

Appendix A – Baseline Measurements



Centar za ekotoksikološka ispitivanja Podgorica d.o.o.
LLC Center for Ecotoxicological Research Podgorica



CETI 5100.101.01

SECTOR FOR LABORATORY DIAGNOSTICS AND RADIATION PROTECTION

EXAMINATION REPORT

Type of examination	Environmental noise level – Background level on the route highway Mateševo – Andrijevića
Number of report	00-1744/B/2
Date of report issue	22.10.2019.
APPLICANTS DATA	
Applicants name	"HILL INTERNATIONAL" IPF 7 Consortium
Contract number	CETI number 00-1744/1 from 18.09.2019.
Adress/tel/fax	Resavska 16A, II floor apt 5, Belgrade

SAMPLING DATA

Measurements dates	23.09. – 28.09.2019.
Plan/sampling method	-MEST ISO 1996-1:2018 " Acoustics – description, measurement and assessment of environmental noise " – Part 1: Basic quantities and assessment procedures; -MEST ISO 1996-2: 2018 " Acoustics – description, measurement and assessment of environmental noise " – Part 2: Determination of sound pressure levels
Required examination	Equivalent noise level (L_{Aeq} , L_{AFmax} , L_{day} , $L_{evening}$, L_{night})
Sampling operator	Benard Berišaj, dipl. fizičar
Annexes	1. Graphical presentation; 2. List of equipment

**DIRECTOR OF SECTOR FOR LABORATORY
DIAGNOSTICS AND RADIATION PROTECTION**

Danijela Šuković, spec. tox. chem.

Izjava:

1. Rezultati ispitivanja se odnose samo na ispitivani uzorak.
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ANNEXES

1. GENERAL DATA

In accordance with the request of the company "Hill International IPF 7 Consortium" – Belgrade, from 23th to 28th September 2019, the levels of residual environmental noise (background levels) were measured near the sites of the future highway Mateševo – Andrijevića.

Noise level measurements were performed with the "Svan 977A – Svantek" phonometer. Phonometer "Svan 977A – Svantek" is calibrated by "SV33A" calibrator from the same manufacturer that meets international standards IEC 60942: 2003, class 1. Measurement methodology according to MEST ISO 1996-1: 2018 and MEST ISO 1996-2: 2018 "Acoustics - Describing, measuring and evaluating environmental noise" – Parts 1 and 2. During the measurements, the microphone was placed at a height of 4 m.

In accordance with the request, measurements of residual environmental noise level (background level) were performed at selected locations during the daytime, evening and night, for a total of 5 measuring positions near to the closest houses, where it was estimated that the noise level is the highest. The exact positions of these measuring points are given in Figure 1.1 while their previews are displayed on Pictures 1.2 – 1.6.

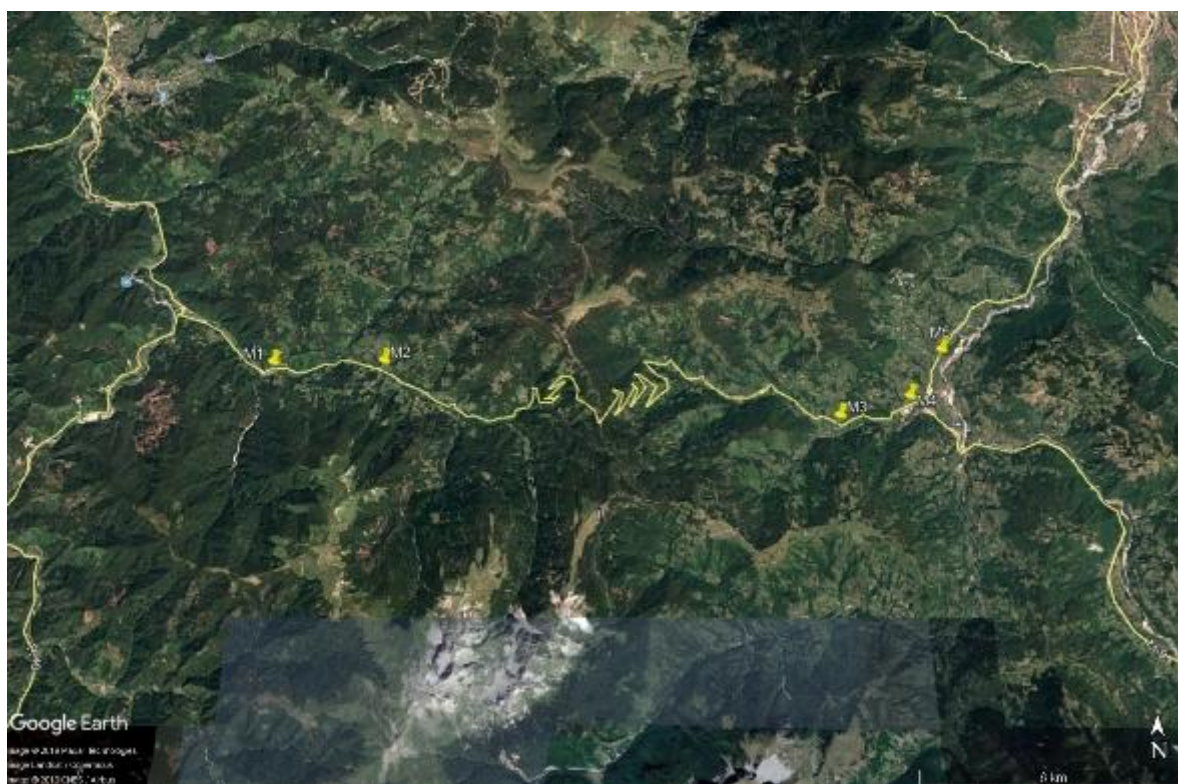


Figure 1.1. Locations of measuring positions on the section of the future highway Mateševo – Andrijevića

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Figure 1.2. Measurement position No. 1 ($42^{\circ} 44' 52.15''$; $19^{\circ} 34' 58.13''$)

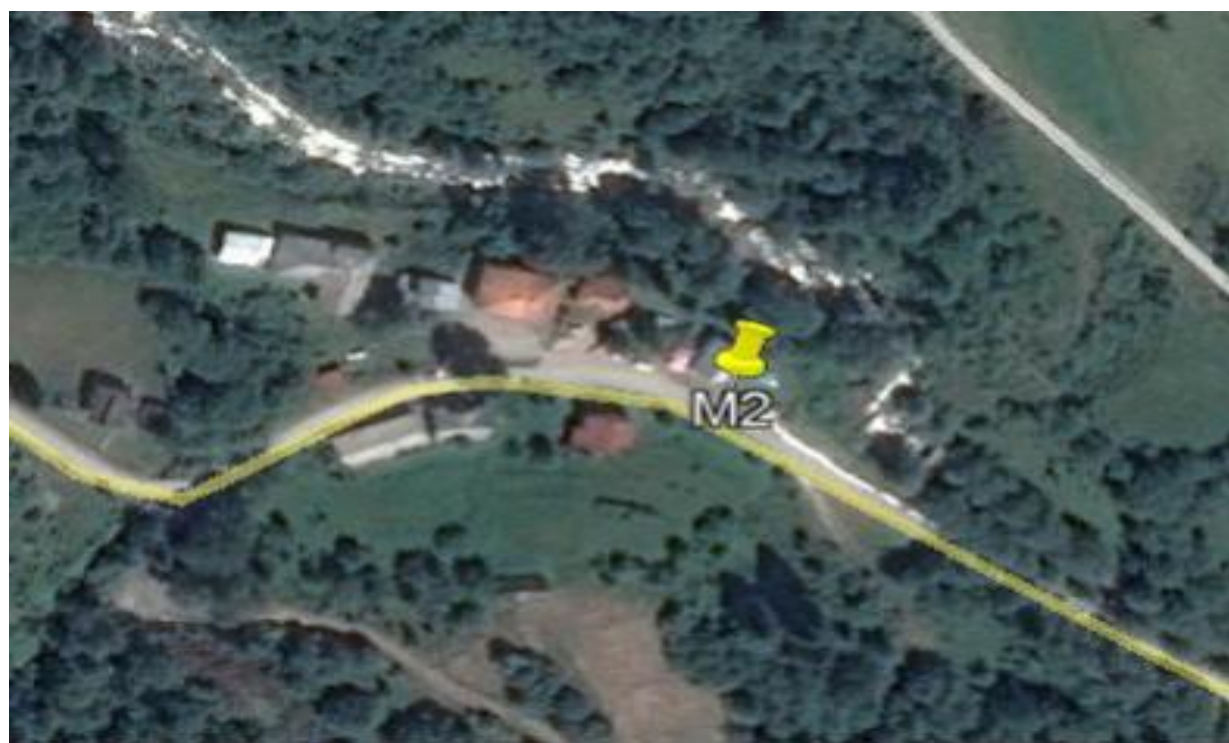


Figure 1.3. Measuring position No. 2 ($42^{\circ} 44' 53.76''$; $19^{\circ} 37' 01.27''$)

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Figure 1.4. Measuring Position No. 3 ($42^{\circ} 44' 07.42''$; $19^{\circ} 45' 24.62''$)



Figure 1.5. Measuring Position No. 4 ($42^{\circ} 44' 23.71''$; $19^{\circ} 46' 43.19''$)

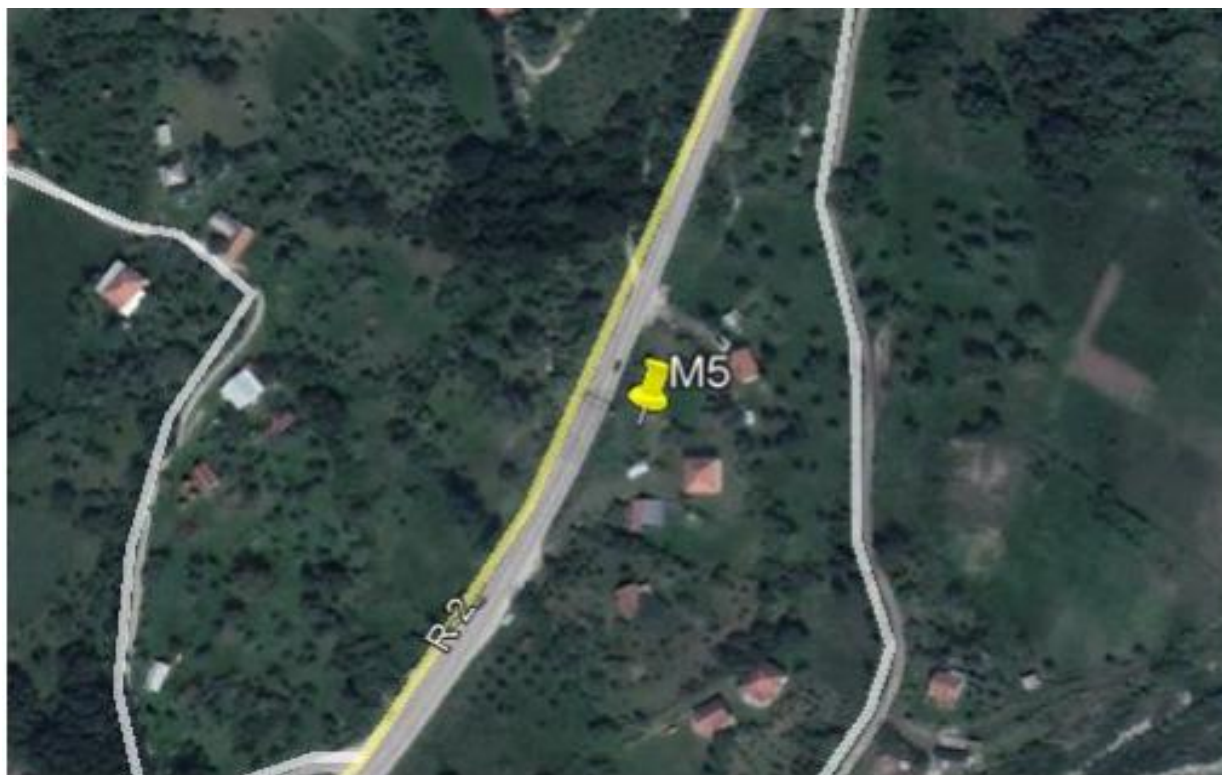


Figure 1.6. Measuring Position No. 5 ($42^{\circ} 45' 03.89''$; $19^{\circ} 47' 23.49''$)

2. RESULTS

At the selected measuring positions, in accordance with the requirement and the contract, full-day (24 h) measurements of residual environmental noise (background level) in the environment were carried out during normal activities in those positions. The results of all noise level measurements are given in Tables 2.1.3 – 2.5.3 and the measurement positions are given in Figures 2.1.1 – 2.5.3. Also, for each measurement position, the main sources of noise are described, as well as meteorological parameters for the time period during which these measurements were realized.

2.1 Measuring position No. 1

Measurement Position 1 was located in Mateševo – Kolašin, in the courtyard of a private residential building and in close proximity to a local road passing here (20 m away). The main sources of noise at this measuring position were vehicles passing by this local road, a dog that occasionally barked as well as the sound of other animals. Also, at a distance of 100 – 200 m workers were present, working with variable intensity on the opposite side of the river occasionally using machinery (excavators, trucks...). A preview of measurement position No. 1 is given in Figure 2.1.1 – 2.1.3.

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Figure 2.1.1. Measuring position No. 1



Figure 2.1.2. Measuring position No. 1

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Figure 2.1.3. Measuring position No. 1

In Table 2.1.1 are presented all data regarding the instrument calibration before the beginning and after the conclusion of measurements, used frequency weighting and dynamic characteristics of the measuring device as well as the position of the microphone.

Table 2.1.1 Calibration for the SVAN 977A

Date of calibration	Sensitivity [mV/Pa]	Deviation [dB]	Frequency weighting	Dynamic characteristics	Microphone position
27-09-19	36.10	-0.27	A	FAST	4 m (Free field)
28-09-19	35.57	0.09	A	FAST	4 m (Free field)

Table 2.1.2 shows the meteorological parameters measured during the noise level surveying: Temperature – T (C), Relative humidity – RH (%), Velocity of air flow – V and Pressure P (mbar).

Table 2.1.2 Measured meteorological parameters during noise level measurements

Date	Time [h]	T [$^{\circ}$ C]	RH [%]	V [m/s]	P [mbar]
27-09-19	21:00	13	78	0.0	932
28-09-19	03:00	7	91	0.0	933
28-09-19	09:00	8	94	0.0	934
28-09-19	15:00	26	44	0.4	930
28-09-19	21:00	16	77	0.0	932

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In Table 2.1.3 are given the measurement results of the noise indicator levels at measuring position No. 1.

Table 2.1.3 Measured indicators of environmental noise at measuring position No. 1

Period of measurement	Date	Time [h]	Le _{Aeq} [dB]	L _{AFmax} [dB]	L _{evening} [dB]	L _{night} [dB]	L _{day} [dB]	L _{den} [dB]	L _{Aeq24} [dB]
Evening	27.09.19	19-20	45.5	67.0	44.6	-	-		
	27.09.19	20-21	47.1	74.2					
	27.09.19	21-22	41.8	60.6					
	27.09.19	22-23	41.6	66.7					
Night	27.09.19	23-24	42.8	70.9	-	41.4	-	50.6	48.4
	28.09.19	24-01	41.1	59.5					
	28.09.19	01-02	40.6	45.8					
	28.09.19	02-03	41.0	53.4					
	28.09.19	03-04	41.3	53.2					
	28.09.19	04-05	41.0	48.3					
	28.09.19	05-06	40.9	48.5					
	28.09.19	06-07	41.9	59.4					
Day	28.09.19	07-08	50.6	81.3	-	-	50.3	50.6	48.4
	28.09.19	08-09	45.7	67.5					
	28.09.19	09-10	47.5	70.6					
	28.09.19	10-11	45.8	69.1					
	28.09.19	11-12	46.4	66.5					
	28.09.19	12-13	44.1	65.4					
	28.09.19	13-14	49.0	70.2					
	28.09.19	14-15	55.4	73.2					
	28.09.19	15-16	55.0	75.2					
	28.09.19	16-17	53.3	84.4					
	28.09.19	17-18	-						
	28.09.19	18-19	-						

2.2 Measuring position No. 2

Measuring position No. 2 was located in Mateševu – Bare Kraljske settlement, next to a private residential building, near the Mateševu – Andrijeviča road via Tresnjevik (5 m distance). The main sources of noise at this measuring position were vehicles passing by this local road, the murmur of a river passing at a distance of about 15 – 20 m and the noise from a neighboring elementary school (50 m away). A preview of measurement position No. 2 is given in Figures 2.2.1 to 2.2.3.



Figure 2.2.1. Measurement position No. 2



Figure 2.2.2. Measurement position No. 2



Slika 2.2.3. Measurement position No. 2

In Table 2.2.1 are presented all data regarding the instrument calibration before the beginning and after the conclusion of measurements, used frequency weighting and dynamic characteristics of the measuring device as well as the position of the microphone.

Table 2.2.1 Calibration for the SVAN 977A

Date of calibration	Sensitivity [mV/Pa]	Deviation [dB]	Frequency weighting	Dynamic characteristics	Microphone position
26-09-19	34.27	0.18	A	FAST	4 m (Free field)
27-09-19	36.10	-0.27	A	FAST	4 m (Free field)

Table 2.2.2 shows the meteorological parameters measured during the noise level surveying: Temperature – T (C), Relative humidity – RH (%), Velocity of air flow – V and Pressure P (mbar).

Table 2.2.2 Measured meteorological parameters during noise level measurements

Date	Time [h]	T [°C]	RH [%]	V [m/s]	P [mbar]
26-09-19	21:00	12	91	0.0	887
27-09-19	03:00	9	90	0.0	898
27-09-19	09:00	10	94	0.0	900
27-09-19	15:00	23	39	0.0	930
27-09-19	21:00	13	78	0.0	932

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In Table 2.2.3 are given the measurement results of the noise indicator levels at measuring position No. 2.

Table 2.2.3 Measured indicators of environmental noise at measuring position No. 2

Period of measurement	Date	Time [h]	L _{Aeq} [dB]	L _{AFmax} [dB]	L _{evening} [dB]	L _{night} [dB]	L _{day} [dB]	L _{den} [dB]	L _{Aeq24} [dB]
Evening	26.09.19	19-20	-	-	54.0	-	-		
	26.09.19	20-21	54.2	74.2					
	26.09.19	21-22	53.2	66.6					
	26.09.19	22-23	54.5	77.4					
Night	26.09.19	23-24	53.3	70.4	-	53.4	-	60.1	54.1
	27.09.19	24-01	53.1	64.2					
	27.09.19	01-02	53.1	67.6					
	27.09.19	02-03	53.0	54.7					
	27.09.19	03-04	54.0	79.0					
	27.09.19	04-05	53.0	54.5					
	27.09.19	05-06	53.7	72.0					
	27.09.19	06-07	53.6	73.2					
Day	27.09.19	07-08	54.6	82.2	-	-	54.6	60.1	54.1
	27.09.19	08-09	53.7	74.8					
	27.09.19	09-10	53.6	75.1					
	27.09.19	10-11	54.8	72.9					
	27.09.19	11-12	54.1	73.6					
	27.09.19	12-13	55.1	80.6					
	27.09.19	13-14	54.8	76.7					
	27.09.19	14-15	54.5	72.3					
	27.09.19	15-16	55.3	76.0					
	27.09.19	16-17	55.0	77.6					
	27.09.19	17-18	-	-					
	27.09.19	18-19	-	-					

2.3 Measuring position No. 3

Measuring position No. 3 was located in Andrijevica, in the village of Kralje, in the immediate vicinity of the Mateševo – Andrijevica road via Tresnjevnik (5 m distance). The main sources of noise at this measuring position were vehicles passing by this local road and occasionally barking of dogs from the settlement. A preview of measurement position No. 3 is given in Figures 2.3.1 – 2.3.3.



Figure 2.3.1. Measurement position No. 3



Figure 2.3.2. Measurement position No. 3

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**Figure 2.3.3.** Measurement position No. 3

In Table 2.3.1 are presented all data regarding the instrument calibration before the beginning and after the conclusion of measurements, used frequency weighting and dynamic characteristics of the measuring device as well as the position of the microphone.

Table 2.3.1 Calibration for the SVAN 977A

Date of calibration	Sensitivity [mV/Pa]	Deviation [dB]	Frequency weighting	Dynamic characteristics	Microphone position
23-09-19	34.27	0.18	A	FAST	4 m (Free field)
24-09-19	35.48	-0.12	A	FAST	4 m (Free field)

Table 2.3.2 shows the meteorological parameters measured during the noise level surveying: Temperature – T (C), Relative humidity – RH (%), Velocity of air flow – V and Pressure P (mbar).

Table 2.3.2 Measured meteorological parameters during noise level measurements

Date	Time [h]	T [°C]	RH [%]	V [m/s]	P [mbar]
23-09-19	21:00	13	88	0.0	921
24-09-19	03:00	12	93	0.0	919
24-09-19	09:00	16	94	0.0	917
24-09-19	15:00	22	58	0.9	926
24-09-19	21:00	13	87	0.0	929

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In Table 2.3.3 are given the measurement results of the noise indicator levels at measuring position No. 3.

Table 2.3.3 Measured indicators of environmental noise at measuring position No. 3

Period of measurement	Date	Time [h]	L _{Aeq} [dB]	L _{AFmax} [dB]	L _{evening} [dB]	L _{night} [dB]	L _{day} [dB]	L _{den} [dB]	L _{Aeq24} [dB]
Evening	23.09.19	19-20	54.2	82.2	50.3	-	-		
	23.09.19	20-21	49.8	71.8					
	23.09.19	21-22	46.2	72.1					
	23.09.19	22-23	44.4	71.2					
Night	23.09.19	23-24	45.4	69.0	-	44.3	-	58.3	57.3
	24.09.19	24-01	42.8	70.7					
	24.09.19	01-02	39.9	69.6					
	24.09.19	02-03	43.5	68.0					
	24.09.19	03-04	47.9	75.3					
	24.09.19	04-05	39.4	51.0					
	24.09.19	05-06	45.2	66.3					
	24.09.19	06-07	44.1	69.6					
Day	24.09.19	07-08	53.8	81.5	-	-	60.3	58.3	57.3
	24.09.19	08-09	57.3	86.9					
	24.09.19	09-10	68.4	106.6					
	24.09.19	10-11	61.4	92.9					
	24.09.19	11-12	55.4	80.1					
	24.09.19	12-13	55.8	85.3					
	24.09.19	13-14	58.5	82.9					
	24.09.19	14-15	58.3	81.5					
	24.09.19	15-16	51.8	73.7					
	24.09.19	16-17	55.0	85.4					
	24.09.19	17-18	52.1	82.0					
	24.09.19	18-19	-	-					

2.4 Measuring position No. 4

Measuring position No. 4 was located in Andrijevica, at the beginning of the Andrijevica – Mateševo road via Tresnjevik (3 m distance). The main sources of noise at this measuring position were vehicles passing by this local road as well as work activities from a nearby pellet factory located 150 m from this position. A preview of measurement position No. 4 is given in Figures 2.4.1 – 2.4.3.



Figure 2.4.1. Measurement position No. 4



Figure 2.4.2. Measurement position No. 4



Figure 2.4.3. Measurement position No. 4

In Table 2.4.1 are presented all data regarding the instrument calibration before the beginning and after the conclusion of measurements, used frequency weighting and dynamic characteristics of the measuring device as well as the position of the microphone.

Table 2.4.1 Calibration for the SVAN 977A

Date of calibration	Sensitivity [mV/Pa]	Deviation [dB]	Frequency weighting	Dynamic characteristics	Microphone position
25-09-19	33.38	0.41	A	FAST	4 m (Free field)
26-09-19	34.27	0.18	A	FAST	4 m (Free field)

Table 2.4.2 shows the meteorological parameters measured during the noise level surveying: Temperature – T (C), Relative humidity – RH (%), Velocity of air flow – V and Pressure P (mbar).

Table 2.4.2 Measured meteorological parameters during noise level measurements

Date	Time [h]	T [°C]	RH [%]	V [m/s]	P [mbar]
25-09-19	21:00	15	85	0.0	929
26-09-19	03:00	13	90	0.0	929
26-09-19	09:00	14	91	0.0	930
26-09-19	15:00	17	72	0.4	896
26-09-19	21:00	12	91	0.0	897

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In Table 2.4.3 are given the measurement results of the noise indicator levels at measuring position No. 4.

Table 2.4.3 Measured indicators of environmental noise at measuring position No. 4

Period of measurement	Date	Time [h]	L _{Aeq} [dB]	L _{AFmax} [dB]	L _{evening} [dB]	L _{night} [dB]	L _{day} [dB]	L _{den} [dB]	L _{Aeq24} [dB]
Evening	25.09.19	19-20	-	-	60.5	-	-		
	25.09.19	20-21	64.0	106.3					
	25.09.19	21-22	53.7	75.6					
	25.09.19	22-23	57.9	90.2					
Night	25.09.19	23-24	52.9	75.0	-	52.7	-	62.7	59.5
	26.09.19	24-01	50.3	73.7					
	26.09.19	01-02	50.3	77.9					
	26.09.19	02-03	50.3	77.6					
	26.09.19	03-04	50.8	75.8					
	26.09.19	04-05	53.2	82.0					
	26.09.19	05-06	50.6	76.6					
	26.09.19	06-07	57.1	80.3					
Day	26.09.19	07-08	58.9	84.9	-	-	61.4	62.7	59.5
	26.09.19	08-09	65.1	91.5					
	26.09.19	09-10	60.6	85.9					
	26.09.19	10-11	59.2	89.1					
	26.09.19	11-12	61.7	96.5					
	26.09.19	12-13	60.8	87.8					
	26.09.19	13-14	59.3	82.6					
	26.09.19	14-15	64.2	89.9					
	26.09.19	15-16	60.0	81.2					
	26.09.19	16-17	57.7	80.1					
	26.09.19	17-18	-	-					
	26.09.19	18-19	-	-					

2.5 Measuring position No. 5

Measuring position No. 5 was located at the entrance of Andrijevica, in the courtyard of a private residential building, next to the Berane – Andrijevica main road (15 m distance). The main sources of noise at this measuring position were vehicles passing by this main road as well as occasional barking of dogs from neighboring households. A preview of measurement position No. 5 is given in Figures 2.5.1 – 2.5.3.



Figure 2.5.1. Measurement position No. 5



Figure 2.5.2. Measurement position No. 5



Figure 2.5.3. Measurement position No. 5

In Table 2.5.1 are presented all data regarding the instrument calibration before the beginning and after the conclusion of measurements, used frequency weighting and dynamic characteristics of the measuring device as well as the position of the microphone.

Table 2.5.1 Calibration for the SVAN 977A

Date of calibration	Sensitivity [mV/Pa]	Deviation [dB]	Frequency weighting	Dynamic characteristics	Microphone position
24-09-19	35.48	-0.12	A	FAST	4 m (Free field)
25-09-19	33.38	0.41	A	FAST	4 m (Free field)

Table 2.1.2 shows the meteorological parameters measured during the noise level surveying: Temperature – T (C), Relative humidity – RH (%), Velocity of air flow – V and Pressure P (mbar).

Table 2.5.2 Measured meteorological parameters during noise level measurements

Date	Time [h]	T [$^{\circ}$ C]	RH [%]	V [m/s]	P [mbar]
24-09-19	21:00	13	87	0.0	929
25-09-19	03:00	13	90	0.9	920
25-09-19	09:00	16	75	2.2	928
25-09-19	15:00	21	61	0.0	928
25-09-19	21:00	15	85	0.0	929

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In Table 2.5.3 are given the measurement results of the noise indicator levels at measuring position No. 5.

Table 2.5.3 Measured indicators of environmental noise at measuring position No. 5

Period of measurement	Date	Time [h]	L _{Aeq} [dB]	L _{AFmax} [dB]	L _{evening} [dB]	L _{night} [dB]	L _{day} [dB]	L _{den} [dB]	L _{Aeq24} [dB]
Evening	24.09.19	19-20	60.4	77.8	58.6	-	-		
	24.09.19	20-21	58.8	78.0					
	24.09.19	21-22	58.5	79.4					
	24.09.19	22-23	55.2	76.4					
Night	24.09.19	23-24	-	-	-	53.6	-	62.5	58.3
	25.09.19	24-01	54.2	77.5					
	25.09.19	01-02	49.6	74.9					
	25.09.19	02-03	49.3	75.3					
	25.09.19	03-04	44.6	71.7					
	25.09.19	04-05	50.5	75.8					
	25.09.19	05-06	53.6	74.5					
	25.09.19	06-07	59.0	77.3					
Day	25.09.19	07-08	62.8	79.8	-	-	61.0	62.5	58.3
	25.09.19	08-09	-	-					
	25.09.19	09-10	-	-					
	25.09.19	10-11	-	-					
	25.09.19	11-12	60.2	80.8					
	26.09.19	12-13	-	-					
	25.09.19	13-14	-	-					
	25.09.19	14-15	-	-					
	25.09.19	15-16	-	-					
	25.09.19	16-17	60.4	74.5					
	25.09.19	17-18	59.9	77.4					
	25.09.19	18-19	61.1	83.5					

3. MEASUREMENT UNCERTAINTY

Measurement uncertainty estimation for determining the sound pressure level is defined by MEST ISO 1996-2: 2018 (Chapter 4). The sound pressure level depends on the noise source, the measurement interval, the weather conditions, the distance from the noise sources, the measurement methods and the class of instruments used.

The total measurement uncertainty, when determining the equivalent noise level, is determined as an expanded uncertainty, ie, standard uncertainty multiplied by the coverage factor $k = 2$ which provides a 95% confidence level.

$$L_{Aeq} \text{ Real} = L_{Aeq} \text{ Measurements} \pm 2 \cdot u_A$$

where $L_{Aeq} \text{ Real}$ - The real value of the equivalent noise level; $L_{Aeq} \text{ Measurements}$ - Measured value of equivalent noise level and $2 \cdot u_A$ is the value of extended measurement uncertainty.

