

REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-0188	
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1. REPORT DATE (DD-MM-YYYY) 18-09-2018		2. REPORT TYPE Interim - Other		3. DATES COVERED (From - To) September 01 – 18, 2018	
4. TITLE AND SUBTITLE Assessment for the Safe Use of Lasers: Pabarade Range, Lithuania				5a. CONTRACT NUMBER FA8650-14-D-6519	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) Kurt Schuster, Edward Kelly				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER HONG	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Air Force Research Laboratory 711th Human Performance Wing Airman Systems Directorate Bioeffects Division Optical Radiation Bioeffects Branch Engility Inc 4141 Petroleum Rd JB SA Fort Sam Houston TX				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) Air Force Research Laboratory 711th Human Performance Wing Airman Systems Directorate Bioeffects Division Optical Radiation Bioeffects Branch 4141 Petroleum Rd JB SA Fort Sam Houston TX				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S) AFRL-RH-FS-OT-2018-0002	
12. DISTRIBUTION / AVAILABILITY STATEMENT Distribution A: Approved for public release (PA); distribution unlimited. PA Case No: TSRL-PA-2019-0125					
13. SUPPLEMENTARY NOTES					
14. Abstract This report provides an assessment detailing the on-site survey, geo-spatial analysis and safety guidance IAW STANAG 3606, ¹ Allied Range Safety Publication 4 (ARSP-4), ² and applicable United States Department of Defense (USDoD) and United States Air Force (USAF) documentation including, AFMAN 13-212, ³ AFI 48-139 ⁴ and MIL-HBK-828C ⁵ for the safe use of lasers on Pabradė Range, Lithuania.					
15. SUBJECT TERMS Raman spectroscopy, Raman microscopy, scattering, Raman, multispectral and hyperspectral imaging, coded aperture imaging					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Edward Kelly
U	U	U	SAR Unclassified	33	19b. TELEPHONE NUMBER (include area code) 210-539-8205



AFRL-RH-FS-OT-2018-0002

**Assessment for the Safe Use of Lasers:
Pabradė Range, Lithuania**

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Surveyed on 18 September 2018

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1 EXECUTIVE SUMMARY

1.1 Purpose

This report provides an assessment detailing the on-site survey, geo-spatial analysis and safety guidance IAW STANAG 3606,¹ Allied Range Safety Publication 4 (ARSP-4),² and applicable United States Department of Defense (USDoD) and United States Air Force (USAF) documentation including, AFMAN 13-212,³ AFI 48-139⁴ and MIL-HBK-828C⁵ for the safe use of lasers on Pabradė Range, Lithuania.

1.2 Conclusions

The document serves as a notification that Pabradė Range has been assessed for joint NATO operations using lasers. The guidelines and recommendations outlined in this report are valid until such time that a new survey is required or the host nation establishes a Laser Safety Program and performs a range laser safety assessment. The USAF in Europe (USAFE) range manager recommends re-evaluation every three years.

2 INTRODUCTION

2.1 Background

Due to increased use of laser systems involving NATO operations, including NATO member and Partners for Peace nations, joint laser safety standards allowing range operations using lasers is required by STANAG 3606. The technical evaluation ensures all laser systems utilized on NATO ranges have been evaluated for use based upon the targets, target areas, firing positions, terrain, airspace, range boundary restrictions, and de-confliction with towers. USAFE/A3TW requested the 711 HPW/RHDO evaluate the safe use of lasers at Pabradė Range IAW STANAG 3606 and ARSP-4. The Optical Radiation Safety (ORS) Team from 711 HPW/RHDO conducts range evaluations and certifications which provide range laser safety uniformly at all US Air Force Primary Training Ranges (PTR) and Major Range and Test Facility Bases (MRTFB) with current guidance as listed in Section 10 “References” of this report. The ORS Team conducts on-site surveys of NATO member nation ranges when requested.

2.2 Scope

The Pabradė Range evaluation was performed on 18 September 2018. Laser target areas (LTAs) and ground-based observation points (OPs) were verified. Laser target areas and OPs are depicted in Attachment 2. A flight profile curve showing the minimum safe lasing altitude for fixed-wing operations was generated and is depicted in Attachment 3. Nominal Hazard Zones (NHZs) were determined for man-transportable systems, and are shown in Attachments 4 through 7. There is one attachment per OP. Information listed in these attachments are worst-case scenarios and are to assist units training with laser systems.

2.3 Range Information

Pabradė Range is located approximately 20 miles NNE of Vilnius, Lithuania. The range is managed by the Lithuanian military and has regular usage by the Lithuanian JTACs as well as US and other NATO forces. The range is relatively flat with sparse sandy berms about 2 to 3 meters high. Bordering Pabradė Range is a thick forest comprised mostly of Birch and Pine trees. Pabradė Range has one target area with four OPs assessed (OP 1, OP2, OP3, and OP 5). At the time of this

survey OP 4 could not be clearly identified and the general location did not have any line-of-sight (LOS) to the target area.

3 EVALUATION PERSONNEL

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4 PERSONNEL CONTACTED

- a) William Forkner, USAFE Training Ranges Program Manager, Ramstein AFB, Germany Comm: +94-111-480-7195, DSN:314-480-7195

5 LASER SAFETY PROGRAM

5.1 Recommendation

Pabradè Range currently has not implemented a laser safety program. It is recommended that the Pabradè Range follow the information contained in the ARSP-4 to create a laser safety program. USAF personnel shall follow guidelines and procedures outlined in the ARSP-4, AFMAN 13-212, and MIL-HBK-828C.

5.2 Host Nation

The following are considered host nation Range Authority Responsibilities IAW STANAG 3606 and ARSP-4:

- a) Obtain the laser hazard data of every laser system to be used
- b) Provide a copy of the Pabradè Range Regulations and appropriate safety Standard Operating Procedures (SOPs) to the visiting nation
- c) Provide a briefing to the visiting nation prior to the laser operations, which should include at least: safety procedures, range SOPs, range opening/closing procedures, and no-fire areas and routes
- d) Confirm or provide firing points, target locations, buffer angles, and nominal hazard zones (NHZs)/probabilistic hazard zones (PHZs)
- e) Post laser warning signs as required
- f) Ensure the appropriate laser eye protection (LEP) is worn
- g) Liaise with civil authorities as required, to include setting up proper medical procedures in event of a laser injury
- h) The host nation has final approval authority for the use of lasers on its ranges by visiting nations

5.3 Visiting Nations

The following are considered visiting nation responsibilities IAW STANAG 3606 and ARSP-4:

- a) Liaise with the host nation to determine information and time line requirements for approval process. Note: As the approval process may take a significant amount of time early contact is strongly advised
- b) Ensure that the devices are properly labelled IAW country guidance
- c) Provide appropriate protective devices where required
- d) Provide laser safety information to host nations for all lasers to be used in their territory
- e) Ensure the visiting nation's regulations are adhered to in addition to the host nation's regulations when the visiting nation's regulations are more stringent than the host nation's requirements and the visiting nation's regulations require protocols and procedures which are not addressed by the host nation's regulations and SOPs
- f) If the USAF unit(s) is the visiting nation and the host nation does not have a Laser Safety Program in place, the USAF unit will comply with USAF guidance as related to training with lasers on ranges. This guidance includes, but is not limited to, DoD MIL-HDBK-828B, AFMAN 13-212 and AFI 48-139. In addition to the laser safety guidance of those documents, military training procedures in AFI 11-214⁶ and Joint Publications 3-09.1⁷ and 3-09.3⁸ will also be followed
- g) If the visiting nation is any other US Military unit, they are required to follow their service specific guidance

In the case where the host nation does not have a Laser Safety Program, it may be appropriate to use the information contained in the survey report provided by the ORS team.

6 RANGE EVALUATION

6.1 Buffer Angles

Buffer angles around laser beams are used in the range evaluation to ensure beams are properly terminated and give a margin of safe space around their footprints. Buffer angles are a method ARSP-4 introduces to ensure the beams project within the intended geometric safety analysis. The buffer angle of a laser system depends on the aiming accuracy of the system and the stability of the platform on which the laser system is mounted. The more stable the platform, the greater the pointing accuracy; the less stable the platform, the poorer the pointing accuracy. Hand-held systems are less stable than tripod-mounted systems, and tripod-mounted systems are less stable than aircraft-mounted systems. The buffer angle increases as the stability of the system decreases. A buffer angle is typically much larger than the laser beam divergence.

Typical NATO buffer angle categories are listed in ANNEX A.4 of the ARSP-4 and fall into four groups: Fixed, Stabilized, Supported, and Unsupported. Refer to the ARSP-4 for assigned buffer angles and descriptions of each situation.

6.2 Aerial Laser Operations

6.2.1 Fixed-wing.

See Attachment 3 for approved flight profiles and laser-to-target headings for aircraft-mounted laser systems. The flight profile is restricted by the maximum forward footprint of 450 m. This flight profile curve is intended to present the worst-case scenario for all possible targets on Pabradé Range and to avoid confusion of safe altitudes for different targets. If specific targets are identified and lased, then the forward footprint used to generate the flight profile curve can be used to define the NHZ around the lased target. The buffer must be equal to or greater than the forward footprint and LEP will need to be worn if personnel are in the NHZ. Specific training scenario footprints may be verified with appropriate laser hazard modeling software to determine if the terrain might obscure the target or pose other issues.

A 5 mrad buffer angle was used to develop the aircraft flight limitation profile curve and table in Attachment 3. Approval for firing upon any target applies for all systems with a buffer angle of 5 mrad or less. If a training scenario must deviate from this curve of safe altitudes, contact the unit laser safety officer (LSO) or the ORS team for re-evaluation. The new footprint would only apply to the specific scenario limitation.

The flight profile limitations (Attachment 3) are not mandated aircraft flight paths but rather are vertical limits at a given distance to distinguish between safe and unsafe laser use altitudes. Flight profiles for laser operations do not supersede airspace definitions and restrictions. The use of lasers outside of range controlled airspace is not authorized by this certification.

6.3 Ground-based Laser Operations

In addition to the criteria listed in section 5.1, the following items were evaluated concerning ground-based laser operations. LOS was verified between each OP and LTA. The terrain and foliage were evaluated for suitability and laser firing scenarios discussed with range personnel. The firing combinations were verified to not have unusual or transient features incompatible with laser operations. A simulation was run on 3D geographic terrain data to predict where laser footprints would be located and determine if they would leave range boundaries.

In the traditional fixed OP and target approach, laser hazards are controlled by identifying the potential laser NHZs based on system buffer angle for each firing combination. These NHZs show the areas personnel must avoid and ensure the beam terminates within the range boundary. This method is used to ensure safe applications of any military laser system. It is well suited to laser systems with long nominal ocular hazard distance (NOHD) such as IR Designators.

With the more general fixed OP and laser-target area approach, and the absence of individual targets, laser NHZs are generated from each firing position to farthest perimeter of the target area for each buffer angle (5, 10, or 15 mrad). The NHZ generated would represent the worst-case scenario for each buffer angle. Any target located within the target area would have an individual

laser NHZ that would be encompassed by the laser-target area NHZ. NHZs generated for each firing position are shown in Attachments 4 through 7. This approach requires that the Range Operating Authorities (ROA)/Range Laser Safety Officer (RLSO) ensure safety through administrative controls (LEP, barricades, closing roads, etc.).

The ROA/RLSO also has the duty to ensure that the laser used has a hazard distance short enough that hazardous laser energy does not leave controlled areas. The tables listed in Attachments 4 through 7 provide the longest laser hazard distance allowable by USAF personnel. Lasers with hazard distances longer than those listed in Attachments 4 through 7 risk leaving range controlled area. Further analysis can be provided with more accurate target locations

6.4 Approved Laser Systems

Attachment 1 is a list of laser systems approved for use by USAF personnel. This Attachment also provides a guide for safety information under consideration for Pabradè Range to develop a range specific dataset. Contact the RHDO ORS team at 711HPW.RHDO.USAF.LaserSafety@us.af.mil for laser performance data for the systems listed in Attachment 1.

6.5 Calculations and Data Sources

For detailed information on hazard footprint calculation methods and formulae, see MIL-HDBK-828C. Formulae used to generate NHZs are incorporated in the Laser Range Management Toolkit (LRMT). LRMT uses digital elevation model data from the United States Geological Survey or National Geospatial-Intelligence Agency to create the ground terrain surface and model laser NHZs. Range boundary, target, and fixed OP coordinates were obtained from range personnel and some on-site spot measurements were verified. Line of sight from the laser firing areas to the targets were verified by range personnel and documented by on-site ORS personnel.

7 RECOMMENDATIONS

7.1 General recommendations/requirements for all ranges include the following:

- a) All laser operators should meet the following minimum criteria. To fire class 3B or class 4 lasers, an individual must have received an appropriate laser range briefing by the LSO or other approved and qualified range personnel. The operator must have training and appropriate qualification in the proper and safe use of the laser systems employed. The operators must have communication capability with the range control office during laser operations. The laser operators, range control, and other personnel on the range must be able to communicate if a safety issue arises. The Range Commander must approve any alternative instructions or standard operating procedures deviating from this assessment.
- b) Warn all personnel on the range of imminent laser operations, including maintenance personnel or visitors who may be in the NHZs shown in the attachments.
- c) For laser operations, the entire NHZ shall be cleared of specular reflectors. Specular reflectors can include, but are not limited to, glass, metal, and flat or standing water. This includes window debris scattered around the range from previous targets. Any painted object should be periodically examined for flaking or wear of the paint. All targets should

be periodically checked for reflective surfaces as conditions change over time.

- d) Laser warning signs should be posted at the range main access points during laser operations. Warning signs should be written in the host countries language and in NATO Standard English. Periodic checks and replacement should be part of the Range Commander's preventive maintenance schedule.
- e) Laser operations should be immediately stopped if unauthorized personnel are observed in the NHZ, equipment malfunction is observed, target is lost in field of view, or anytime laser safety cannot be assured.
- f) Essential personnel in the NHZ should wear appropriate LEP corresponding to the wavelength and optical density for the laser used.
- g) Range personnel should document each laser mission. This documentation includes the specific type of laser activity and the start/stop times of laser operations. In addition, we recommend recording the unit using the laser, the date of laser activity, and the name of the laser used.
- h) Water can become a flat specular reflector when it is calm and clear, i.e., mirror-like surface. In these cases, the reflection hazard to personnel in towers and in other aircraft increases, requiring additional precautions. The recommendation to use a target for lasing when calm, standing water is present should be made by the RCO/LSO. The condition of the standing water will need to be taken into consideration; as a general rule if a reflected image can be seen with little distortion, it should be considered a specular reflector. No special precautions are necessary for firing during rain, fog, or snowfall. Certain ranges may need to stop laser operation if water begins pooling either on the ground or on snow.
- i) Range Commander should have emergency procedures in-place for the unlikely case of a suspected laser eye injury according to specific country and range guidance.

8 SUMMARY

The Pabradė Range has not implemented a laser safety program. It is recommended that the guidelines addressed in this assessment be used until the host nation institutes a Laser Safety Program or until it is deemed necessary that a re-assessment of the range is needed. Pabradė Range is not fully in compliance with NATO 3606 and ARSP-4.

Please contact the ORS Team at DSN 389-2375/COMM (210) 539-2375, by email at 711HPW.RHDO.USAF.LaserSafety@us.af.mil, or contact the individual listed in Paragraph 3 "Evaluation Personnel" if you have any questions concerning this report.

