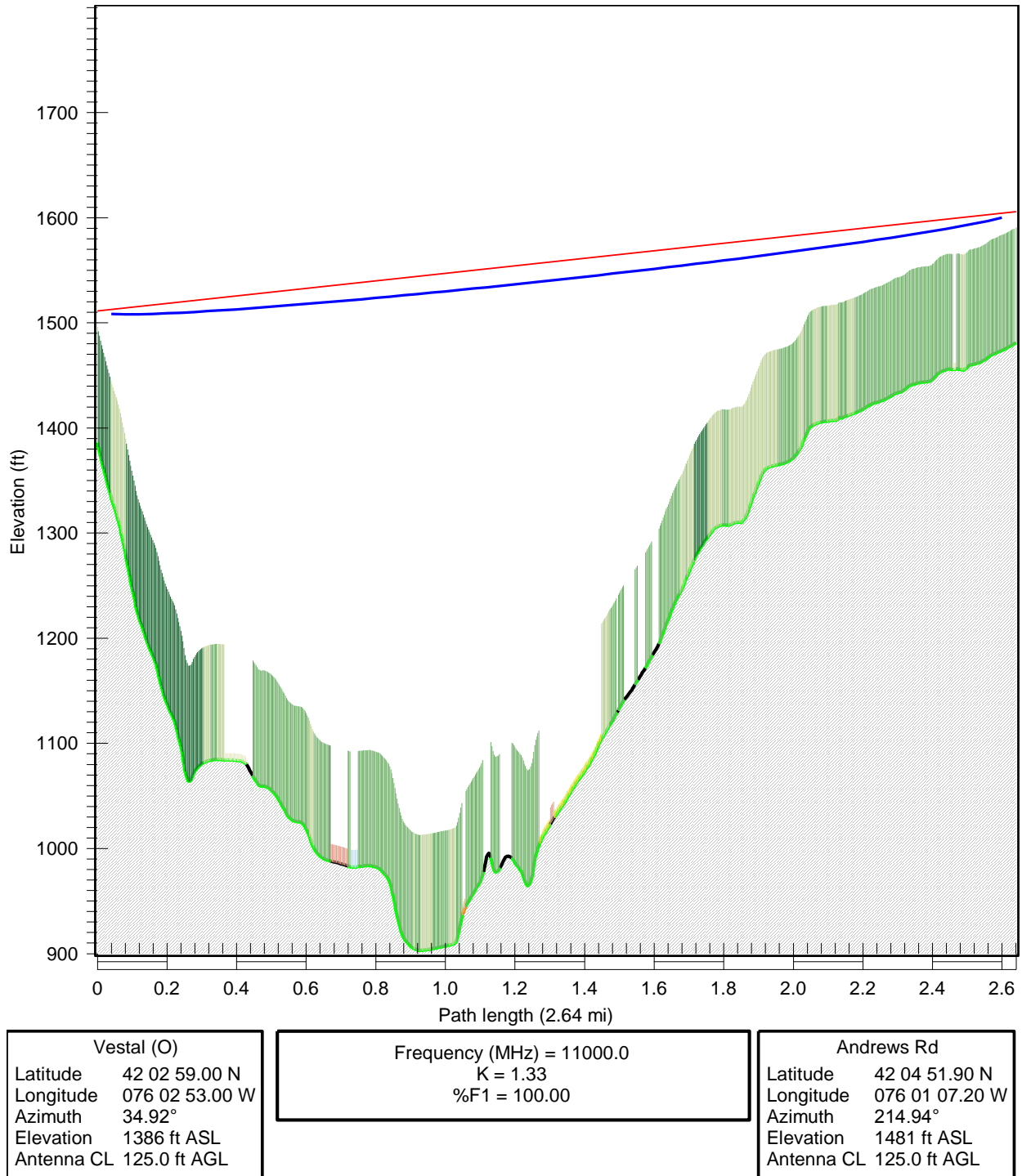


Figure 3-19: Vestal (O) to Andrews Rd.