Given the defined factors that influence the measurement uncertainty, the total measurement uncertainty is calculated as:

$$u_A = \sqrt{(C_L \cdot U_L)^2 + (C_{sou} \cdot U_{sou})^2 + (C_{met} \cdot U_{met})^2 + (C_{loc} \cdot U_{loc})^2 + (C_{res} \cdot U_{res})^2}$$

where:

- C_L : The coefficient of sensitivity of the measured noise level which contains residual noise in itself
- $U_L (U_{slm})$: Uncertainty of the measured noise level (measuring uncertainty of the measuring chain)
- C_{sou} : Sensitivity coefficient for the variation of the noise source regime
- U_{sou} : Measurement uncertainty due to the variation of the noise source regime
- C_{met} : Sensitivity coefficient for variation of meteorological conditions
- U_{met} : Measurement uncertainty due to variation of meteorological conditions
- C_{loc} : Sensitivity coefficient for the location of the measuring instrument
- U_{loc} : Measurement uncertainty for the location of the measuring instrument
- C_{res} : Sensitivity coefficient for the measured residual noise level
- U_{res} : Measurement uncertainty for the measured residual noise level

In this case we have measurements of residual environmental noise level (background level), which is treated as a specific noise, without the contribution of other sources, so the previous formula for measurement uncertainty is reduced to:

$$u_A = \sqrt{(U_{slm})^2 + (U_{met})^2}$$

where $U_{slm} = 0.5$ dB (for class 1 instruments), $U_{met} = 2.0$ dB. Measurement uncertainty for one hour measurement is $u_A = 2.1$ dB, while extended uncertainty is $2 \cdot u_A = 2 \cdot 2.1 = 4.2$ dB.

4. OVERVIEW AND ANALYSIS OF THE RESULTS

From a total of 5 measuring positions where the background level of environmental noise were measured on the section of the future Mateševo – Andrijevica highway, 2 measuring positions (No. 1 and 2) are located in the Municipality of Kolašin and the remaining 3 (No. 3, 4 and 5) are located in the territory of Andrijevica Municipality.

Secretariat for Spatial Planning, Communal Housing and Environmental Protection of the Municipality of Kolašin, on 27.08.2013. adopted the Decision on Identification of Acoustic Zones with Noise Map in the Municipality of Kolašin (Decision No. 05-1337/2), which defined the acoustic zoning of the territory of the Municipality of Kolašin. Likewise, the Secretariat for Local Government Affairs of Andrijevica Municipality issued a decision on the identification of acoustic zones in Andrijevica municipality (No: 04-032-46/2013-04/1 of 10.04.2013) and the Decision on the amendment of this Decision (No: 038-709/2015-0452/1 of 11 May 2015) which defined acoustic zoning of the territory of Andrijevica Municipality.

All measurement positions belong to the zone under the strong influence of traffic noise, for which the limit value of the environmental noise level for the day and evening is 60 dB, and for the night period is 55 dB, in accordance with the above mentioned Decisions and the Rulebook on Boundaries environmental noise values, method of determining noise indicators and acoustic zones and methods for assessing the harmful effects of noise” (“Official Gazette of Montenegro”, No. 060/11).

Table 4.1 shows the mean values of a series of measured equivalent noise levels for day, evening, night, the mean value of a series of measurements for the whole day (24 hours), the calculated value of the noise level day-evening-night (L_{den}), as well as the corresponding noise level limits for a given acoustic zone to which the measurement positions belong.

EXAMINATION REPORT No. 00-1744/B/2

Table 4.1 Measured values of daily noise level indicators at all measuring positions

Measurement Position	LA _{eq} (dB)		Noise level limit (dB)	LA _{eq} 24h (dB)	L _{den} (dB)
1.	L _{day}	50	60	48	51
	L _{evening}	45	60		
	L _{night}	41	55		
2.	L _{day}	55	60	54	60
	L _{evening}	54	60		
	L _{night}	53	55		
3.	L _{day}	60	60	57	58
	L _{evening}	50	60		
	L _{night}	44	55		
4.	L _{day}	61	60	59	63
	L _{evening}	60	60		
	L _{night}	53	55		
5.	L _{day}	61	60	58	62
	L _{evening}	59	60		
	L _{night}	54	55		

5. CONCLUSION

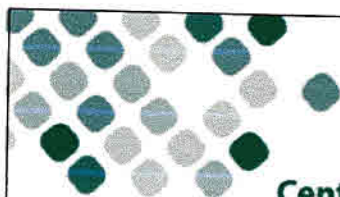
Analysis of the results of measuring the background noise level in the environment on the section of the future highway Mateševo – Andrijevica, shows that daily indicators of the noise level in the measuring positions 4 and 5 exceed the limit value prescribed by the "Decision (Decision No. 05-1337 / 2 of 27.08.2013) on the identification of acoustic zones with noise map in the Municipality of Kolašin", "by Decision (No: 038-709 / 2015-0452 / 1 of 11.05.2015) on the amendment of the Decision (No: 04-032 -46 / 2013-04 / 1 of 10.4.2013) on the determination of acoustic zones in the territory of the Municipality of Andrijevica" and the "Rulebook on Limit Values of Environmental Noise, the Method of Determining Noise Indicators and Acoustic Zones and Methods for Assessing the Noise Effects of Noise" (Official Gazette of Montenegro, No. 060/11). Other noise level indicators at all measuring positions do not exceed the limit values from the above decisions.

Processed by:

Benard Berišaj, dipl. fiz.

Head of unit for dosimetric measurements and
measurements of noise

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Centar za ekotoksikološka ispitivanja Podgorica d.o.o.
LLC Center for Ecotoxicological Research Podgorica



CETI 5100.101.01

SECTOR FOR LABORATORY DIAGNOSTIC AND RADIATION PROTECTION

EXAMINATION REPORT

Type of examination	Ambient air quality measurement on the highway route Mateševo-Andrijevisa, baseline state
Number of report	00-1744/2
Date of report issue	22.10.2019.
APPLICANTS DATA	
Applicants name	HILL INTERNATIONAL, IPF 7 Consortium
Request number	00-1744
Submission date	18.09.2019.
Adress	Resavska 16A. II flour apt 5, Belgrade

SAMPLING DATA	
Sampling date	Measuring point 3, Measuring period 23-24.09.2019. Measuring point 5, Measuring period 24-25.09.2019. Measuring point 4, Measuring period 25-26.09.2019. Measuring point 2, Measuring period 26-27.09.2019.
Plan/sampling method	According to „Regulation on the manner and conditions in air quality monitoring“ (“Off.gazette of Montenegro”, No: 21/11, 32/16) / Standard MEST EN methods
Sample type	Ambient air
Required examination	SO ₂ , NO, NO ₂ , CO, PM ₁₀ , PM _{2,5}
ANNEXES	1. Images of measuring positions with air quality measurement equipment

DIRECTOR OF SECTOR FOR LABORATORY DIAGNOSTICS
AND RADIATION PROTECTION
Danijela Šuković, spec.tox.chem.

Statement:

1. The test results is related only to the tested sample.
2. The test report can be reproduced only as a whole.
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EXAMINATION REPORT No. 00-1744/2

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EXAMINATION REPORT No. 00-1744/2

SECTOR FOR LABORATORY DIAGNOSTIC AND RADIATION PROTECTION

General data about authorised measuring institution

Name of institution	LLC Center for ecotoxicological research Podgorica
Location	Podgorica
Address	Charles De Gaulle br.2 Boulevard
Telephone/fax number	+ 382 20 658 090 / + 382 20 658 092
E-mail	info@ceti.co.me
Contact person	Radomir Žujović

Applicants general data

Applicants name	HIIL INTERNATIONAL, IPF 7 Consortium
Location	Belgrade
Address	Resavska 16A, II floor apt 5
E-mail	geopar1983@gmail.com
Contact person	GeorgeParaskevopoulos

The measurement realization basics

„Rulebook on the method and conditions of air quality monitoring“ (“Off.gazette of Montenegro”, No. 21/11) and „Rulebook on amendments to Rulebook on the method and conditions of air quality monitoring“, („Off.gazette of Montenegro“ No.32/16) lay down that periodic measurements of air quality have to be evenly distributed over the year. That means next possibilities:

- One day's measurement a week at random, evenly distributed over the year or
- Eight weeks evenly distributed over the year to be representative for different climate and other conditions, regarding time criterion of min 14% on yearly basis.

In accordance with applicants request No: 00-1465 from 07.08.2019. **baseline** air quality measurement is being planned to monitor air quality in 24 hours on the four measuring points.

Measuring periods:

Measuring point 3, Measuring period 23-24.09.2019.
 Measuring point 5, Measuring period 24-25.09.2019.
 Measuring point 4, Measuring period 25-26.09.2019.
 Measuring point 2, Measuring period 26-27.09.2019.

EXAMINATION REPORT No. 00-1744/2

Measurement points

The selection of measuring points is made with following criteria:

- Along the new highway alignment
- Locations where a homes are close to the highway.

The availability, basic infrastructure for the implementation of monitoring, roads and power sources also have been taken into account during the selection. Taking into consideration the above mentioned, air quality measuring equipment, mobile station and sequential samplers of PM₁₀ are installed beside houses with power sources.

Table 1. and picture 1 show the locations and coordinates of measurement points.

Table 1. Measuring points where measurement of air quality has been carried out

Measuring point (M)	Latitude	Longitude
MM2 - Bare Kraljske, besides regional road Mateševo-Andrijeva	42° 44' 53.76''	19° 37' 01.27''
MM3 - Kralje, about 100m from regional road Mateševo-Andrijeva	42° 44' 02.45''	19° 45' 22.29''
MM4 - About 400m from Most Bandovića, besides regional road Mateševo-Andrijeva	42° 44' 23.71''	19° 46' 43.19''
MM5 - Besides regional road Andrijeva-Berane	42° 45' 03.89''	19° 47' 23.49''

Picture 1. Orienting picture of the measuring points (taken from Google Earth)



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Measured pollutants

Monitoring includes measurement of all primary pollutants according to request, listed in the table 2.

Table 2. Measured/analysed pollutant

Ordinal number	Formula	Name of pollutant	Measuring unit	Averaging period
1.	SO ₂	Sulfur (IV) oxide	µg/m ³	1 h 24 h
2.	NO	Nitrogen (II) oxide	µg/m ³	1 h
3.	NO ₂	Nitrogen (IV) oxide	µg/m ³	1 h
4.	CO	Carbon (II) oxide	mg/m ³	8 h
5.	PM ₁₀	PM ₁₀ (fraction of suspended particulate matter, diameter less than 10 µm)	µg/m ³	24h
6.	PM _{2.5}	PM _{2.5} (fraction of suspended particulate matter, diameter less than 2.5 µm)	µg/m ³	24h

Methods

For monitoring purpose, in compliance with „Rulebook on the method and conditions of air quality monitoring“ (“Off.gazette of Montenegro”, No. 21/11; 32/16) methods used are given in table 3.

Table 3. Review of used methods

Standard referent method / name	Tag
Standard method for measuring concentration of sulfur dioxide by ultraviolet fluorescence	MEST EN 14212:2014
Standard method for measuring concentration of nitrogen monoxide and nitrogen dioxide by chemiluminiscence	MEST EN 14211:2014
Standard method for measuring concentration of carbon monoxide by nondispersive infrared spectroscopy	MEST EN 14626:2014
Standard gravimetric method for determination of mass concentration of PM ₁₀ or PM _{2.5} suspended particles	MEST EN 12341:2016

Methods given in table 3 are accredited according to standard MEST ISO/IEC 17025, by Accreditation Body of Montenegro (ATCG).

For achieving data quality all QA/QC procedures are applied according used reference methods and traceable to standard SSC ISO/IEC 17025.

All results in the report are evaluated according „Rulebook on the method and conditions of air quality monitoring“ (“Off.gazette of Montenegro”, No. 21/11, 32/16) and recommendations of ILAC (ILAC-G8:03/2009).

EXAMINATION REPORT No. 00-1744/2

Measuring instruments and equipment in realised measurements

Air quality monitoring is being carried out, with mobile measuring station which is equipped with air sampling system and the instruments for measuring gas pollutants and sampling PM₁₀ and PM_{2.5}. Gravimetric analysis of samples collected is performed with the laboratory equipment quoted in table 4.

Table 4. Instruments and equipment

Measuring/field equipment				
R.br.	Instrument name	Manufacturer	Model	Serial number
1.	Ambient CO monitor	Horiba, Ltd	APMA 370	46GYT2UP
2.	Ambient NO _x monitor		APNA 370	Y016JUFH
3.	Ambient SO ₂ monitor		APSA 370	S89ED3P5
4.	Sequential sampler SEQ 47/50	Sven Leckel	SEQ47/50, LVS3	16/0085 and 17/0191
Laboratory instrumental equipment				
5.	Analytical balance Sartorius (type:BP 211 D; class I, readability d = 0,00001 g)			

Measuring uncertainty is based on type approvals and working characteristics tests in the referent laboratories according relevant norms.

Legislative framework

Indicative measurements, result processing and analysis are made in agreement with legislative regulations listed:

- „Law on air protection“ (“Off.gazette of Montenegro”, No: 25/10,43/15)
- „Regulation on determination of the types of pollutants, limits and other air quality standards ” (“Off.gazette of Montenegro”,No: 25/12)
- „Rulebook on the method and conditions of air quality monitoring“ (“Off.gazette of Montenegro”, No: 21/11, 32/16)
- “Regulation on establishment of a network of measuring points for air quality monitoring” (“Off.gazette of Montenegro”, No: 44/10, 13/11)

EXAMINATION REPORT No. 00-1744/2

Measuring results

Measuring results presented in this report are collected during twenty-four hour measurement of air quality on the four measuring points. Results are displayed along with the limit values:

By tables:

- Average daily values during the measurements of: SO₂, NO, NO₂, PM₁₀, PM_{2.5} and maximal eight-hour mean values for carbon monoxide.

By graphic:

- Hourly mean values of sulphur dioxide and nitrogen dioxide (due to volumen of data).

Tags and abbreviations used in tables and graphics:

- LV (DM)-limit value (daily mean)
- LV (M8hDM)-limit value (maximal eight-hour daily mean)
- LV (AM)-limit value (annual mean)

EXAMINATION REPORT No. 00-1744/2

Tabular display of measuring results on the measuring point 3

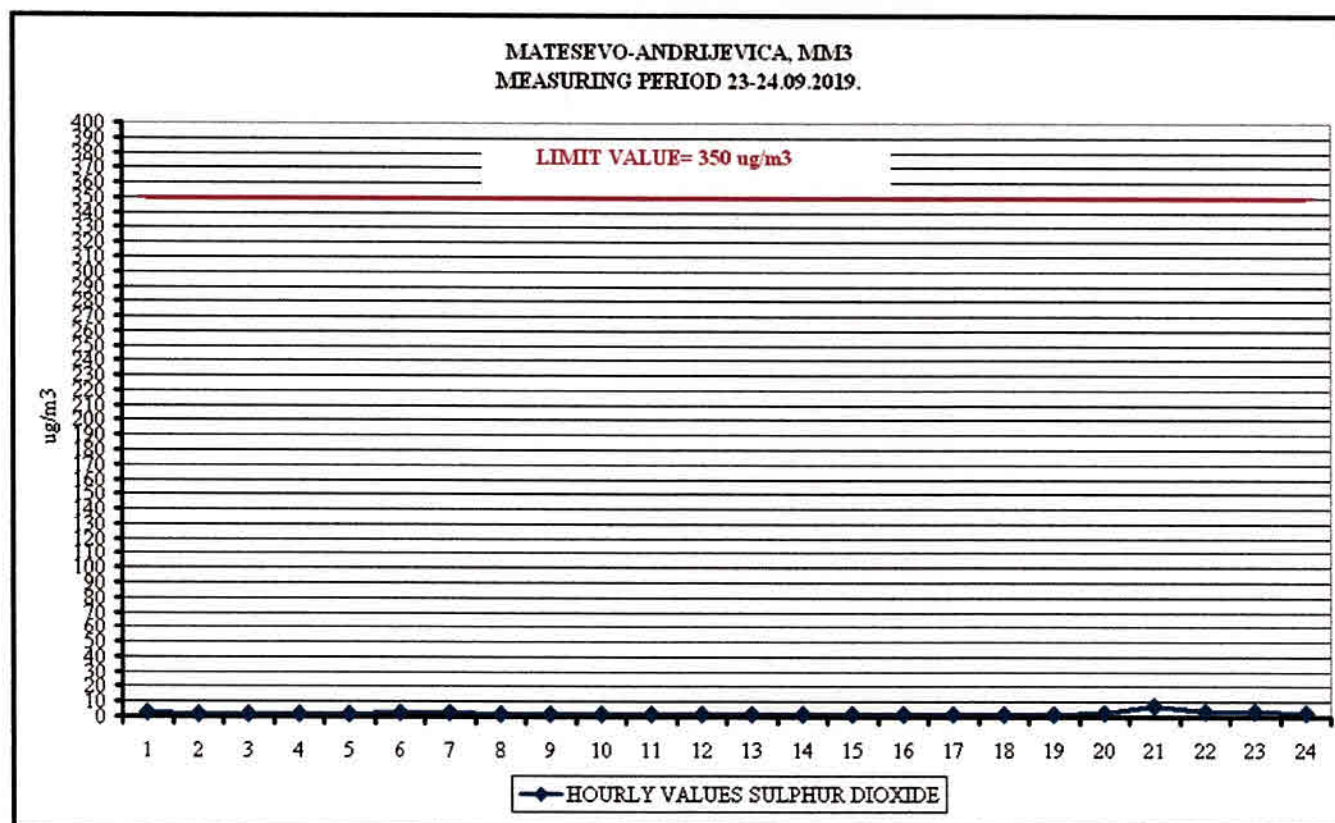
PM₁₀, PM_{2.5} and gaseous pollutants daily mean concentrations of: sulfur dioxide, nitrogen monoxide, nitrogen dioxide; maximal 8h daily mean of carbon monoxide are presented in table 5.

Table 5. Daily means: PM₁₀, PM_{2.5}, SO₂, NO, NO₂, maximal eight-hour daily mean CO

Measuring period	PM ₁₀	PM _{2.5}	SO ₂	NO	NO ₂	CO
			µg/m ³			mg/m ³
23-24.09.2019.	13.82	7.44	2.35	3.35	4.00	0.21
LV (DM)	50		125			
LV (M8hDM)						10
LV (AM)	40	25			40	

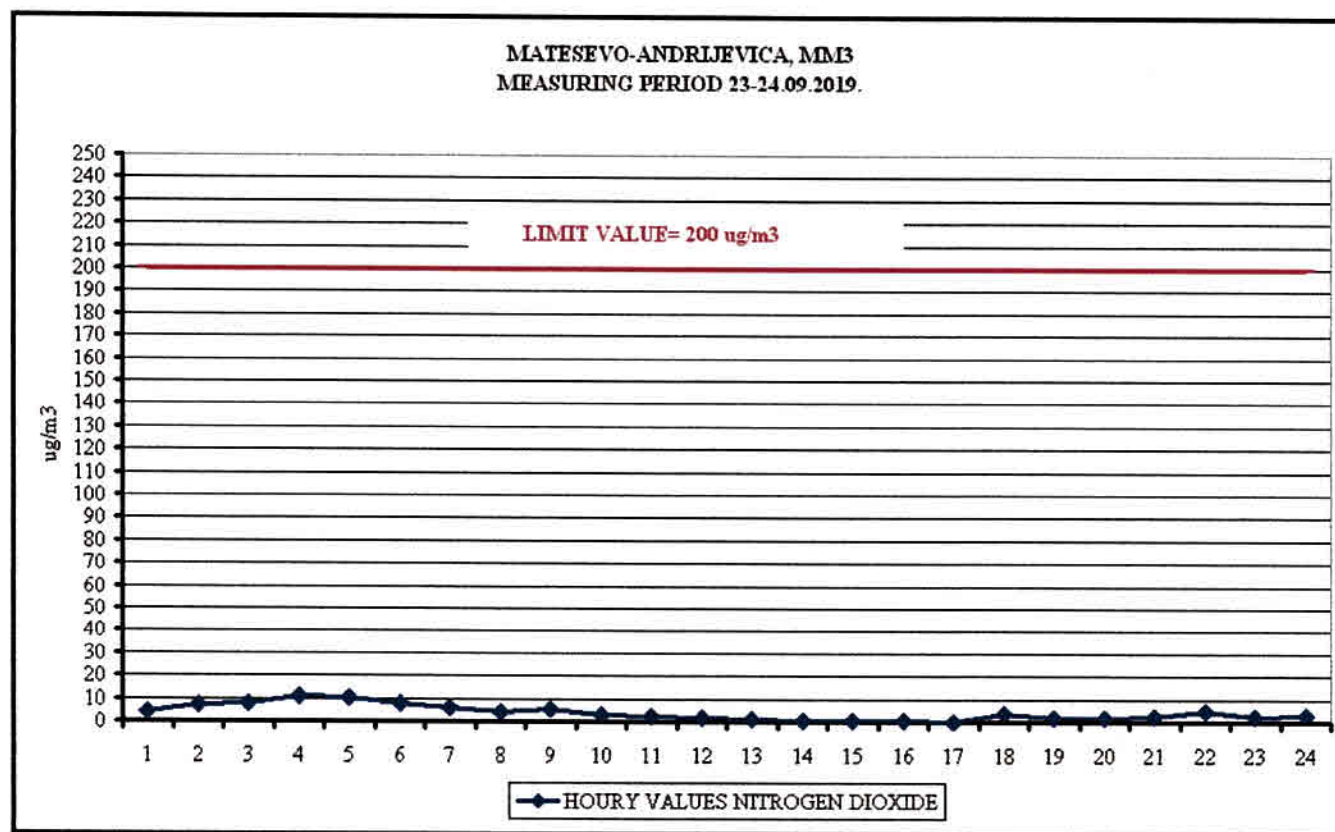
Graphical presentation of measuring results on the measuring point 3

- Hourly means of sulfur dioxide and nitrogen dioxide (pictures 2 and 3)



Picture 2. Hourly means values of sulfur dioxide

EXAMINATION REPORT No. 00-1744/2



Picture 3. Hourly means values of nitrogen dioxide

EXAMINATION REPORT No. 00-1744/2

Tabular display of measuring results on the measuring point 5

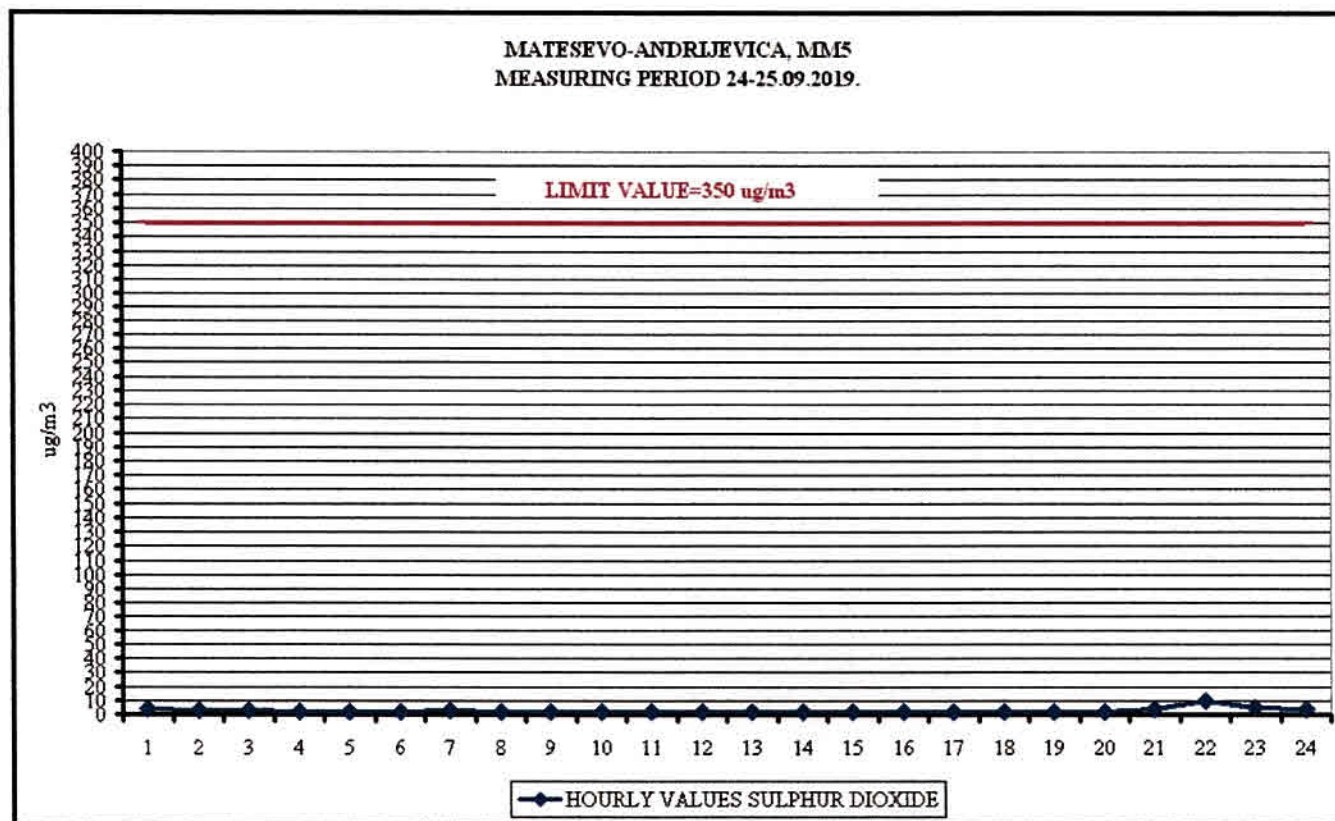
PM₁₀, PM_{2.5} and gaseous pollutants daily mean concentrations of: sulfur dioxide, nitrogen monoxide, nitrogen dioxide; maximal 8h daily mean of carbon monoxide are presented in table 6.

Table 6. Daily means: PM₁₀, PM_{2.5}, SO₂, NO, NO₂, maximal eight-hour daily mean CO

Measuring period	PM ₁₀	PM _{2.5}	SO ₂ µg/m ³	NO	NO ₂	CO mg/m ³
24-25.09.2019.	21.61	8.80	2.71	7.76	6.13	0.21
LV (DM)	50		125			
LV (M8hDM)						10
LV (AM)	40	25			40	

Graphical presentation of measuring results on the measuring point 5

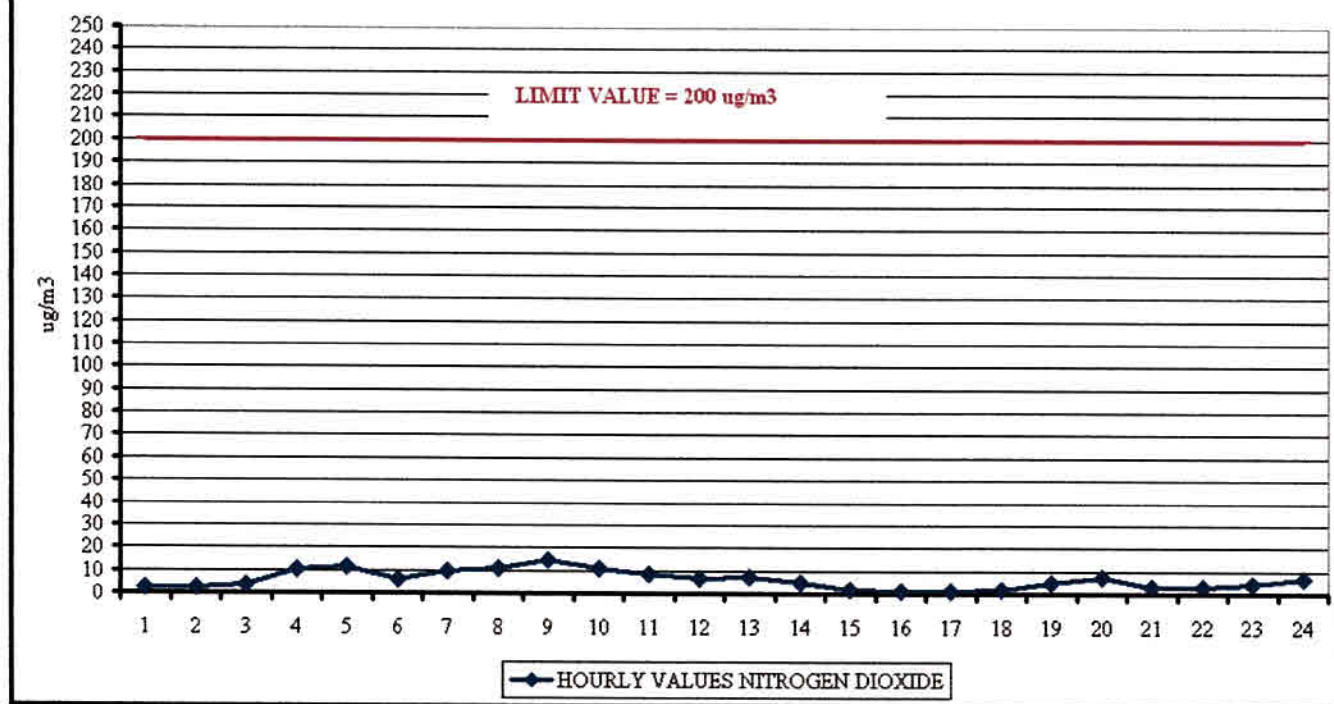
- Hourly means of sulfur dioxide and nitrogen dioxide (pictures 4 and 5)



Picture 4. Hourly means of sulfur dioxide

EXAMINATION REPORT No. 00-1744/2

MATESEVO-ANDRLJEVICA, MM5
MEASURING PERIOD 24-25.09.2019.