9 Attachments:

1. Safety Information for USAF Laser Systems
2. Range Maps and Imagery with Boundary, Target Areas, Ground Laser Firing Positions, Terrain, and other Features

3. Flight Profile Limitations for Aircraft-Mounted Laser Systems, Pabradė Range, Lithuania
4. OP 1 Firing Position and Laser NHZ, Pabradė Range, Lithuania
5. OP 2 Firing Position and Laser NHZ, Pabradė Range, Lithuania
6. OP 3 Firing Position and Laser NHZ, Pabradė Range, Lithuania
7. OP 5 Firing Position and Laser NHZ, Pabradė Range, Lithuania

cc:

HAF/A3TI

USAFE/A3TW

10 REFERENCES

1. *LASER SAFETY FOR MILITARY USE*, STANAG 3606, Edition 7, 4 October 2016
2. Allied Range Safety Publication ARSP-4, Edition B Version 1 *LASER SAFETY FOR MILITARY USE*, 4 October 2016
3. Air Force Manual 13-212, Volume 1, 22 June 2018, Range Planning and Operations
4. Air Force Instruction 48-139, 30 September 2014, Laser and Optical Radiation Protection Program
5. DoD MIL-HDBK-828C, 31 March 2017, Range Laser Safety
6. Air Force Instruction 11-214, 14 August 2012, Air Operations Rules and Procedures
7. Joint Publication 3-09.1, Joint Fire Support, 30 June 2010
8. Joint Publication 3-09.3, Joint Tactics, Techniques, and Procedures for Close Air Support (CAS), 08 July 2009

Attachment 1: Safety Information for USAF Laser Systems

Safety Data for USAF Laser Systems

Table 1-1

Laser System	Mode	Wavelength (nm)	Unaided NOHD (km)	7X50 Binoculars NOHD (km)	Buffer Angle (mrad)	Unaided OD	7X50 Binoculars Aided OD	Platform type
AC-130U ALLTV	Designator	860	0.28	1.64	5.00	3.00	2.90	Fixed Wing
AC-130U LIA	Illuminator	807	0.10	0.70	5	3.3	5.2	Fixed Wing
AC-130U LTD/RF	Combat	1064	3.10	18.00	5	0.8	3.4	Fixed Wing
ACP-2	Pointer	836	0.00	-	10	1.9	-	Man Transportable
ACP-2A	Pointer	800-850	0.14	0.97	10	2.2	2.2	Man Transportable
ACP-2B	Pointer	836	0.16	0.93	10	2.5	2.3	Man Transportable
AIM-1/D	Pointer	800-850	0.08	0.46	10	1.7	1.7	Man Transportable
AIM-1/DLR	Pointer	830	0.24	1.56	10	2.5	2.5	Man Transportable
AIM-1/EXL	Pointer	800-850	0.09	0.68	10	1.7	1.7	Fixed Wing
AIM-1/EXL/MLR	Pointer	830	0.09	0.68	10	1.7	1.7	Man Transportable
AIM-1/MLR	Pointer	800-851	0.09	0.68	10	1.7	1.7	Rotary Wing
AN/AAQ-28 LITENING GEN 4/SE	Combat	1064	26.62	63.40	5	4.8	5.6	Fixed Wing
AN/AAQ-28 LITENING GEN 4/SE	Marker	804	0.25	1.41	5	2.8	2.7	Fixed Wing
AN/AAQ-28 LITENING GEN 4/SE	Training	1570	0.17	1.06	5	0.8	2.4	Fixed Wing
AN/AAQ-14 LANTIRN	Combat	1064	20.50	146.00	5	4.0	5.4	Fixed Wing
AN/AAQ-14 LANTIRN	Training	1540	0.00	0.18	5	0.0	1.2	Fixed Wing
AN/AAQ-16D AESOP	Designator	1064	10.00	36.00	10	5.1	5.1	Rotary Wing
AN/AAQ-22 NTIS (UH-1N)	Designator	1064	0.72	4.00	5	4.1	5.3	Rotary Wing
AN/AAQ-24 LAIRCM	SLTA (1x)	950-10600	0.04	0.19	5	2.5	2.5	Fixed Wing
AN/AAQ-24 LAIRCM	SLTA (2x)	950-10600	0.06	0.26	5	2.5	2.5	Fixed Wing
AN/AAQ-24 LAIRCM	GLTA (1x)	950-10600	0.04	0.16	5	2.5	2.5	Fixed Wing
AN/AAQ-24 LAIRCM	GLTA (2x)	950-10600	0.05	0.22	5	2.5	2.5	Fixed Wing
AN/AAQ-28 LITENING II (ER) (AT)	Designator	1064	12.00	43.00	5	4.1	5.4	Fixed Wing
AN/AAQ-28 LITENING II (ER) (AT)	Marker	808	0.19	1.33	5	2.6	2.9	Fixed Wing
AN/AAQ-33 ATP Sniper XR	Training	1570	0.00	0.60	2	0.0	1.5	Fixed Wing
AN/AAQ-33 ATP Sniper XR	Marker	804	0.25	1.41	2	2.8	2.7	Fixed Wing
AN/AAQ-33 ATP Sniper XR	Combat	1064	15.60	44.80	2	3.9	5.3	Fixed Wing
AN/AAQ-33 ATP-SE	LTM	808	1.22	6.32	5	1.9	3.1	Fixed Wing
AN/AAQ-33 ATP-SE	Tactical	1064	21.70	55.14	5	3.9	5.3	Fixed Wing
AN/AAQ-33 ATP-SE	Training	1570	0.00	1.48	5	0.0	1.6	Fixed Wing
AN/AAQ-39 CLDR (AC-130U)	Combat	1064	20.42	54.34	5	4.0	5.2	Fixed Wing
AN/AAQ-39 CLDR (AC-130U)	Training	1570	0.00	0.00	5	0.0	0.0	Fixed Wing
AN/AAQ-39 CLDR (AC-130U)	Alignment	830	0.46	2.86	5	0.8	1.3	Fixed Wing
AN/AAQ-39 GMS-2 (AC 130U)	Tactical	1064	17.65	48.65	2	4.1	5.4	Fixed Wing
AN/AAQ-39 GMS-2 (AC 130U)	Training	1570	0.00	0.00	2	0.0	0.2	Fixed Wing
AN/AAQ-39 GMS-2 (AC 130U)	Marker	860	0.28	1.60	2	3.0	2.9	Fixed Wing
AN/AAQ-40 EOTS (F-35)	"CONTACT THIS OFFICE"							
AN/AAQ-45 DAIRCM	Combat	1850-5000	0.02	0.07	5	3.0	3.0	Rotary Wing
AN/AAS-37 (OV-10D NOS)	Designator	1064	11.20	45.00	5	5.2	5.6	Fixed Wing
AN/AAS-44 LAMPS (UH-1N)	Rangefinder	1064	19.97	52.67	5	4.1	5.3	Rotary Wing
AN/AAS-44 LAMPS (UH-1N)	Designator	1064	22.36	56.67	5	4.3	5.4	Rotary Wing
AN/AAS-52 MQ-1 Predator MTS	LRD	1060	39.07	81.29	2	4.3	5.4	Fixed Wing
AN/AAS-52 MQ-1 Predator MTS	LTM	850	0.31	1.79	2	2.9	2.9	Fixed Wing
AN/AAS-52 MTS-A Firefly	Illuminator	532	1.05	6.28	2	4.1	4.1	Fixed Wing
AN/AAS-52 MTS-A Firefly	Illuminator	1064 RLE	1.05	6.28	2	1.5	1.5	Fixed Wing
AN/AAS-52 MTS-A Firefly	Illuminator (Hi-Beam Laser System w/ 1.1 mrad Divergence)	532	0.20	1.29	5	2.5	2.5	Fixed Wing
AN/AAS-54 MTS-A (HC-130J and MC-130J)	Rangefinder	1540	0.00	0.00	2	0.0	0.0	Fixed Wing
AN/AAS-54 MTS-A (HC-130J and MC-130J)	LTM	860	0.27	1.53	2	2.6	2.7	Fixed Wing
AN/AASQ-36 Star SAFIRE II (MC-130H)	Pointer/Illuminator	830	0.36	2.06	5	2.2	2.0	Fixed Wing
AN/AAT-3A (AC130H) PAVE SPECTRE	Illuminator	860	0.79	0.55	5	3.3	5.2	Fixed Wing
AN/ASQ-153 Pave Spike (F-4E)	Designator	1064	10.00	20.42	5	4.2	5.6	Fixed Wing
AN/AVQ-19/19A CLDR (AC-130H)	Training	1570	0.00	2.29	5	0.0	1.6	Fixed Wing
AN/AVQ-19/19A CLDR (AC-130H)	Tactical	1064	28.10	65.70	5	3.7	5.3	Fixed Wing
AN/DAS-1A MQ-9 Reaper MTS-B	LRD	1060	46.61	91.26	5	3.8	5.4	Fixed Wing
AN/DAS-1A MQ-9 Reaper MTS-B	LTM	860	0.32	1.83	5	3.0	2.9	Fixed Wing
AN/GAQ-T1 LD82LB	Designator	1064	12.50	38.00	5	4.6	5.5	Man Transportable

Attachment 1: Safety Information for USAF Laser Systems

Safety Data for USAF Laser Systems

Table 1-1 Cont.

Laser System	Mode	Wavelength (nm)	Unaided NOHD (km)	7X50 Binoculars NOHD (km)	Buffer Angle (mrad)	Unaided OD	7X50 Binoculars Aided OD	Platform type
AN/GVS-5	Rangefinder	1064	2.70	13.00	10	3.7	4.4	Man Transportable
AN/KAX-1A MARFLIR Pointer	Pointer	820- 840	0.64	4.00	5	2.5	2.5	Vehicle Mounted (ground-to-ground)
AN/MAD-1 HPMF	Pointer	830	0.68	3.74	5	2.5	2.3	Vehicle Mounted
AN/MAD-1 HPMF	Rangefinder	1540	0.00	0.00	5	0.0	0.0	Vehicle Mounted
AN/PAQ-1 LWLD	Designator	1064	7.00	15.00	10	4.2	5.8	Man Transportable
AN/PAQ-3 MULE	Designator	1064	20.00	53.00	Tripod - 5	3.9	5.6	Man Transportable
AN/PAQ-3 MULE	Designator	1064	20.00	53.00	Day-10	3.9	5.6	Man Transportable
AN/PAQ-3 MULE	Designator	1064	20.00	53.00	Night-15	3.9	5.6	Man Transportable
AN/PAQ-3 MULE	Rangefinder	1064	12.00	37.00	Tripod - 5	3.9	5.6	Man Transportable
AN/PAQ-3 MULE	Rangefinder	1064	12.00	37.00	Day -10	3.9	5.6	Man Transportable
AN/PAQ-3 MULE	Rangefinder	1064	12.00	37.00	Night -15	3.9	5.6	Man Transportable
AN/PAQ-3 MULE	Rangefinder w/ 12dB Filter	1064	3.30	16.00	Tripod - 5	3.9	5.6	Man Transportable
AN/PAQ-3 MULE	Rangefinder w/ 12dB Filter	1064	3.30	16.00	Day-10	3.9	5.6	Man Transportable
AN/PAQ-3 MULE	Rangefinder w/ 12dB Filter	1064	3.30	16.00	Night-15	3.9	5.6	Man Transportable
AN/PAS-24 RECON III	Pointer	820	0.27	1.50	10	2.1	2.1	Man Transportable
AN/PEQ-1 SOFLAM	Designator	1064	22.00	61.00	Tripod - 5	3.8	5.3	Man Transportable
AN/PEQ-1 SOFLAM	Designator	1064	22.00	61.00	Day-10	3.8	5.3	Man Transportable
AN/PEQ-1 SOFLAM	Designator	1064	22.00	61.00	Night-15	3.8	5.3	Man Transportable
AN/PEQ-15 ATPIAL (LA-5)	Visible Aim	605	0.08	0.52	10	0.7	0.7	Man Transportable
AN/PEQ-15 ATPIAL (LA-5)	IR Aim	820	0.19	1.13	10	1.7	1.5	Man Transportable
AN/PEQ-15 ATPIAL (LA-5)	IR Illuminator	820	0.06	0.34	10	1.9	1.7	Man Transportable
AN/PEQ-15 ATPIAL UHP (LA-5)	Visible	625-655	0.17	1.12	10	1.4	1.4	Man Transportable
AN/PEQ-15 ATPIAL UHP (LA-5)	IR Pointer	820-850	0.08	0.48	10	0.8	0.8	Man Transportable
AN/PEQ-15 ATPIAL UHP (LA-5)	IR Illuminator	820-850	0.60	3.30	10	2.5	2.5	Man Transportable
AN/PEQ-1B SOFLAM/GLTD II	Designator	1064	19.50	64.60	Tripod -5	4.3	5.3	Man Transportable
AN/PEQ-1B SOFLAM/GLTD II	Designator	1064	19.50	64.60	Day-10	4.3	5.3	Man Transportable
AN/PEQ-1B SOFLAM/GLTD II	Designator	1064	19.50	64.60	Night -15	4.3	5.3	Man Transportable
AN/PEQ-1C SOFLAM/GLTD III	Designator	1064	16.80	47.10	Tripod -5	4.0	5.2	Man Transportable
AN/PEQ-1C SOFLAM/GLTD III	Designator	1064	16.80	47.10	Day-10	4.0	5.2	Man Transportable
AN/PEQ-1C SOFLAM/GLTD III	Designator	1064	16.80	47.10	Night-15	4.0	5.2	Man Transportable
AN/PEQ-2 ITPIAL	Illuminator	850	0.26	1.81	10	2.0	2.0	Man Transportable
AN/PEQ-2A TPIAL	IR Aim	830	0.13	0.76	5	1.6	1.4	Man Transportable
AN/PEQ-2A TPIAL	IR Illuminator	830	0.13	0.76	5	1.6	1.4	Man Transportable
AN/PEQ-16A MIPIM	Aim Laser	605-665	0.07	0.52	10	0.70	0.65	Man Transportable
AN/PEQ-16A MIPIM	IR-Low	820-859	0.02	0.00	10	0.02	0.00	Man Transportable
AN/PEQ-16A MIPIM	IR-High	820-860	0.20	1.19	10	1.65	1.50	Man Transportable
AN/PEQ-16A MIPIM	IR Illuminator-High	820-859	0.02	0.09	10	0.72	0.60	Man Transportable
AN/PEQ-16A MIPIM	IR Illuminator-Low	820-860	3.64	3.38	10	1.83	1.67	Man Transportable
AN/PSQ-18A Grenade Sight	Aim Lo	830	0.00	0.00	10	0.0	-	Man Transportable
AN/PSQ-18A Grenade Sight	Dual Lo	830	0.00	0.00	10	0.5	-	Man Transportable
AN/PSQ-18A Grenade Sight	Dual Hi	830	0.03	0.19	10	1.5	-	Man Transportable
AN/PSQ-23 STORM RWS	Range Finder	1570	0.00	0.00	10	0.0	0.0	Man Transportable
AN/PSQ-23 STORM RWS	Visible	635	0.18	1.16	10	1.2	1.2	Man Transportable
AN/PSQ-23 STORM RWS	MILES	894	0.01	0.02	10	0.5	0.5	Man Transportable
AN/PSQ-23 STORM RWS	IR	830	0.22	1.25	10	1.9	1.9	Man Transportable
AN/PSQ-23A STORM-PI	IR	830	0.23	1.29	10	1.9	1.9	Man Transportable
AN/PSQ-23A STORM-PI	Visible	635	0.14	0.88	10	1.2	1.2	Man Transportable
AN/PSQ-23A STORM-PI	Miles	894	0.01	0.05	10	0.0	0.0	Man Transportable
AN/PSQ-23A STORM-PI	Rangefinder	1570	0.00	0.00	10	0.0	0.0	Man Transportable
AN/PVS-6 MELIOS	Rangefinder	1540	0.00	0.01	10	0.0	0.4	Man Transportable
AN/TVQ-2 G/VLLD	Designator	1064	44.20	316.00	5	3.7	6.2	Man Transportable
AN/VAS-7	Pointer	820	0.69	3.80	10	2.5	2.5	Man Transportable
AN/VAS-7	Rangefinder	1570	0.00	0.00	10	0.0	0.0	Man Transportable
Avian Dissuader	Illuminator	659	0.73	4.67	10	1.7	1.7	Man Transportable
BRITE STAR DP TFU	Pointer	830	1.17	6.17	5	2.2	3.3	Fixed Wing
BRITE STAR DP TFU	Designator	1064	15.20	47.80	5	3.7	4.7	Fixed Wing
BRITE STAR DP TFU	Pointer	830	15.30	48.50	5	2.2	3.3	Fixed Wing
BRITE STAR DP TFU	Designator	1064	15.30	48.50	5	3.7	4.7	Fixed Wing
BRITE STAR DP TFU	Range Finder	1570	0.00	0.00	5	0.0	0.0	Fixed Wing

Attachment 1: Safety Information for USAF Laser Systems

Safety Data for USAF Laser Systems

Table 1-1 Cont.