Blue Wing

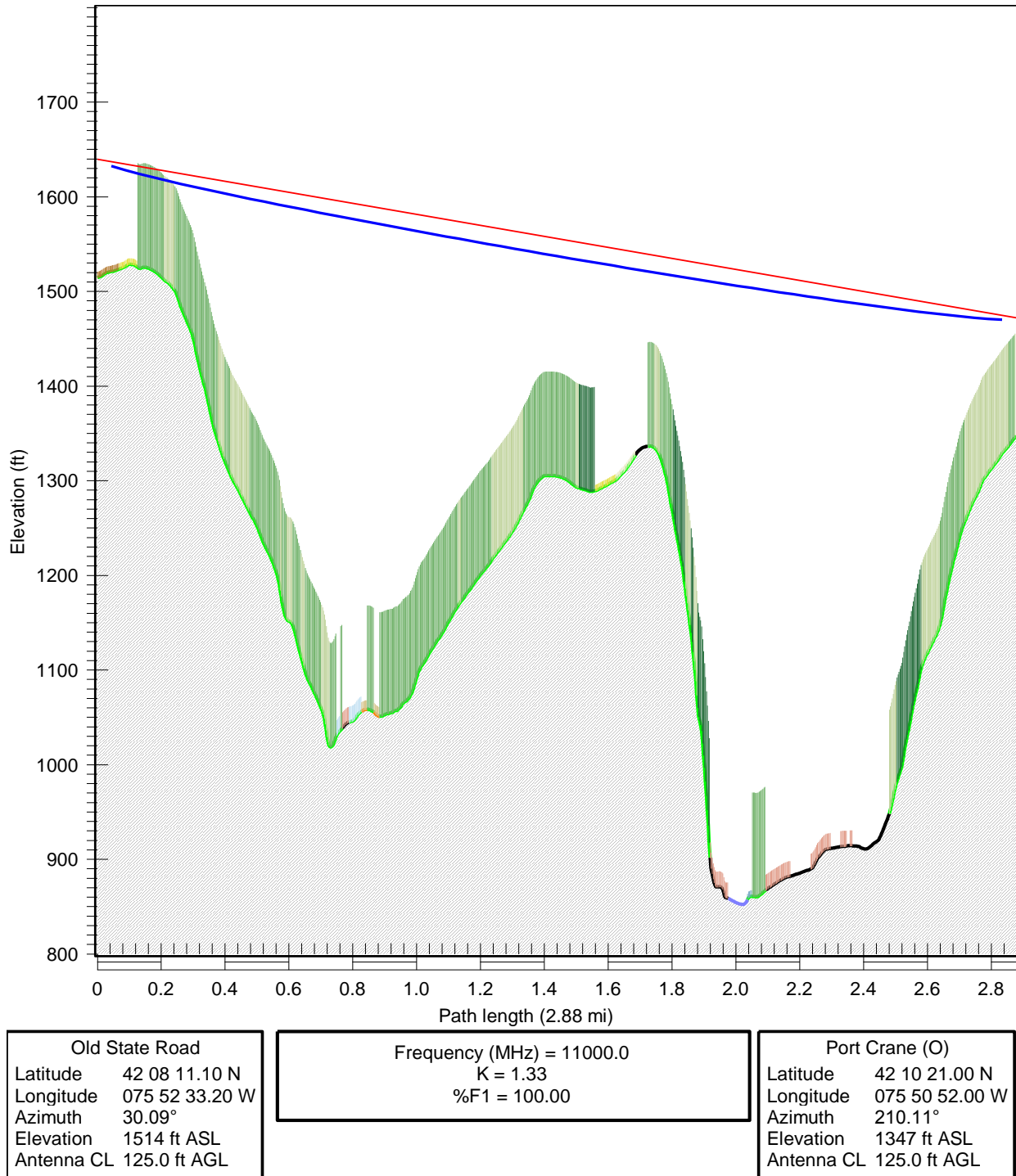


Figure 3-20: Old State Road to Port Crane (O)