Picture 5. Hourly means of nitrogen dioxide

EXAMINATION REPORT No. 00-1744/2

Tabular display of measuring results on the measuring point 4

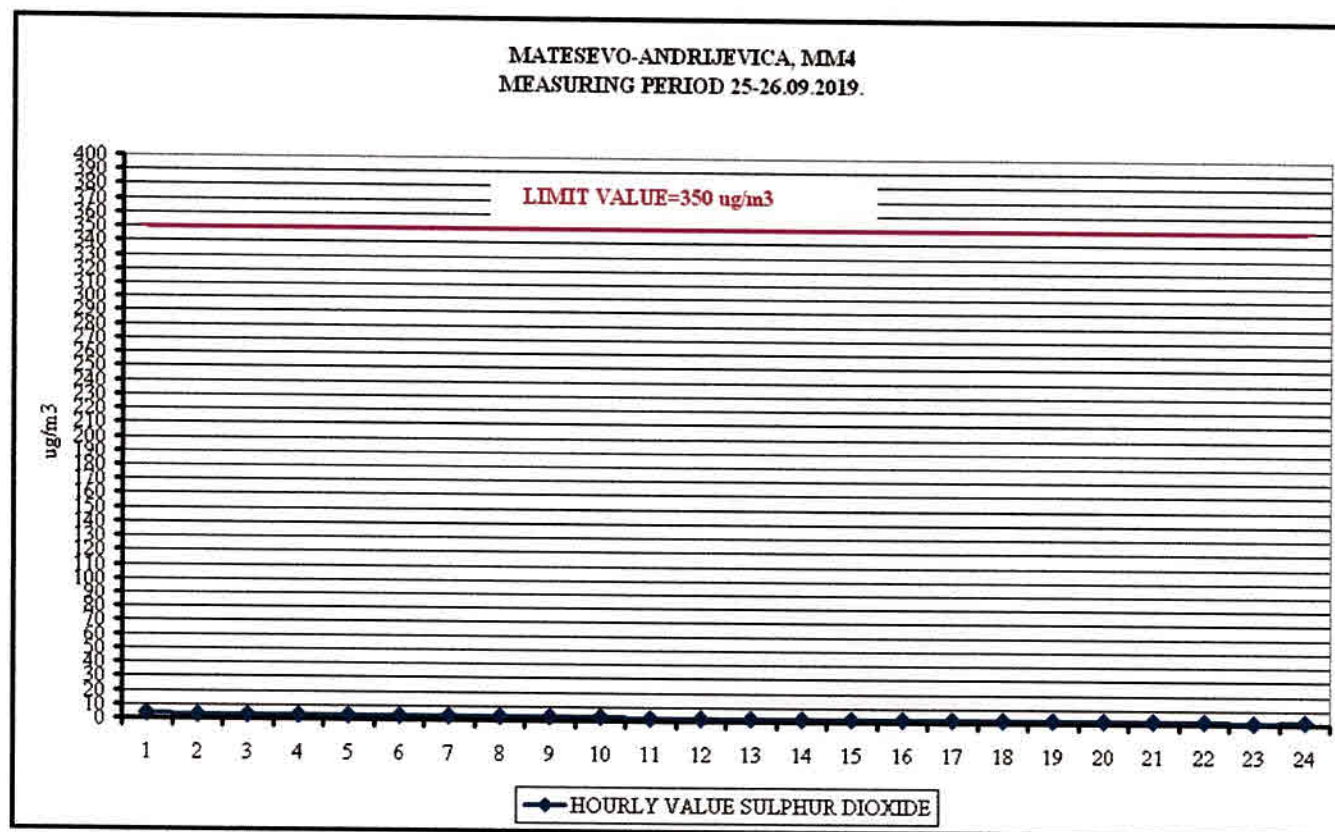
PM₁₀, PM_{2.5} and gaseous pollutants daily mean concentrations of: sulfur dioxide, nitrogen monoxide, nitrogen dioxide; maximal 8h daily mean of carbon monoxide are presented in table 7.

Table 7. Daily means: PM₁₀, PM_{2.5}, SO₂, NO, NO₂, maximal eight-hour daily mean CO

Measuring period	PM ₁₀	PM _{2.5}	SO ₂	NO	NO ₂	CO
			µg/m ³			mg/m ³
25-26.09.2019.	11.34	6.83	2.44	4.52	5.58	0.10
LV (DM)	50		125			
LV (M8hDM)						10
LV (AM)	40	25			40	

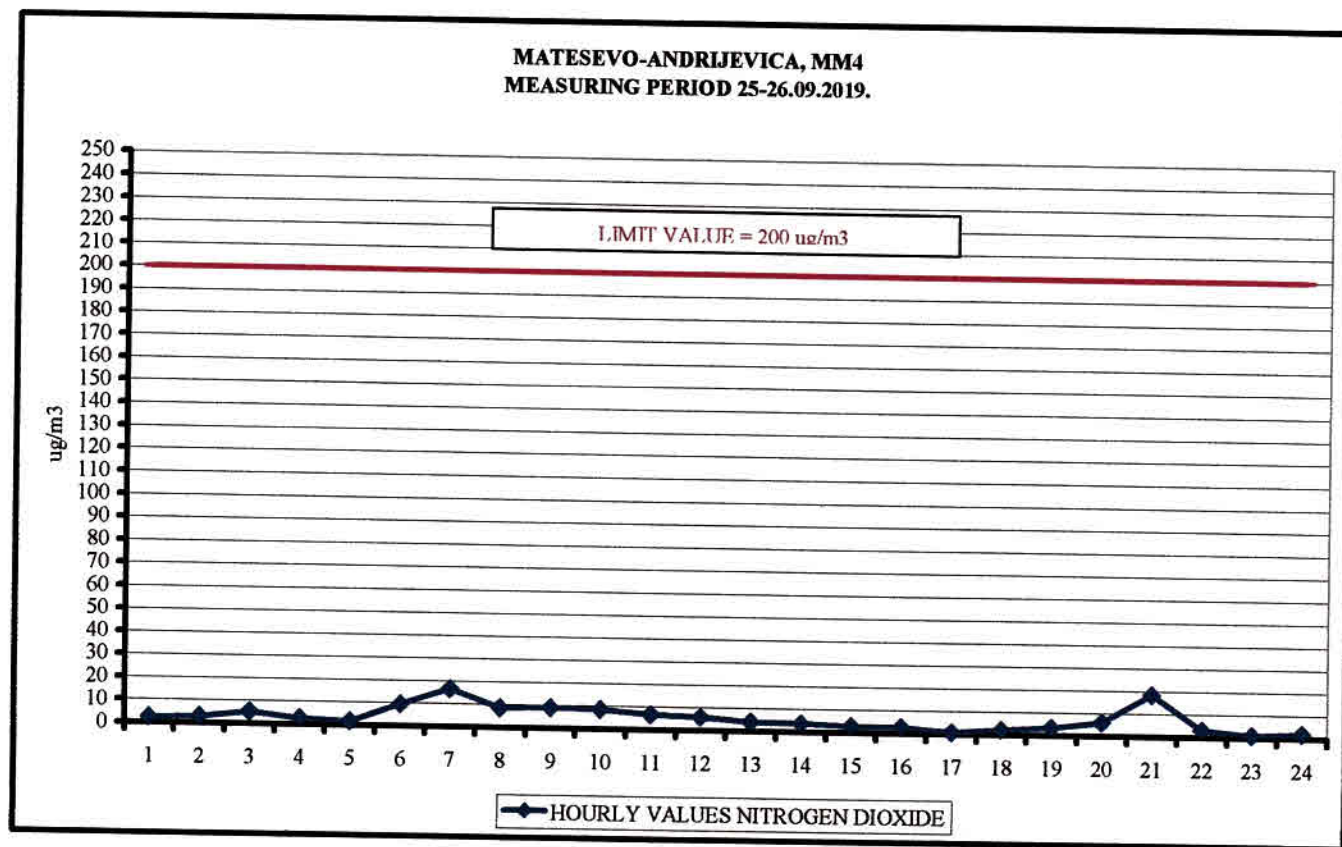
Graphical presentation of measuring results on the measuring point 4

- Hourly means of sulfur dioxide and nitrogen dioxide (pictures 6 and 7)



Picture 6. Hourly means of sulfur dioxide

EXAMINATION REPORT No. 00-1744/2



Picture 7. Hourly means of nitrogen dioxide

EXAMINATION REPORT No. 00-1744/2

Tabular display of measuring results on the measuring point 2

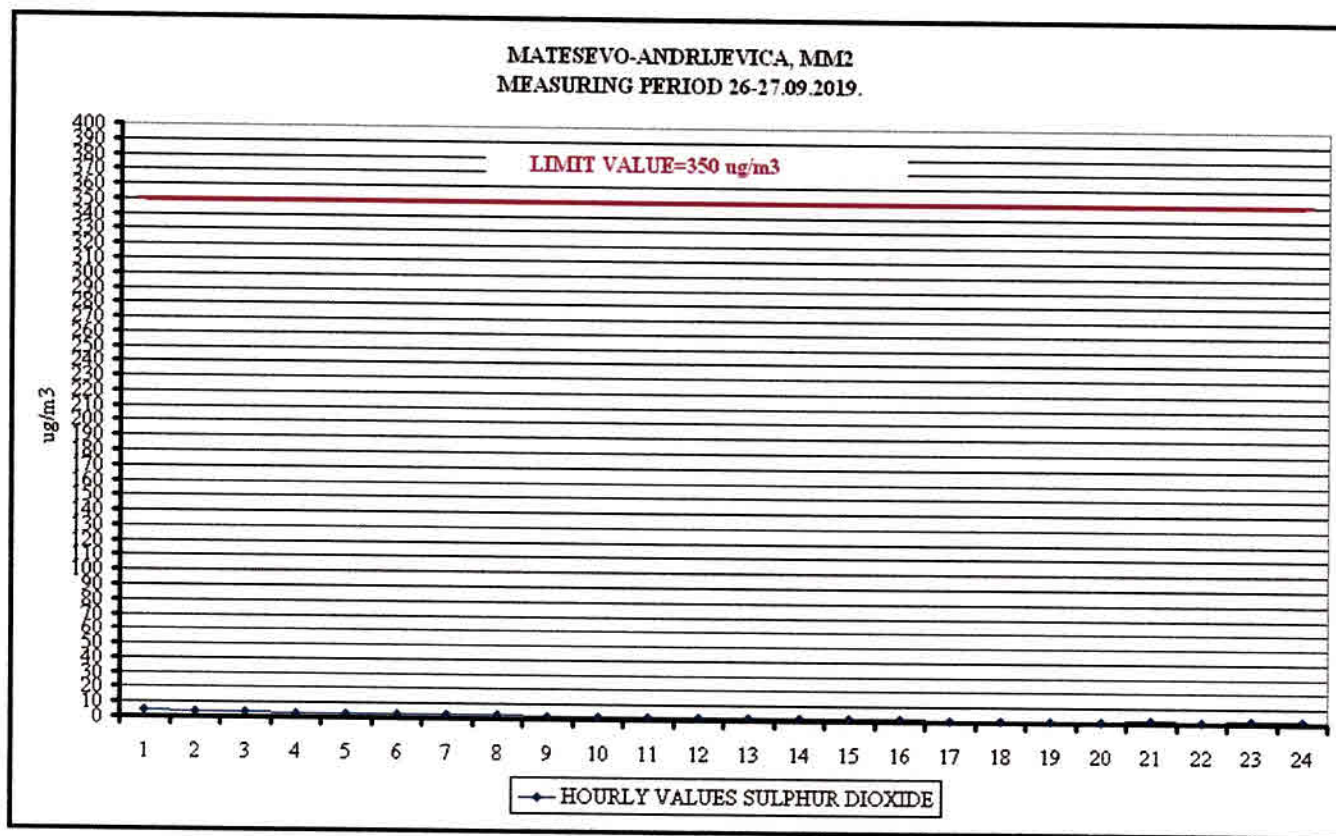
PM₁₀, PM_{2.5} and gaseous pollutants daily mean concentrations of: sulfur dioxide, nitrogen monoxide, nitrogen dioxide; maximal 8h daily mean of carbon monoxide are presented in table 8.

Table 8. Daily means: PM₁₀, PM_{2.5}, SO₂, NO, NO₂, maximal eight-hour daily mean CO

Measuring period	PM ₁₀	PM _{2.5}	SO ₂	NO	NO ₂	CO
			µg/m ³			mg/m ³
26-27.09.2019.	10.70	6.44	2.25	2.83	1.35	0.16
LV (DM)	50		125			
LV (M8hDM)						10
LV (AM)	40	25			40	

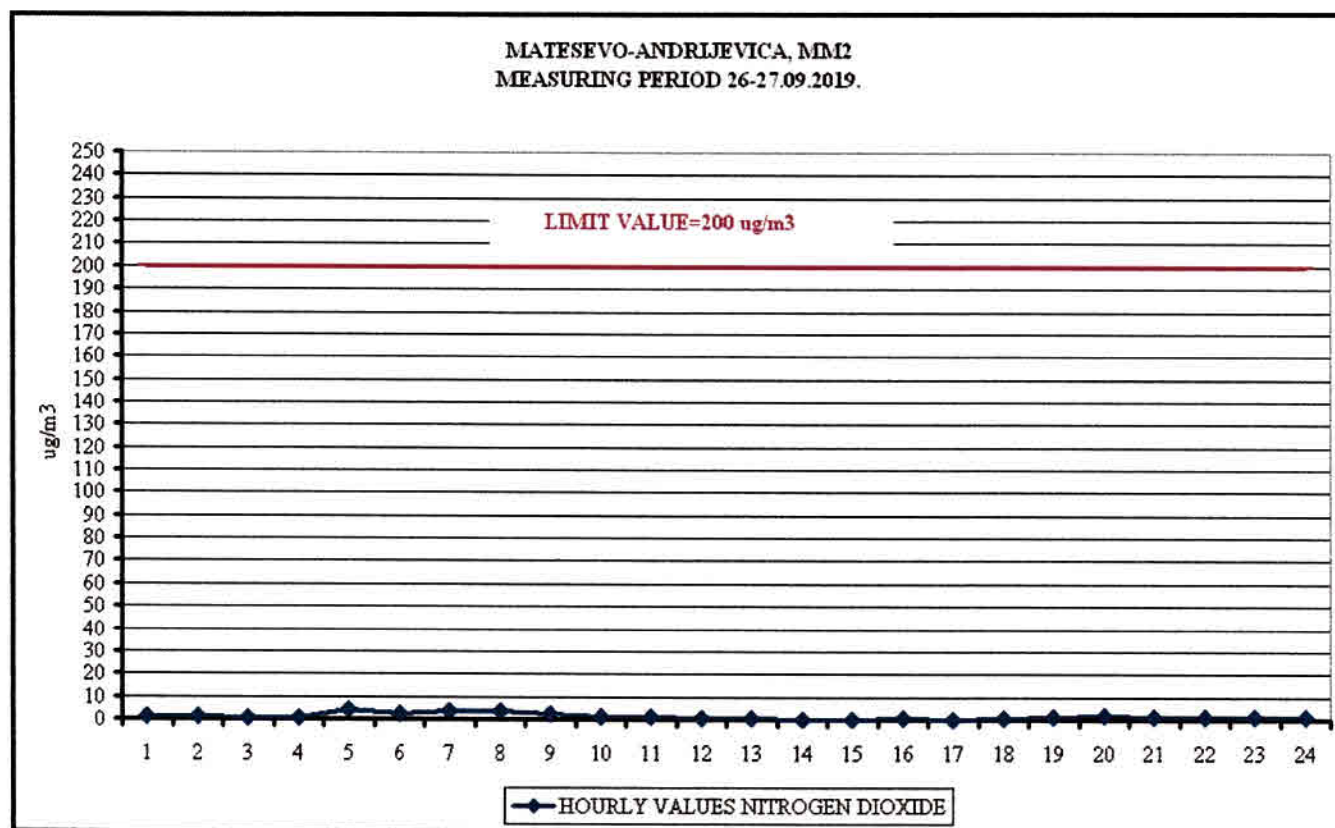
Graphical presentation of measuring results on the measuring point 2

- Hourly means of sulfur dioxide and nitrogen dioxide (pictures 8 and 9)

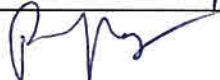


Picture 8. Hourly means of sulfur dioxide

EXAMINATION REPORT No. 00-1744/2



Picture 9. Hourly means of nitrogen dioxide

Report created by :	
Radomir Žujovic, Head of Ambient air quality and occupational environment conditions measuring unit	 
Siniša Popović, Associate in Ambient air quality and occupational environment conditions measuring unit	
Field sampling and measurements:	
Radomir Žujovic, Head of Ambient air quality and occupational environment conditions measuring unit	
Ivan Đurović, Chem.Technician for field measurements	
Petar Galičić, Chem.Technician for field measurements	
Mitar Pavićević, Technician for field measurements	
Laboratory measurements :	
Siniša Popović, Associate in Ambient air quality and occupational environment conditions measuring unit	

COMMENT OF MEASUREMENTS

The results of measurements of air quality at:

Measuring point 3, Measuring period 23-24.09.2019.

Measuring point 5, Measuring period 24-25.09.2019.

Measuring point 4, Measuring period 25-26.09.2019.

Measuring point 2, Measuring period 26-27.09.2019.

during the twenty four hour cycle, (Report. No. 00-1744/2 from 22/10/2019.), were observed in relation to the standards given by "Regulation on determination of the types of pollutants, limits and other air quality standards" ("Official Gazette of Montenegro", No.25/12)

An overview of air quality is given by pollutants:

SULFUR DIOXIDE, SO₂

The results of measurements of sulfur dioxide were compared with the limits for hourly mean value (350 µg/m³) and the daily limit value (125 µg/m³).

All measured values of sulfur dioxide during the twenty four hour of measurements at all measuring points, were below the appointed limit values.

NITROGEN DIOXIDE, NO₂

The results of measurements of nitrogen dioxide (as hourly mean values) are compared with the limit for hourly mean value (200 µg/m³).

• All measured hourly mean values of nitrogen dioxide (presented only graphically because of the large number of data) during the twenty four hour of measurements at all measuring points, were below the appointed limits.

CARBON MONOXIDE, CO

All maximal eight-hour carbon monoxide daily mean values, were compared with the layed down limit for the annual average value.

All maximal eight-hour daily mean values of carbon monoxide, during the twenty four hour of measurements at all measurement points, were below the limit value of 10 mg/m³.

PARTICULATE MATTER PM₁₀

Daily mean values of PM₁₀ were compared with the layed down limit for mean daily value (50 µg/m³), which must not be exceeded more than 35 times during the year.

All daily mean concentrations of PM₁₀ at all measuring points, were below the limit value of 50 µg/m³.

PARTICULATE MATTER PM_{2.5}

For PM_{2.5} the limit value has been set up on the yearly basis.

CENTER FOR ECOTOXICOLOGICAL RESEARCH PODGORICA

Report and comment created by :	
Radomir Žujovic, Head of Ambient air quality and occupational environment conditions measuring unit	
Siniša Popović, Associate in Ambient air quality and occupational environment conditions measuring unit	
Field sampling and measurements:	
Radomir Žujovic, Head of Ambient air quality and occupational environment conditions measuring unit	
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Petar Galičić, Chem.Technician for field measurements	
Mitar Pavićević, Technician for field measurements	
Laboratory measurements :	
Siniša Popović, Associate in Ambient air quality and occupational environment conditions measuring unit	

ANNEX 1. Images of measuring positions with air quality measurement equipment



Picture 1 and 2. Air quality mobile station at the MM3



Picture 3 and 4. Air quality mobile station at the MM5



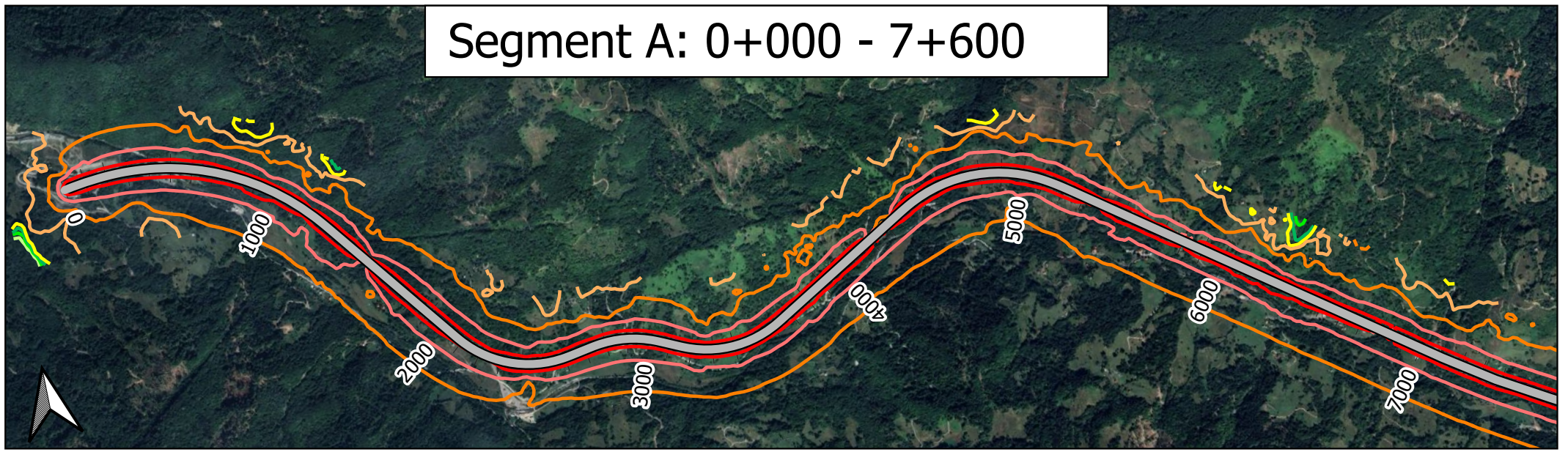
Picture 5 and 6. Air quality mobile station at the MM4



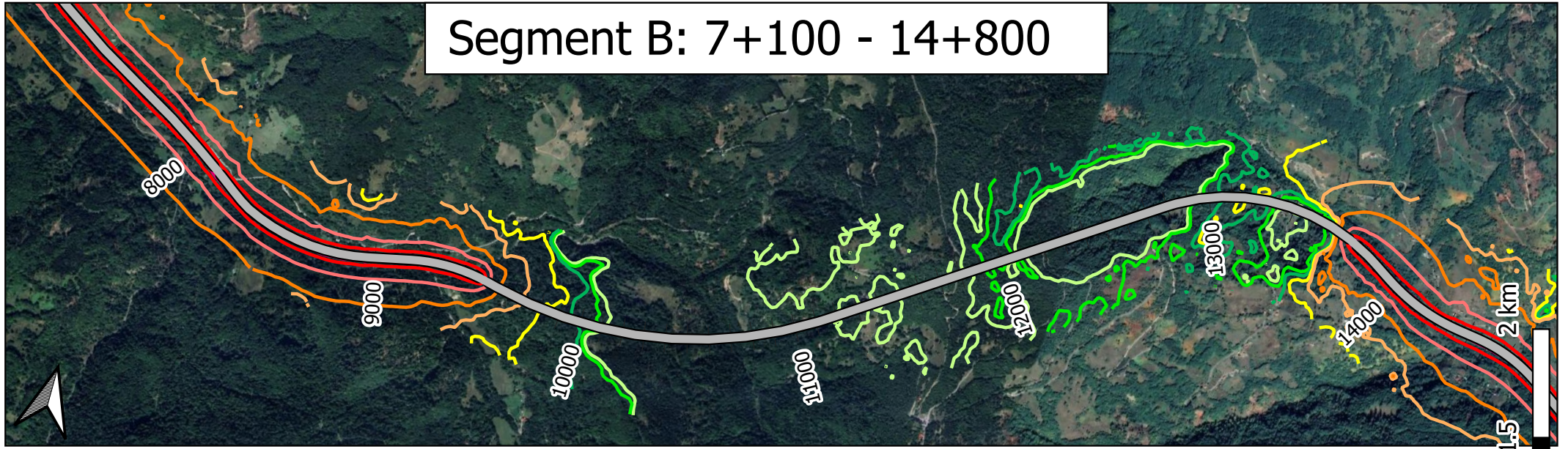
Picture 7. Air quality mobile station at the MM2

Appendix B – Contour Maps

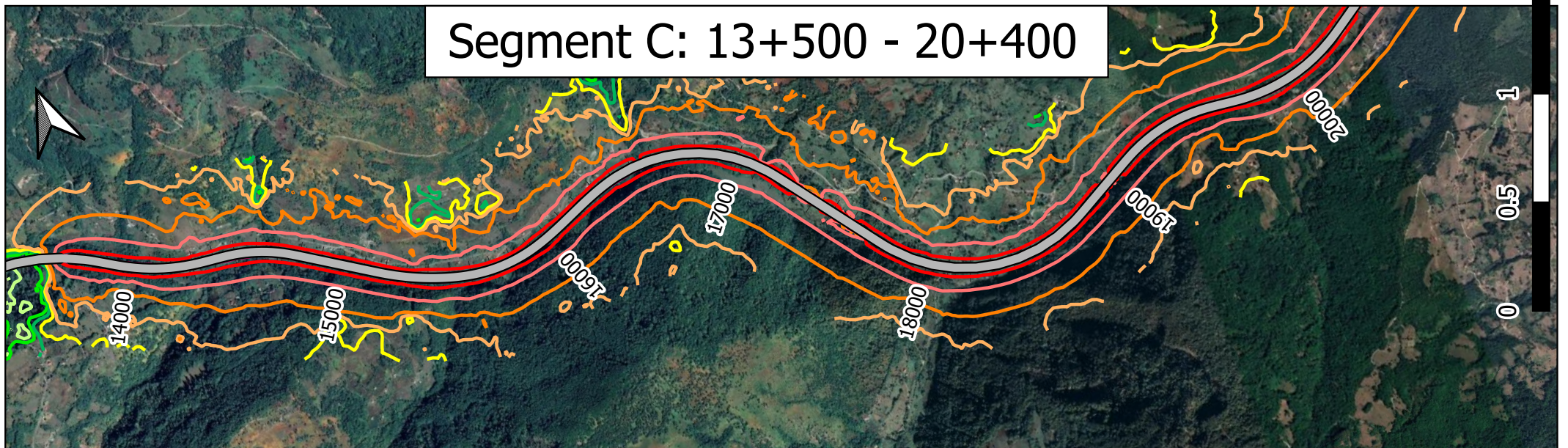
Segment A: 0+000 - 7+600



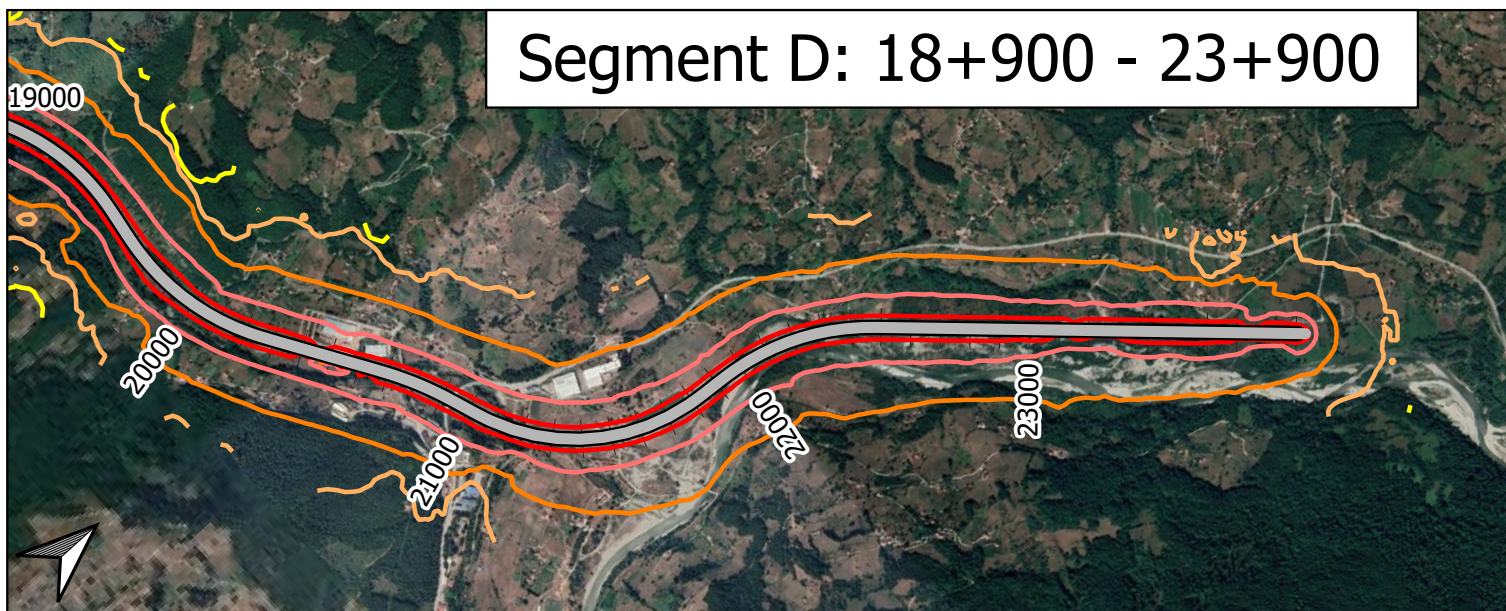
Segment B: 7+100 - 14+800



Segment C: 13+500 - 20+400



Segment D: 18+900 - 23+900

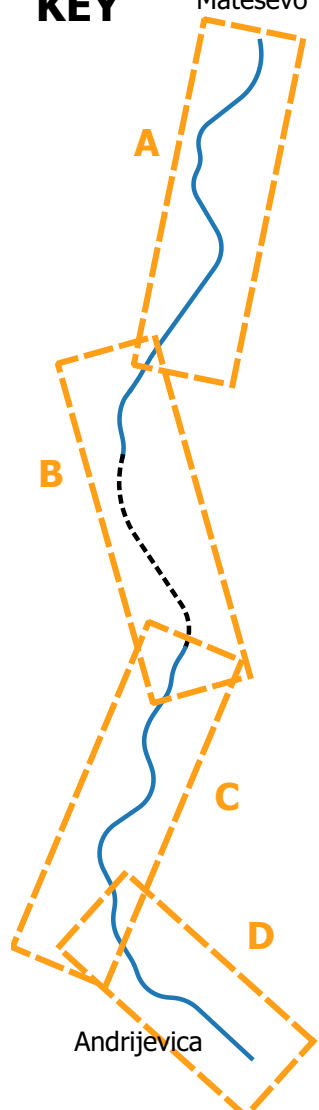


LEGEND

Isophones

- 30 dB(A)
- 35 dB(A)
- 40 dB(A)
- 45 dB(A)
- 50 dB(A)
- 55 dB(A)
- 60 dB(A)
- 65 dB(A)
- 70 dB(A)
- 75 dB(A)
- 80 dB(A)