Laser System	Mode	Wavelength (nm)	Unaided NOHD (km)	7X50 Binoculars NOHD (km)	Buffer Angle (mrad)	Unaided OD	7X50 Binoculars Aided OD	Platform type
BRITE STAR DP TFU (export version)	Pointer	830	1.17	6.17	5	2.2	3.3	Fixed Wing
BRITE STAR DP TFU (export version)	Designator	1064	15.20	47.80	5	3.7	4.7	Fixed Wing
BRITE STAR DP TFU (export version)	Pointer	830	15.30	48.50	5	2.2	3.3	Fixed Wing
BRITE STAR DP TFU (export version)	Designator	1064	15.30	48.50	5	3.7	4.7	Fixed Wing
BRITE STAR DP TFU (export version)	Range Finder	1570	0.00	0.00	5	0.0	0.0	Fixed Wing
CLD	Marker	1064	9.70	38.00	10	4.5	5.4	Man Transportable
CLIP	IR Illuminator Pointer	830	0.26	2.86	10	2.4	2.9	Man Transportable
CROWS II-Kongsberg LRF	Rangefinder	916	0.00	0.00	5	0.0	0.0	Vehicle Mounted
CSP	LTM - High	871	0.24	1.40	5	2.9	-	Fixed Wing
CSP	LTM - Low	871	0.17	1.00	5	2.7	-	Fixed Wing
CSP	Designator	1064	17.60	48.70	5	5.4	-	Fixed Wing
CSP	Designator-Boresight	1064	0.00	1.20	5	-	1.5	Fixed Wing
CSP	Range Finder	1540	0.00	0.00	5	0.0	0.0	Fixed Wing
CT25KAM	-	905	0.00	0.19	10	0.0	1.6	Ceilorometer
CVL (Carbine Visible Laser)	Pointer	630	0.05	0.35	10	1.1	-	Man Transportable
Dissuader	Illuminator	650	0.00	0.12	10	0.0	1.7	Man Transportable
DPLD	Designator	1064	24.00	59.0	5	4.0	5.3	Fixed Wing
Eagle-Owl	Rangefinder	1571	0.02	0.11	5	1.8	1.8	Rotary Wing
ELRF-1MC Laser	Rangefinder	1540	-	0.00	5	0.0	0.0	Vehicle Mounted
FATS II	Pointer	794	0.00	0.04	10	0.0	1.8	Man Transportable
FLIR Star SAFIRE 380HD	Rangefinder	1570	0.00	0.00	5	0.0	0.0	Fixed Wing
FLIR Star SAFIRE 380HD	Illuminator	810	0.10	0.70	5	3.2	3.1	Fixed Wing
FLIR Star SAFIRE 380HD	Pointer	850	0.40	2.40	5	2.4	2.2	Fixed Wing
FLIR Star SAFIRE 380HDc (LP)	Designator	852	0.42	2.35	5	2.4	2.2	Fixed Wing
FLIR Star SAFIRE 380HDc (LRF)	Designator	1574	0.00	0.00	5	0.0	0.0	Fixed Wing
FLIR Star SAFIRE 380HDc(LI)	Designator	808	0.13	0.73	5	3.2	3.1	Fixed Wing
FLIR2000 (UH-1N)	Illuminator	794	0.53	3.50	5	2.2	2.2	Rotary Wing
GBD II	Pointer	532	0.12	0.84	10	2.2	2.2	Man Transportable
GBD III	Pointer	532	1.46	8.33	10	2.4	2.4	Man Transportable
GBD IIIC	Pointer	532	0.07	0.45	10	2.3	2.3	Man Transportable
GBD IIIC	Pointer w/Diffuser	532	0.01	0.05	10	2.2	2.2	Man Transportable
GCP-1/1A	Pointer	830	0.12	0.84	10	1.8	1.8	Man Transportable
GCP-1B	Pointer	835	0.30	2.10	10	2.4	2.4	Man Transportable
GCP-1C	Pointer	832	0.69	3.83	10	2.5	2.4	Man Transportable
GCP-1D	Pointer	870	0.28	1.89	10	2.4	2.9	Man Transportable
GCP-1H	Pointer	870	0.28	1.89	10	2.4	2.9	Man Transportable
GCP-2A	Pointer	807-817	0.25	1.73	10	2.2	4.7	Man Transportable
GCP-2B	Pointer	840	0.20	1.10	10	2.6	2.6	Man Transportable
GLARE MOUT 532P-M	Pointer	532	0.02	0.10	10	2.1	2.1	Man Transportable
GLARE RECOIL	Illuminator	532	0.00	0.24	5	0.0	0.0	Handheld
GLBI (Green Laser Baton Illuminator)	Pointer	531	0.01	0.02	10	0.4	1.9	Man Transportable
GRIIP / LA-4PEQ	IR	860	1.75	8.75	5	3.1	3.0	Fixed Wing
GRIIP / LA-4PEQ	Vis	532	0.11	0.70	5	2.4	2.4	Fixed Wing
HALT	Pointer	652	0.00	0.13	10	0.0	1.7	Man Transportable
HAVIS (M16 Aiming light)	Pointer	850	0.01	0.03	10	1.7	-	Man Transportable
HI-BEAM Overt Laser Signaling System AC-130H (HBLOSS)	Illuminator	532 RLE	1.43	9.20	5	4.1	4.0	Fixed Wing
HI-BEAM Overt Laser Signaling System AC-130H (HBLOSS)	Illuminator	1064	1.43	9.20	5	1.5	1.3	Fixed Wing
HLM 2	IR Marker	1064	5.90	23.00	10	5.0	5.0	Man Transportable
HLM 2	IR Pointer	840	0.18	1.06	10	2.0	2.0	Man Transportable
HLM 2	Visible Pointer	650	0.05	0.34	10	1.0	1.0	Man Transportable
HLM CSLLaM LA-10u/PEQ	Pointer	658	0.05	0.34	10	0.9	0.9	Man Transportable
HLM CSLLaM LA-10u/PEQ	Marker	1064	5.90	23.00	10	5.0	5.0	Man Transportable
IDWS MiniPOP	Rangefinder	1532	0.00	0.00	N/A	0.0	0.0	Rotary Wing
ILM-500-R	Rangefinder	905	0.00	69.00	5	0.00	0.60	Fixed Wing
IRADS (F-117A)	Designator	1064	18.50	130.00	5	4.5	6.0	Fixed Wing
IZLID 1000 Stealth	Pointer	978	0.14	0.96	10	2.2	2.7	Man Transportable
IZLID 1000(P)-A1	Pointer	856	0.85	4.76	10	3.0	3.0	Man Transportable

Attachment 1: Safety Information for USAF Laser Systems

Safety Data for USAF Laser Systems

Table 1-1 Cont.

Laser System	Mode	Wavelength (nm)	Unaided NOHD (km)	7X50 Binoculars NOHD (km)	Buffer Angle (mrad)	Unaided OD	7X50 Binoculars Aided OD	Platform type
IZLID 200P	Pointer	820-850	0.34	1.94	-	2.5		Man Transportable
IZLID I (Model #424-100)	Pointer	827	0.32	2.18	10	2.2	2.2	Man Transportable
IZLID II	Pointer	867	0.24	1.68	10	2.1	2.8	Man Transportable
IZLID II Stealth	Pointer	976	0.06	0.44	10	1.1	1.6	Man Transportable
IZLID ULTRA (Model #434P)	Pointer	835	0.75	4.10	10	3.2	3.2	Man Transportable
IZLID-1P	Pointer	830	0.32	1.89	10	2.2	2.2	Man Transportable
Javelin (Field Tactical Trainer)	Pointer	905	0.01	0.02	10	1.0	1.1	Man Transportable
LA-17/PEQ D-PILS NIR	Pointer/Illuminator	825-855	0.41	2.70	10	2.3	2.3	Man Transportable
LA-17/PEQ D-PILS SWIR	Pointer/Illuminator	1400-1600	0.05	0.27	10	0.9	0.9	Man Transportable
LA-17/PEQ D-PILS Visible	Pointer/Illuminator	625-645	0.18	1.10	10	1.8	1.8	Man Transportable
LA-7/PEQ SCAR EGLM	Pointer	905	0.04	0.24	-	0.6	0.5	Man Transportable
LAKEODD (EOD aiming lasers)	M6X	640	0.03	0.22	-	0.7	0.7	Man Transportable
LAKEODD (EOD aiming lasers)	SL-150	630	0.02	0.10	-	0.7	0.7	Man Transportable
LAKEODD (EOD aiming lasers)	PAN	656	0.02	0.10	-	0.7	0.7	Man Transportable
Laser Light Target Designator (LLTD)	Designator	1064	7.00	15.00	10	4.0	4.9	Man Transportable
LaserGrips LG-202IR	Pointer	850	0.02	0.15	10	0.6	0.6	Man Transportable
Lazarus LTE	IR Pointer	799	0.13	0.77	5	3.0	3.1	Man Transportable
Lazarus LTE	Pointer/Illuminator	532	0.15	0.97	5	3.8	3.7	Man Transportable
LP-1000	Pointer	836	0.70	3.70	10	2.8	3.2	Man Transportable
LPL-30	Pointer	800-850	0.09	0.68	10	1.7	1.7	Man Transportable
LRR-104 (Mark V)	Designator	1064	0.87	5.50	10	3.7	3.7	Man Transportable
LRTV	Rangefinder	1560	0.00	0.00	10	0.0	0.0	Man Transportable
LRTV	Pointer	828	0.00	0.00	10	0.0	0.0	Man Transportable
LTE	GBD-III-3MR	532	0.14	0.83	10	2.3	2.3	Fixed Wing
LTE	IZLID 1000P	860	0.14	0.83	10	2.9	3.0	Fixed Wing
M-931	Pointer	850	0.01	0.16	10	0.7	0.8	Man Transportable
MANTIS (Multi-Adaptable Night Tactical Imaging System)	Pointer	827	0.10	0.70	10	2.2	2.2	Man Transportable
MARK VII	Rangefinder	1570	0.00	0.00	10	0.0	0.0	Man Transportable
MILES	Training	multiple	0.03	-	-	0.6	0.6	Man Transportable
MILES 2000	Training	multiple	0.01	0.04	-	0.0	0.0	Man Transportable
MTS-B HD/TLA	LTM	860	0.40	2.20	5	3.0	2.9	Fixed Wing
MTS-B HD/TLA	Designator	1064	28.00	71.00	5	3.6	5.0	Fixed Wing
MTS-B HD/TLA	Rangefinder	1572	0.00	1.40	5	0.0	1.1	Fixed Wing
MWSS	Training	266	0.65	0.65	2	7.6	7.6	Fixed Wing
MX-10 L0032	MELT LRF	1535	0.00	0.00	5	0.0	0.0	Fixed Wing
MX-10 L0033	DDLI Dual (Both Modes)	820-864	0.44	2.56	5	3.0	2.9	Fixed Wing
MX-10 L0034	DDLI Dual (Both Modes)	820-864	0.44	2.56	5	3.0	2.9	Fixed Wing
MX-10 L0034	MELT LRF	1535	0.00	0.00	5	0.0	0.0	Fixed Wing
MX-15 / MX-15i / MX-15Di L0009	WDLI	835-865	0.06	0.37	5	3.1	3.1	Fixed Wing
MX-15 / MX-15i / MX-15Di L0009	LRF	1540	0.00	0.00	5	0.0	0.0	Fixed Wing
MX-15 / MX-15i / MX-15Di L0010	NDLI	835-865	0.57	2.22	5	3.2	3.2	Fixed Wing
MX-15 / MX-15i / MX-15Di L0010	LRF	1540	0.00	0.00	5	0.0	0.0	Fixed Wing
MX-15 / MX-15i / MX-15Di L0011	UNDLI	835-865	0.77	4.33	5	2.9	2.9	Fixed Wing
MX-15 / MX-15i / MX-15Di L0011	LRF	1540	0.00	0.00	5	0.0	0.0	Fixed Wing
MX-15 Di / L0039	SWLS - OPO	1570	0.00	0.00	5	0.0	0.0	Fixed Wing
MX-15 Di / L0039	SWLS - Tactical	1064	26.55	62.83	5	4.3	4.3	Fixed Wing
MX-15 Di / L0039	DWLI - OPSL	532	0.78	4.70	5	3.9	3.8	Fixed Wing
MX-15 Di / L0039	DWLI - NIR	861	0.45	2.48	5	3.1	3.1	Fixed Wing
MX-15 Di / L0039	DWLI - OPSL	532	0.78	4.70	5	3.9	3.8	Fixed Wing
MX-15 Di / L0039	DWLI NIR	861	0.45	2.48	5	3.1	3.1	Fixed Wing
MX-15 Di / L0039	SWLS Tactical	1064	26.55	62.83	5	4.3	5.3	Fixed Wing
MX-15 Di / L0039	SWLS OPO	1570	0.00	0.00	5	0.0	0.0	Fixed Wing
MX-15 Dia L0018	CLDR	1064	19.85	53.37	5	4.9	5.5	Fixed Wing
MX-15 Dia L0018	NDLI	835-865	0.39	2.22	5	3.2	3.2	Fixed Wing
MX-15 Dia L0018	LRF	1540	0.00	0.00	5	0.0	0.0	Fixed Wing
MX-15 Dia L0029	CLDR	1064	19.85	50.37	5	4.9	5.5	Fixed Wing
MX-15 Dia L0029	NDLI	835-865	0.39	2.22	5	3.2	3.2	Fixed Wing
MX-15Dia L0031	CLDR	1064	19.85	53.37	5	4.9	5.5	Fixed Wing
MX-15Dia L0031	NDLI	835-865	0.39	2.22	5	3.2	3.2	Fixed Wing

Attachment 1: Safety Information for USAF Laser Systems

Safety Data for USAF Laser Systems

Table 1-1 Cont.