Blue Wing

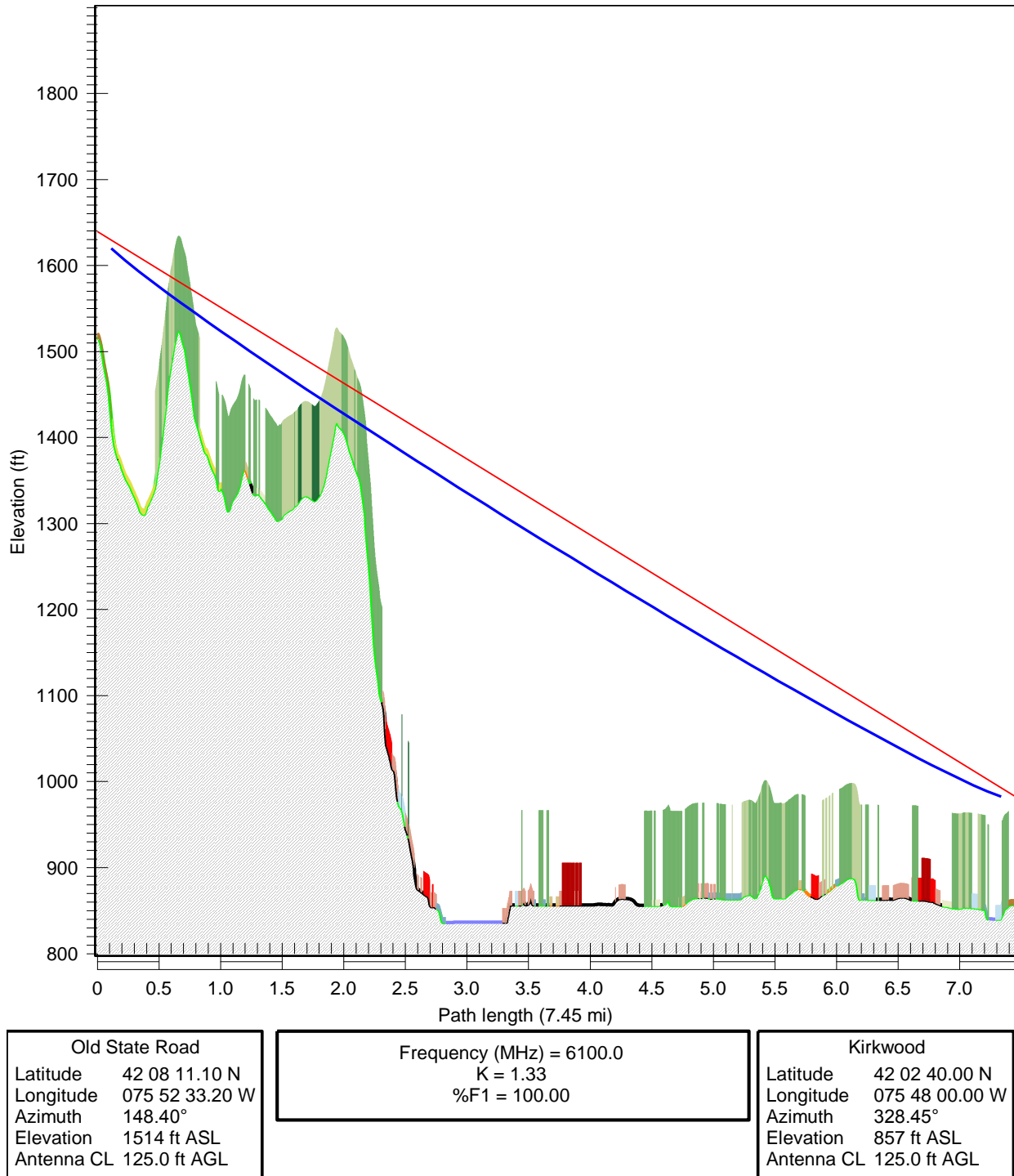
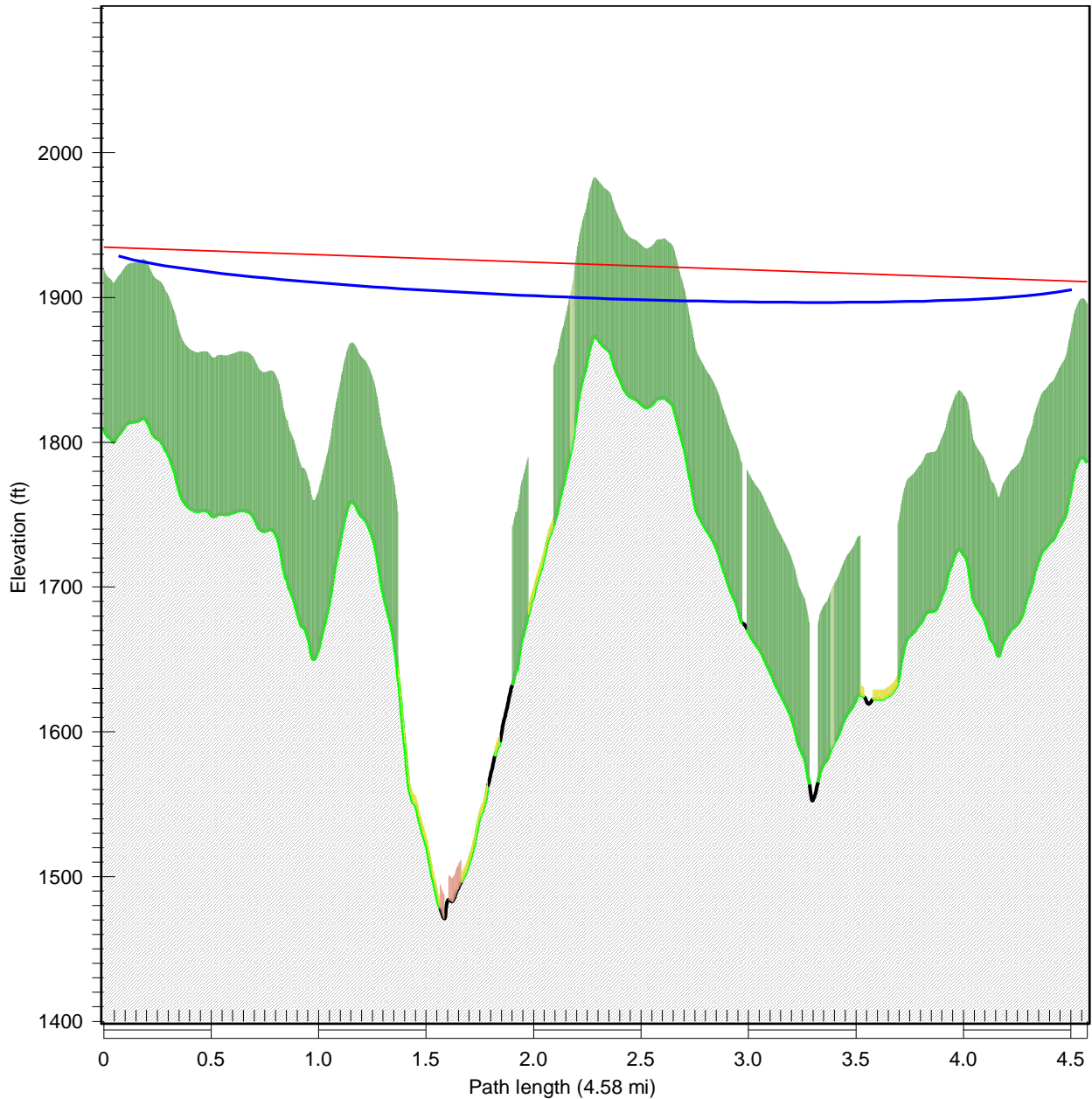