SEGMENTS KEY



Western Balkans Investment Framework
Infrastructure Project Facility
Technical Assistance 7 (IPF 7)

TA2017050 R0 IPA
Bar-Boljare highway (SEETO Road Route 4),
Montenegro

Subsection:
Mateševu - Andrijevica
WB17-MNE-TRA-02

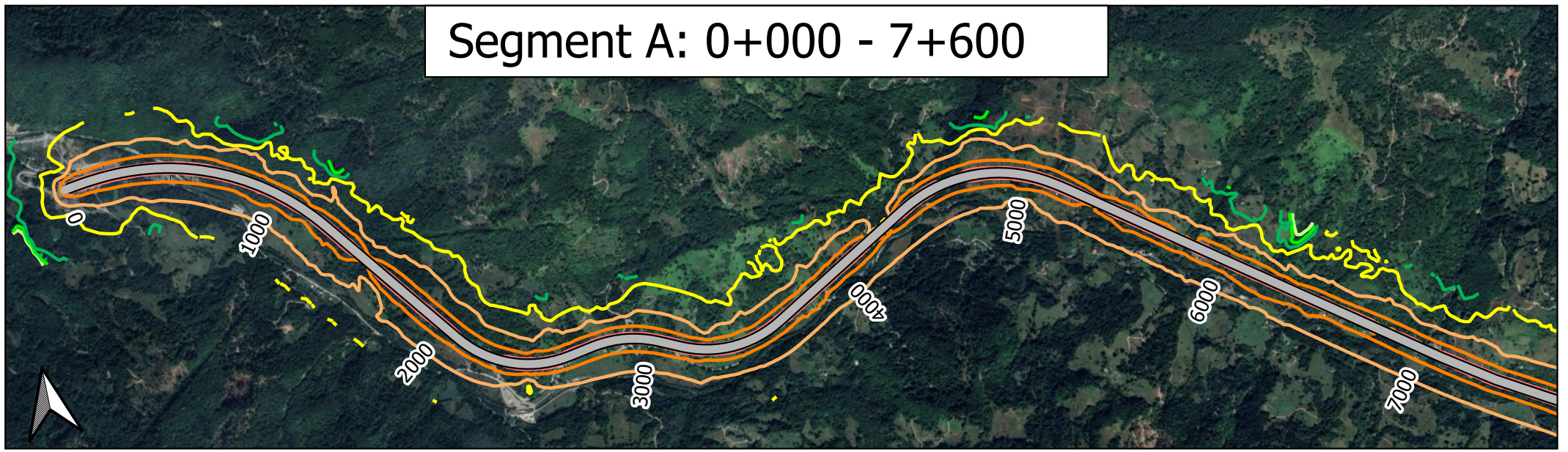
Noise & Air Pollution Modelling for
Preliminary design and Environmental
and Social Impact Assessment (ESIA)

RATING PERIOD:
Day (07:00 - 19:00)

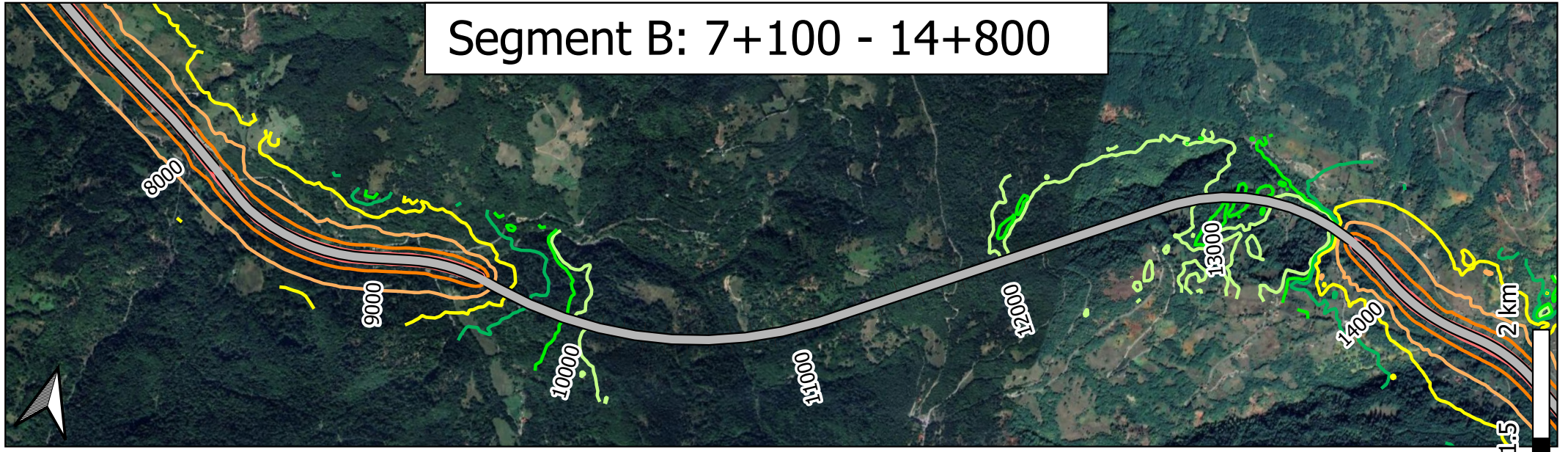
SCENARIO:
Launch year traffic flow

DATE: December 2024

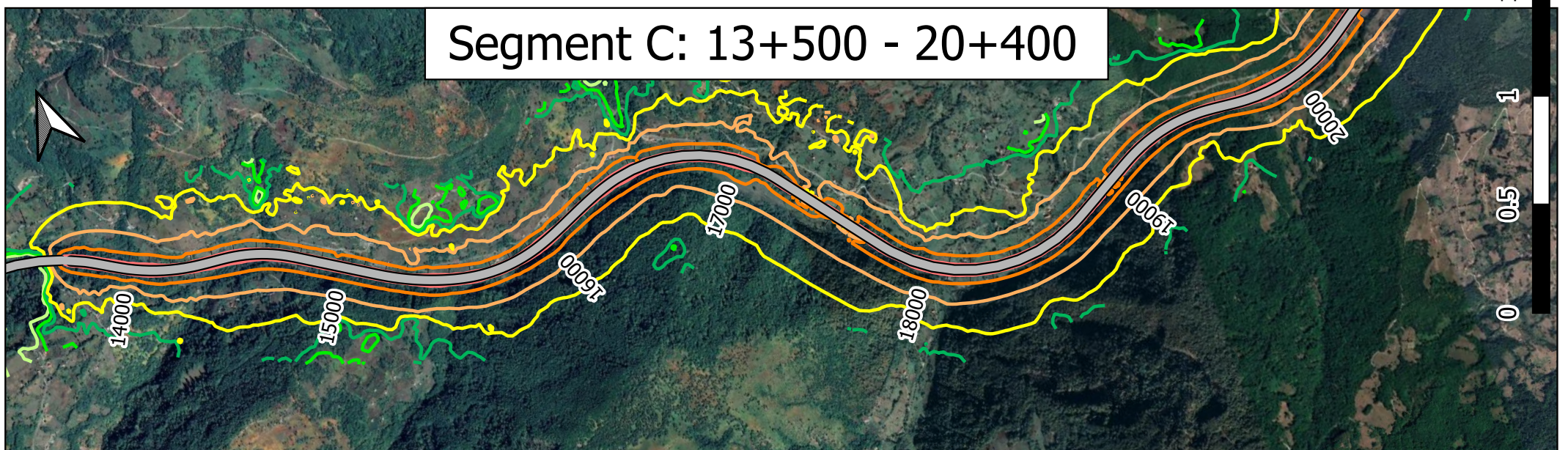
Segment A: 0+000 - 7+600



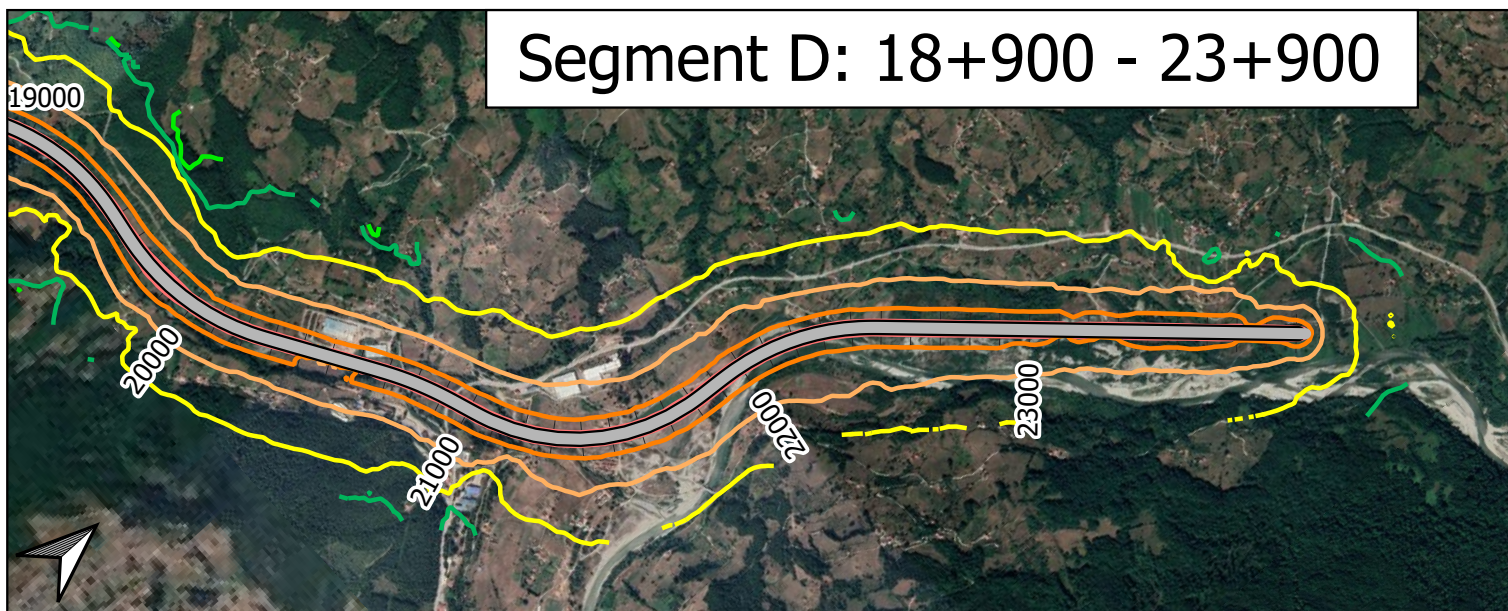
Segment B: 7+100 - 14+800



Segment C: 13+500 - 20+400



Segment D: 18+900 - 23+900

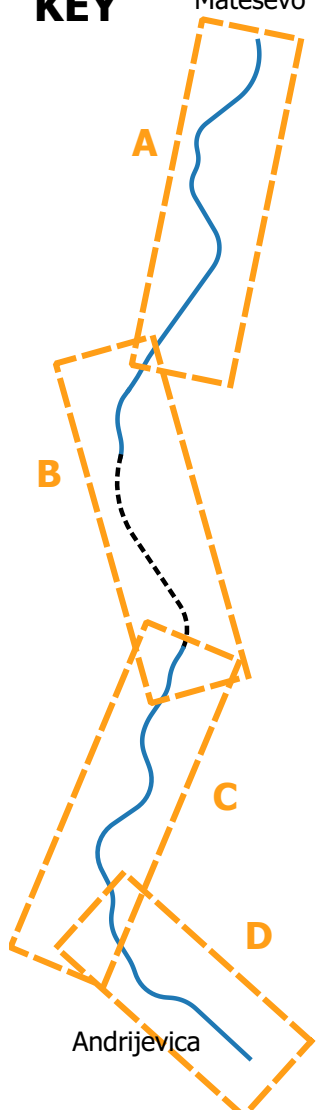


LEGEND

Isophones

- 30 dB(A)
- 35 dB(A)
- 40 dB(A)
- 45 dB(A)
- 50 dB(A)
- 55 dB(A)
- 60 dB(A)
- 65 dB(A)
- 70 dB(A)
- 75 dB(A)
- 80 dB(A)

SEGMENTS KEY



Western Balkans Investment Framework
Infrastructure Project Facility
Technical Assistance 7 (IPF 7)

TA2017050 R0 IPA
Bar-Boljare highway (SEETO Road Route 4),
Montenegro

Subsection:
Matešev - Andrijeva
WB17-MNE-TRA-02

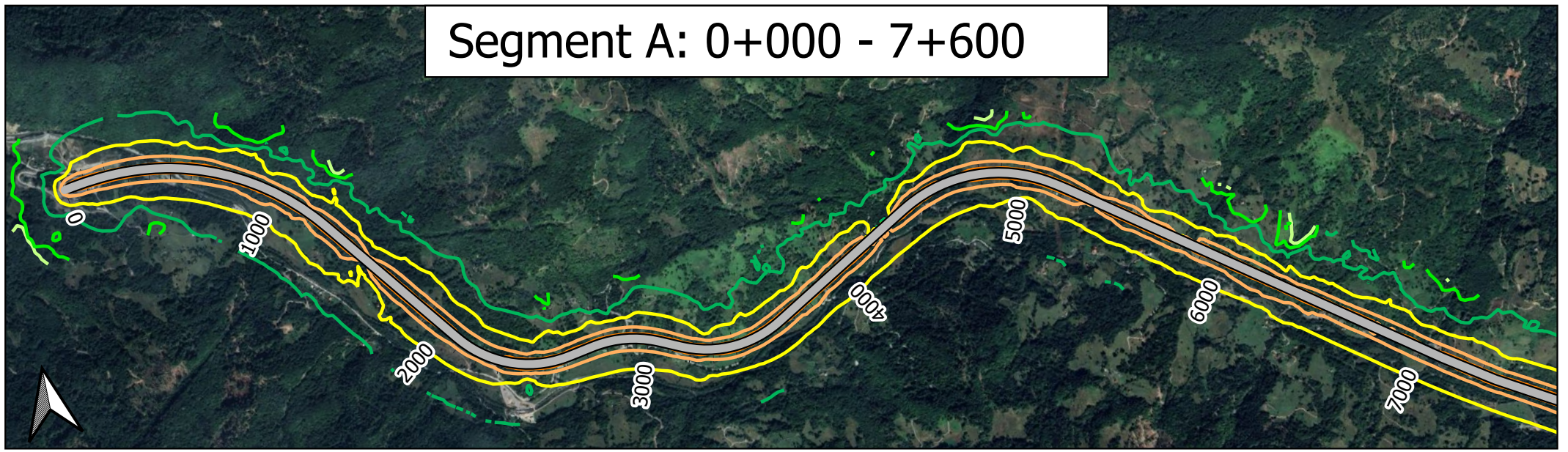
Noise & Air Pollution Modelling for
Preliminary design and Environmental
and Social Impact Assessment (ESIA)

RATING PERIOD:
Evening (19:00 - 23:00)

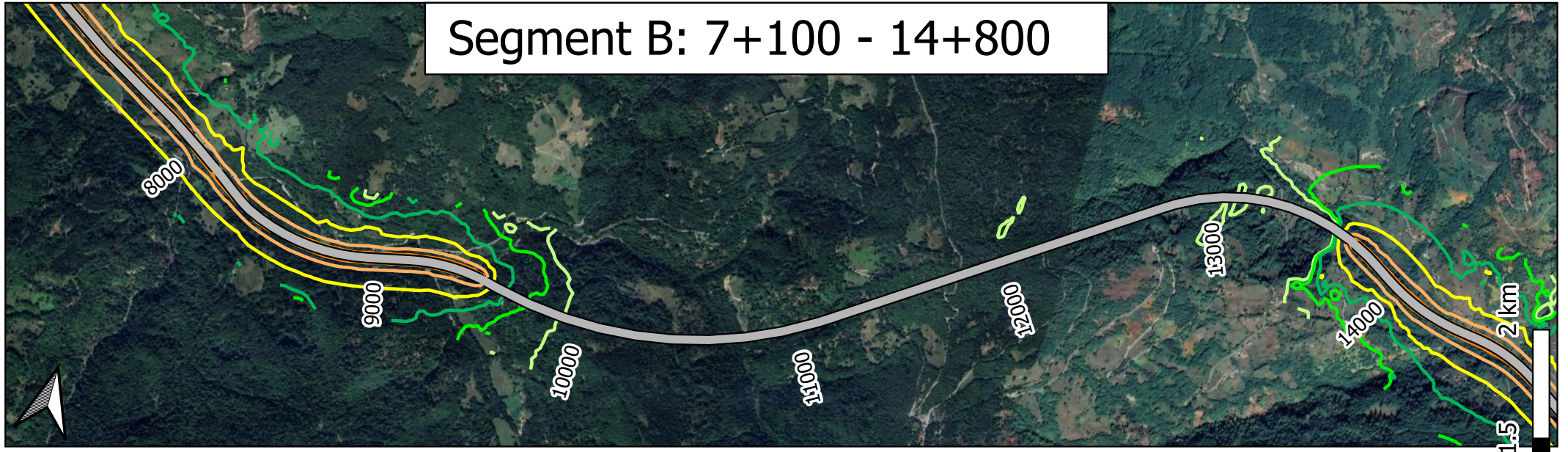
SCENARIO:
Launch year traffic flow

DATE: December 2024

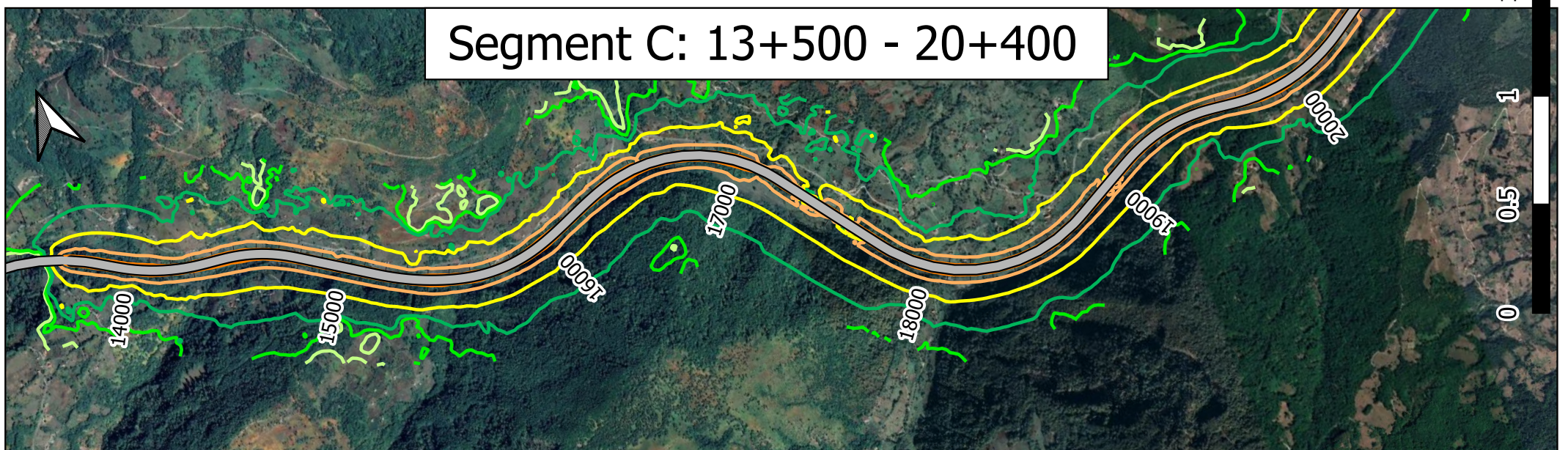
Segment A: 0+000 - 7+600



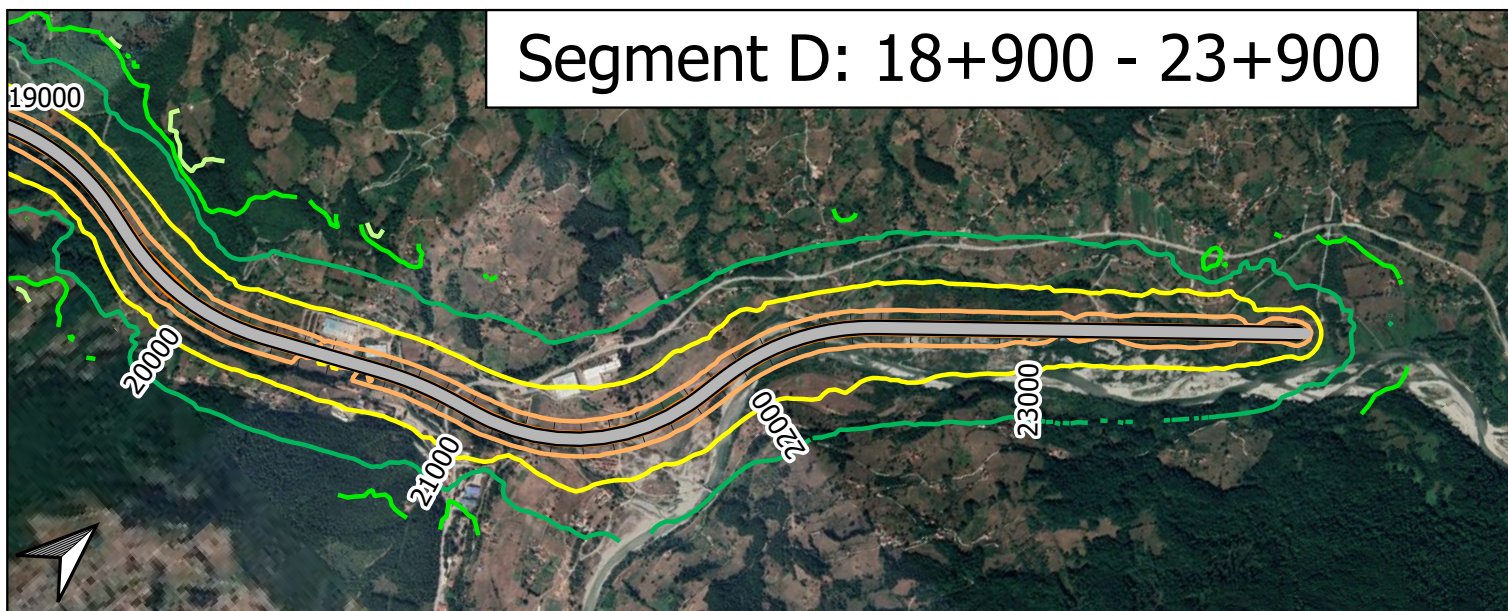
Segment B: 7+100 - 14+800



Segment C: 13+500 - 20+400



Segment D: 18+900 - 23+900

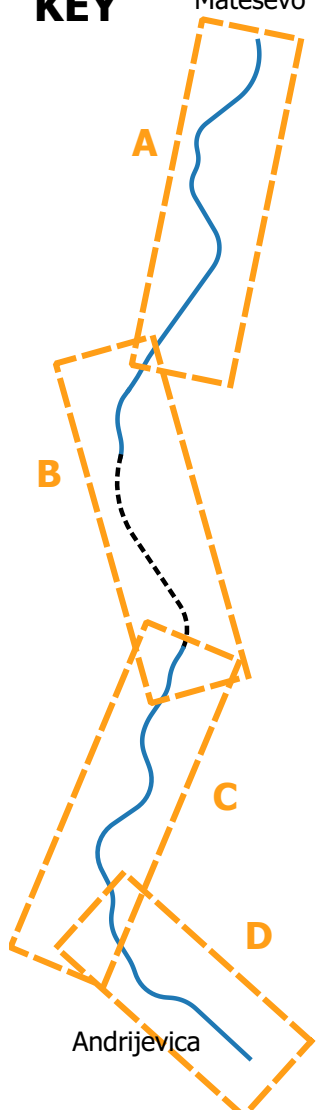


LEGEND

Isophones

- 30 dB(A)
- 35 dB(A)
- 40 dB(A)
- 45 dB(A)
- 50 dB(A)
- 55 dB(A)
- 60 dB(A)
- 65 dB(A)
- 70 dB(A)
- 75 dB(A)
- 80 dB(A)

SEGMENTS KEY



Western Balkans Investment Framework
Infrastructure Project Facility
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TA2017050 R0 IPA
Bar-Boljare highway (SEETO Road Route 4),
Montenegro

Subsection:
Mateševci - Andrijevica
WB17-MNE-TRA-02

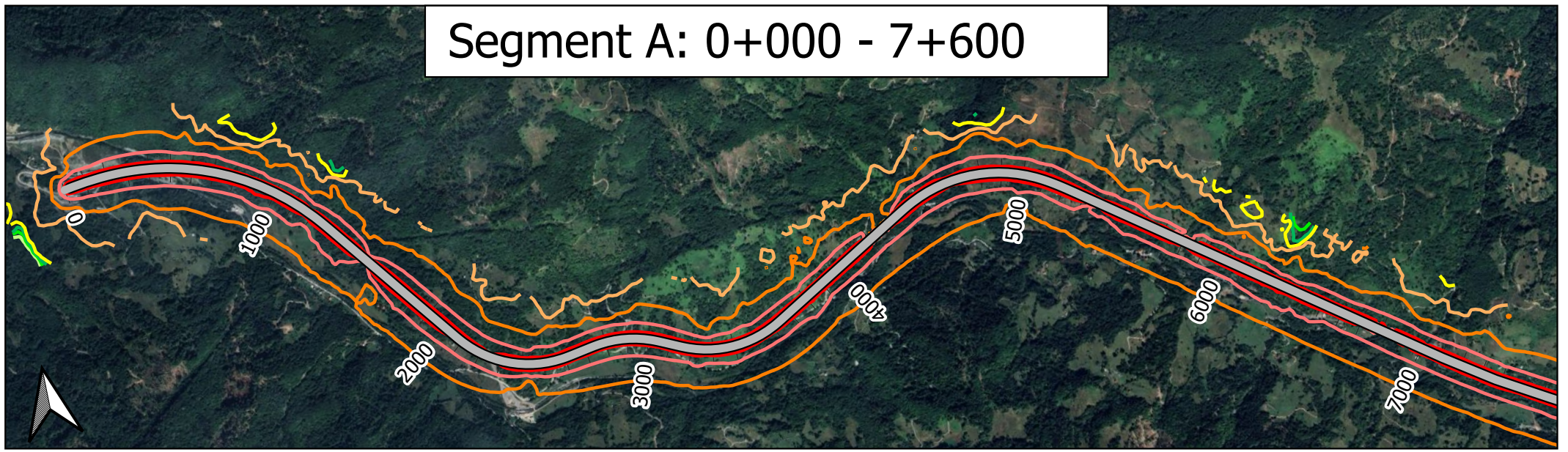
Noise & Air Pollution Modelling for
Preliminary design and Environmental
and Social Impact Assessment (ESIA)

RATING PERIOD:
Night (23:00 - 07:00)