Laser System	Mode	Wavelength (nm)	Unaided NOHD (km)	7X50 Binoculars NOHD (km)	Buffer Angle (mrad)	Unaided OD	7X50 Binoculars Aided OD	Platform type
MX-15Dia L0031	LRF	1540	0.00	0.00	5	0.0	0.0	Fixed Wing
MX-15i Demo L0026	HPVLI	532 RLE	45.78	321.79	5	4.0	3.9	Fixed Wing
MX-15i Demo L0026	NDLI	835-865	0.57	2.22	5	3.2	3.1	Fixed Wing
MX-15i Demo L0027	HPVLI	1064	45.78	321.79	5	1.3	1.2	Fixed Wing
MX-20 L0012	WDLI	835-865	0.06	0.37	5	3.2	3.1	Fixed Wing
MX-20 L0012	LRF	1540	0.00	0.00	5	0.0	0.0	Fixed Wing
MX-20 L0013	NDLI	835-865	0.39	2.22	5	3.2	3.2	Fixed Wing
MX-20 L0013	LRF	1540	0.00	0.00	5	0.0	0.0	Fixed Wing
MX-20 L0014	UNDLI	835-865	0.77	4.33	5	2.9	2.9	Fixed Wing
MX-20 L0014	LRF	1540	0.00	0.00	5	0.0	0.0	Fixed Wing
MX-20D L0023	SLWS - OPO	1064	0.08	0.90	5	2.4	2.0	Fixed Wing
MX-25D L0058	SWLS-ED OPO	1570	0.00	0.80	2	0.0	1.2	Fixed Wing
MX-25D L0058	OPSL	532	0.72	4.10	2	3.8	3.7	Fixed Wing
MX-25D L0058	NIR	860	0.45	2.50	2	2.6	3.1	Fixed Wing
MX-25D L0058	SWLS-ED Tactical	1064	35.00	82.80	2	3.9	5.1	Fixed Wing
MX-25D L0092	SWLS Tactical	1064	43.47	95.33	5	3.9	5.2	Fixed Wing
MX-25D L0092	SWLS OPO	1570	0.00	1.00	5	0.0	0.8	Fixed Wing
MX-25D L0092	WALI	830	0.12	0.65	5	3.9	4.1	Fixed Wing
MX-25D L0092	DWLI-OPSL	532	0.73	4.18	5	3.8	3.8	Fixed Wing
MX-25D L0092	DWLI-NIR	860	0.45	2.49	5	2.6	3.1	Fixed Wing
MX-Di w/HD L0021	NDLI	835-865	1.39	2.22	5	3.2	3.2	Fixed Wing
MX-Di w/HD L0021	SWLS - Tactical	1064	27.88	66.49	5	4.6	5.4	Fixed Wing
MX-Di w/HD L0021	SLWS - OPO	1570	0.08	0.86	5	0.3	1.7	Fixed Wing
MX-Di w/HD L0022	SLWS - OPO	SLE: 1064	0.08	0.86	5	2.4	2.0	Fixed Wing
NITE EAGLE (UH-1N)	Designator	1064	15.00	45.00	5	4.1	5.2	Rotary Wing
NITE EYE	Pointer	980	0.09	0.68	10	1.7	1.7	Man Transportable
OWL	Pointer	830	0.07	-	10	1.6	1.6	Man Transportable
PLRF 15	Laser Range Finder	1550	0.00	0.00	15	0.0	0.0	Man Transportable
PLRF 15C	Laser Range Finder	1550	0.00	0.00	15	0.0	0.0	Man Transportable
PLRF 25C	Laser Range Finder	1550	0.00	0.00	15	0.0	0.0	Man Transportable
PLRF 25C BT	Laser Range Finder	1550	0.00	0.00	15	0.0	0.0	Man Transportable
SABER-203	Pointer	650	0.01	-	10	0.9	-	Man Transportable
Talon XR AN-VAS-8	Rangefinder	1574	0.00	0.00	5	0.0	0.0	Vehicle Mounted
Talon XR AN-VAS-8	Pointer	808	0.48	2.63		2.3	2.9	Vehicle Mounted
TD-100	Pointer	850	0.10	0.10	10	1.1		Man Transportable
TD-100	Pointer	632.8				0.3		Man Transportable
TD-100A	Pointer	850	0.10	0.10	10	1.1		Man Transportable
TD-100A	Pointer	670	0.10	0.10	10	0.6		Man Transportable
TGO/IR (Model 2300A)	Pointer	810	0.01	0.07	10	2.3	3.5	Man Transportable
Type 163 LTD	Designator	1064	14.81	42.95	Tripod-5	4.3	4.9	Man Transportable
Type 163 LTD	Designator	1064	14.81	42.95	Handheld-10	4.3	4.9	Man Transportable
Vector IV/ Viper	Rangefinder	1550	0.00	0.00	10	0.0	0.0	Man Transportable
Vectronix AG (PLRF 15)	PLRF	1550	0.00	0.00	10	0.0	0.0	Man Transportable
Vectronix AG (PLRF 15-C)	PLRF	1550	0.00	0.00	10	0.0	0.0	Man Transportable
VITAL-100	Training	819.2	0.01	0.00	10	0.1	0.0	Man Transportable
VITAL-100	Combat	819.2	0.30	1.77	10	2.2	2.1	Man Transportable
VITAL-2	Pointer	816.6	0.01	0.00	10	0.0	0.0	Man Transportable
VSLIM	IR Illuminator	815-845	0.54	3.07	10	3.4	3.4	Man Transportable
X2 TASER CEW	Pointer	630-680	0.03	0.20	15	0.7	0.7	Man Transportable
X26 Taser Laser Pointer	Pointer	655	0.02	0.15	15	1.0	1.0	Man Transportable
X26P TASER ECD	Pointer	630-680	0.03	0.17	15	0.7	0.7	Man Transportable

1. Air Force policy is to maintain aircraft separation of 100 ft. Navy prohibits tandem or buddy aircraft lasing.
2. Air Force assigns a 2 mrad buffer zone to LANTIRN; Navy assigns a 5 mrad buffer zone
3. Assume that built-in safety filter only protects against the wavelength of the laser in which it is installed, and that it does not protect against other laser wavelengths.
4. Items are listed alphabetically by system.

WARNING! THIS HAZARD DATA COULD CHANGE SINCE DOD HAS NO CONTROL OF MANUFACTURING OF THESE PRODUCTS.
CHECK WITH THE MANUFACTURER TO ENSURE THAT CHARACTERISTICS HAVE NOT CHANGED SINCE THE LAST DOD EVALUATION.

Attachment 2. Range Maps and Imagery with Boundary, Target Areas, Ground Laser Firing Positions, Terrain, and other Features

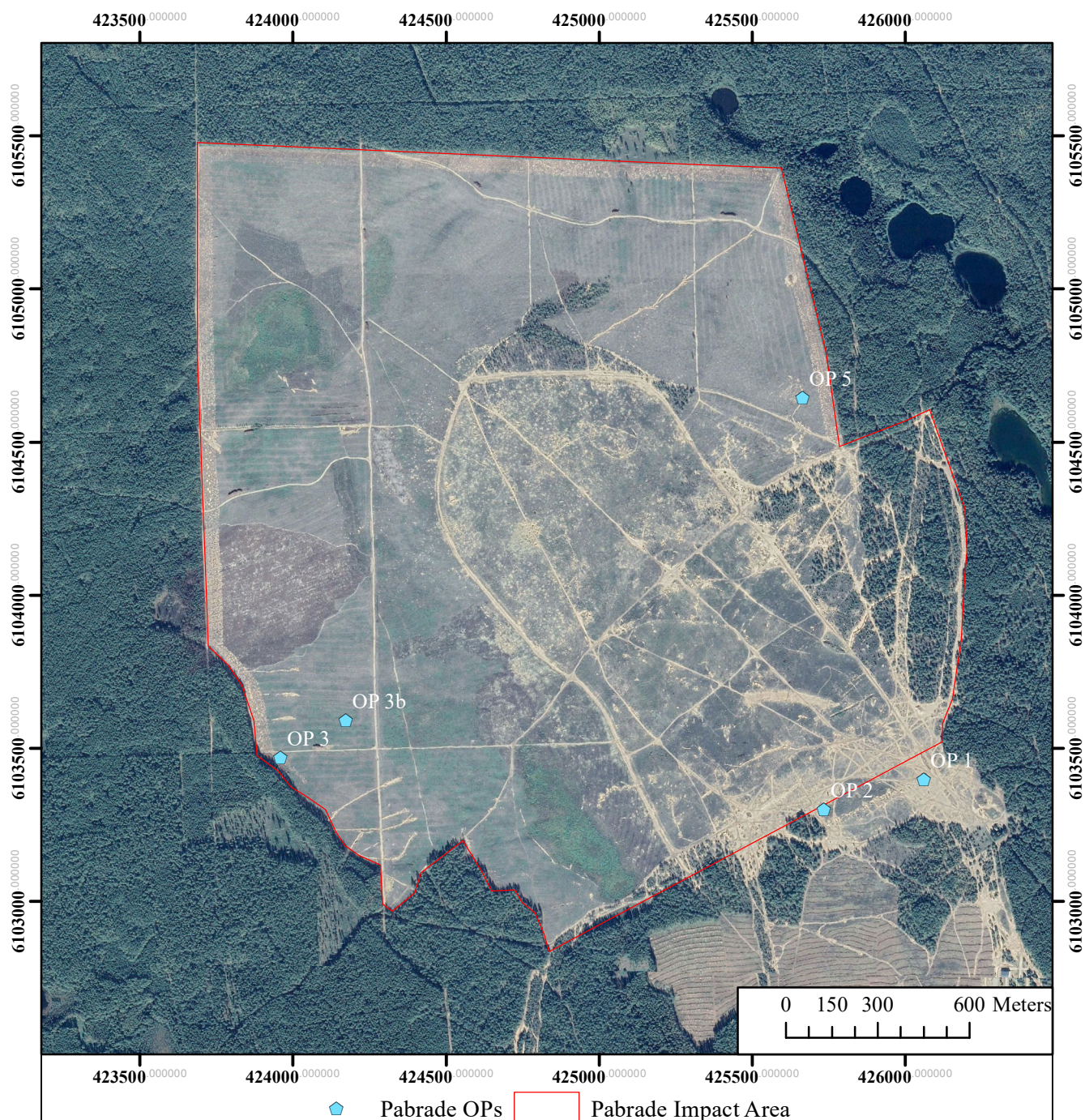


Figure 2-1: Pabradė Range Overview.
Refer to Table 2-1 for specific OP coordinates.

POC: William Forkner, USAFE Email: william.forkner.1@us.mail.mil		Phone Number: Comm. +94-(111)480-7195 USAF Laser Injury Telephone Number: (800) 473-3549
Location: N/A	Buffer Angle: N/A	Height (ft): N/A
Date: 5 December 2018	Created By: K. Schuster	LRMT Version 10.4.1.0.02

Attachment 2. Range Maps and Imagery with Boundary, Target Locations, Ground Laser Firing Positions, Terrain, and other Features

Table 2-1. Coordinates of OPs Assessed

Target Number	OP Description	Latitude	Longitude	MGRS
OP 1	Wooden Tower	55° 4' 18.612" N	25° 50' 31.337" E	35UMB4260661033
OP 2	Stone Building	55° 4' 15.332" N	25° 50' 12.995" E	35UMB4257361033
OP 3	Clearing	55° 4' 19.798" N	25° 48' 32.785" E	35UMB4239561034
OP 3b	Small Hill near OP 3	55° 4' 23.930" N	25° 48' 44.711" E	35UMB4241761035
OP 4	N/A			
OP 5	Clearing	55° 4' 58.732" N	25° 50' 7.788" E	35UMB4256661046

Attachment 3: Flight Profile Limitations for Aircraft-Mounted Laser Systems, Pabradė Range, Lithuania

The calculated flight limitations profile shown is intended to minimize the laser hazard from the main beam of 5-mrad, fixed-wing laser system. By adhering to the slant-range and altitude combinations listed in Figure 3-1 and Table 3-1, the main beam will be contained within the defined range restriction and will not include any areas with specular reflectors or non-essential personnel.

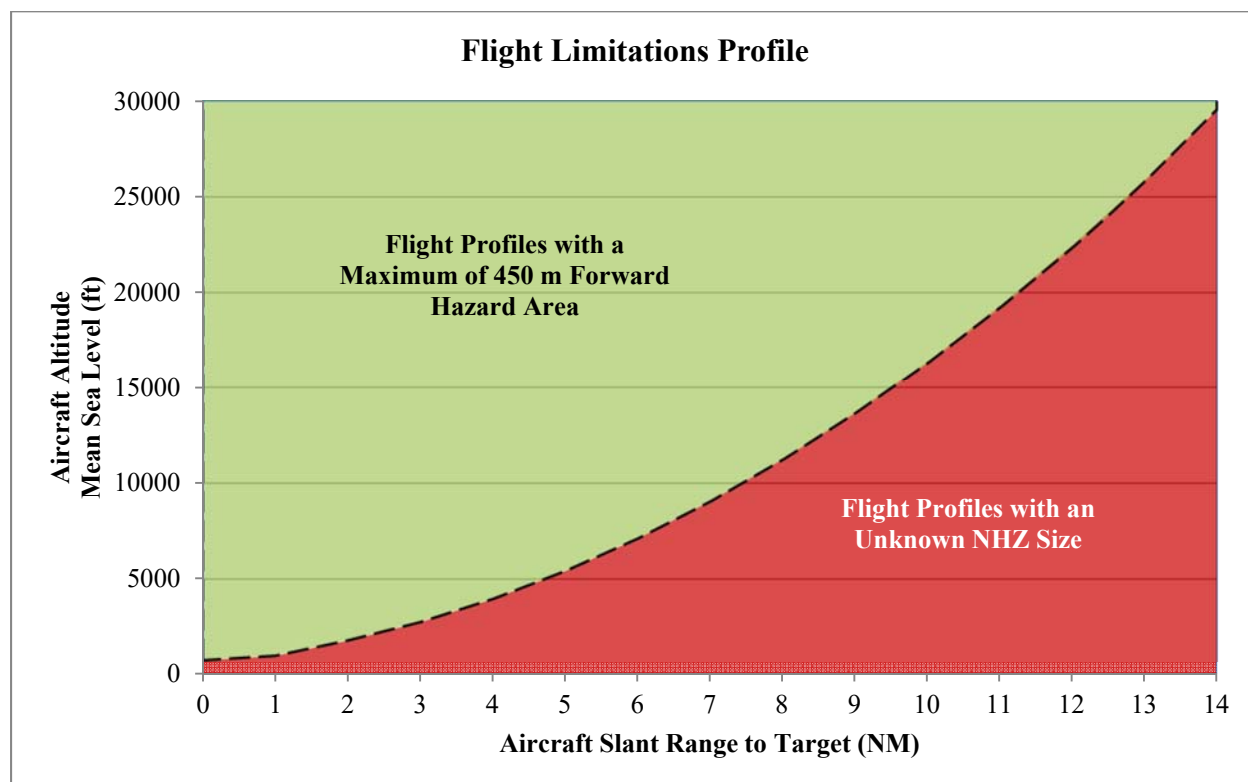


Figure 3-1. Aircraft Flight Profile for 450 m forward hazard area with 5 mrad buffer angle. Available run in headings are from 0°-360°.

This flight profile curve is for Pabradė Range. Limiting combination for Pabradė Range is 450 m. This curve is not intended to authorize lasing from altitudes above airspace ceiling. Engagements may be represented in this chart which are not allowed due to restricted airspace limitations. Ensure airspace restrictions are adhered to by verifying with RCO for real-time airspace ceiling limitations prior to operation. This chart is a visual representation of Table 3-1. The altitudes and corresponding slant ranges above the black dotted line have a known NHZ, while altitudes and corresponding slant ranges below the black dotted line have an unknown NHZ that could extend beyond range boundaries. For additional questions, please contact 711 HPW/RHDO.

Attachment 3: Flight Profile Limitations for Aircraft-Mounted Laser Systems, Pabradė Range, Lithuania

Table 3-1. Flight Profile Limitation Table for Aircraft Mounted Laser Systems with Buffer Angle up to 5mrad. All targets are certified as approved to lase when aircraft is above the minimum altitude at the indicated range from any direction from which there is line of sight.

Slant Range to Target (NM)	Minimum Safe Lasing Altitude (meters above MSL)	Slant Range to Target (NM)	Minimum Safe Lasing Altitude (meters above MSL)
14	29,600	7	9,100
13	25,900	6	7,200
12	22,500	5	5,500
11	19,300	4	4,000
10	16,400	3	2,800
9	13,700	2	1,800
8	11,300	≤1	1000

Attachment 4. OP 1 Firing Position and Laser NHZ, Pabradė Range, Lithuania

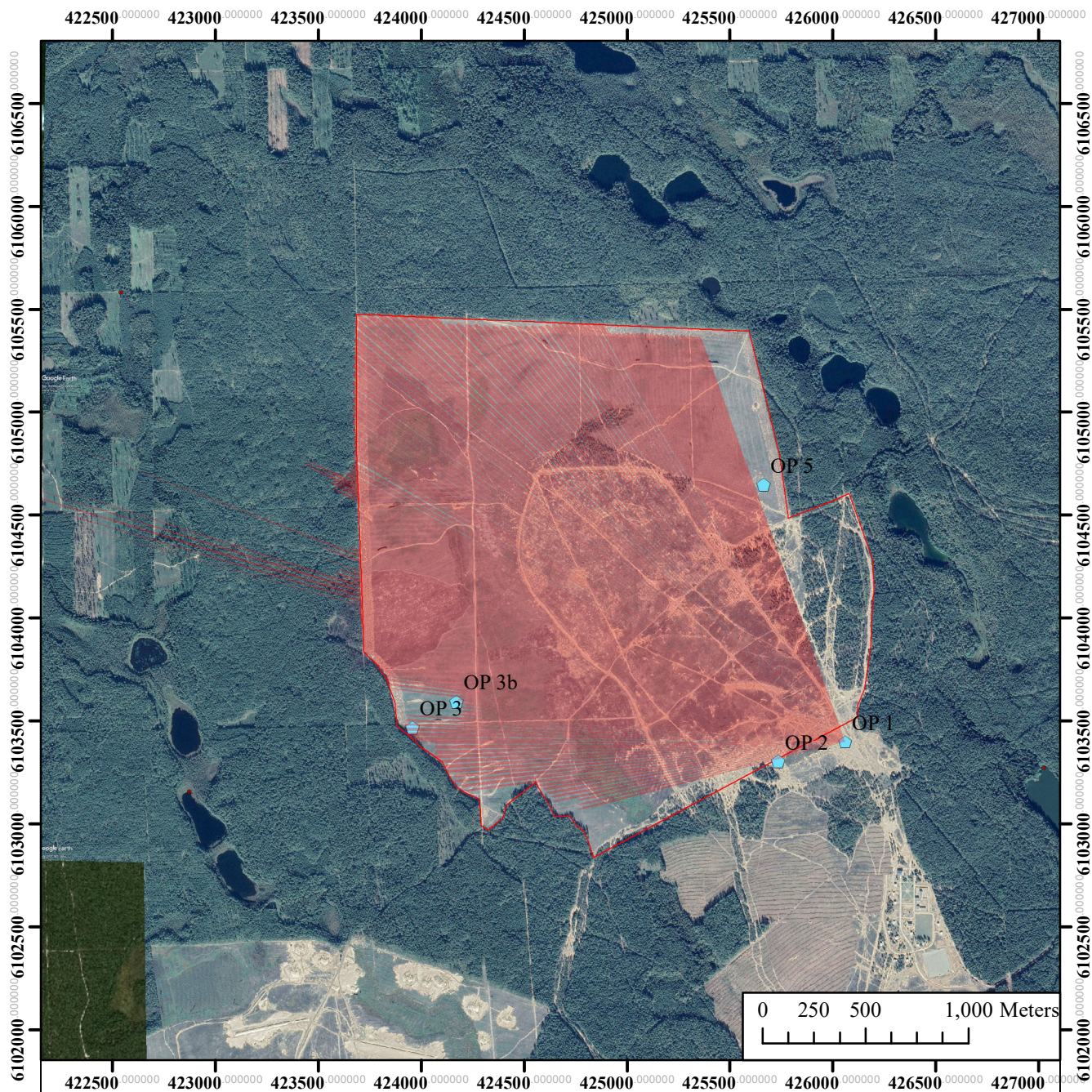


Figure 4-1: NHZ for 5 mrad laser systems implemented from the OP 1.
The NHZ shown is for the entire target area.
Maximum recommended laser NOHD: 2.4 km.