Figure 3-21: Old State Road to Kirkwood



Blue Wing



Dunbar	
Latitude	42 06 49.50 N
Longitude	075 44 38.60 W
Azimuth	173.47°
Elevation	1810 ft ASL
Antenna CL	125.0 ft AGL

Frequency (MHz) = 11000.0
K = 1.33
%F1 = 100.00

Lester (O)	
Latitude	42 02 52.40 N
Longitude	075 44 02.20 W
Azimuth	353.48°
Elevation	1786 ft ASL
Antenna CL	125.0 ft AGL

Figure 3-22: Dunbar to Lester (O)



Blue Wing

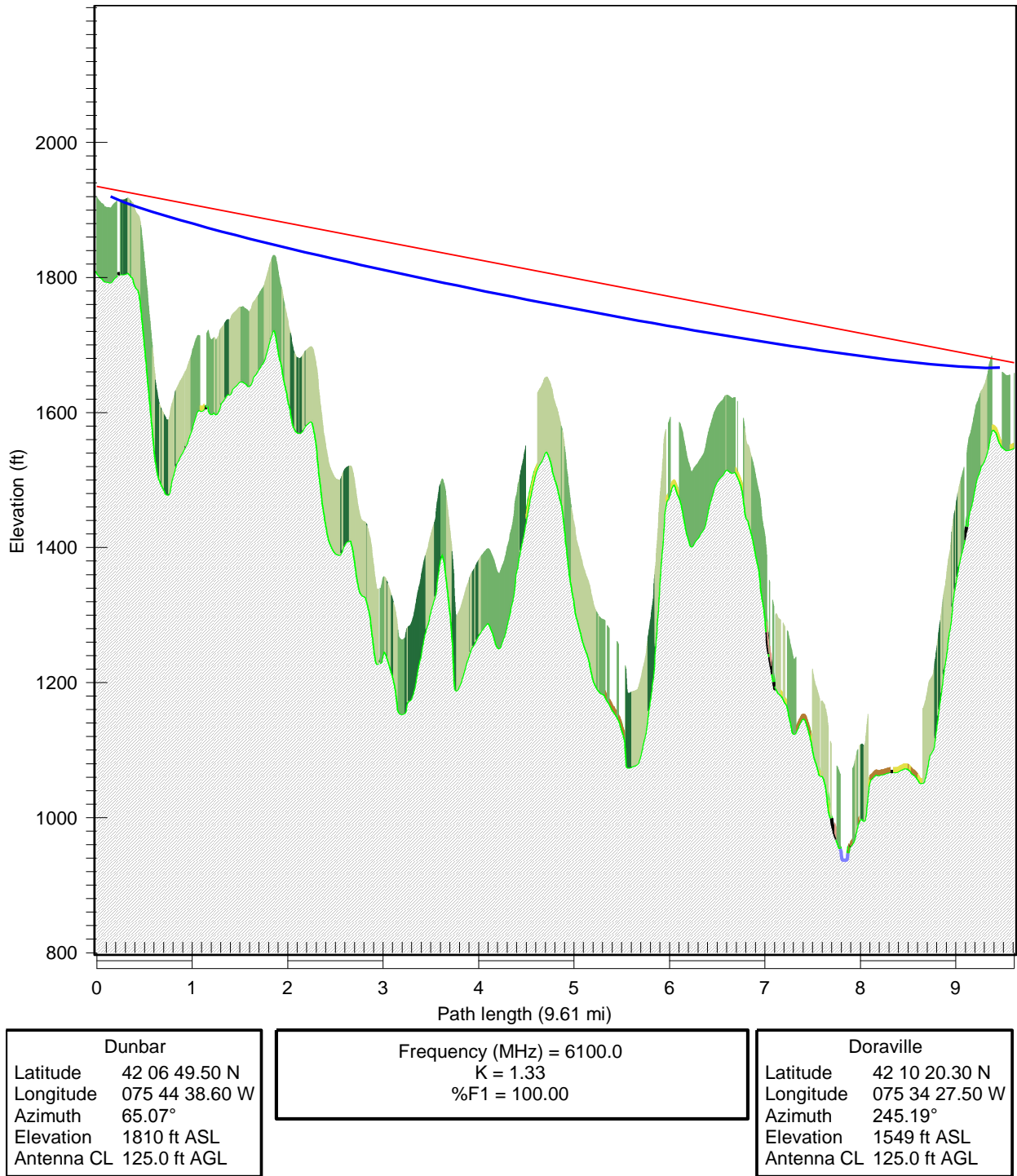


Figure 3-23: Dunbar to Doraville



Blue Wing