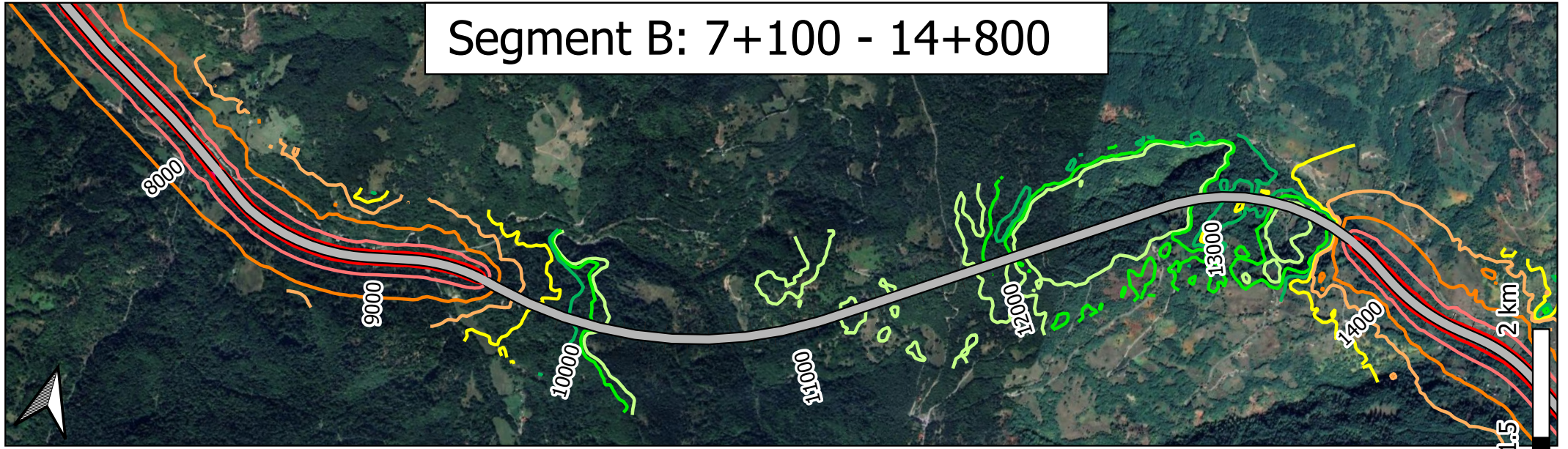
SCENARIO:
Launch year traffic flow

DATE: December 2024

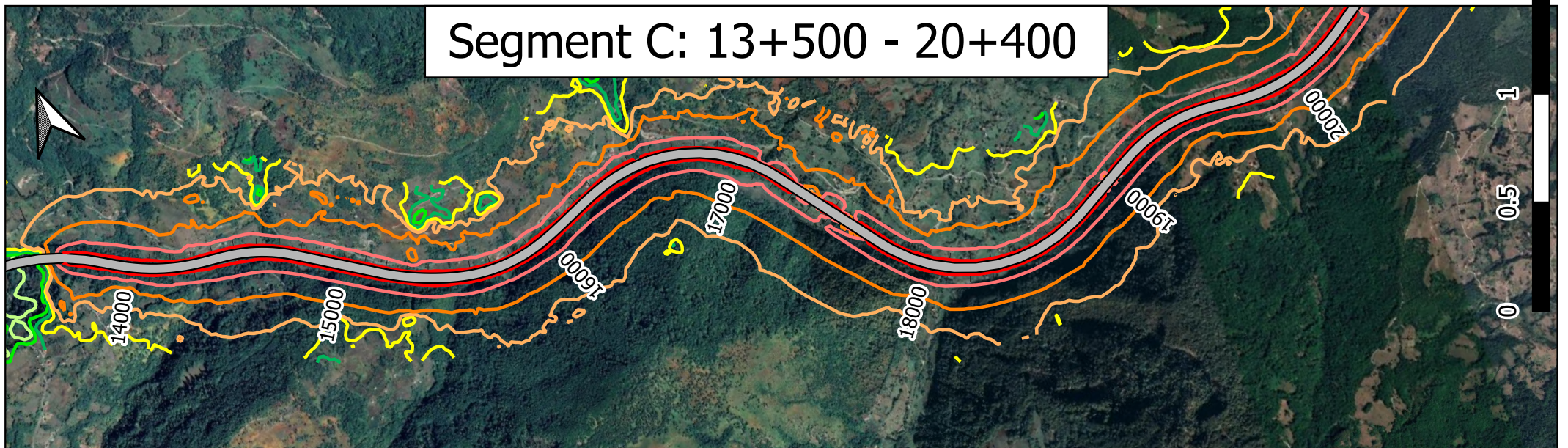
Segment A: 0+000 - 7+600



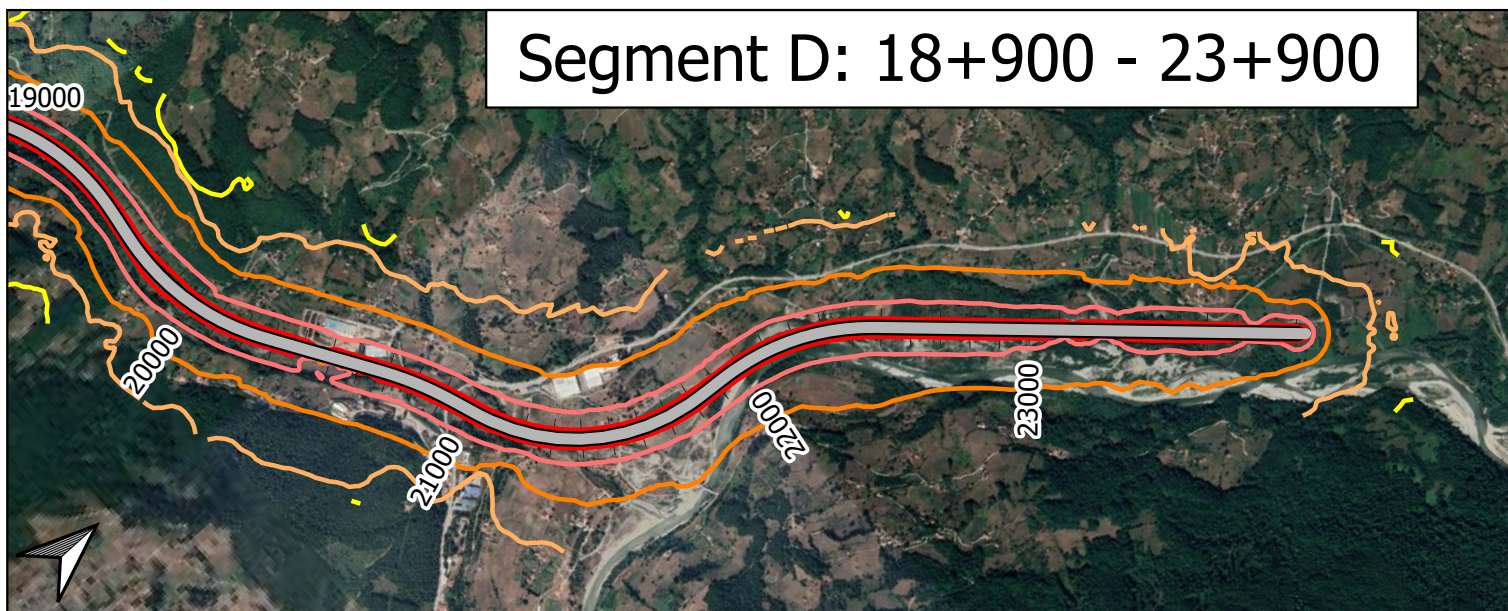
Segment B: 7+100 - 14+800



Segment C: 13+500 - 20+400



Segment D: 18+900 - 23+900

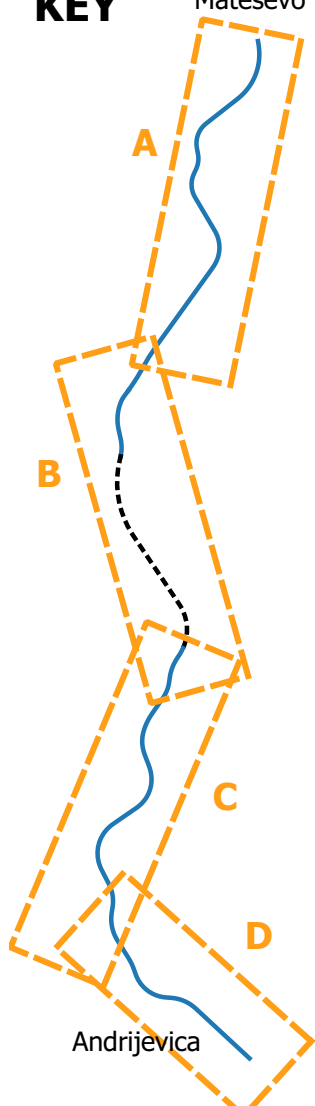


LEGEND

Isophones

- 30 dB(A)
- 35 dB(A)
- 40 dB(A)
- 45 dB(A)
- 50 dB(A)
- 55 dB(A)
- 60 dB(A)
- 65 dB(A)
- 70 dB(A)
- 75 dB(A)
- 80 dB(A)

SEGMENTS KEY



Western Balkans Investment Framework
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TA2017050 R0 IPA
Bar-Boljare highway (SEETO Road Route 4),
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Matešev - Andrijeva
WB17-MNE-TRA-02

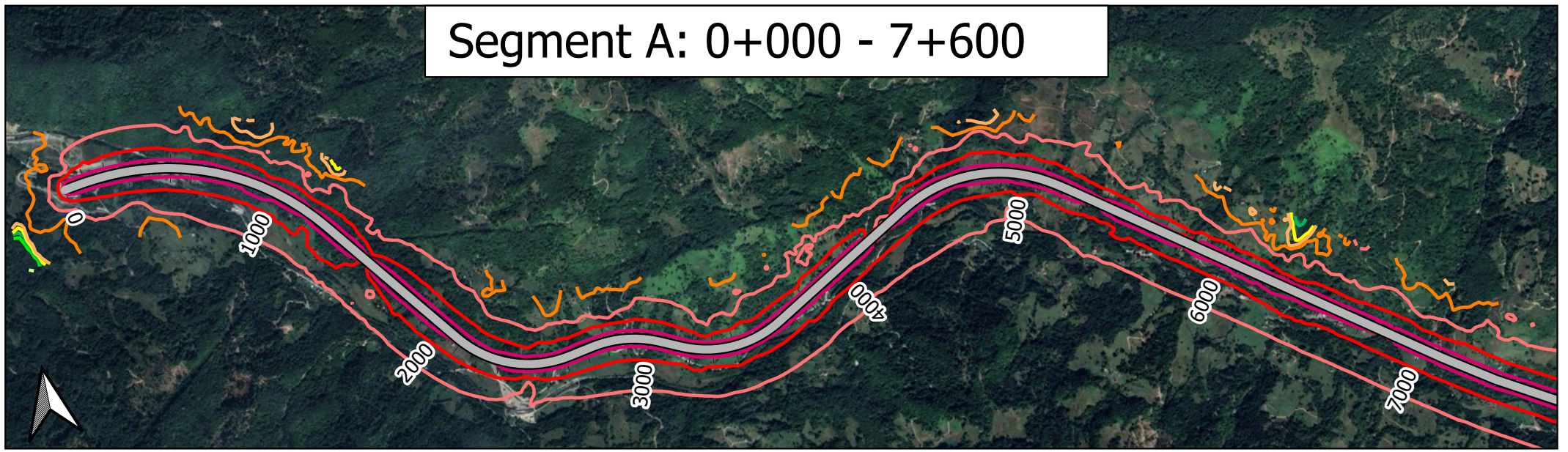
Noise & Air Pollution Modelling for
Preliminary design and Environmental
and Social Impact Assessment (ESIA)

RATING PERIOD:
DEN (weighted 24hours)

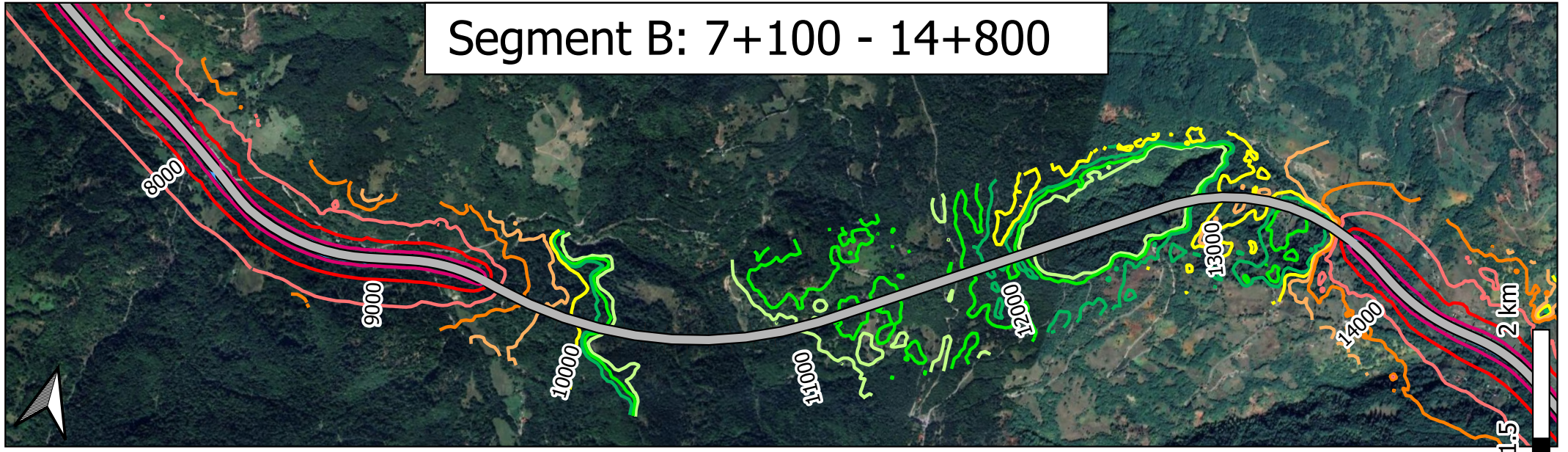
SCENARIO:
Launch year traffic flow

DATE: December 2024

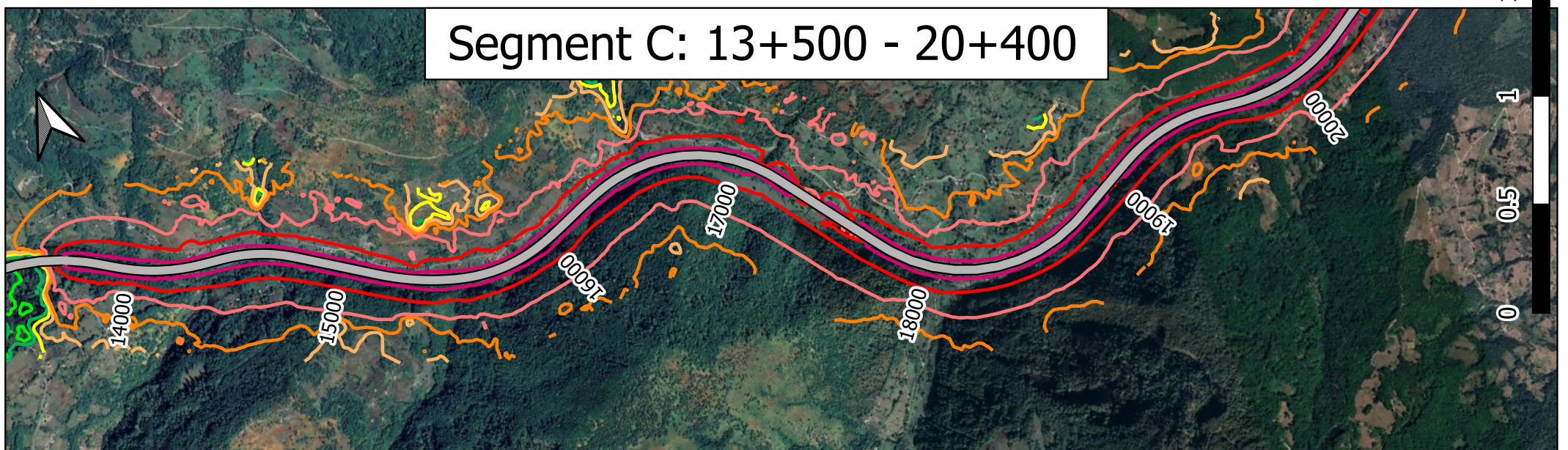
Segment A: 0+000 - 7+600



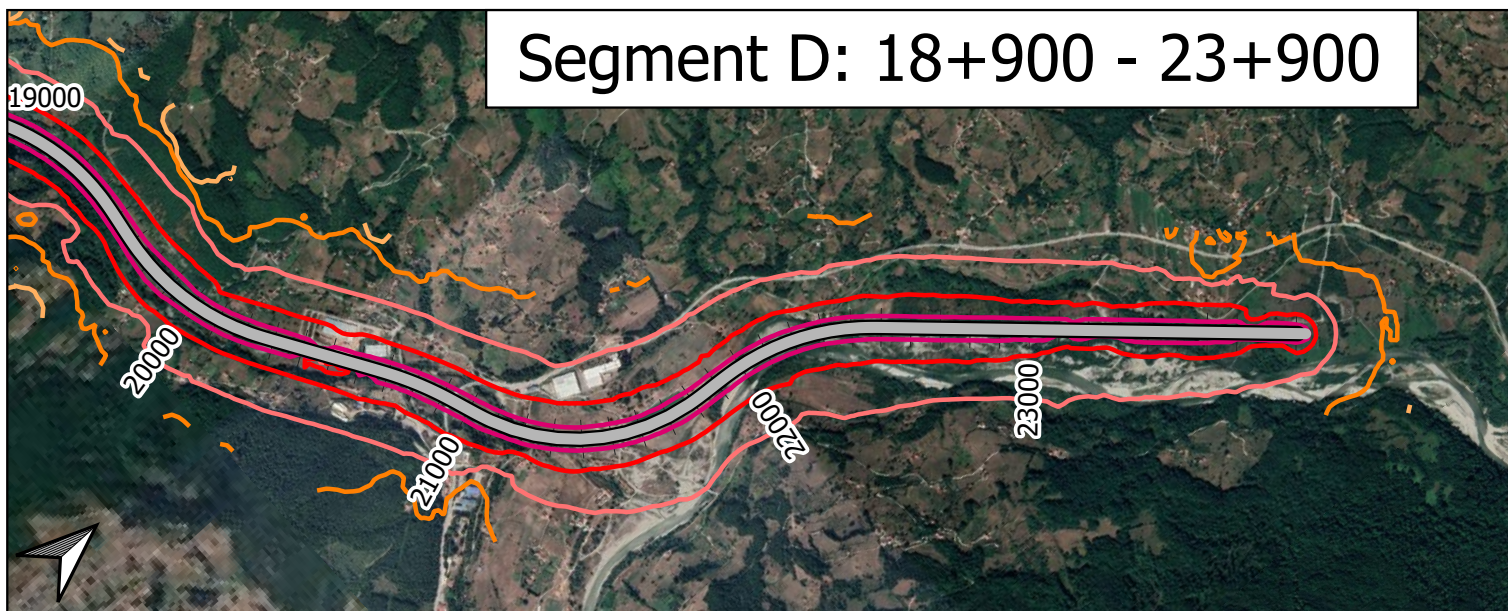
Segment B: 7+100 - 14+800



Segment C: 13+500 - 20+400



Segment D: 18+900 - 23+900

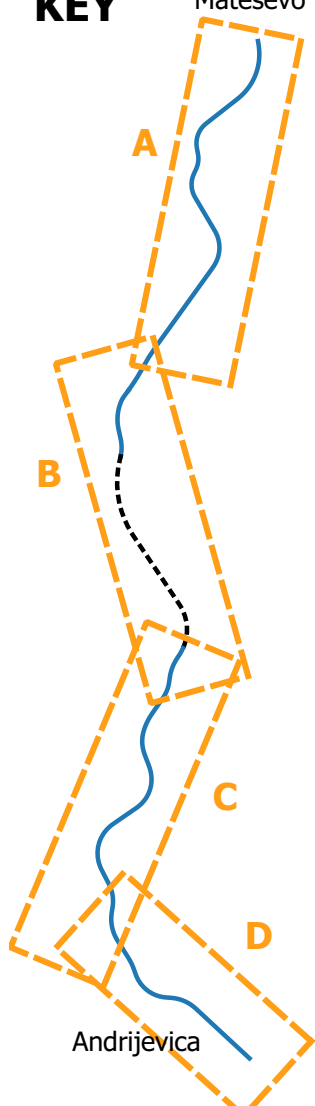


LEGEND

Isophones

- 30 dB(A)
- 35 dB(A)
- 40 dB(A)
- 45 dB(A)
- 50 dB(A)
- 55 dB(A)
- 60 dB(A)
- 65 dB(A)
- 70 dB(A)
- 75 dB(A)
- 80 dB(A)

SEGMENTS KEY



Western Balkans Investment Framework
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TA2017050 R0 IPA
Bar-Boljare highway (SEETO Road Route 4),
Montenegro

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Mateševci - Andrijevica
WB17-MNE-TRA-02

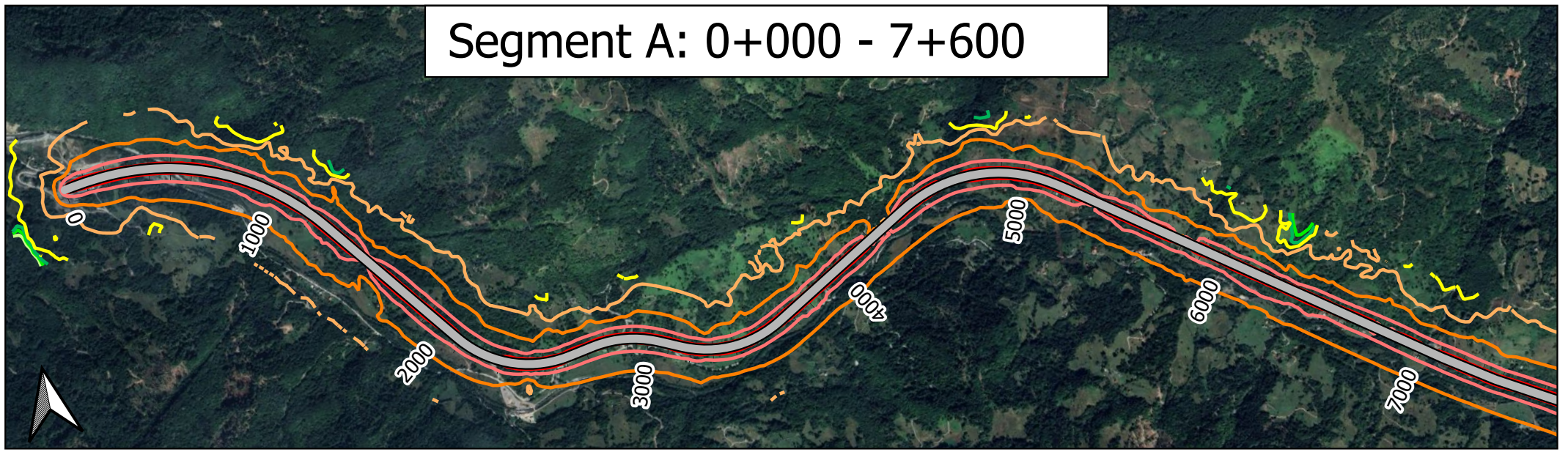
Noise & Air Pollution Modelling for
Preliminary design and Environmental
and Social Impact Assessment (ESIA)

RATING PERIOD:
Day (07:00 - 19:00)

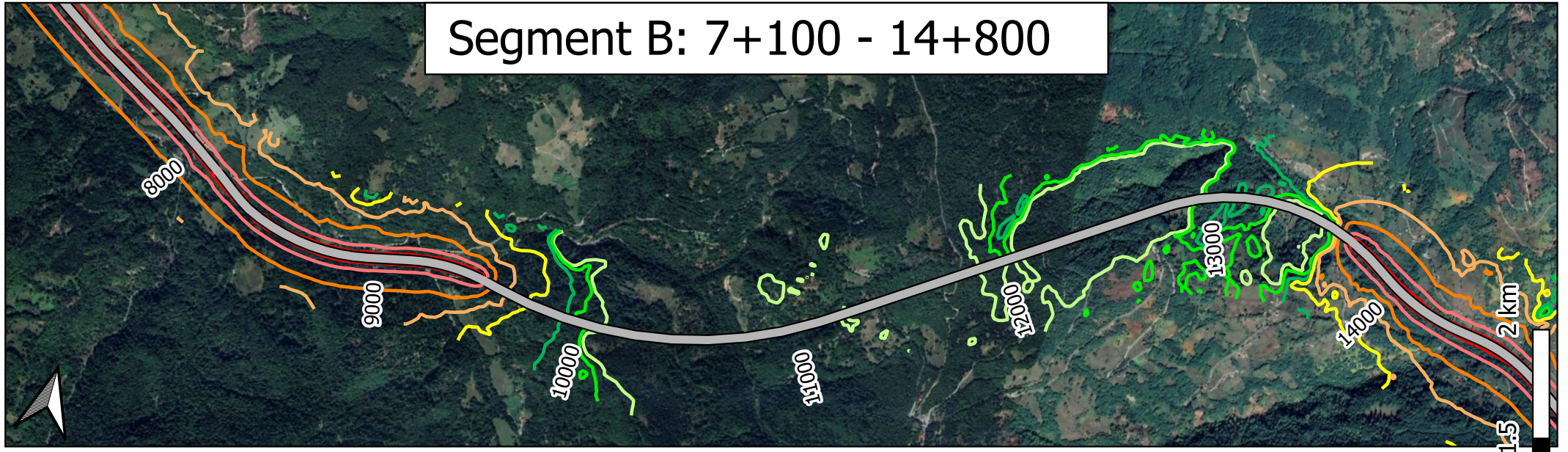
SCENARIO:
Horizon year traffic flow

DATE: December 2024

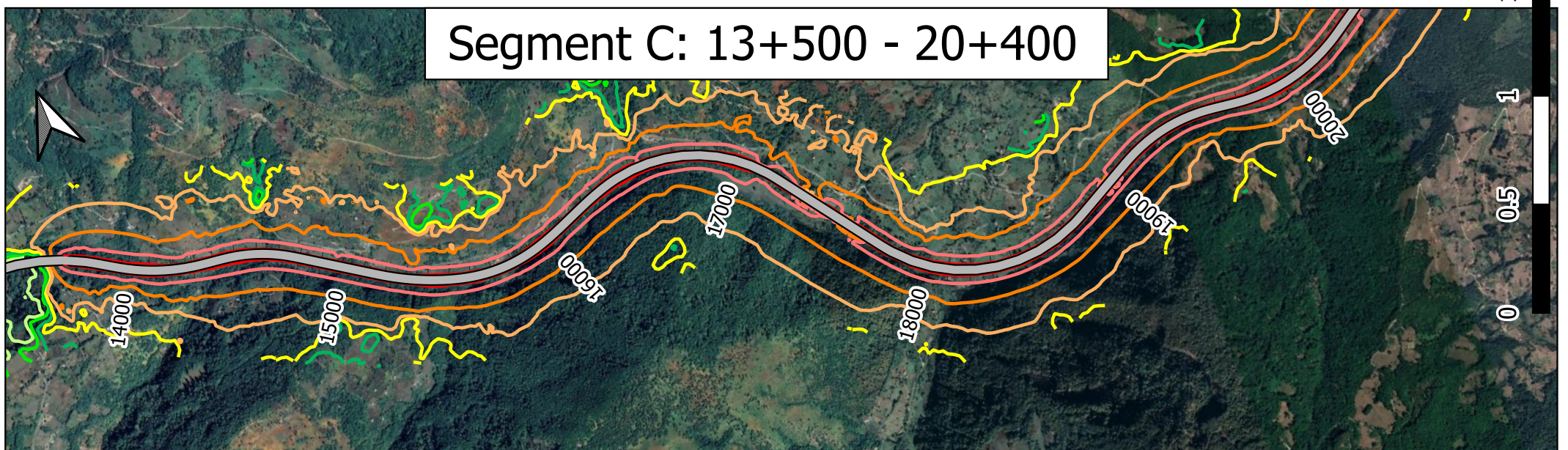
Segment A: 0+000 - 7+600



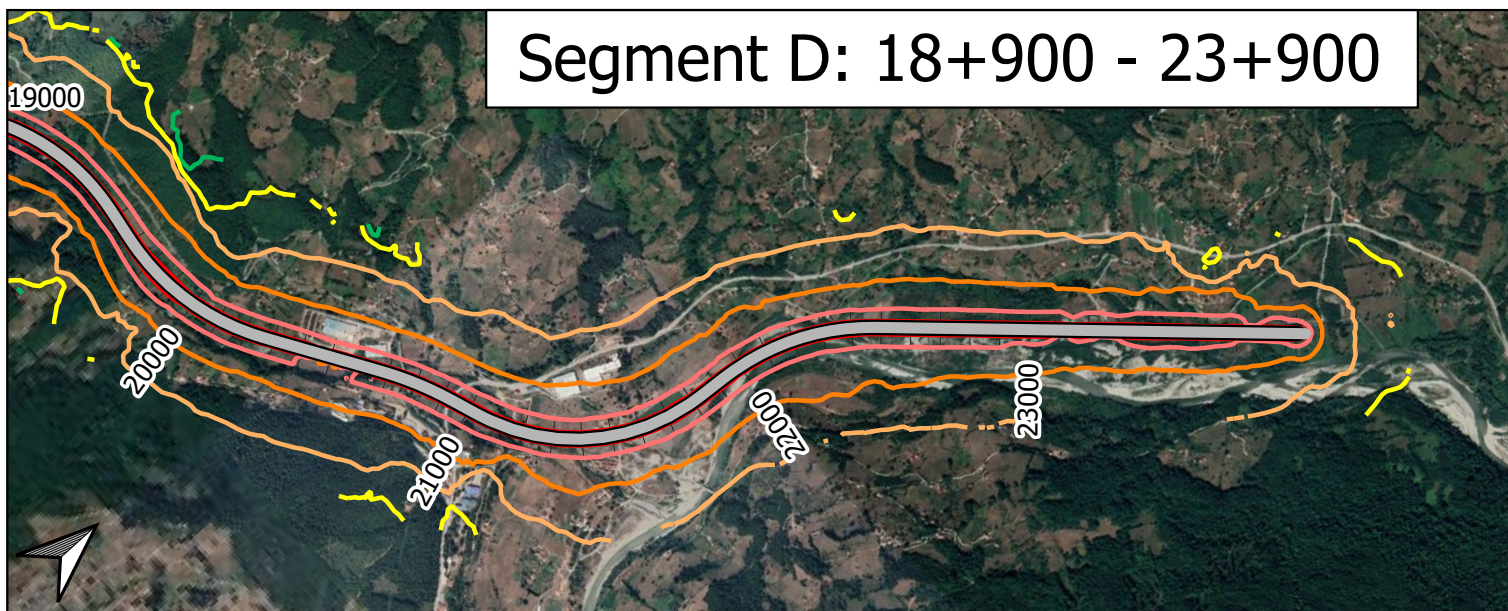
Segment B: 7+100 - 14+800



Segment C: 13+500 - 20+400



Segment D: 18+900 - 23+900

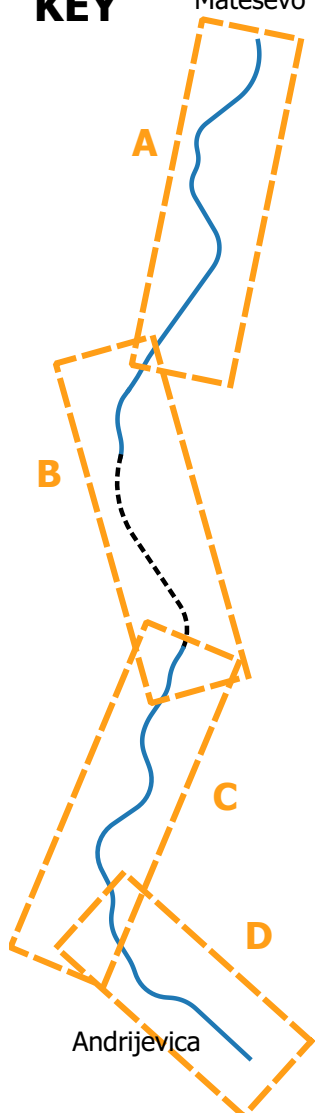


LEGEND

Isophones

- 30 dB(A)
- 35 dB(A)
- 40 dB(A)
- 45 dB(A)
- 50 dB(A)
- 55 dB(A)
- 60 dB(A)
- 65 dB(A)
- 70 dB(A)
- 75 dB(A)
- 80 dB(A)