POC: William Forkner, USAFE		Phone Number: Comm. +94-(111)480-7195
Email: william.forkner.1@us.mail.mil		USAF Laser Injury Telephone Number: (800) 473-3549
Location: OP 1	Buffer Angle: 5 mrad	Height (ft): 5
Date: 5 December 2018	Created By: K. Schuster	LRMT Version 10.4.1.0.02

Attachment 4. OP 1 Firing Position and Laser NHZ, Pabradė Range, Lithuania

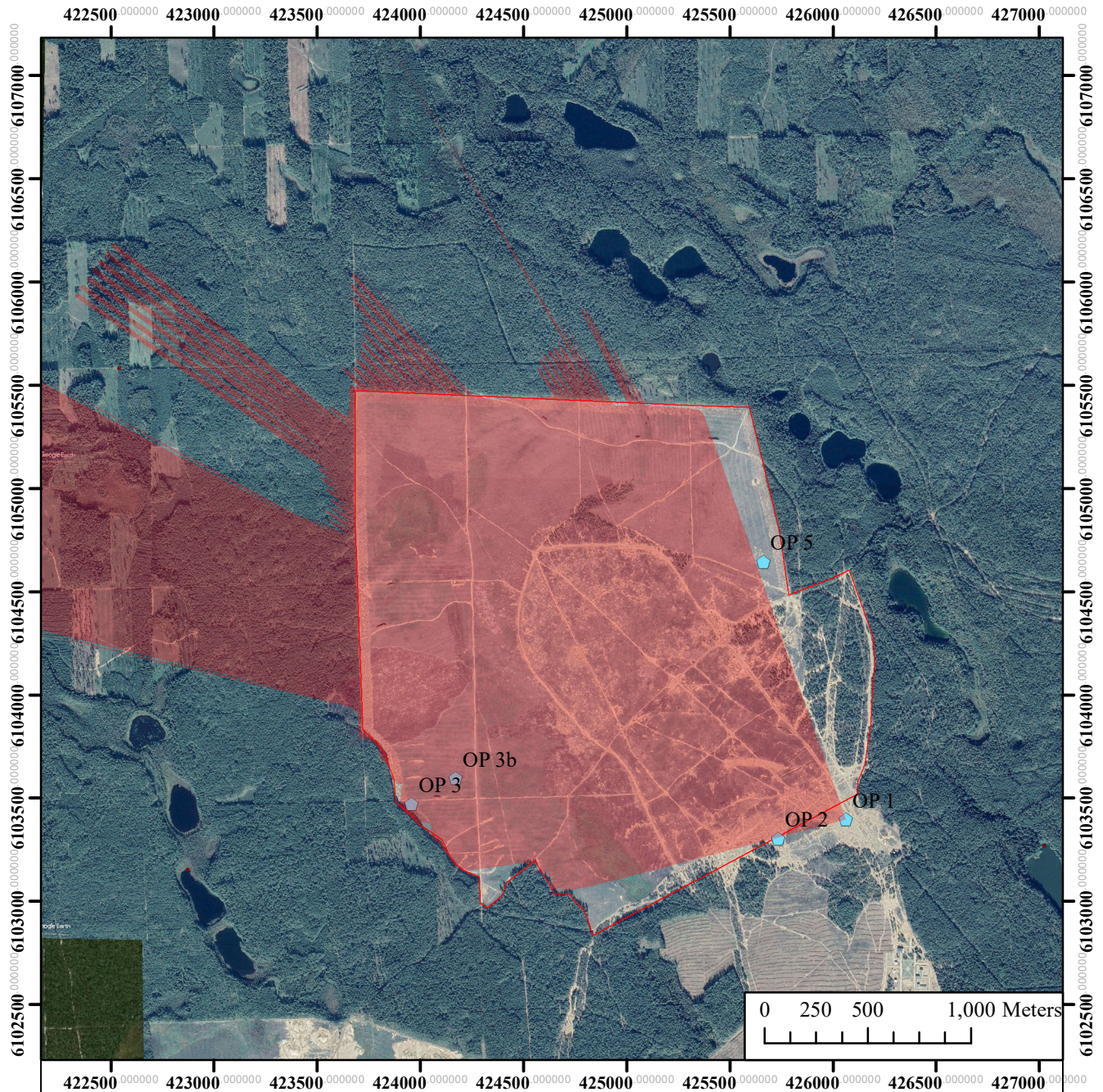
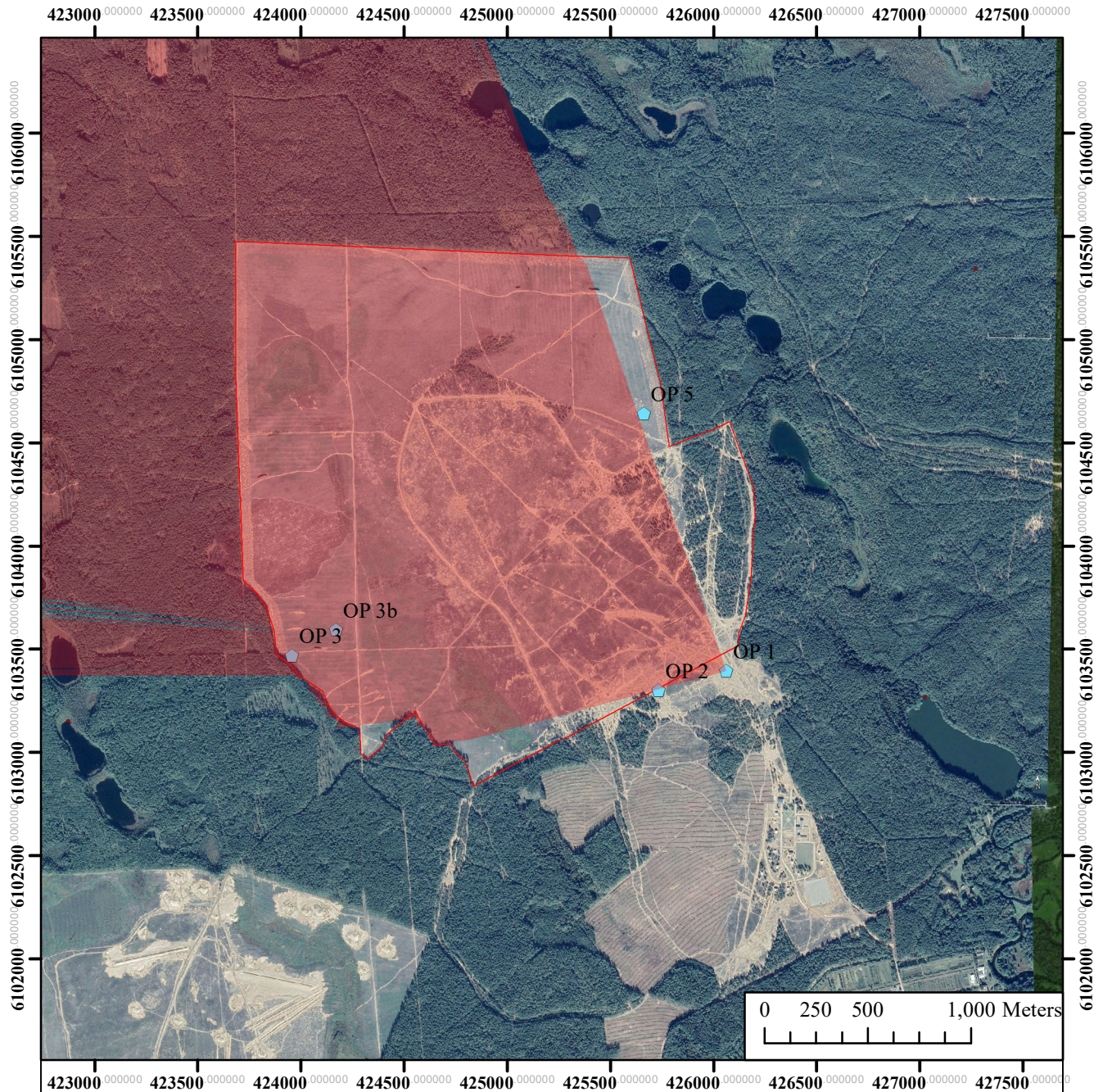


Figure 4-2: NHZ for 10 mrad laser systems implemented from the OP 1.
The NHZ shown is for the entire target area.
Maximum recommended laser NOHD: 2.4 km.

POC: William Forkner, USAFE		Phone Number: Comm. +94-(111)480-7195
Email: william.forkner.1@us.mail.mil		USAF Laser Injury Telephone Number: (800) 473-3549
Location: OP 1	Buffer Angle: 10 mrad	Height (ft): 5
Date: 5 December 2018	Created By: K. Schuster	LRMT Version 10.4.1.0.02

Attachment 4. OP 1 Firing Position and Laser NHZ, Pabradė Range, Lithuania



Laser NHZ
 Pabradė OPs
 Pabradė Impact Area

Figure 4-3: NHZ for 15 mrad laser systems implemented from the OP 1.

The NHZ shown is for the entire target area.

Maximum recommended laser NOHD: 2.0 km.

POC: William Forkner, USAFE		Phone Number: Comm. +94-(111)480-7195
Email: william.forkner.1@us.mail.mil		USAF Laser Injury Telephone Number: (800) 473-3549
Location: OP 1	Buffer Angle: 15 mrad	Height (ft): 5
Date: 5 December 2018	Created By: K. Schuster	LRMT Version 10.4.1.0.02

Attachment 5. OP 2 Firing Position and Laser NHZ, Pabradė Range, Lithuania

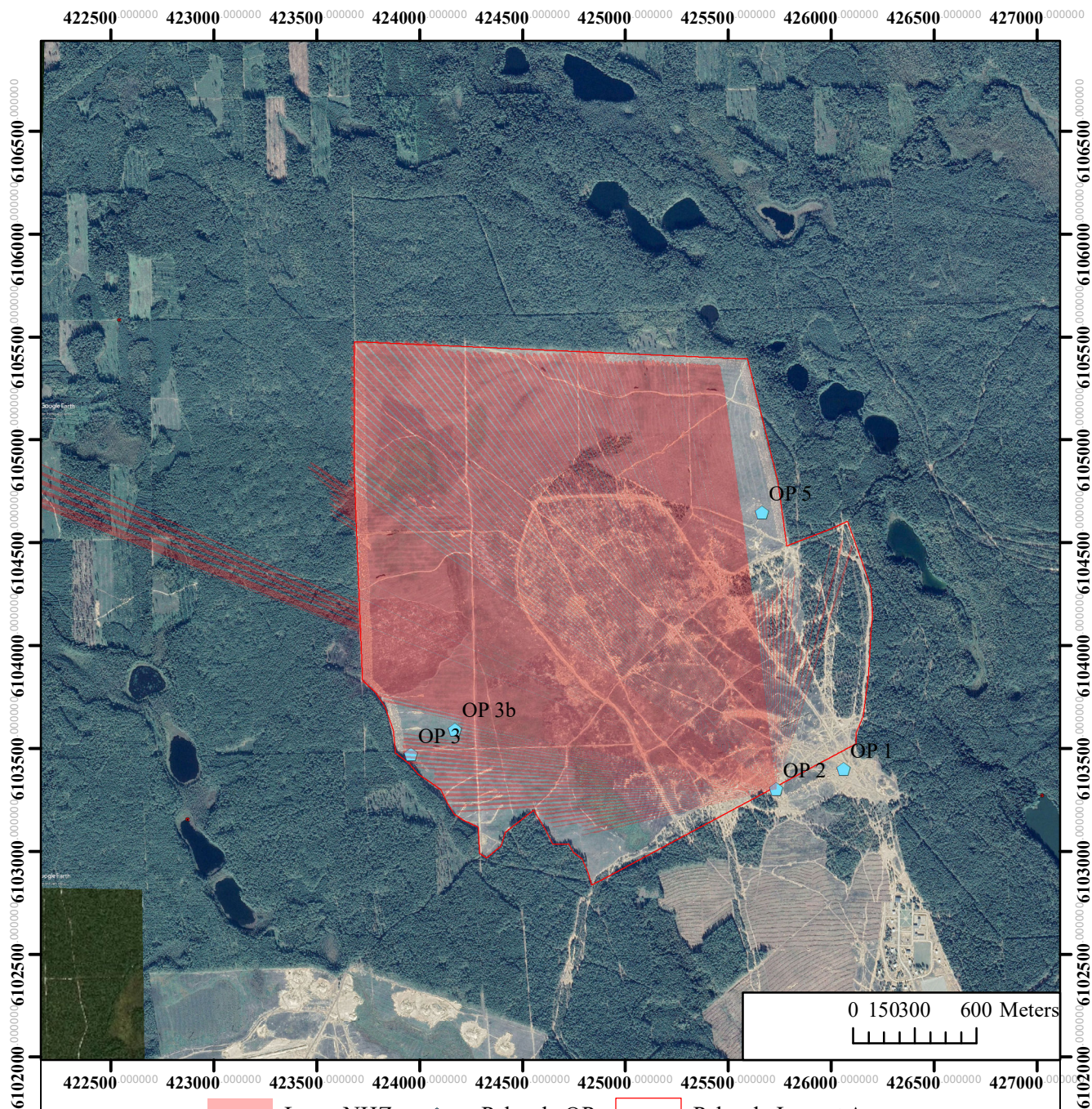
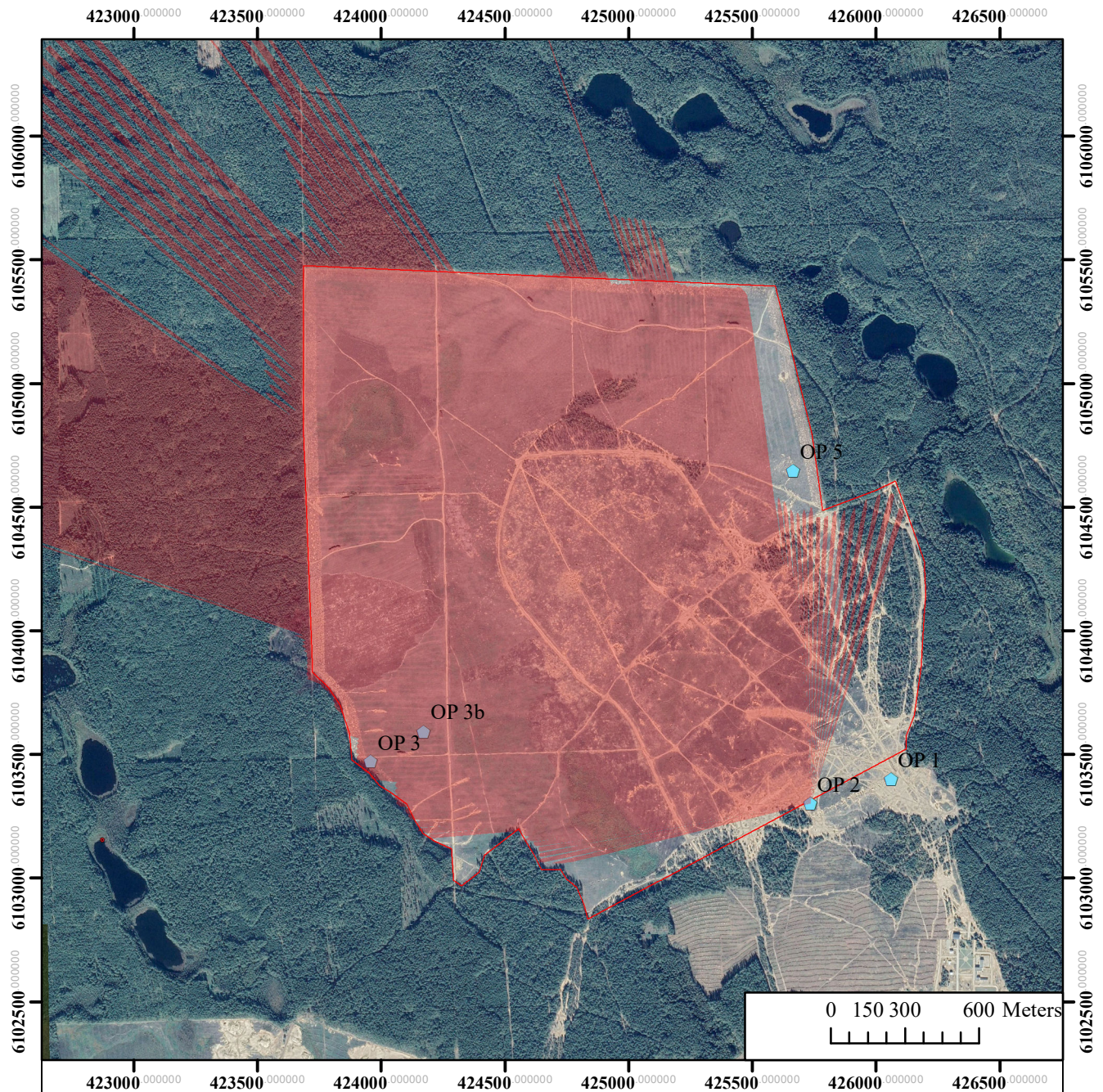