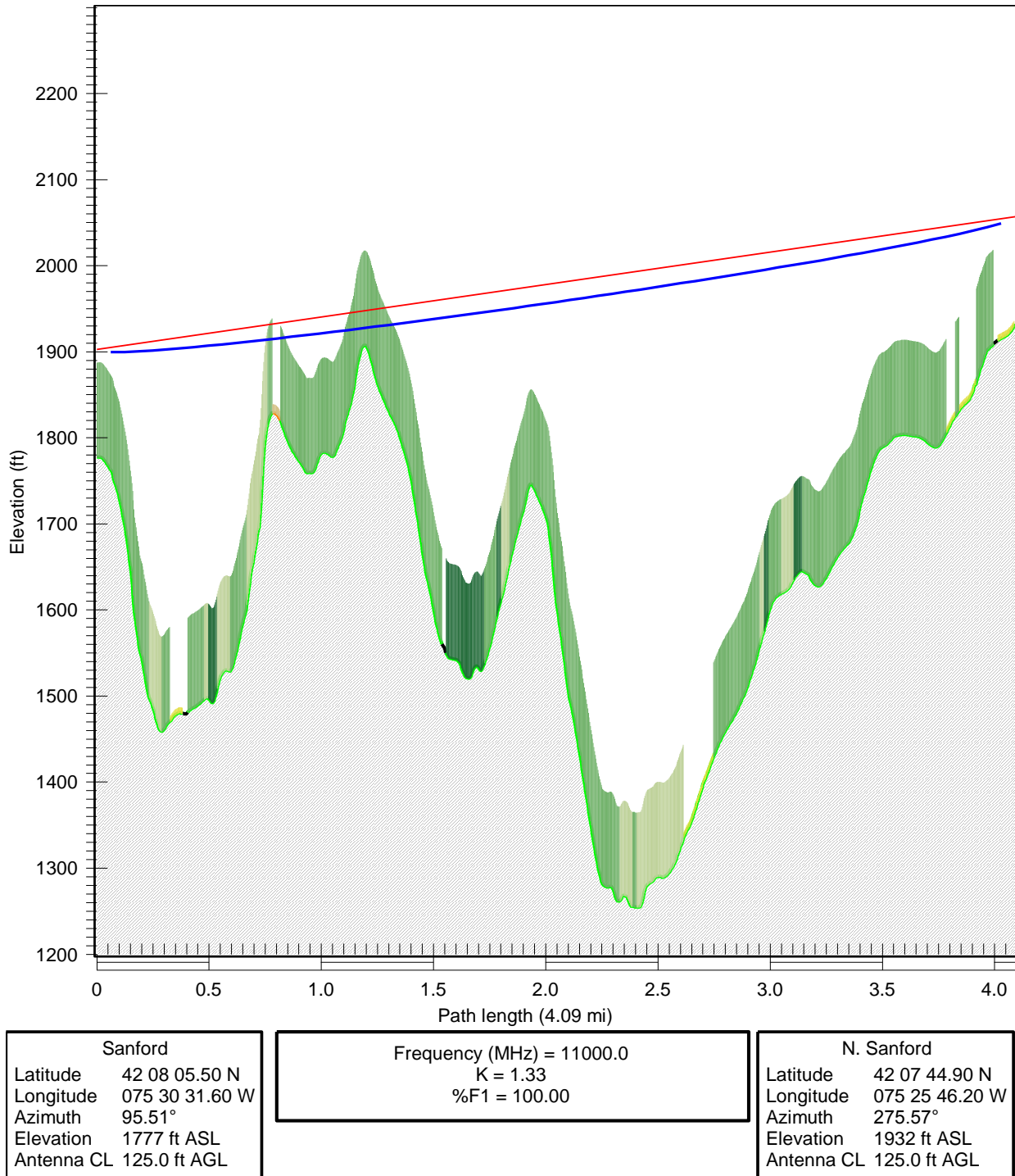


Figure 3-24: Sanford to N. Sanford



Blue Wing

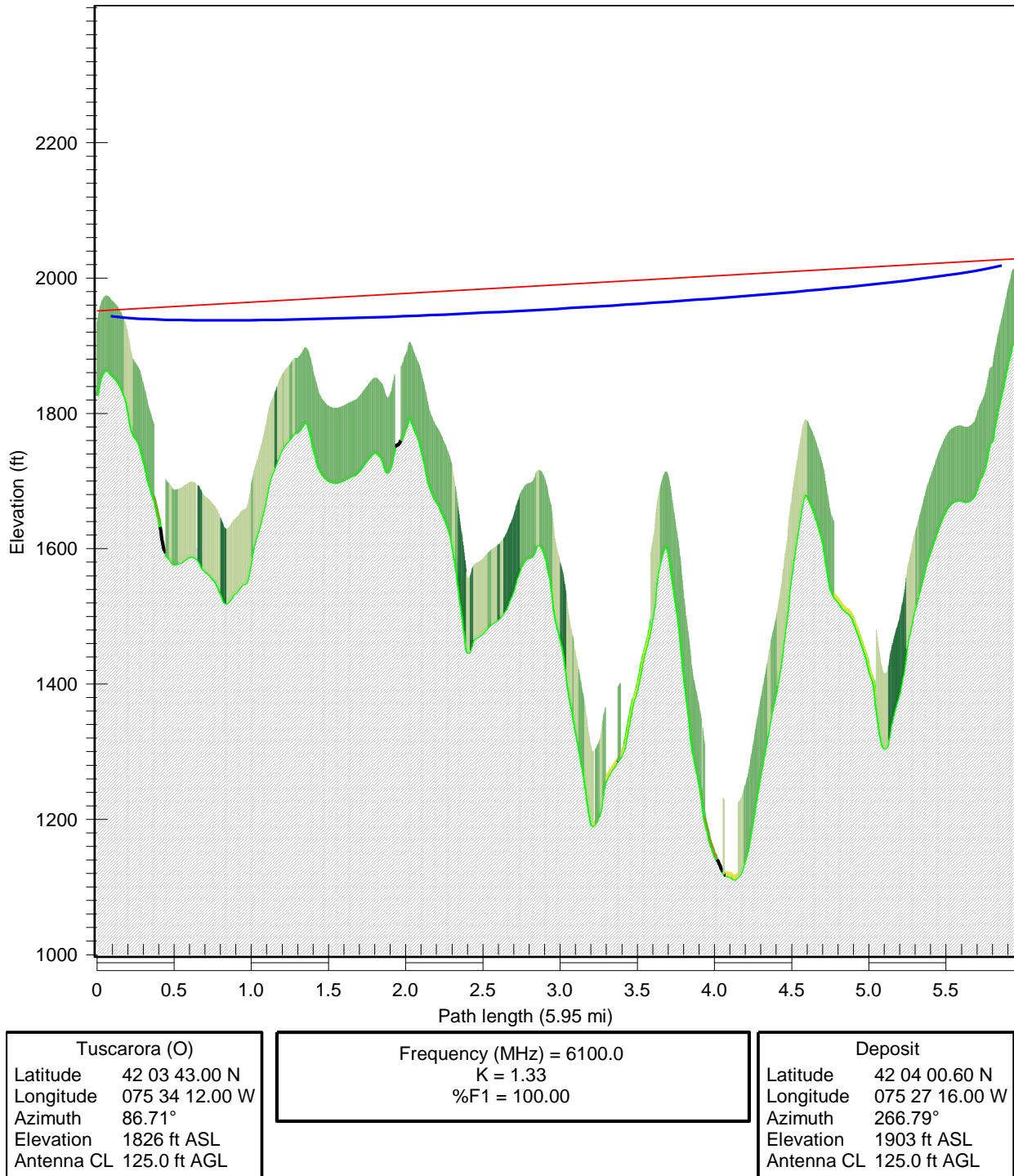
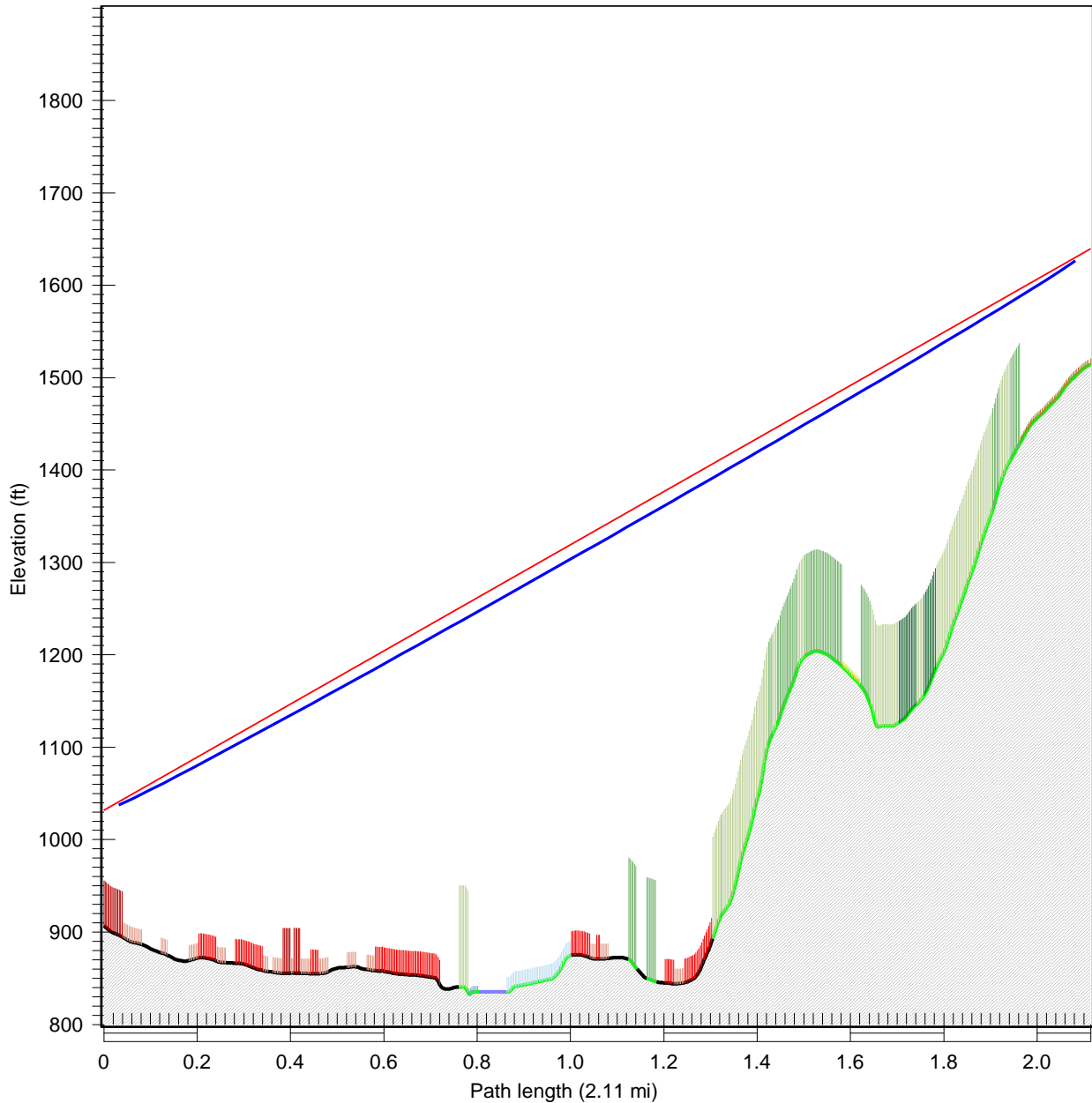