SEGMENTS KEY



Western Balkans Investment Framework
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TA2017050 R0 IPA
Bar-Boljare highway (SEETO Road Route 4),
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Subsection:
Mateševu - Andrijevu
WB17-MNE-TRA-02

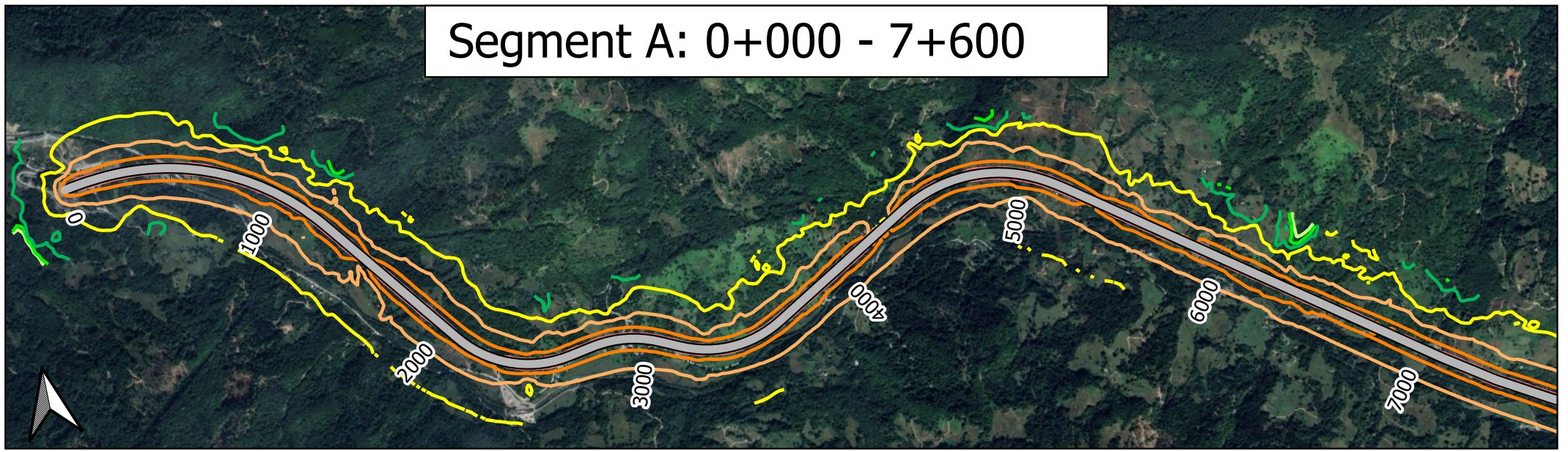
Noise & Air Pollution Modelling for
Preliminary design and Environmental
and Social Impact Assessment (ESIA)

RATING PERIOD:
Evening (19:00 - 23:00)

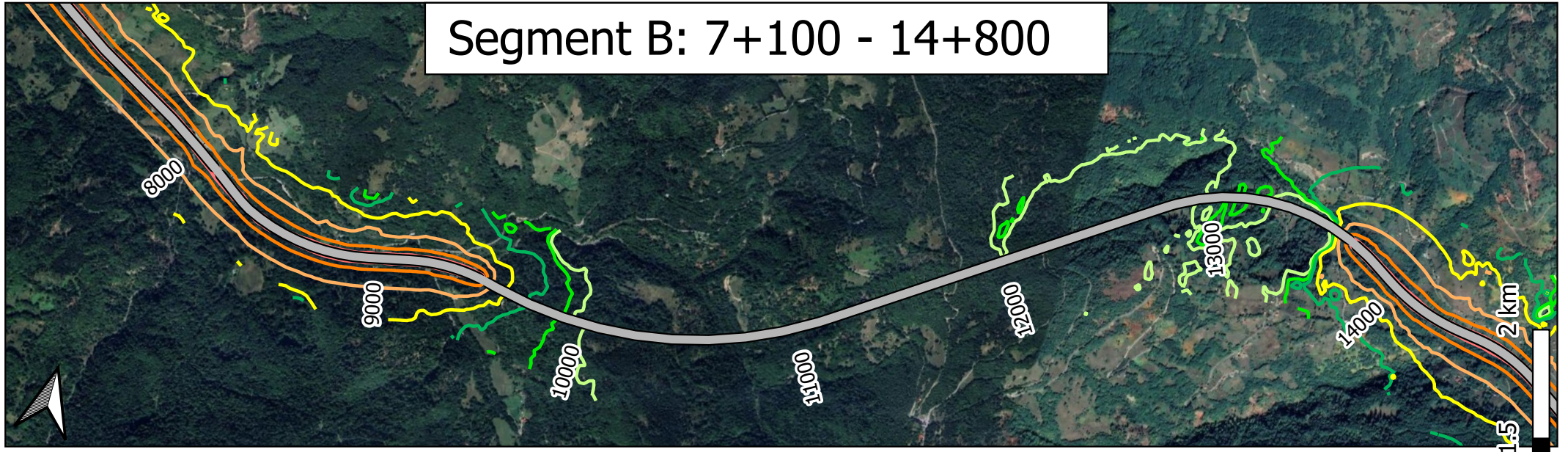
SCENARIO:
Horizon year traffic flow

DATE: December 2024

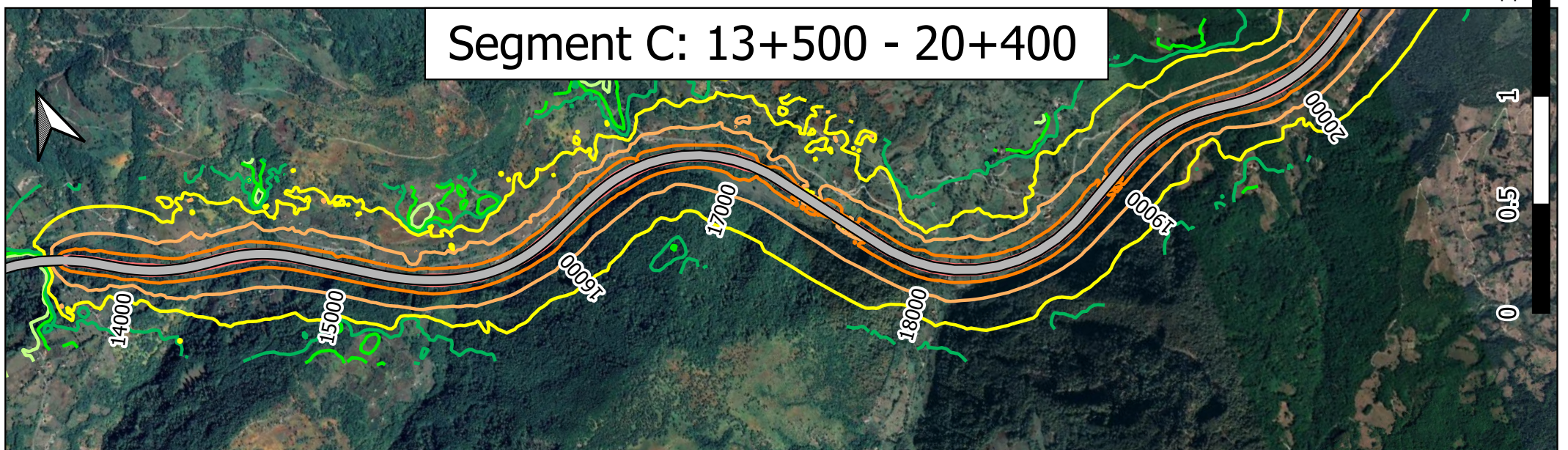
Segment A: 0+000 - 7+600



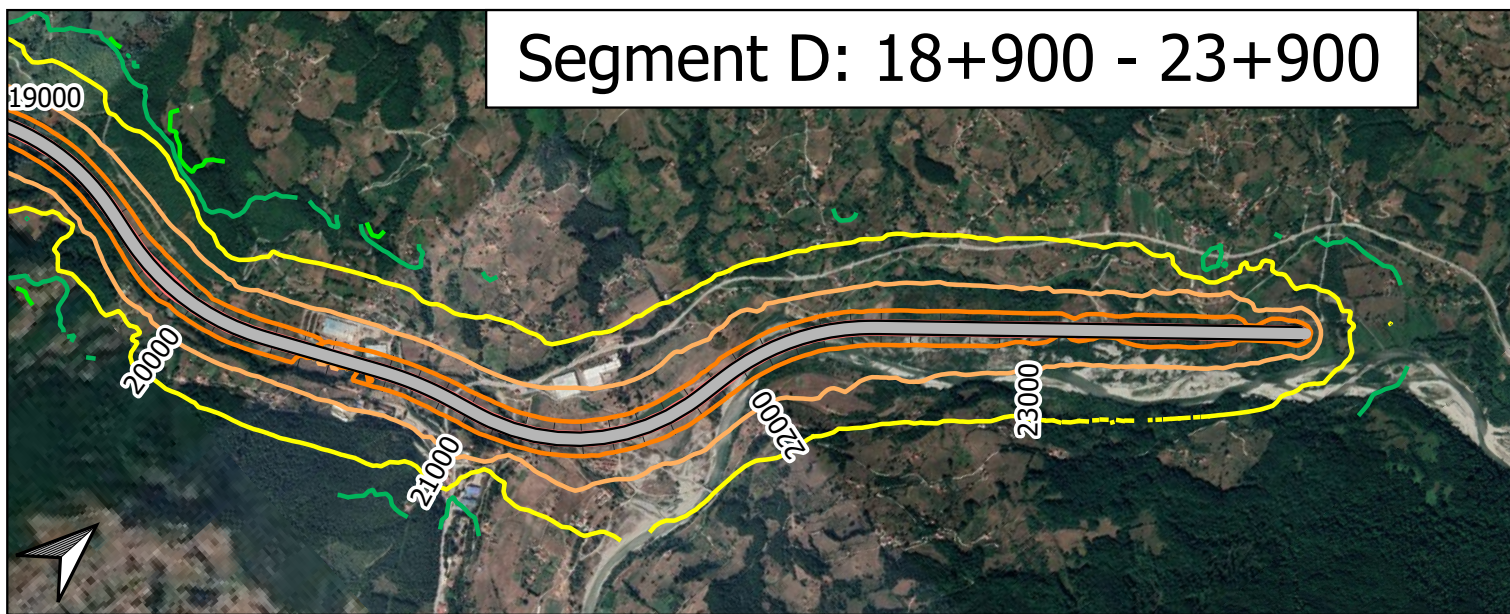
Segment B: 7+100 - 14+800



Segment C: 13+500 - 20+400



Segment D: 18+900 - 23+900

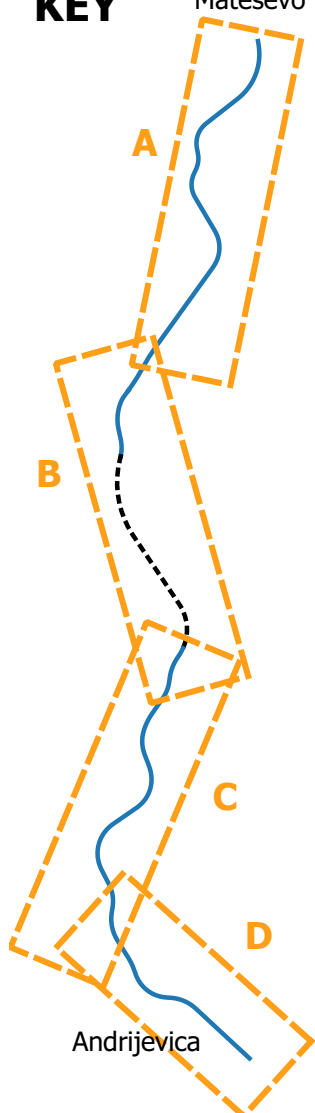


LEGEND

Isophones

- 30 dB(A)
- 35 dB(A)
- 40 dB(A)
- 45 dB(A)
- 50 dB(A)
- 55 dB(A)
- 60 dB(A)
- 65 dB(A)
- 70 dB(A)
- 75 dB(A)
- 80 dB(A)

SEGMENTS KEY



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Bar-Boljare highway (SEETO Road Route 4),
Montenegro

Subsection:
Mateševci - Andrijevica
WB17-MNE-TRA-02

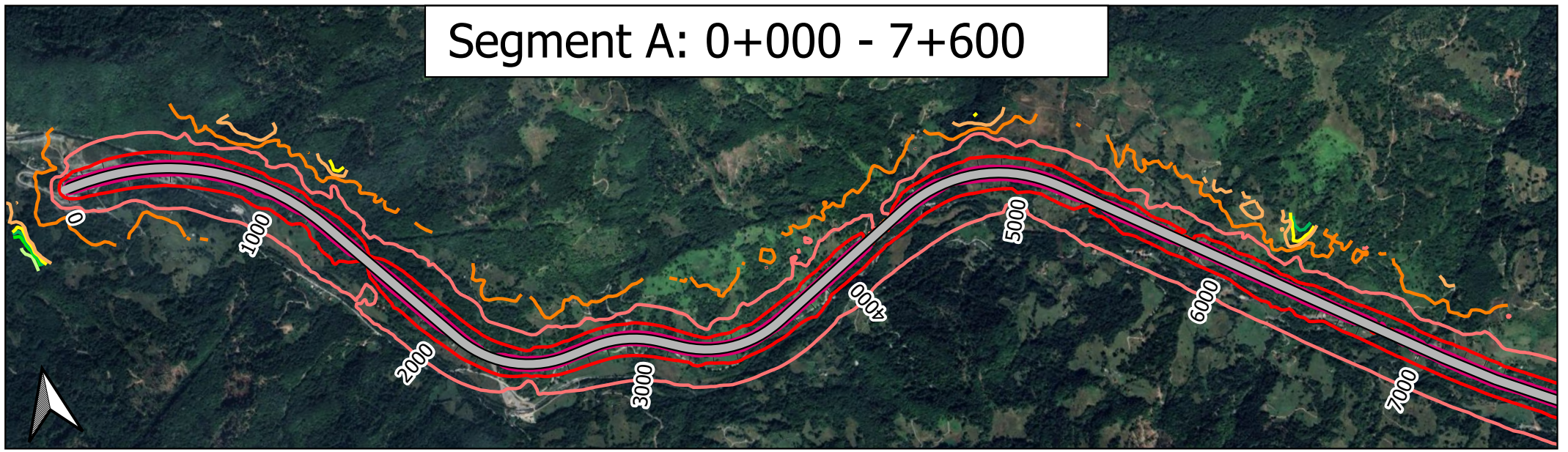
Noise & Air Pollution Modelling for
Preliminary design and Environmental
and Social Impact Assessment (ESIA)

RATING PERIOD:
Night (23:00 - 07:00)

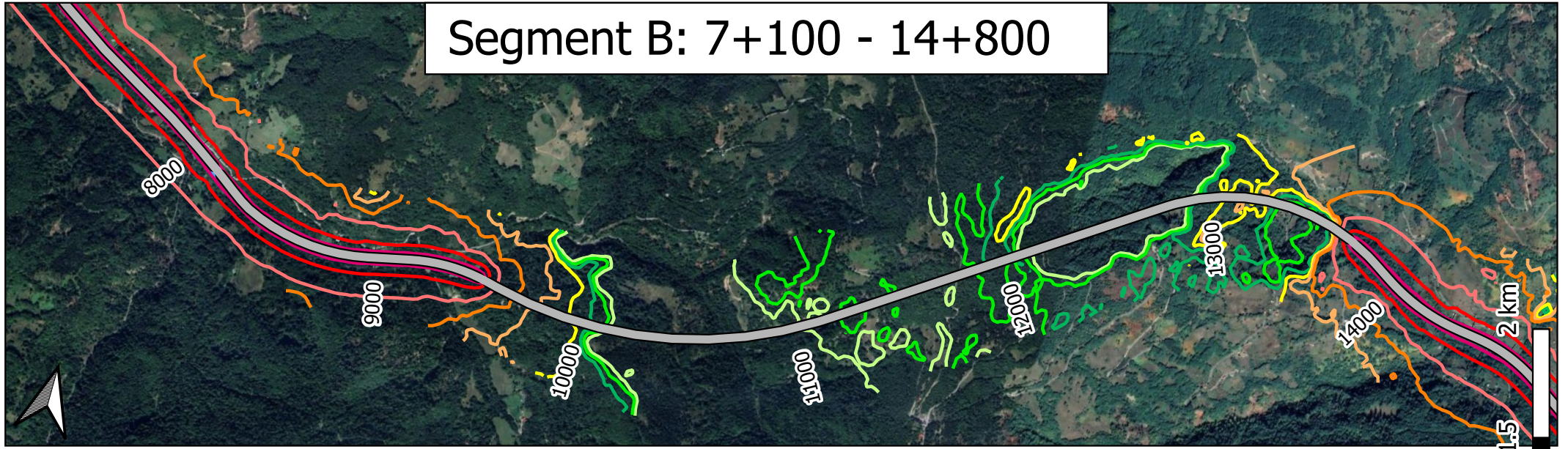
SCENARIO:
Horizon year traffic flow

DATE: December 2024

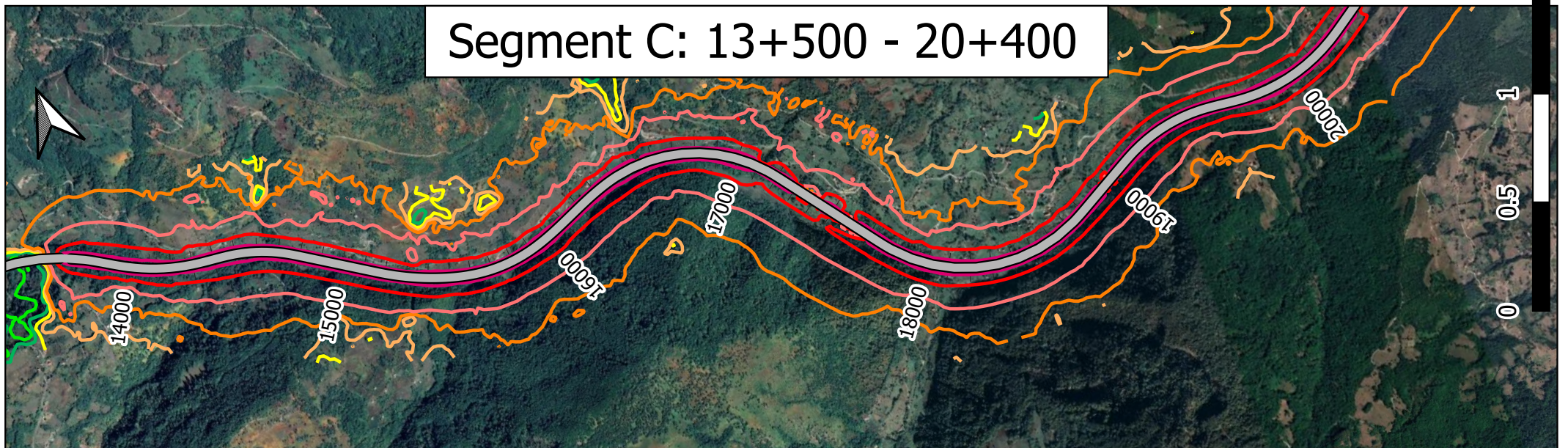
Segment A: 0+000 - 7+600



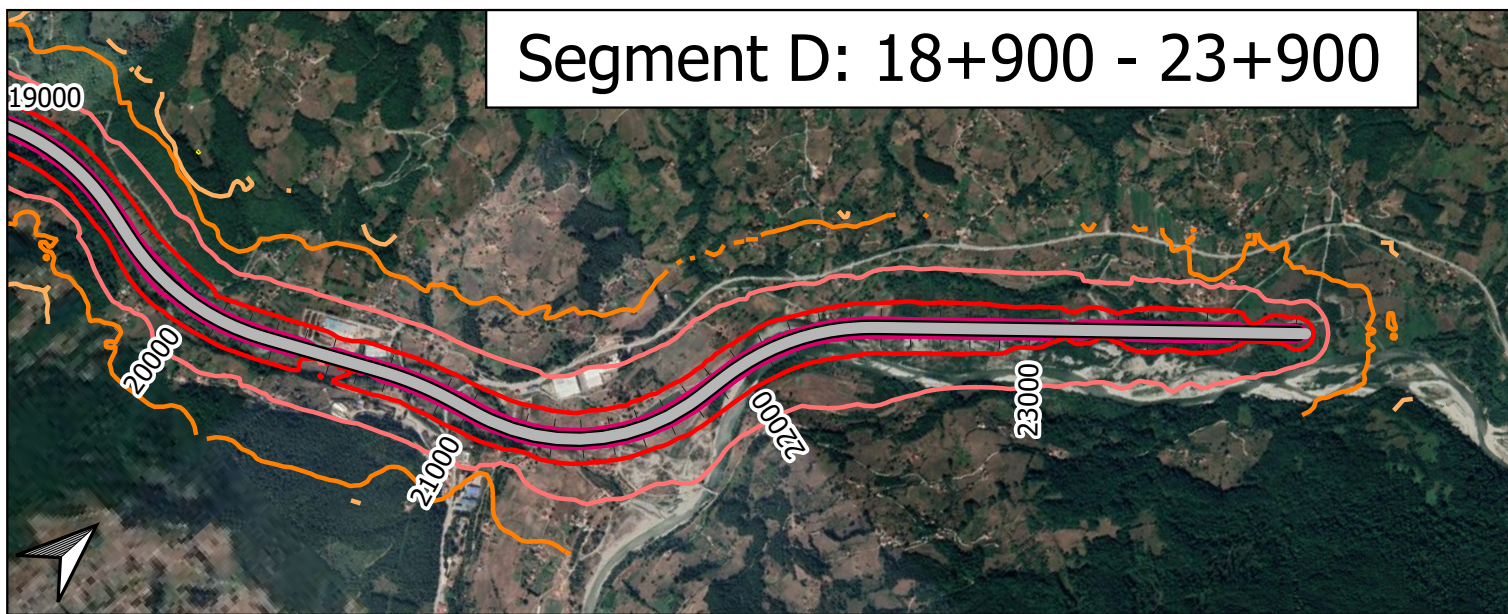
Segment B: 7+100 - 14+800



Segment C: 13+500 - 20+400



Segment D: 18+900 - 23+900

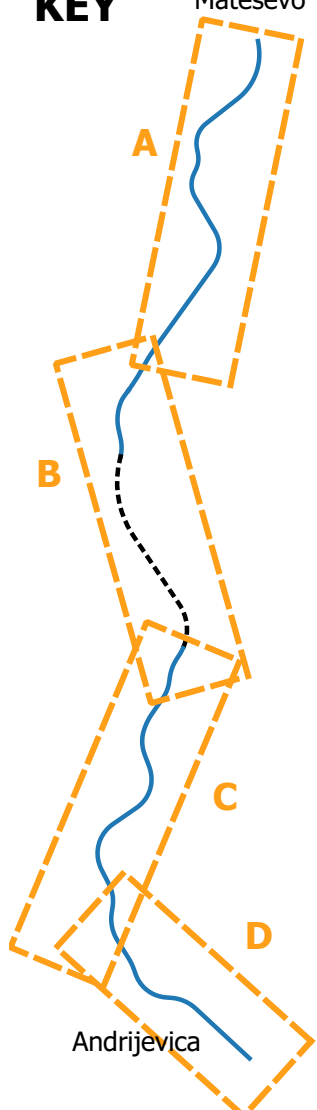


LEGEND

Isophones

- 30 dB(A)
- 35 dB(A)
- 40 dB(A)
- 45 dB(A)
- 50 dB(A)
- 55 dB(A)
- 60 dB(A)
- 65 dB(A)
- 70 dB(A)
- 75 dB(A)
- 80 dB(A)

SEGMENTS KEY



Western Balkans Investment Framework
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TA2017050 R0 IPA
Bar-Boljare highway (SEETO Road Route 4),
Montenegro

Subsection:
Matešev - Andrijeva
WB17-MNE-TRA-02

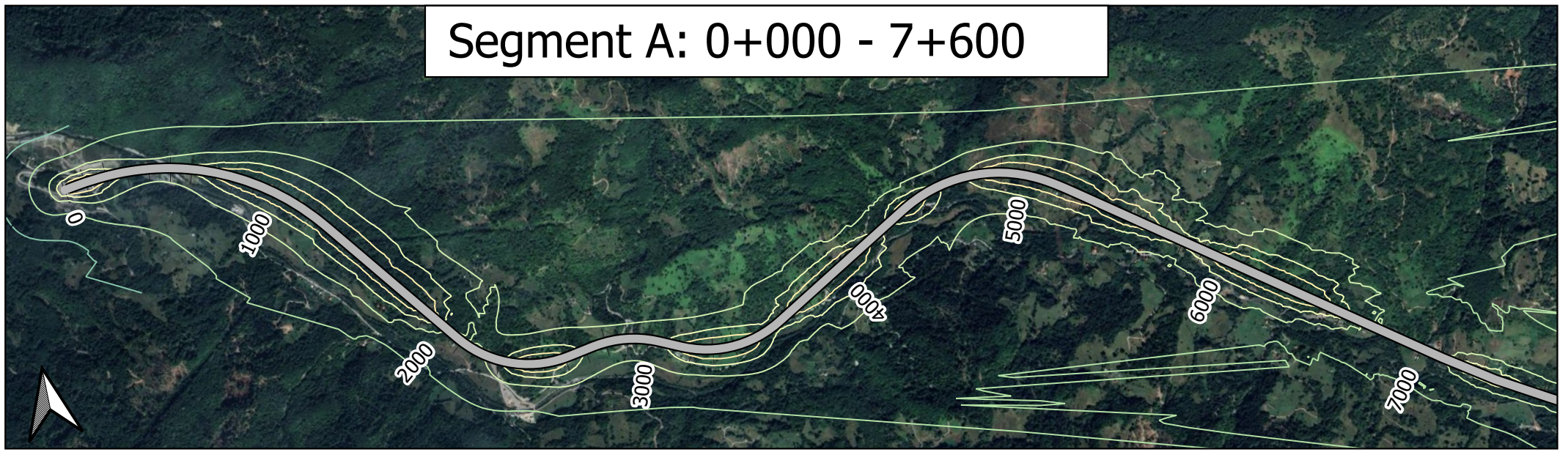
Noise & Air Pollution Modelling for
Preliminary design and Environmental
and Social Impact Assessment (ESIA)

RATING PERIOD:
DEN (weighted 24hours)