Figure 5-1: NHZ for 5 mrad laser systems implemented from the OP 2.
The NHZ shown is for the entire target area.
Maximum recommended laser NOHD: 2.4 km.

POC: William Forkner, USAFE		Phone Number: Comm. +94-(111)480-7195
Email: william.forkner.1@us.mail.mil		USAF Laser Injury Telephone Number: (800) 473-3549
Location: OP 2	Buffer Angle: 5 mrad	Height (ft): 5
Date: 5 December 2018	Created By: K. Schuster	LRMT Version 10.4.1.0.02

Attachment 5. OP 2 Firing Position and Laser NHZ, Pabradė Range, Lithuania



Laser NHZ
 Pabradė OPs
 Pabradė Impact Area

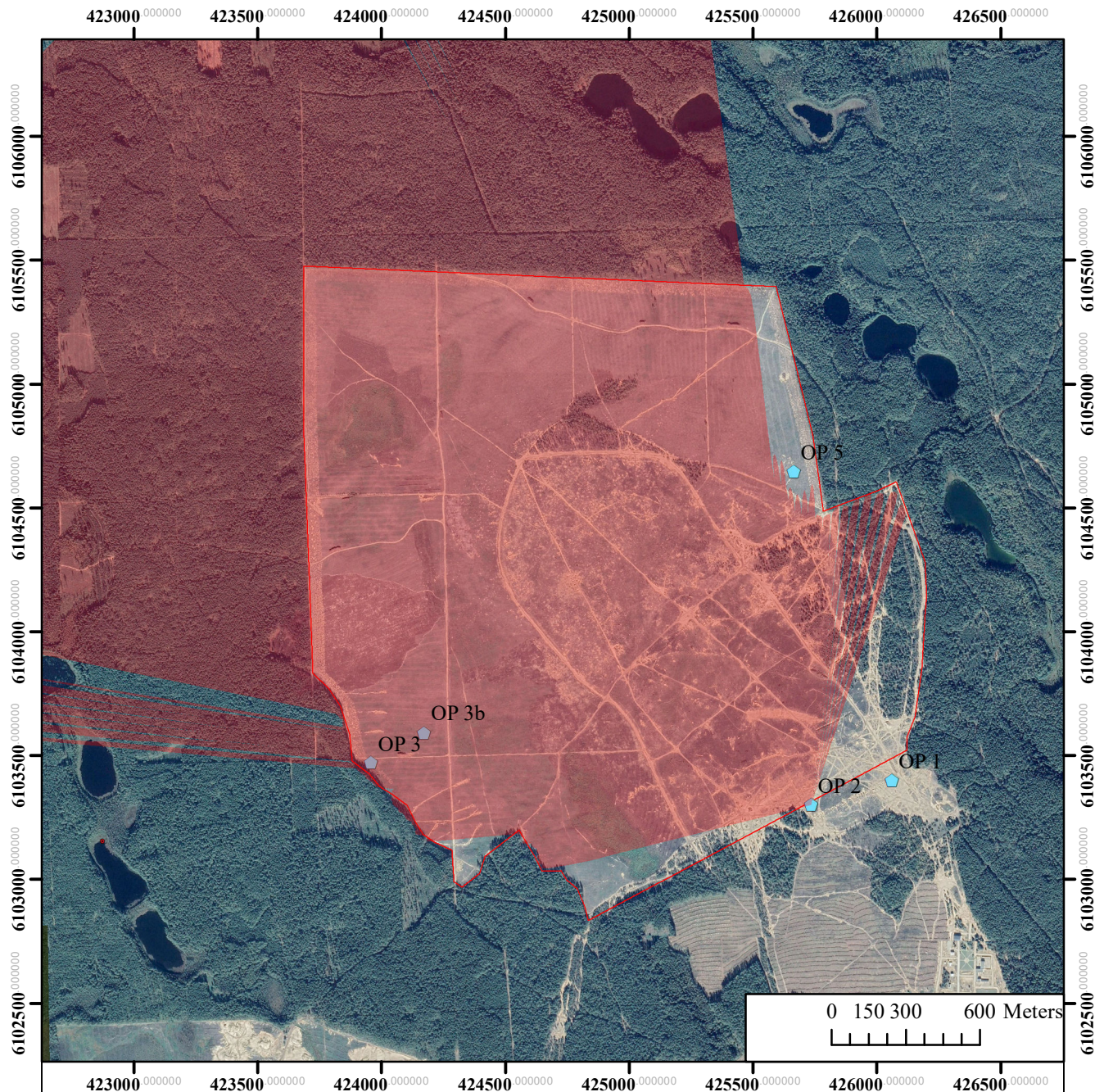
Figure 5-2: NHZ for 10 mrad laser systems implemented from the OP 2.

The NHZ shown is for the entire target area.

Maximum recommended laser NOHD: 2.4 km.

POC: William Forkner, USAFE		Phone Number: Comm. +94-(111)480-7195
Email: william.forkner.1@us.mail.mil		USAF Laser Injury Telephone Number: (800) 473-3549
Location: OP 2	Buffer Angle: 10 mrad	Height (ft): 5
Date: 5 December 2018	Created By: K. Schuster	LRMT Version 10.4.1.0.02

Attachment 5. OP 2 Firing Position and Laser NHZ, Pabradė Range, Lithuania



Laser NHZ
 Pabrade OPs
 Pabrade Impact Area

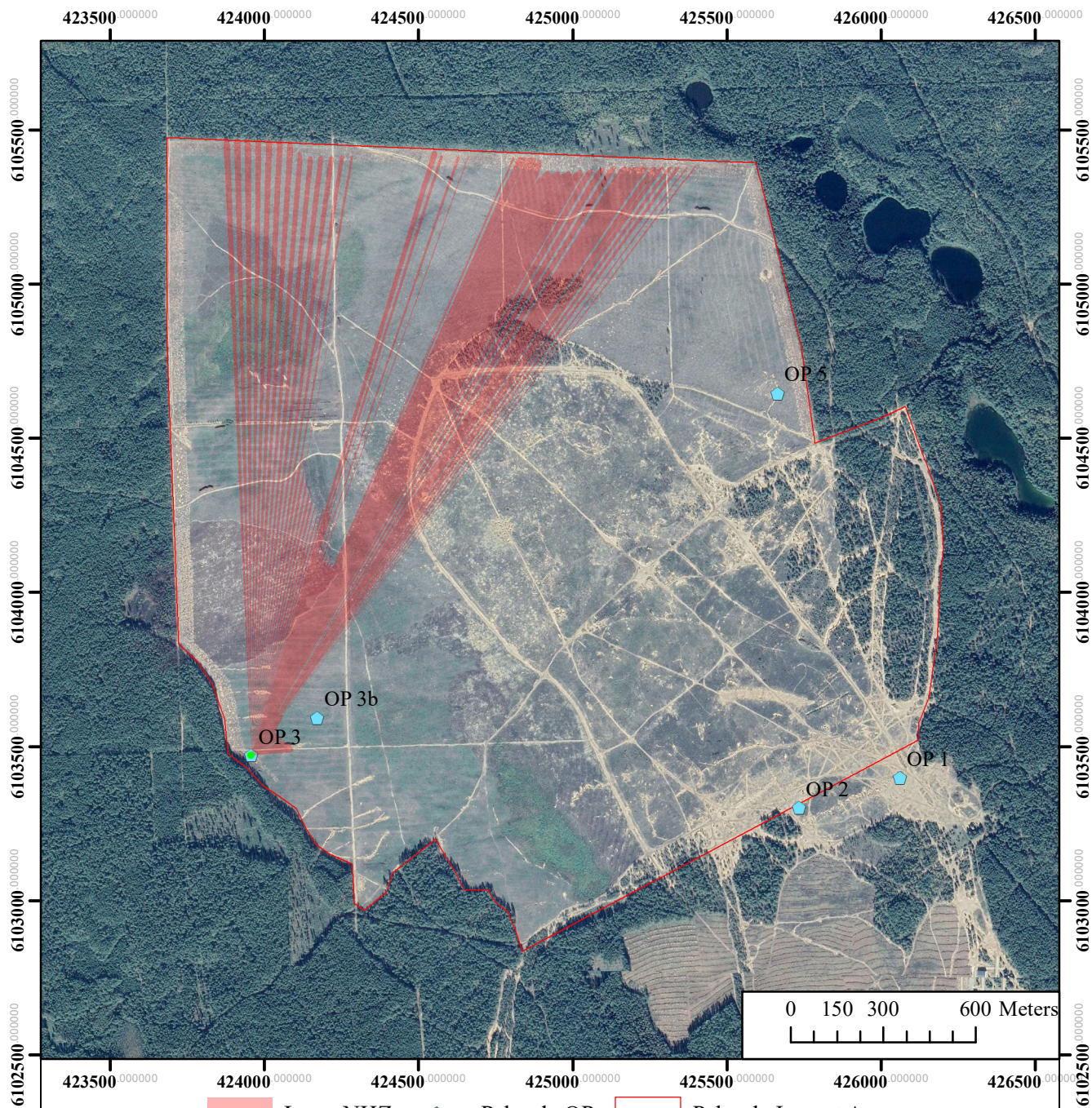
Figure 5-3: NHZ for 15 mrad laser systems implemented from the OP 2.

The NHZ shown is for the entire target area.

Maximum recommended laser NOHD: 2.1 km.

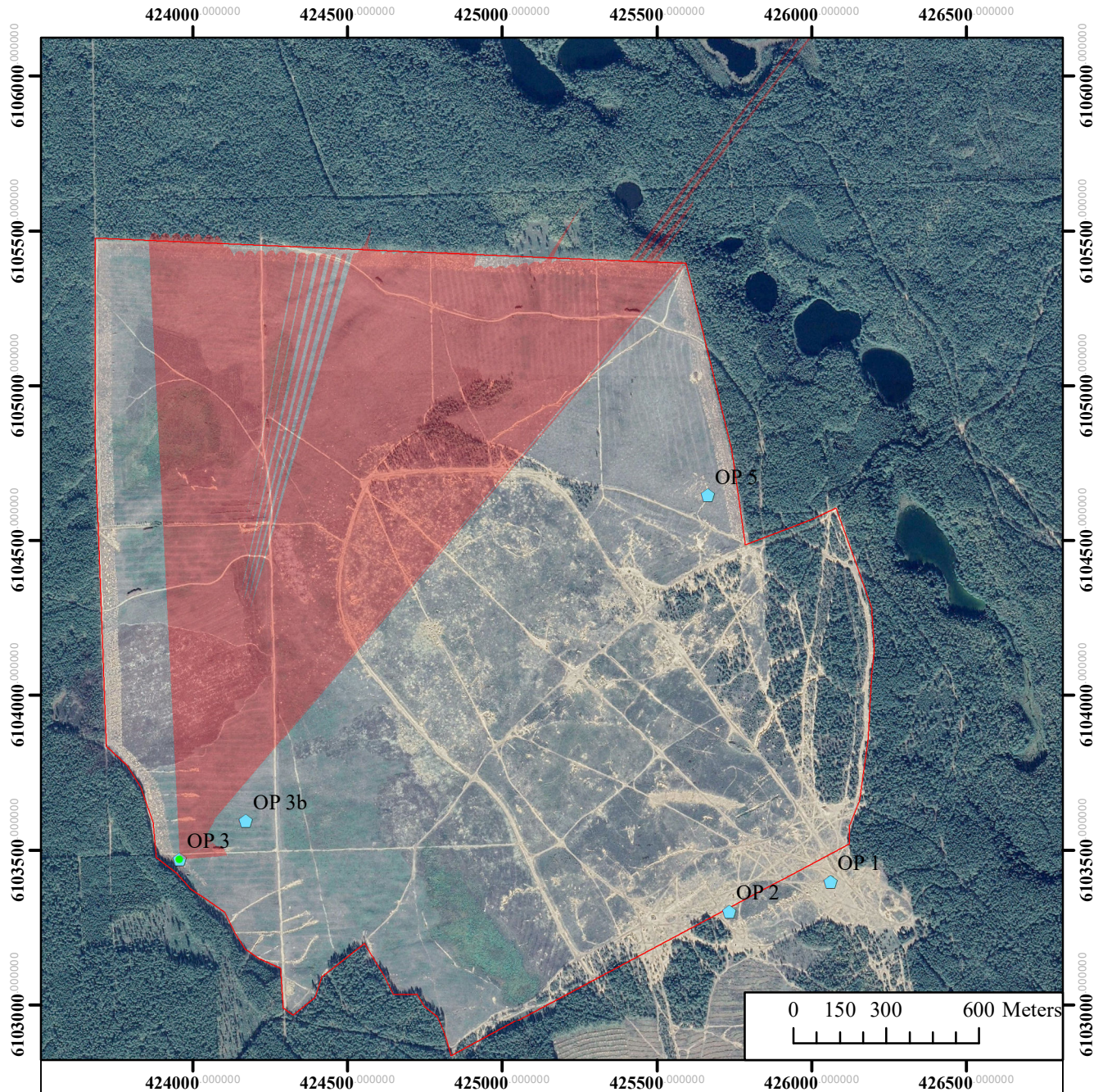
POC: William Forkner, USAFE		Phone Number: Comm. +94-(111)480-7195
Email: william.forkner.1@us.mail.mil		USAF Laser Injury Telephone Number: (800) 473-3549
Location: OP 2	Buffer Angle: 15 mrad	Height (ft): 5
Date: 5 December 2018	Created By: K. Schuster	LRMT Version 10.4.1.0.02