Figure 3-25: Tuscarora (O) to Deposit



Blue Wing



911 Center	
Latitude	42 07 55.56 N
Longitude	075 54 59.90 W
Azimuth	81.89°
Elevation	907 ft ASL
Antenna CL	125.0 ft AGL

Frequency (MHz) = 11000.0
K = 1.33
%F1 = 100.00

Old State Road	
Latitude	42 08 11.10 N
Longitude	075 52 33.20 W
Azimuth	261.91°
Elevation	1514 ft ASL
Antenna CL	125.0 ft AGL

Figure 3-26: 911 Center to Old State Road



3.2 Calculated Antenna Heights

For the paths shown in Figure 3-1 that are blocked by terrain (red lines) Pathloss is employed to calculate the necessary antenna heights at the sites for full Fresnel zone clearance. Clearance is based on 110 feet trees. Table 3-2 gives the calculated heights.

Site	Antenna Height (feet)	Site	Antenna Height (feet)
Round Top	462.2	Vestal	111.4
Vestal	492.9	Kirkwood	602.8
Ingraham	397.3	Kirkwood	378.8
Ely Park	552	Kirkwood	525.9
Old State Rd.	383.4	Doraville	317.2
Kirkwood	618.2	Dunbar	190.9
Kirkwood	985.2	Windsor	485.9
Kirkwood	998.8	Gulf Summitt	572.5
Dunbar	115.1	Sanford	276.5
Hawkins Hill	111.4	Sanford	359.1
Hawkins Hill	343.3	Doraville	122.4
Doraville	428.9	N.Sanford	291.6
Doraville	225.3	Sanford	260.9
Windsor	150.2	Sanford	289.9
Windsor	277.1	N.Sanford	355.7
Windsor	299.2	Deposit	116.5

Table 3-2: Pathloss Calculated Antenna Heights