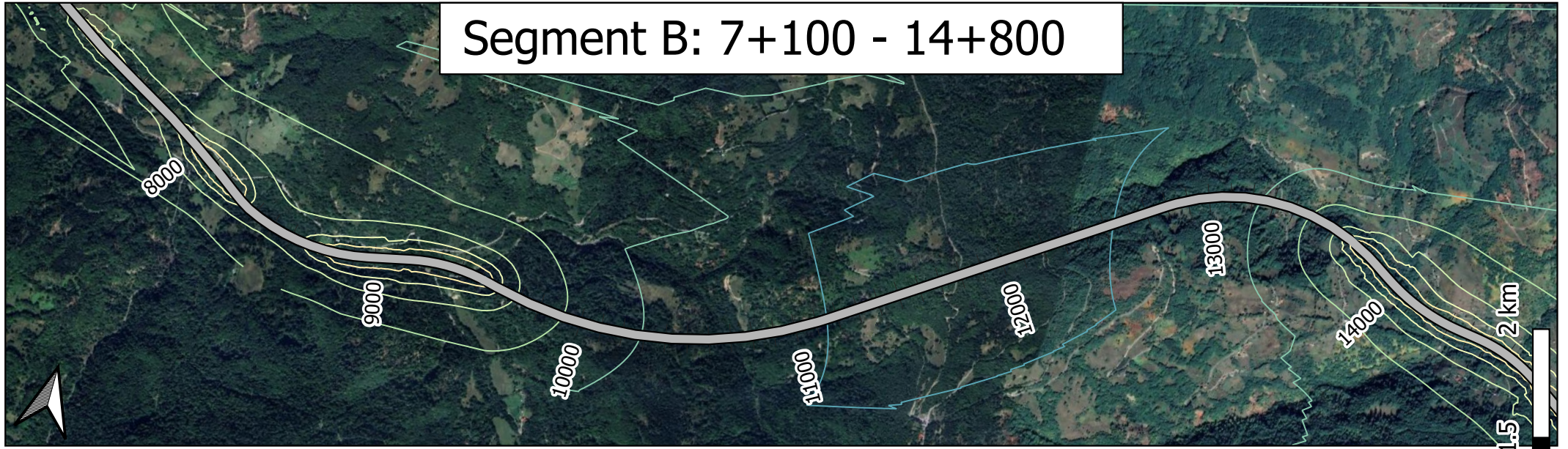
SCENARIO:
Horizon year traffic flow

DATE: December 2024

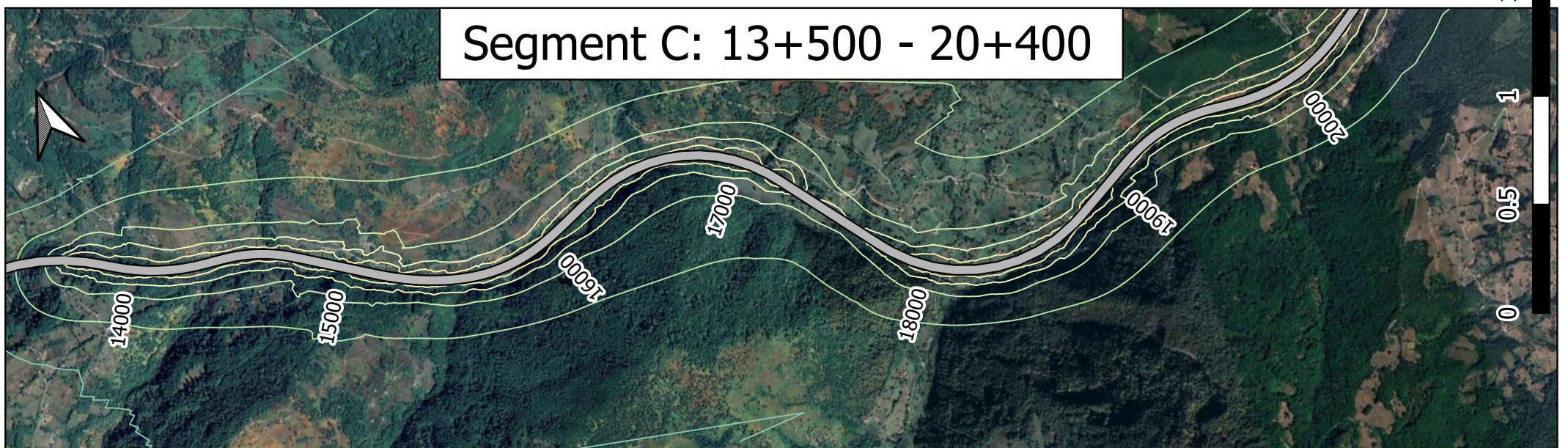
Segment A: 0+000 - 7+600



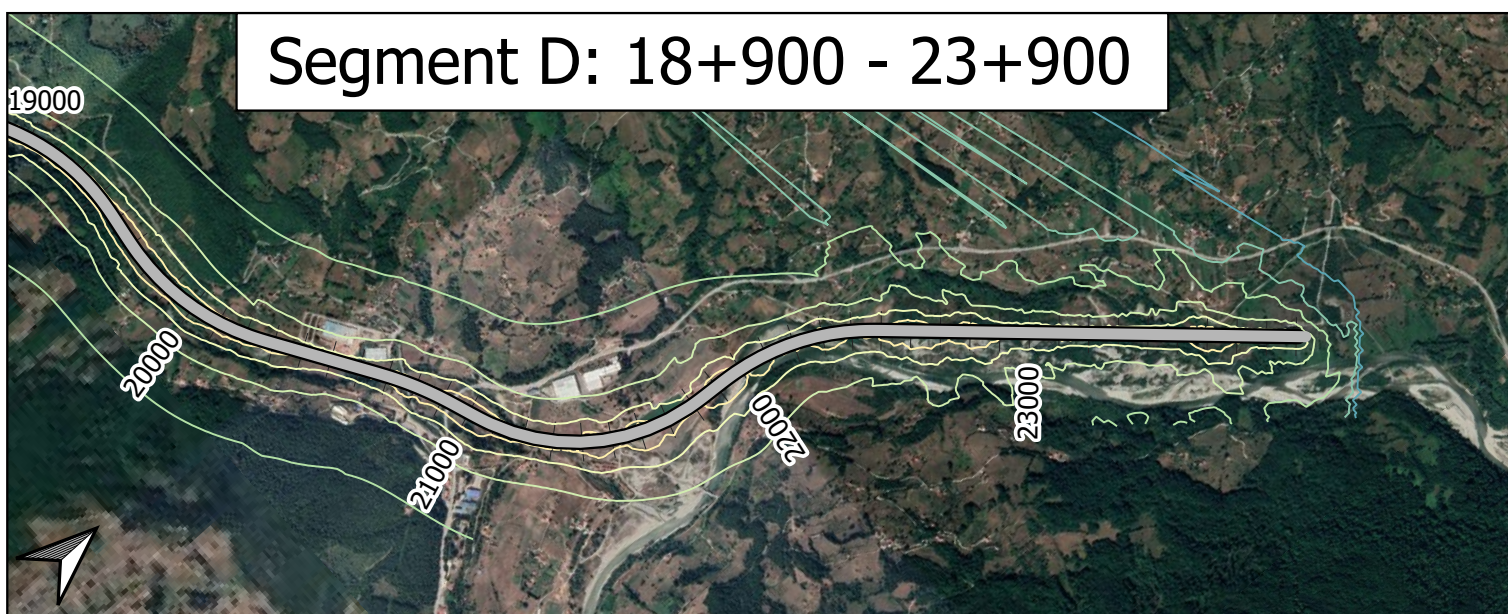
Segment B: 7+100 - 14+800



Segment C: 13+500 - 20+400



Segment D: 18+900 - 23+900

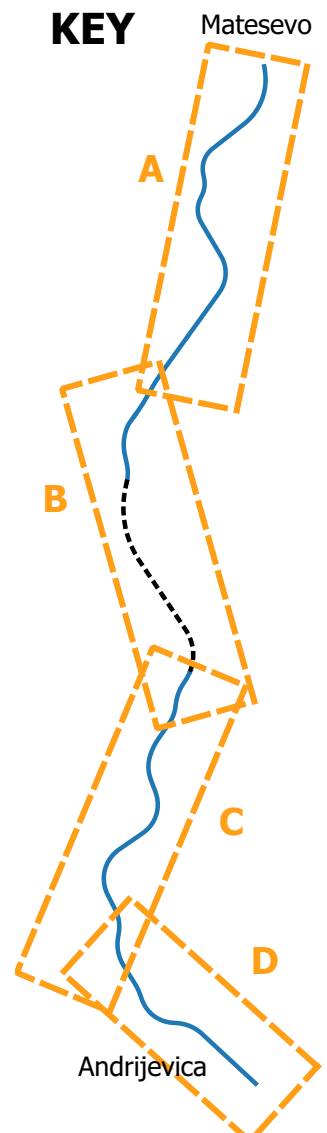


LEGEND

I1ZSO2

- 0.1
- 0.2
- 0.5
- 1.0
- 2.0
- 5.0

SEGMENTS KEY



Western Balkans Investment Framework
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TA2017050 R0 IPA
Bar-Boljare highway (SEETO Road Route 4),
Montenegro

Subsection:
Mateševci - Andrijevica
WB17-MNE-TRA-02

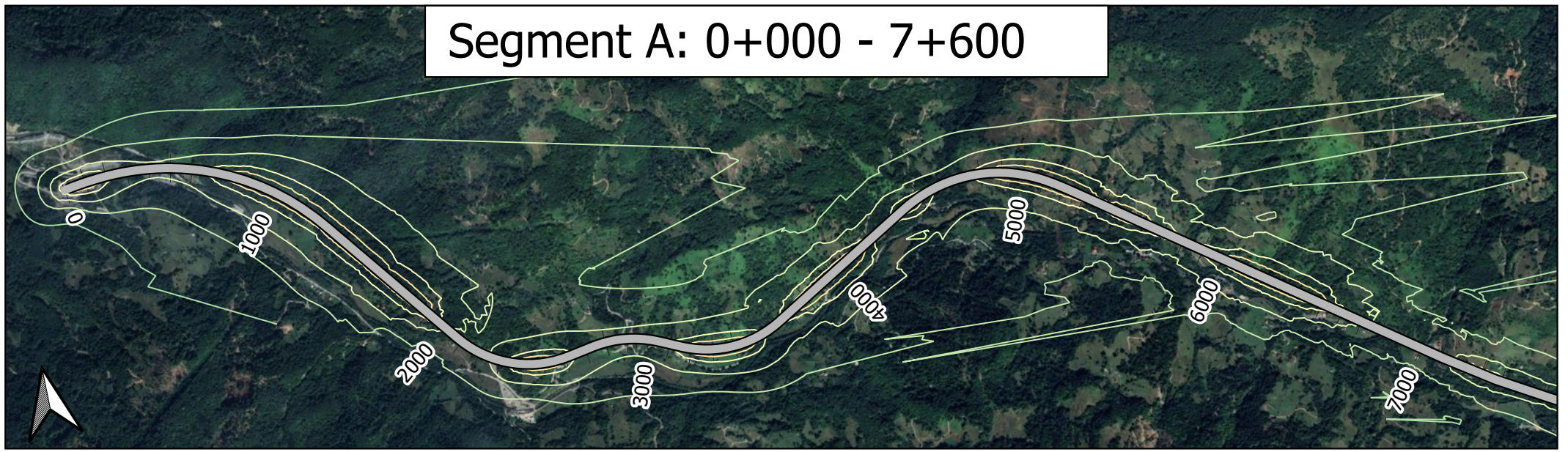
Noise & Air Pollution Modelling for
Preliminary design and Environmental
and Social Impact Assessment (ESIA)

POLLUTANT:
SO₂

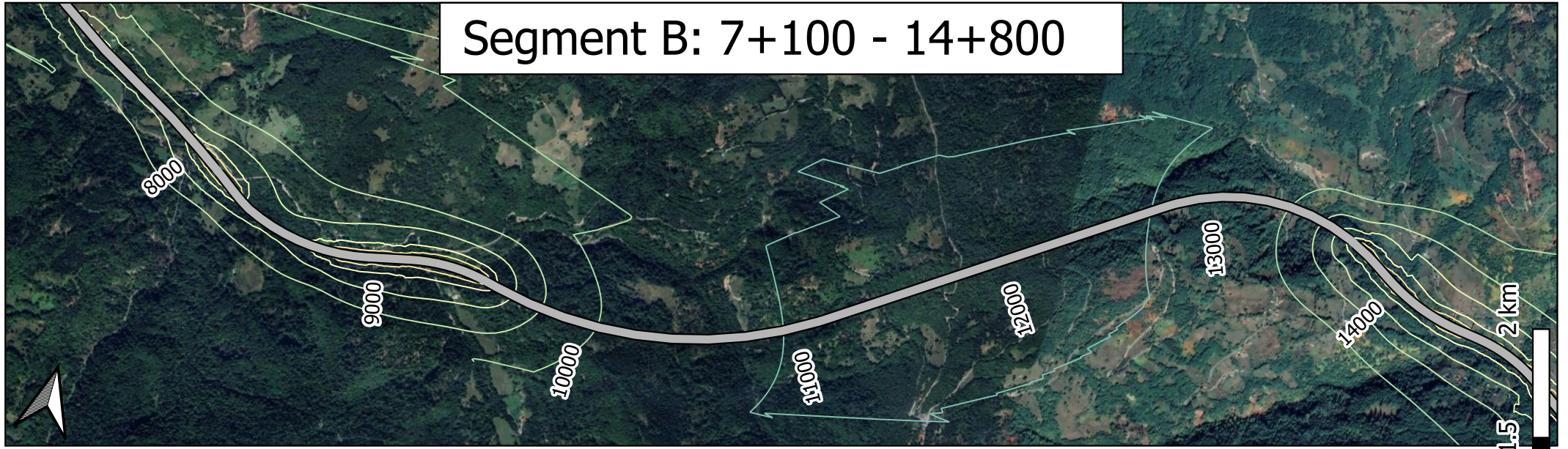
SCENARIO:
Launch year traffic flow

DATE: December 2024

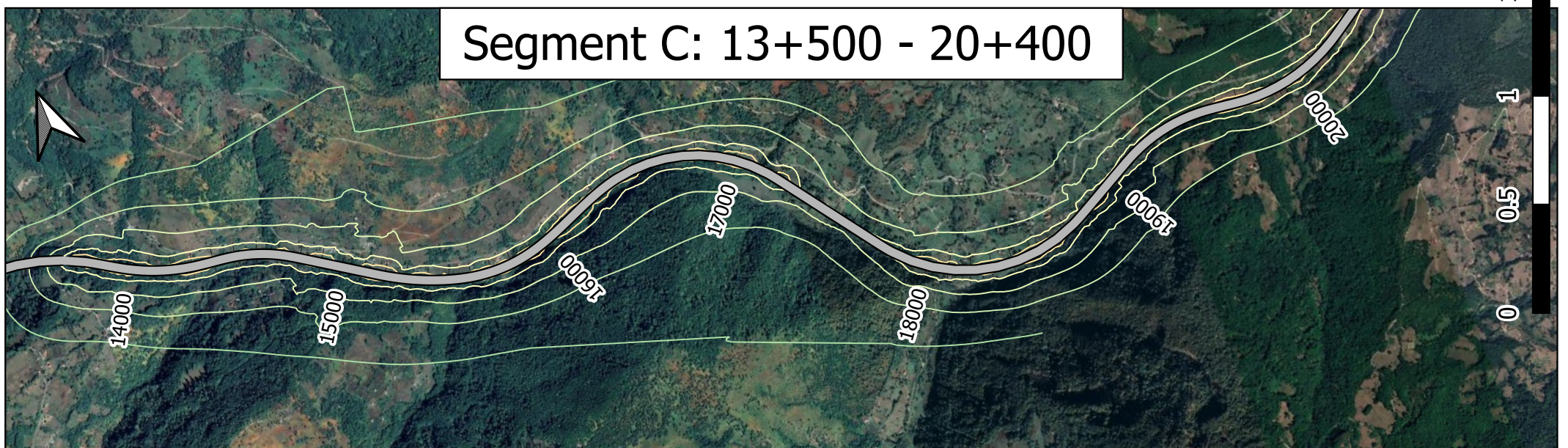
Segment A: 0+000 - 7+600



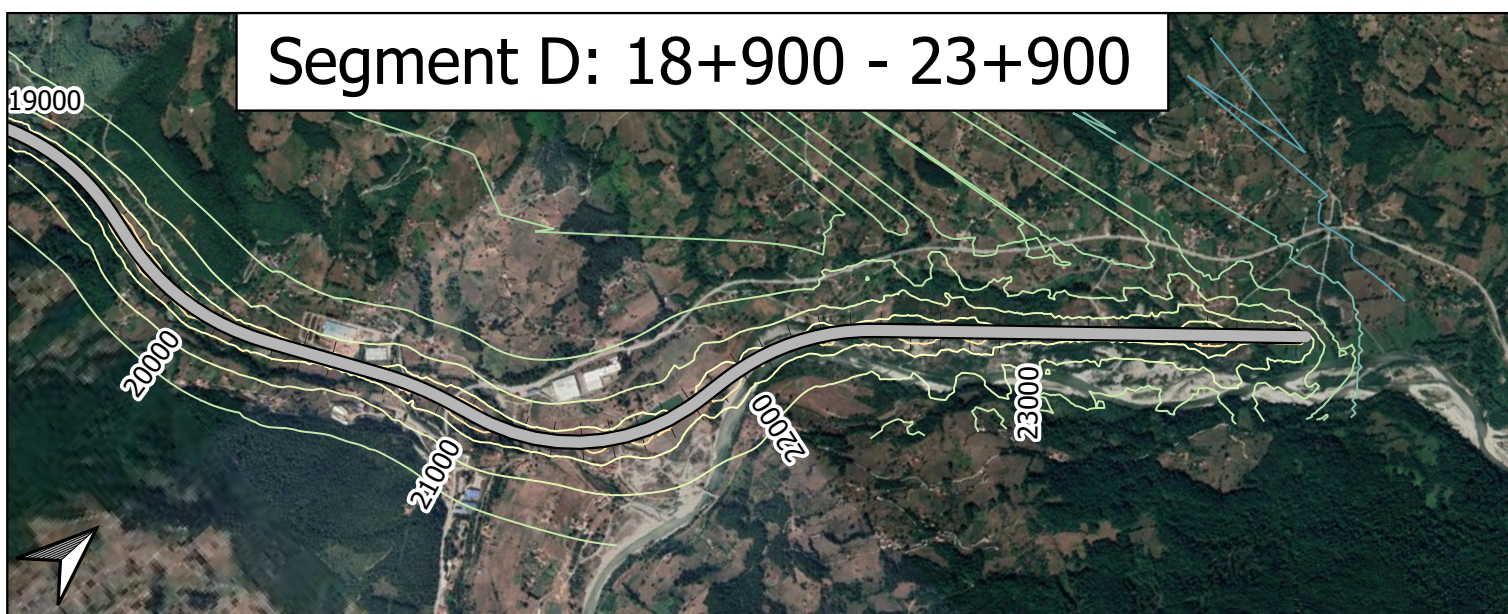
Segment B: 7+100 - 14+800



Segment C: 13+500 - 20+400



Segment D: 18+900 - 23+900

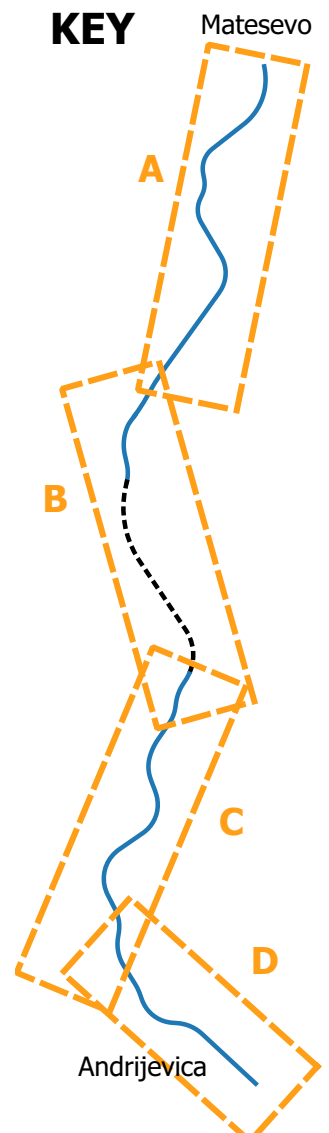


LEGEND

I1ZNOX

- 5.0
- 10
- 20
- 50
- 100
- 200

SEGMENTS KEY



Western Balkans Investment Framework
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TA2017050 R0 IPA
Bar-Boljare highway (SEETO Road Route 4),
Montenegro

Subsection:
Mateševo - Andrijevisa
WB17-MNE-TRA-02

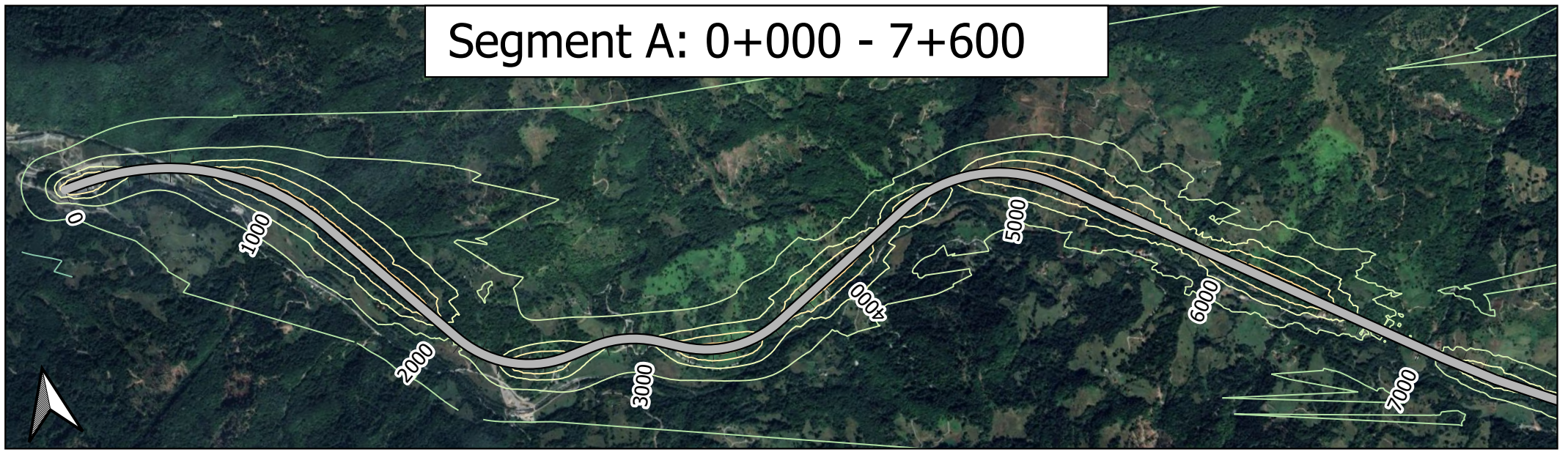
Noise & Air Pollution Modelling for
Preliminary design and Environmental
and Social Impact Assessment (ESIA)

POLLUTANT:
NOx

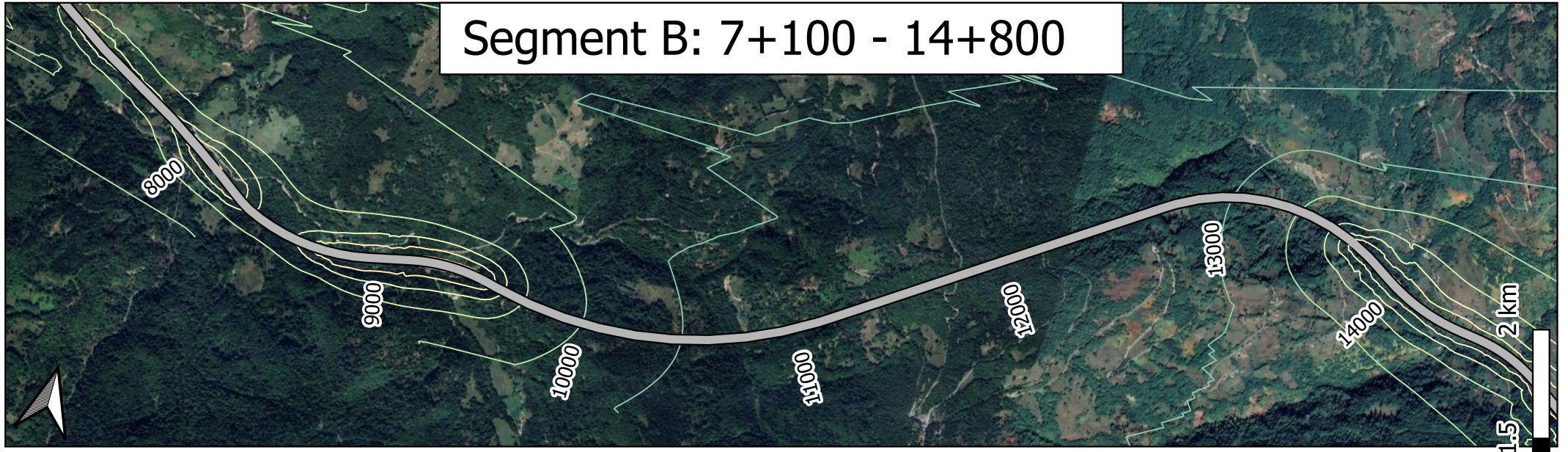
SCENARIO:
Launch year traffic flow

DATE: December 2024

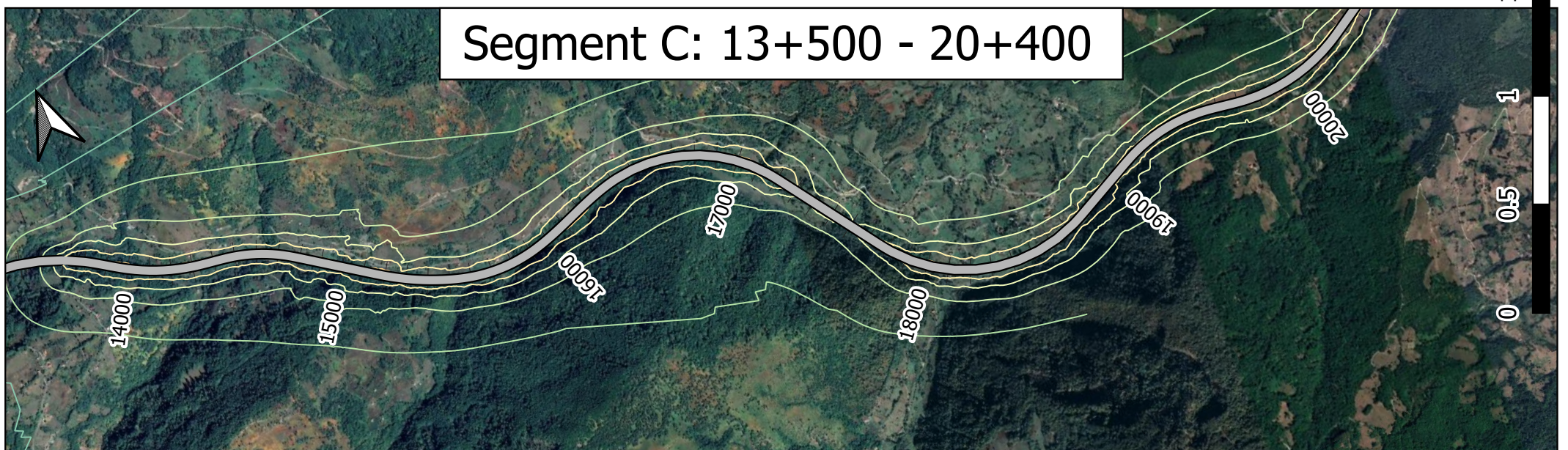
Segment A: 0+000 - 7+600



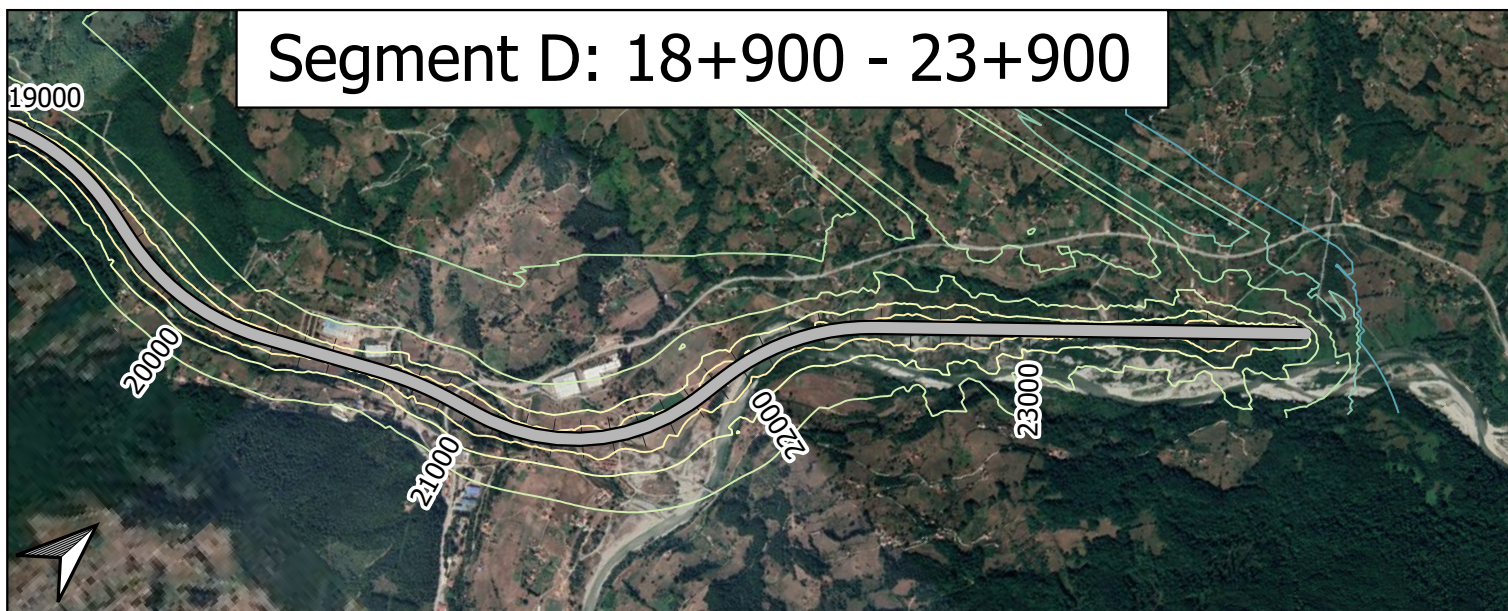
Segment B: 7+100 - 14+800



Segment C: 13+500 - 20+400



Segment D: 18+900 - 23+900

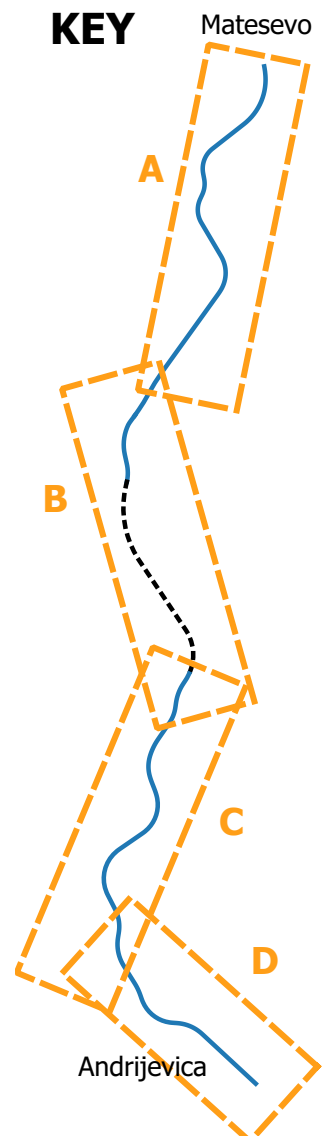


LEGEND

I1ZCO

- 10
- 20
- 50
- 100
- 200
- 500

SEGMENTS KEY



Western Balkans Investment Framework
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TA2017050 R0 IPA
Bar-Boljare highway (SEETO Road Route 4),
Montenegro