Attachment 6. OP 3 Firing Position and Laser NHZ, Pabradė Range, Lithuania



<div><div></div> Laser NHZ</div> <div><div></div> Pabrade OPs</div> <div><div></div> Pabrade Impact Area</div>		
POC: William Forkner, USAFE Phone Number: Comm. +94-(111)480-7195 Email: william.forkner.1@us.mail.mil USAF Laser Injury Telephone Number: (800) 473-3549		
Location: OP 3a	Buffer Angle: 5 mrad	Height (ft): 5
Date: 5 December 2018	Created By: K. Schuster	LRMT Version 10.4.1.0.02

Attachment 6. OP 3 Firing Position and Laser NHZ, Pabradė Range, Lithuania



Laser NHZ
 Pabrade OPs
 Pabrade Impact Area

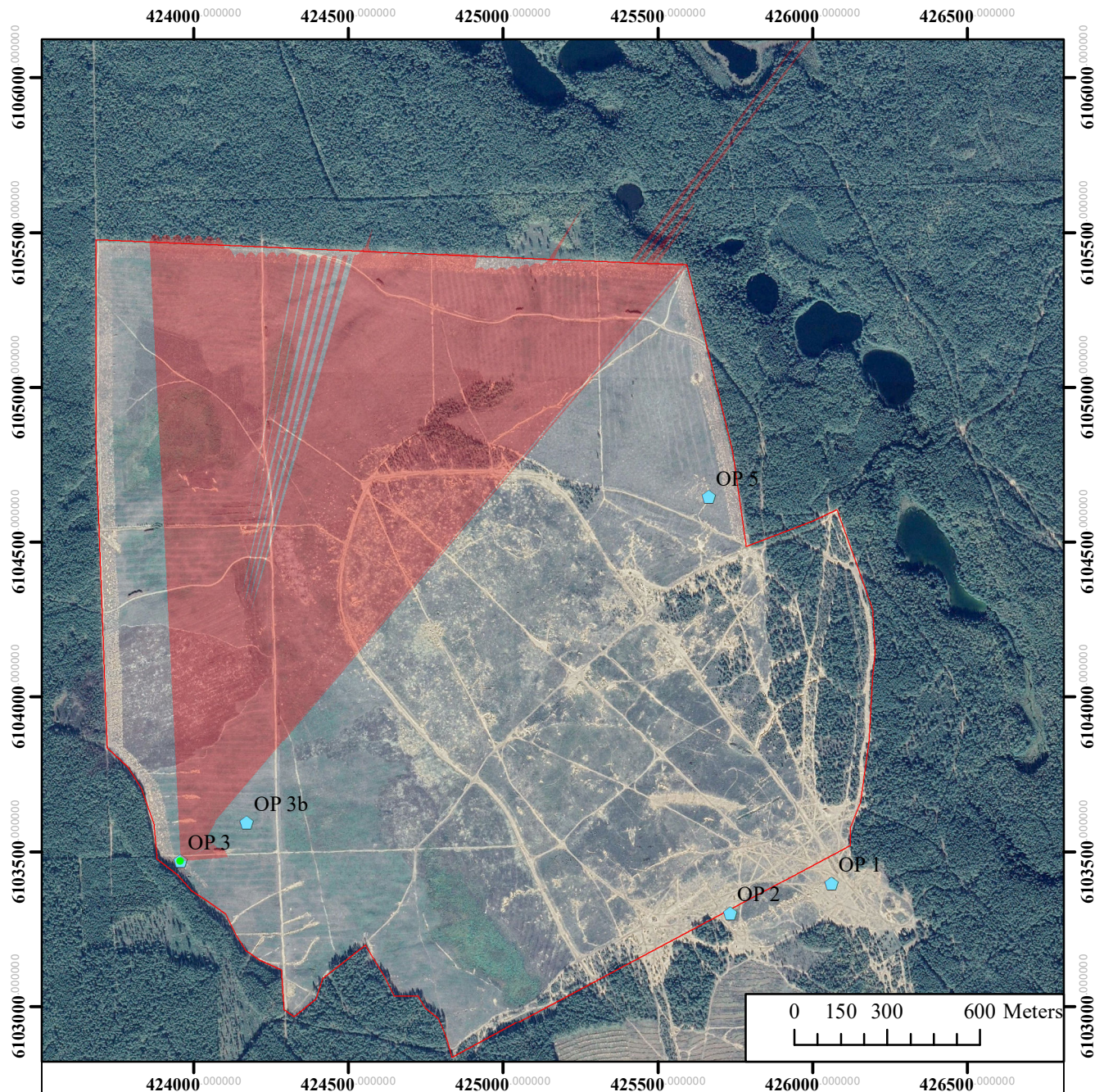
Figure 6-2: NHZ for 10 mrad laser systems implemented from the OP 3.

The NHZ shown is for the entire target area.

Maximum recommended laser NOHD: 2.0 km.

POC: William Forkner, USAFE		Phone Number: Comm. +94-(111)480-7195
Email: william.forkner.1@us.mail.mil		USAF Laser Injury Telephone Number: (800) 473-3549
Location: OP 3a	Buffer Angle: 10 mrad	Height (ft): 5
Date: 5 December 2018	Created By: K. Schuster	LRMT Version 10.4.1.0.02

Attachment 6. OP 3 Firing Position and Laser NHZ, Pabradė Range, Lithuania



Laser NHZ
 Pabrade OPs
 Pabrade Impact Area

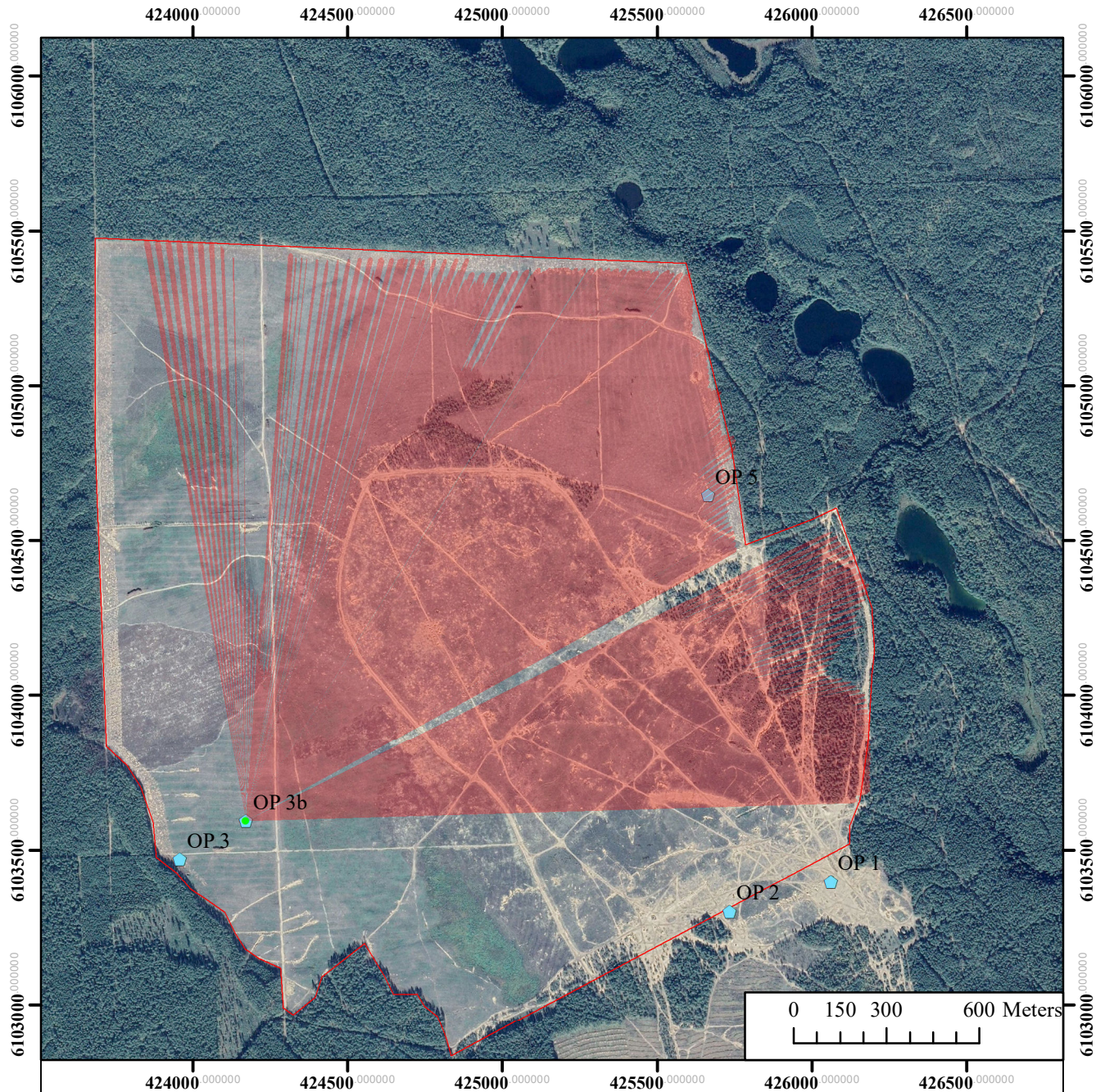
Figure 6-3: NHZ for 15 mrad laser systems implemented from the OP 3.

The NHZ shown is for the entire target area.

Maximum recommended laser NOHD: 2.0 km.

POC: William Forkner, USAFE		Phone Number: Comm. +94-(111)480-7195
Email: william.forkner.1@us.mail.mil		USAF Laser Injury Telephone Number: (800) 473-3549
Location: OP 3a	Buffer Angle: 15 mrad	Height (ft): 5
Date: 5 December 2018	Created By: K. Schuster	LRMT Version 10.4.1.0.02

Attachment 6. OP 3 Firing Position and Laser NHZ, Pabradė Range, Lithuania



Laser NHZ **Pabrade OPs** **Pabrade Impact Area**
Figure 6-4: NHZ for 5 mrad laser systems implemented from the OP 3.
The NHZ shown is for the entire target area.
Maximum recommended laser NOHD: N/A (Contained).

POC: William Forkner, USAFE		Phone Number: Comm. +94-(111)480-7195
Email: william.forkner.1@us.mail.mil		USAF Laser Injury Telephone Number: (800) 473-3549
Location: OP 3b	Buffer Angle: 5 mrad	Height (ft): 5
Date: 5 December 2018	Created By: K. Schuster	LRMT Version 10.4.1.0.02

Attachment 6. OP 3 Firing Position and Laser NHZ, Pabradė Range, Lithuania

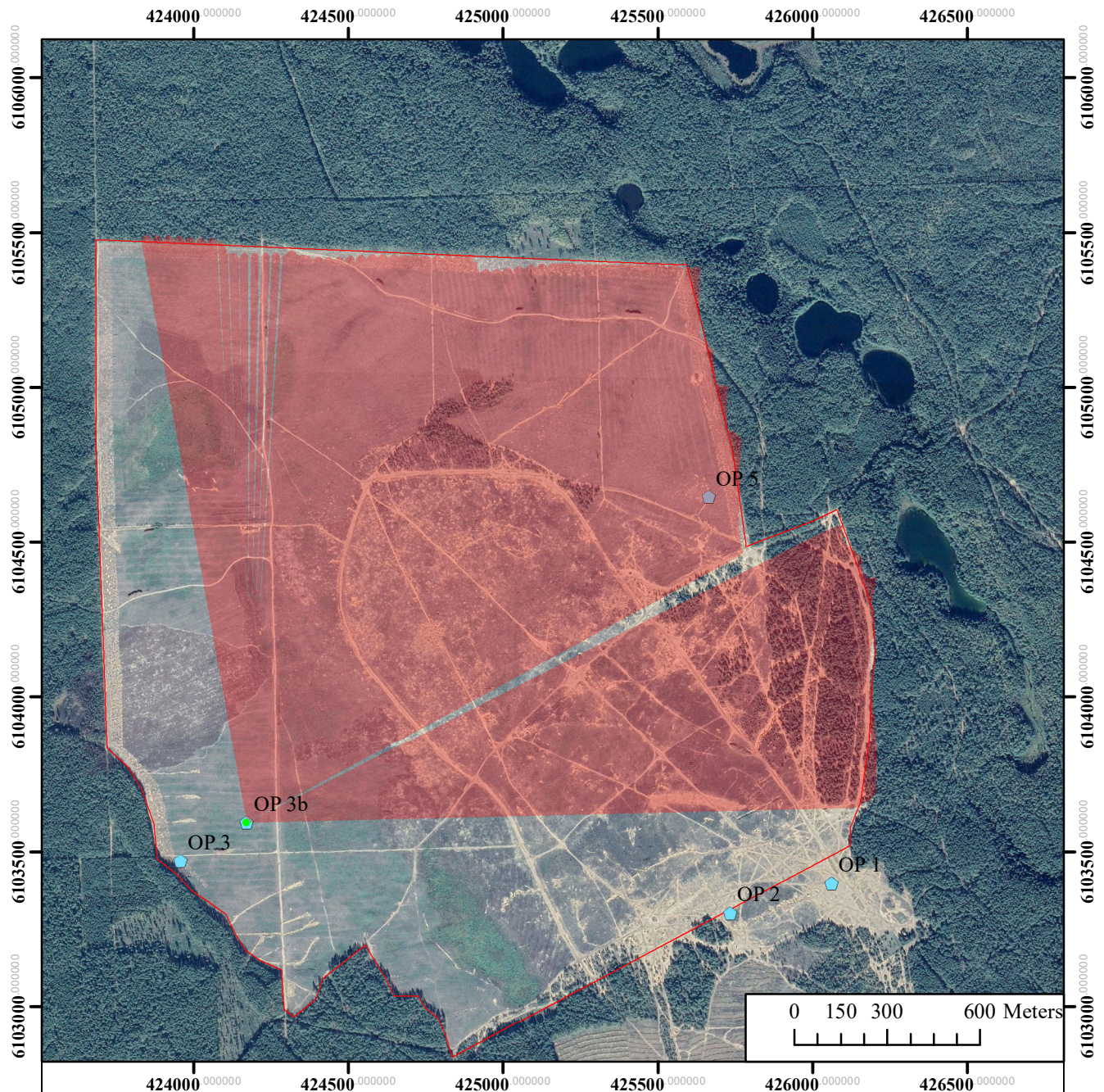


Figure 6-5: NHZ for 10 mrad laser systems implemented from the OP 3.
 The NHZ shown is for the entire target area.
 Maximum recommended laser NOHD: N/A (Contained).

POC: William Forkner, USAFE		Phone Number: Comm. +94-(111)480-7195
Email: william.forkner.1@us.mail.mil		USAF Laser Injury Telephone Number: (800) 473-3549
Location: OP 3b	Buffer Angle: 10 mrad	Height (ft): 5
Date: 5 December 2018	Created By: K. Schuster	LRMT Version 10.4.1.0.02

Attachment 6. OP 3 Firing Position and Laser NHZ, Pabradė Range, Lithuania

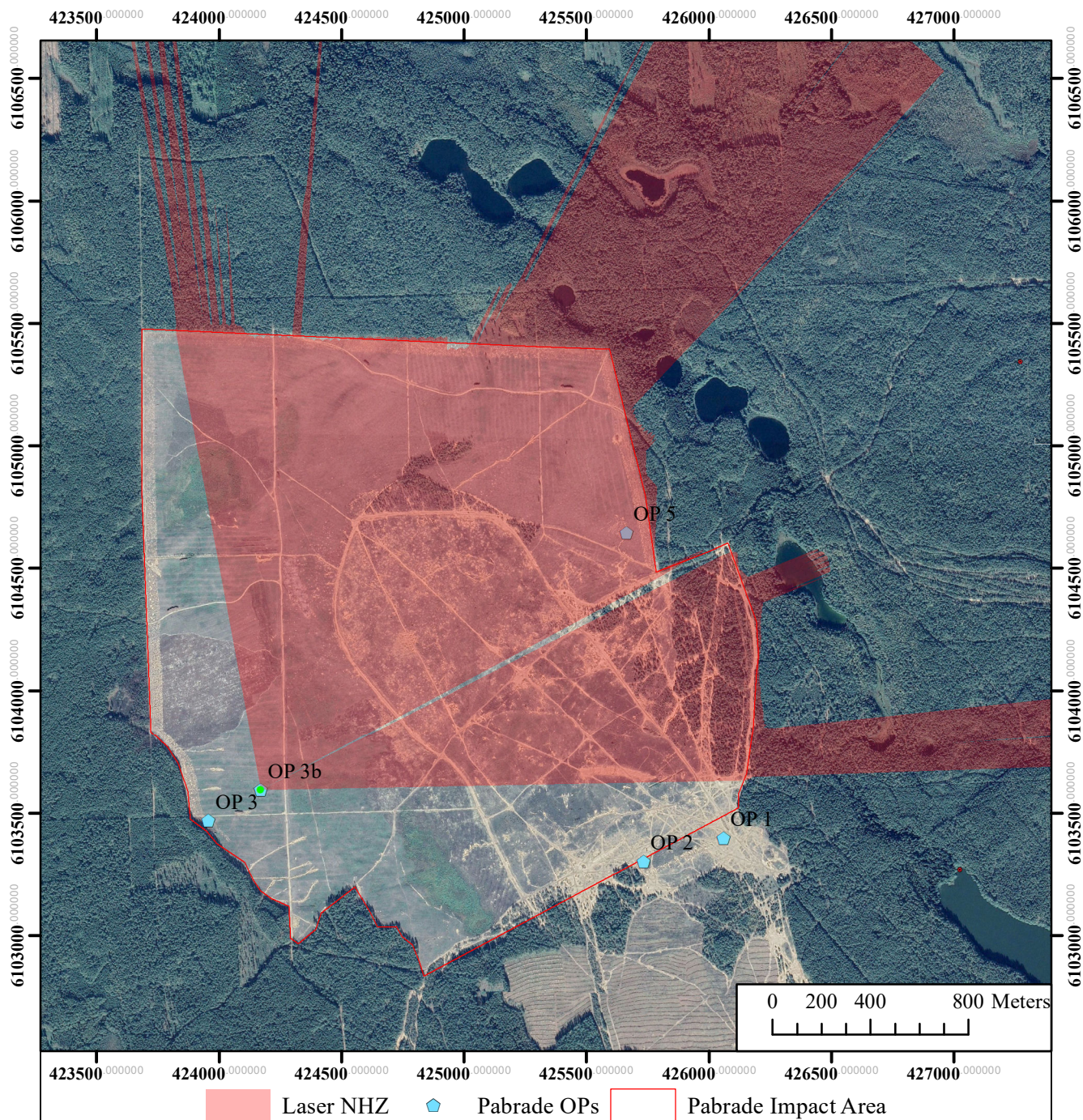
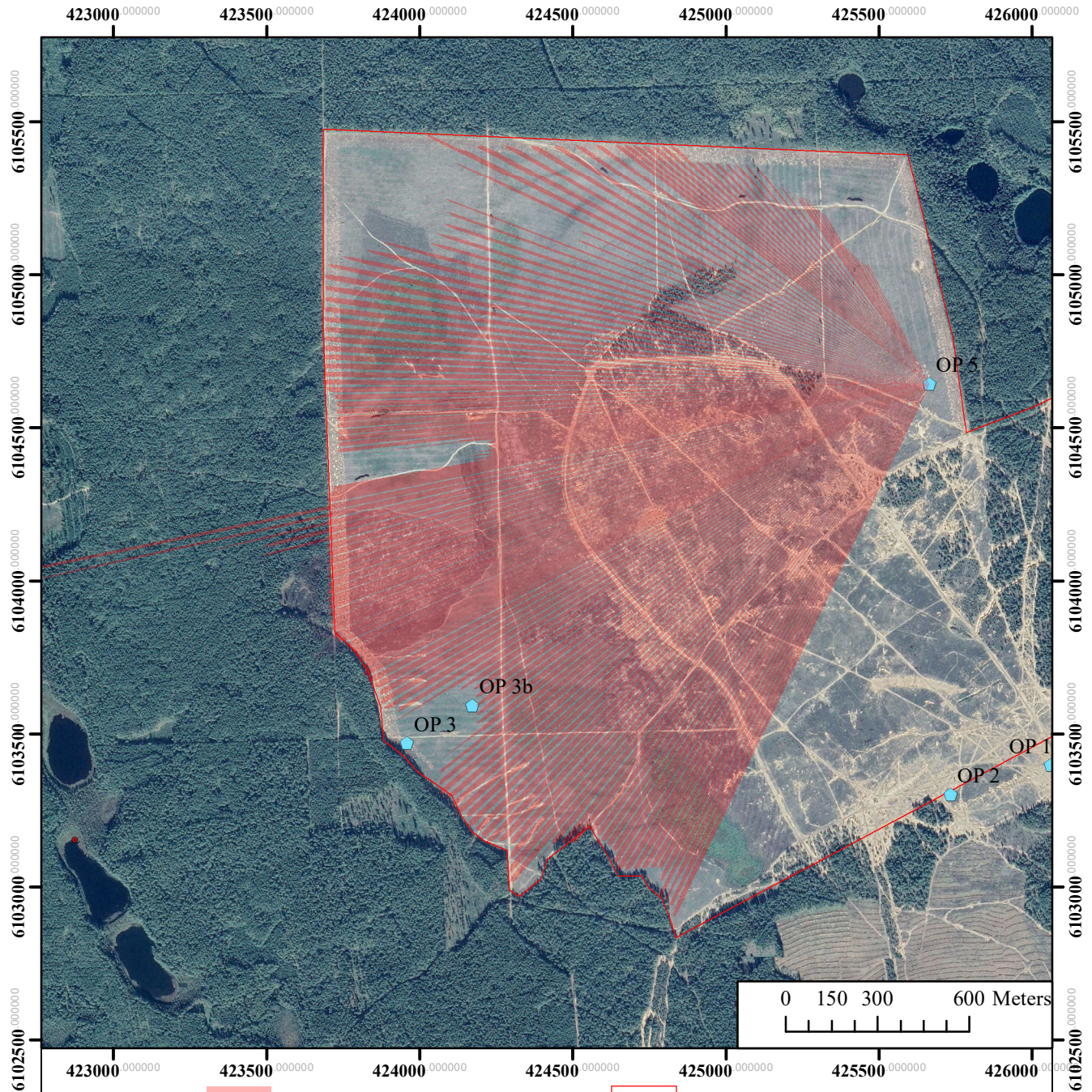


Figure 6-6: NHZ for 15 mrad laser systems implemented from the OP 3.
The NHZ shown is for the entire target area.
Maximum recommended laser NOHD: 2.0 km.

POC: William Forkner, USAFE		Phone Number: Comm. +94-(111)480-7195
Email: william.forkner.1@us.mail.mil		USAF Laser Injury Telephone Number: (800) 473-3549
Location: OP 3b	Buffer Angle: 15 mrad	Height (ft): 5
Date: 5 December 2018	Created By: K. Schuster	LRMT Version 10.4.1.0.02

Attachment 7. OP 5 Firing Position and Laser NHZ, Pabradė Range, Lithuania



Laser NHZ
 Pabrade OPs
 Pabrade Impact Area

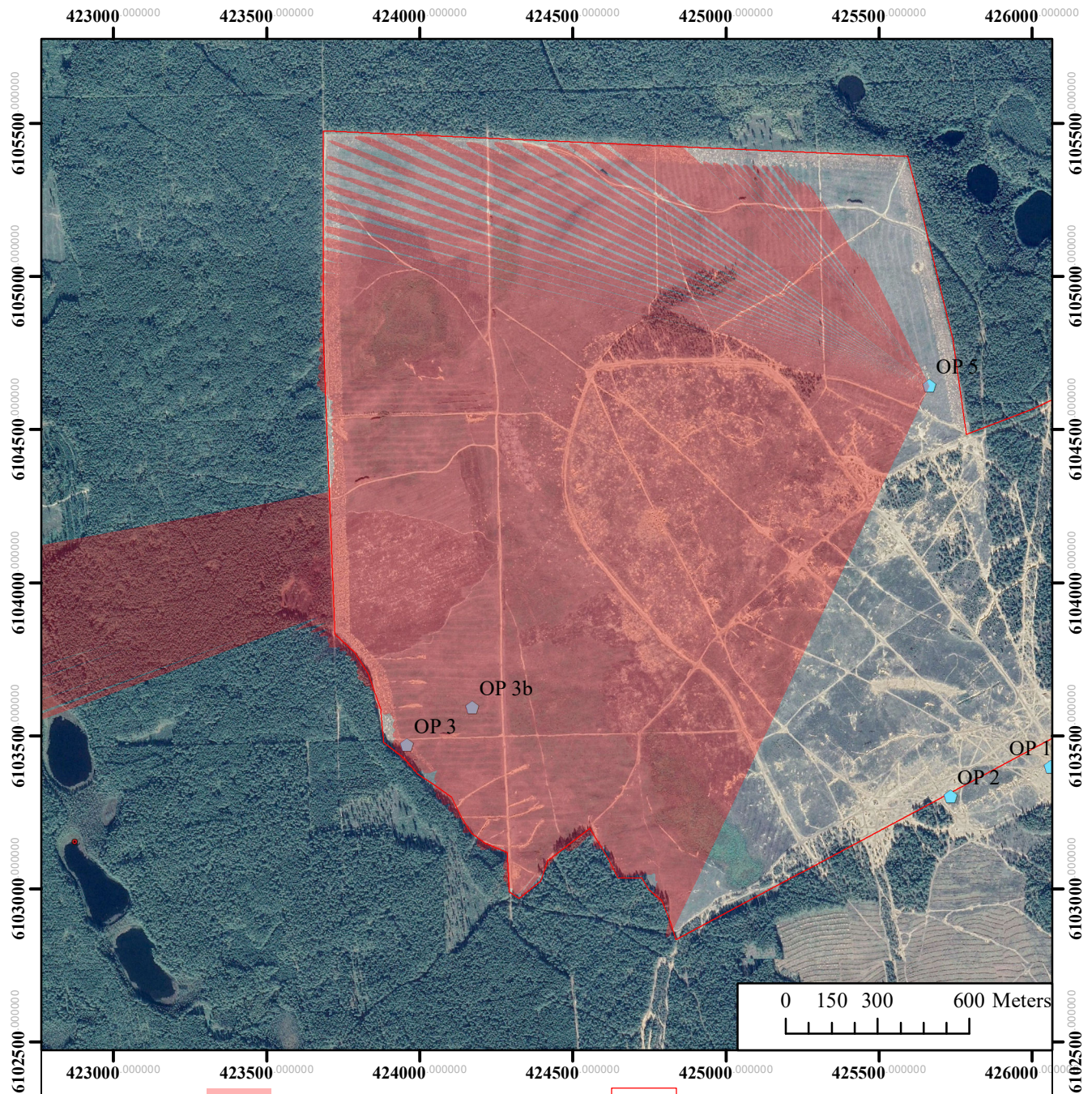
Figure 7-1: NHZ for 5 mrad laser systems implemented from the OP 5.

The NHZ shown is for the entire target area.

Maximum recommended laser NOHD: 2.9 km.

POC: William Forkner, USAFE		Phone Number: Comm. +94-(111)480-7195
Email: william.forkner.1@us.mail.mil		USAF Laser Injury Telephone Number: (800) 473-3549
Location: OP 5	Buffer Angle: 5 mrad	Height (ft): 5
Date: 5 December 2018	Created By: K. Schuster	LRMT Version 10.4.1.0.02

Attachment 7. OP 5 Firing Position and Laser NHZ, Pabradė Range, Lithuania



<p> Laser NHZ Pabradė OPs Pabradė Impact Area </p>		
<p> POC: William Forkner, USAFE Phone Number: Comm. +94-(111)480-7195 Email: william.forkner.1@us.mail.mil USAF Laser Injury Telephone Number: (800) 473-3549 </p>		
Location: OP 5	Buffer Angle: 10 mrad	Height (ft): 5
Date: 5 December 2018	Created By: K. Schuster	LRMT Version 10.4.1.0.02

Attachment 7. OP 5 Firing Position and Laser NHZ, Pabradė Range, Lithuania

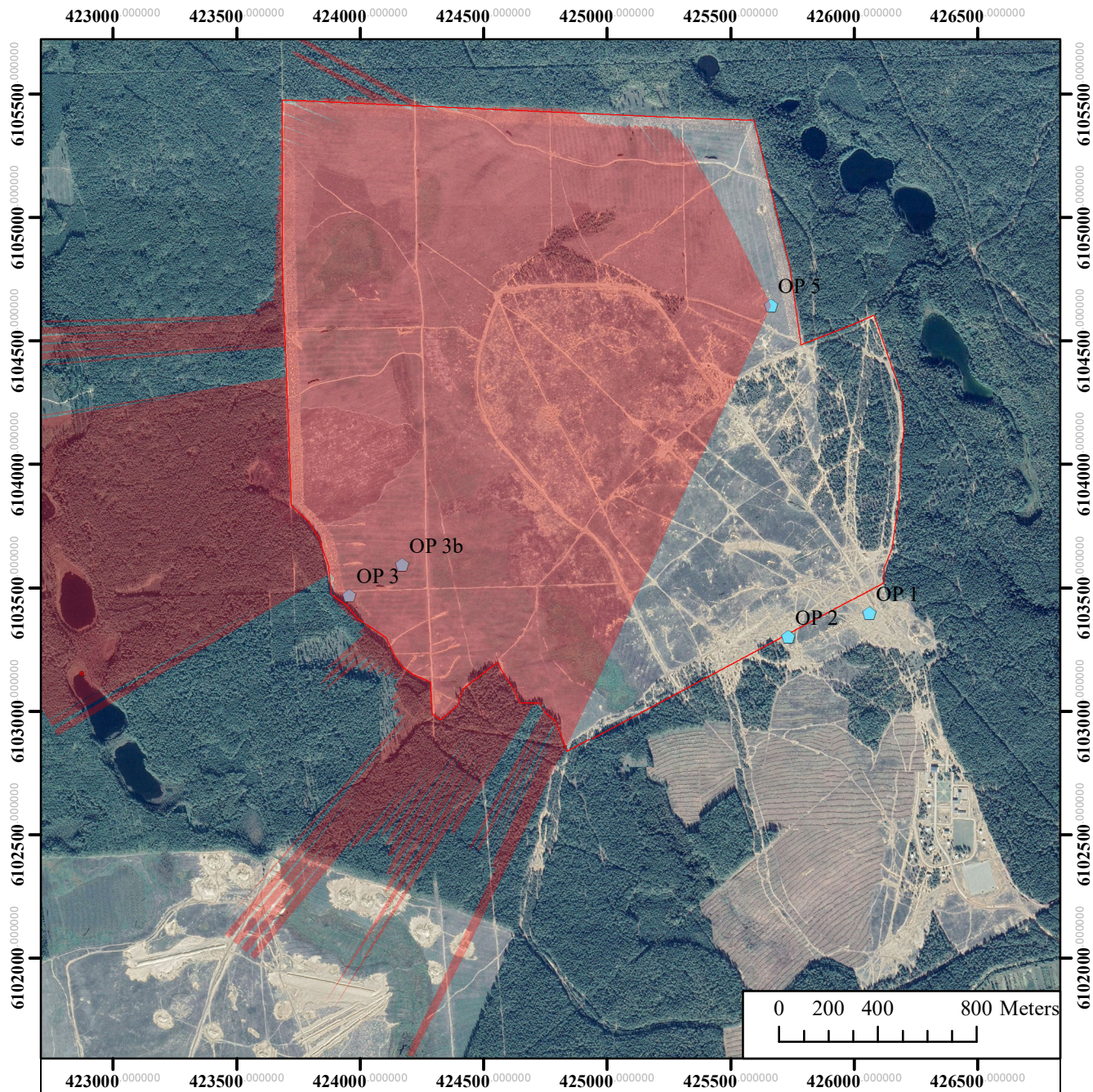


Figure 7-3: NHZ for 15 mrad laser systems implemented from the OP 5.
The NHZ shown is for the entire target area.
Maximum recommended laser NOHD: 1.9 km.

POC: William Forkner, USAFE		Phone Number: Comm. +94-(111)480-7195
Email: william.forkner.1@us.mail.mil		USAF Laser Injury Telephone Number: (800) 473-3549
Location: OP 5	Buffer Angle: 15 mrad	Height (ft): 5
Date: 5 December 2018	Created By: K. Schuster	LRMT Version 10.4.1.0.02