Subsection:
Mateševo - Andrijevica
WB17-MNE-TRA-02

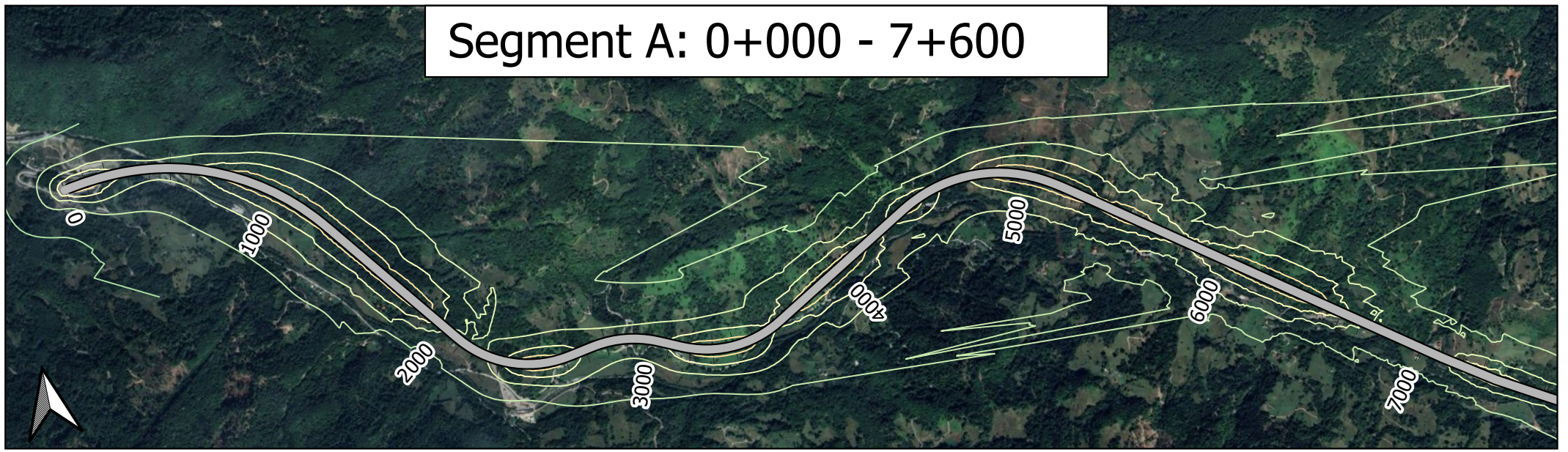
Noise & Air Pollution Modelling for
Preliminary design and Environmental
and Social Impact Assessment (ESIA)

POLLUTANT:
CO

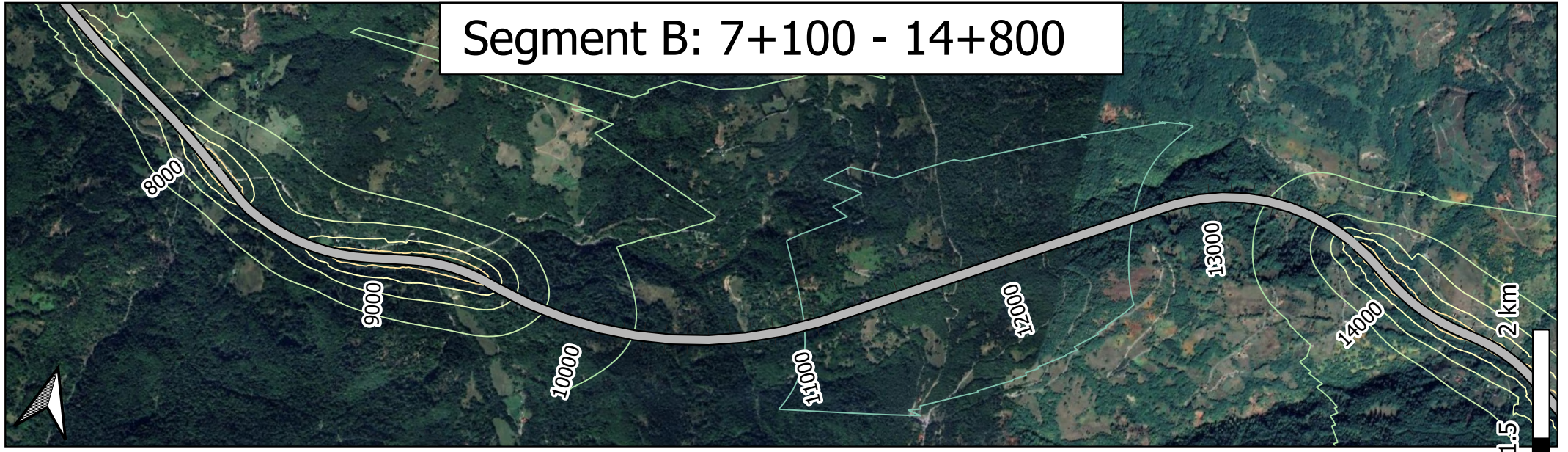
SCENARIO:
Launch year traffic flow

DATE: December 2024

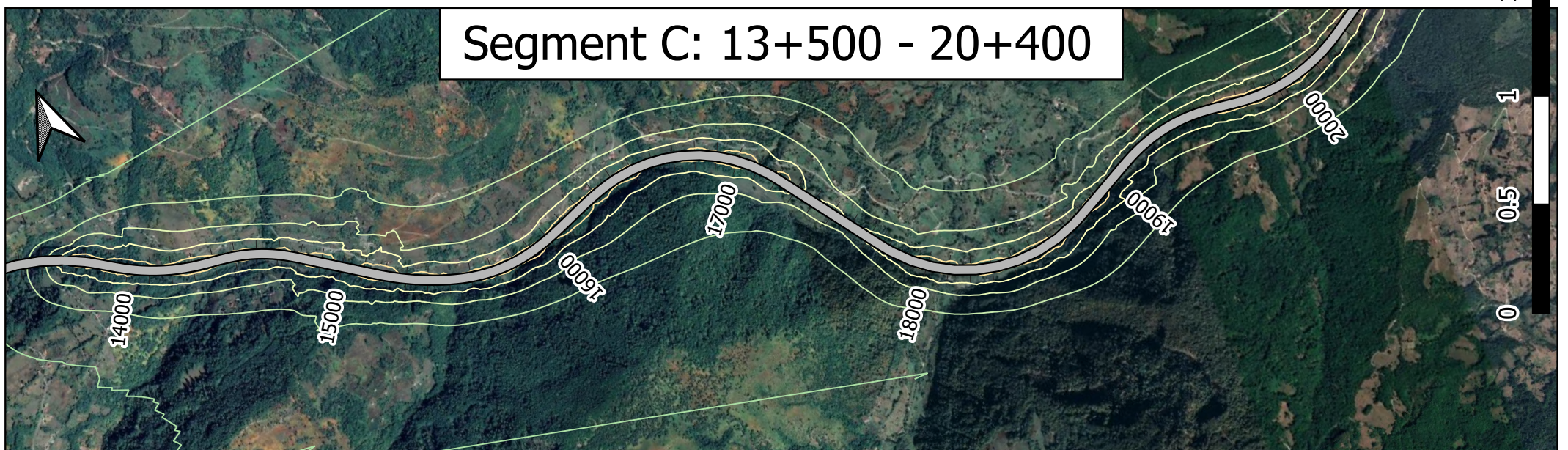
Segment A: 0+000 - 7+600



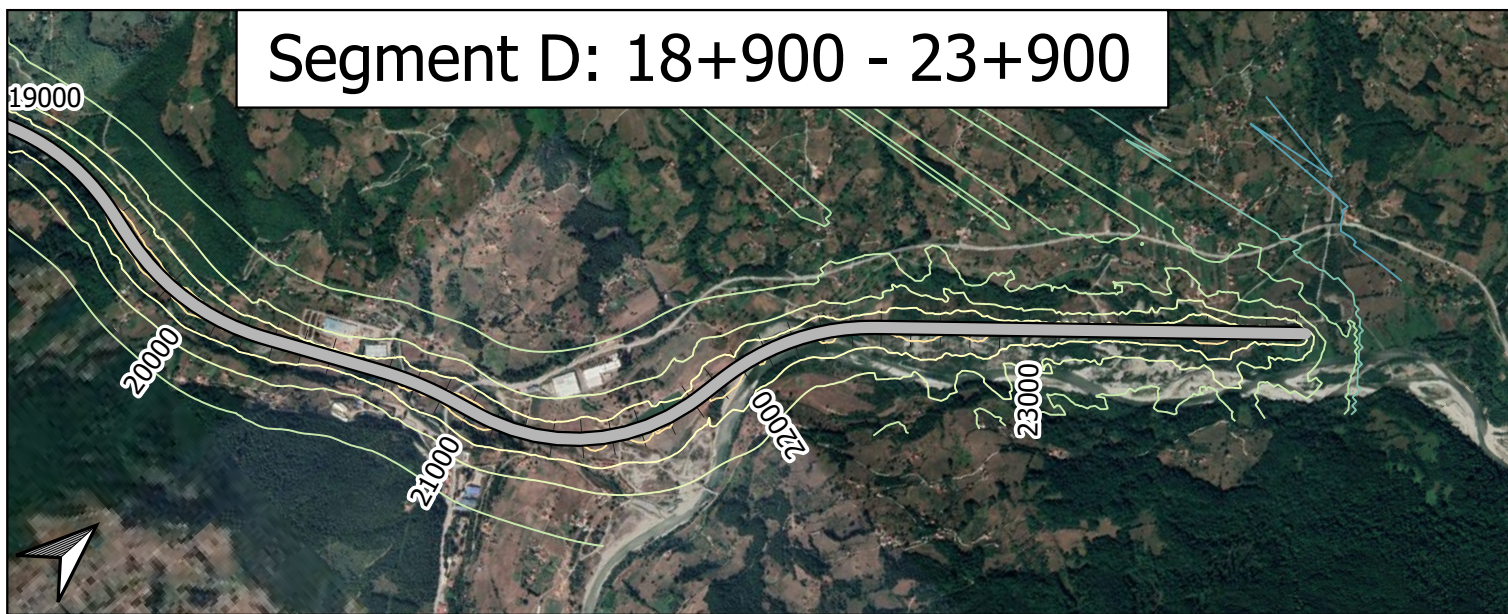
Segment B: 7+100 - 14+800



Segment C: 13+500 - 20+400



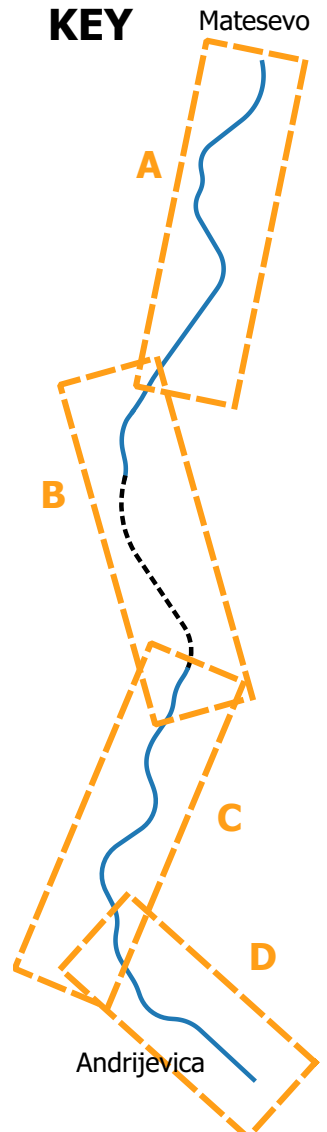
Segment D: 18+900 - 23+900



LEGEND

I1ZPARTICL	
0.2	—
0.5	—
1.0	—
2.0	—
5.0	—
10	—

SEGMENTS KEY



Western Balkans Investment Framework
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Bar-Boljare highway (SEETO Road Route 4),
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WB17-MNE-TRA-02

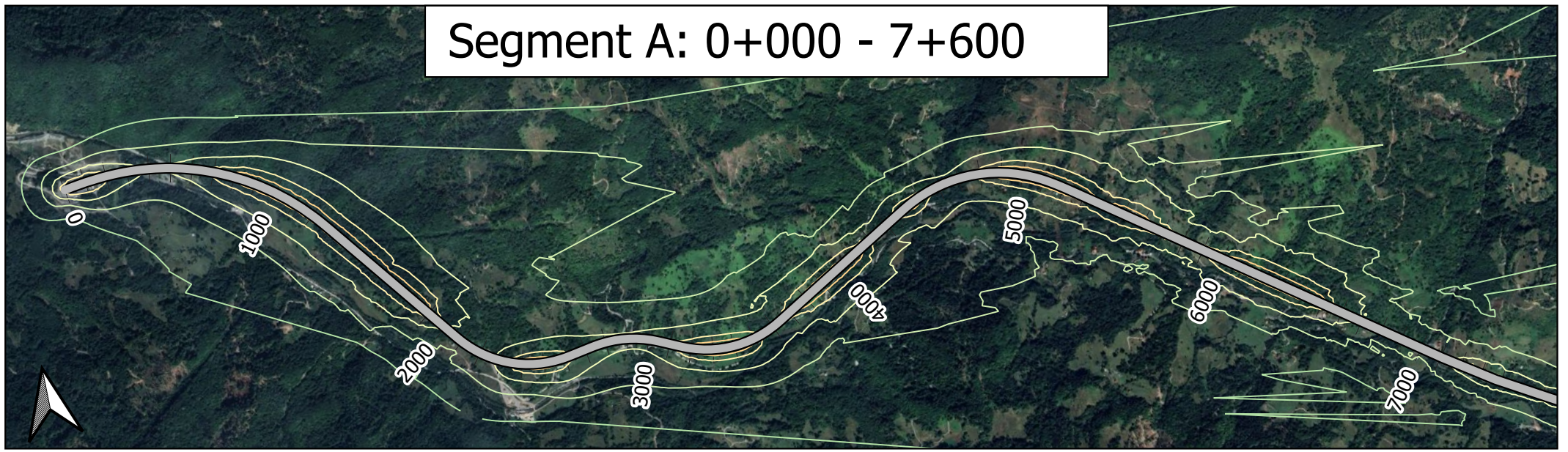
Noise & Air Pollution Modelling for
Preliminary design and Environmental
and Social Impact Assessment (ESIA)

POLLUTANT:
PM

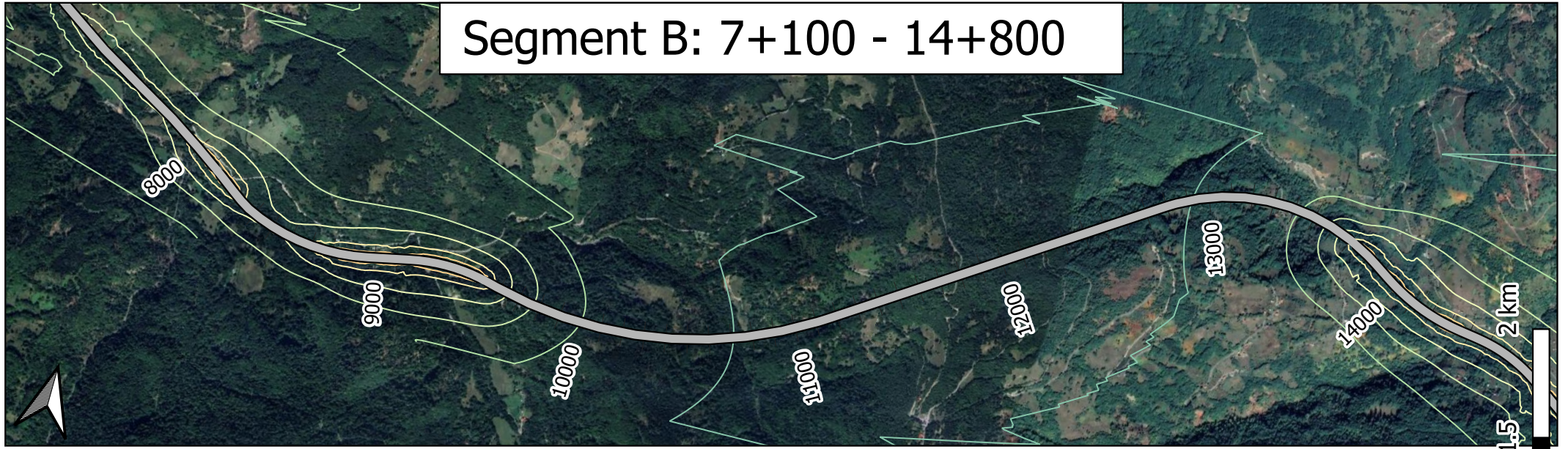
SCENARIO:
Launch year traffic flow

DATE: December 2024

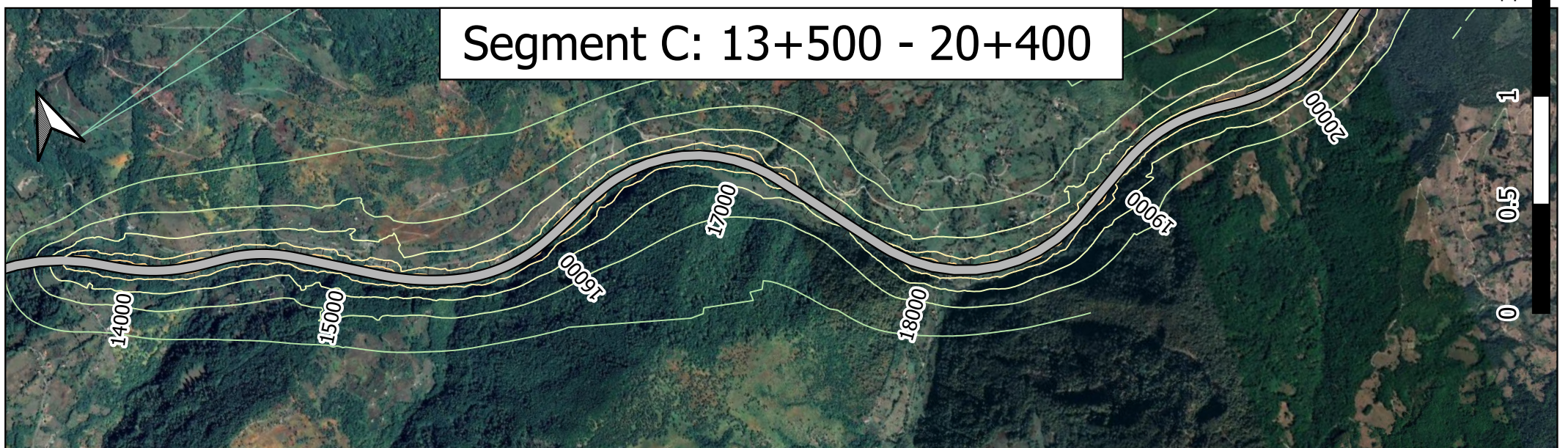
Segment A: 0+000 - 7+600



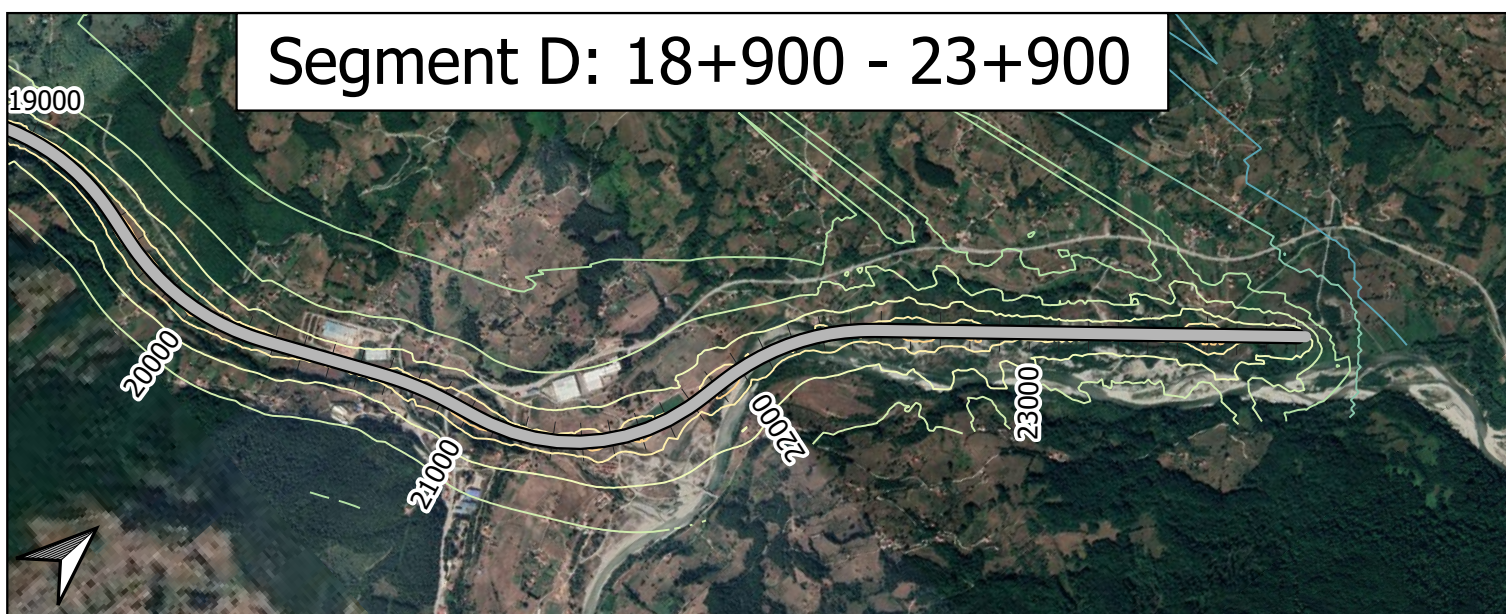
Segment B: 7+100 - 14+800



Segment C: 13+500 - 20+400



Segment D: 18+900 - 23+900

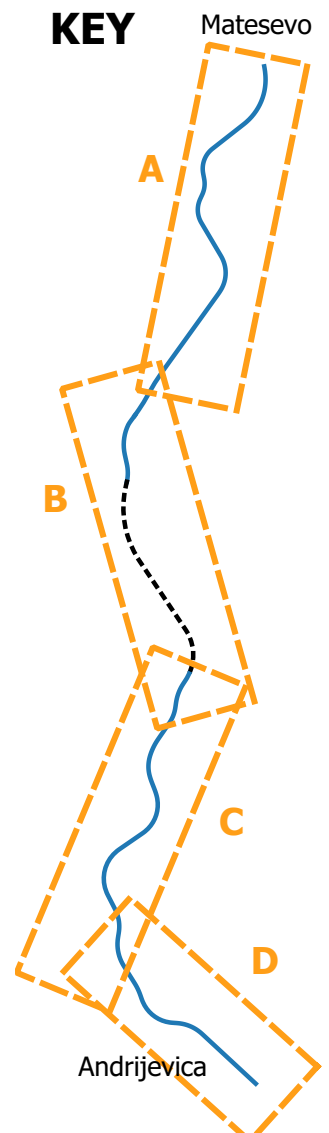


LEGEND

I1ZSO2

- 0.5
- 1.0
- 2.0
- 5.0
- 10

SEGMENTS KEY



Western Balkans Investment Framework
Infrastructure Project Facility
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TA2017050 R0 IPA
Bar-Boljare highway (SEETO Road Route 4),
Montenegro

Subsection:
Mateševo - Andrijevisa
WB17-MNE-TRA-02

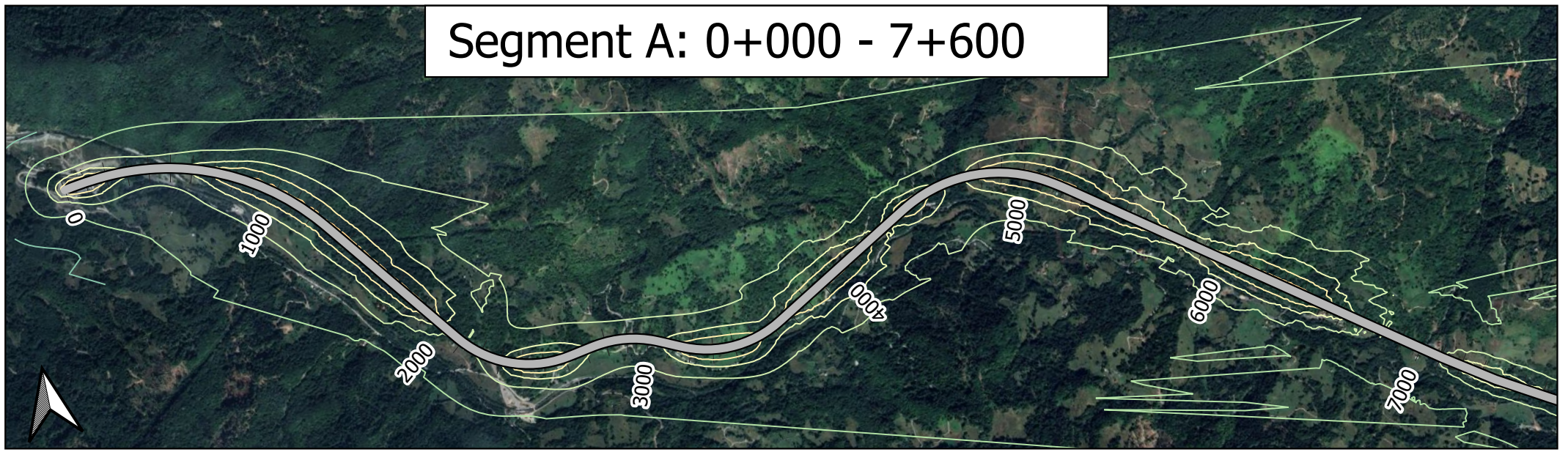
Noise & Air Pollution Modelling for
Preliminary design and Environmental
and Social Impact Assessment (ESIA)

POLLUTANT:
SO₂

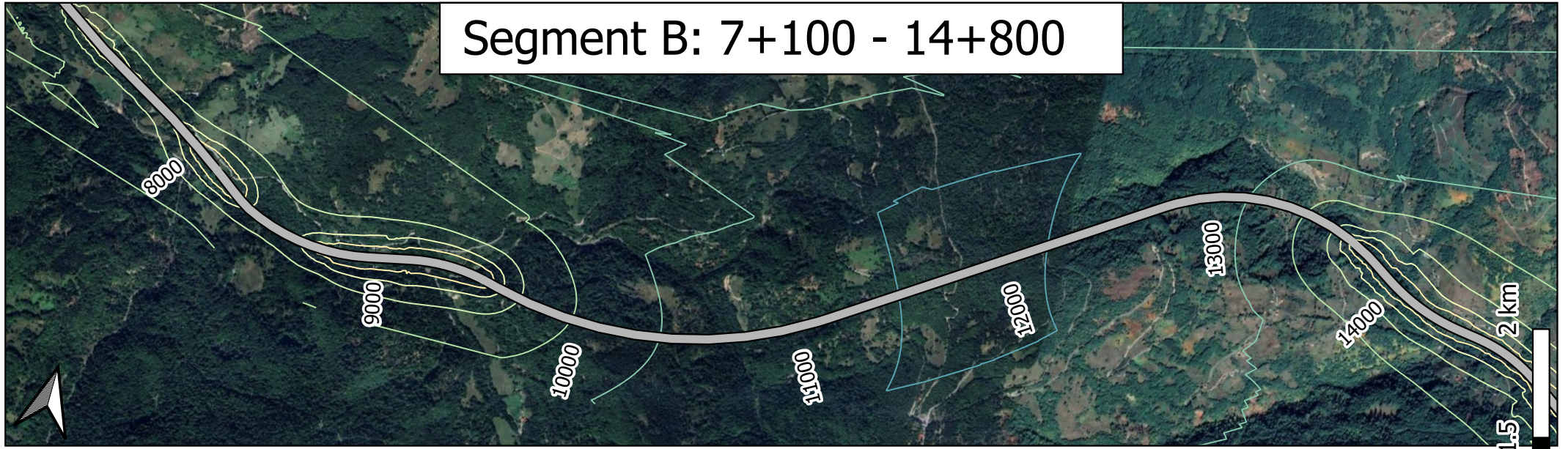
SCENARIO:
Horizon year traffic flow

DATE: December 2024

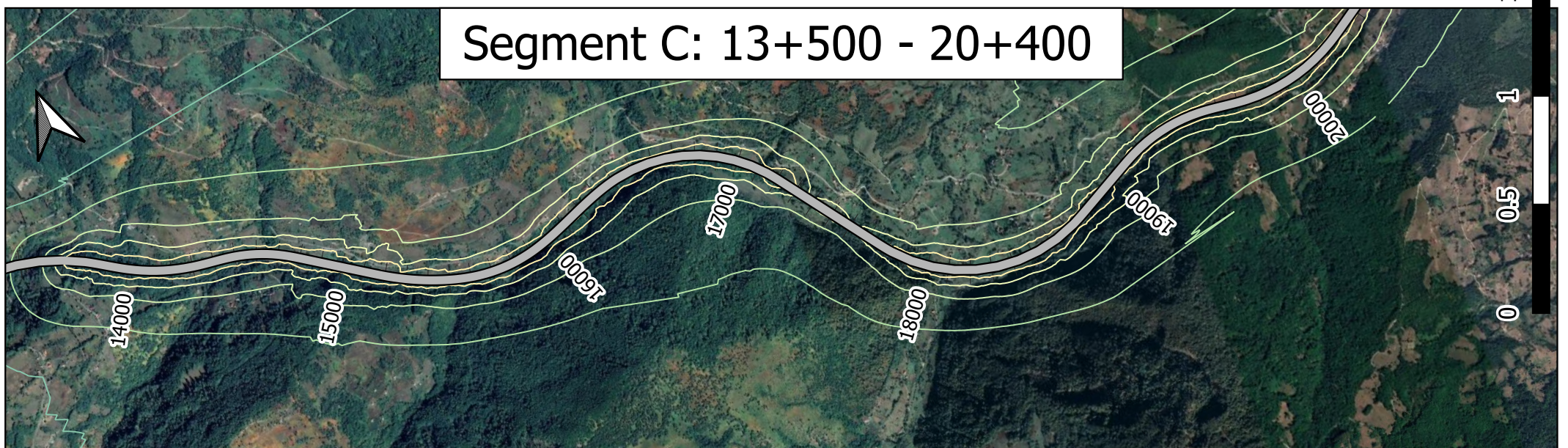
Segment A: 0+000 - 7+600



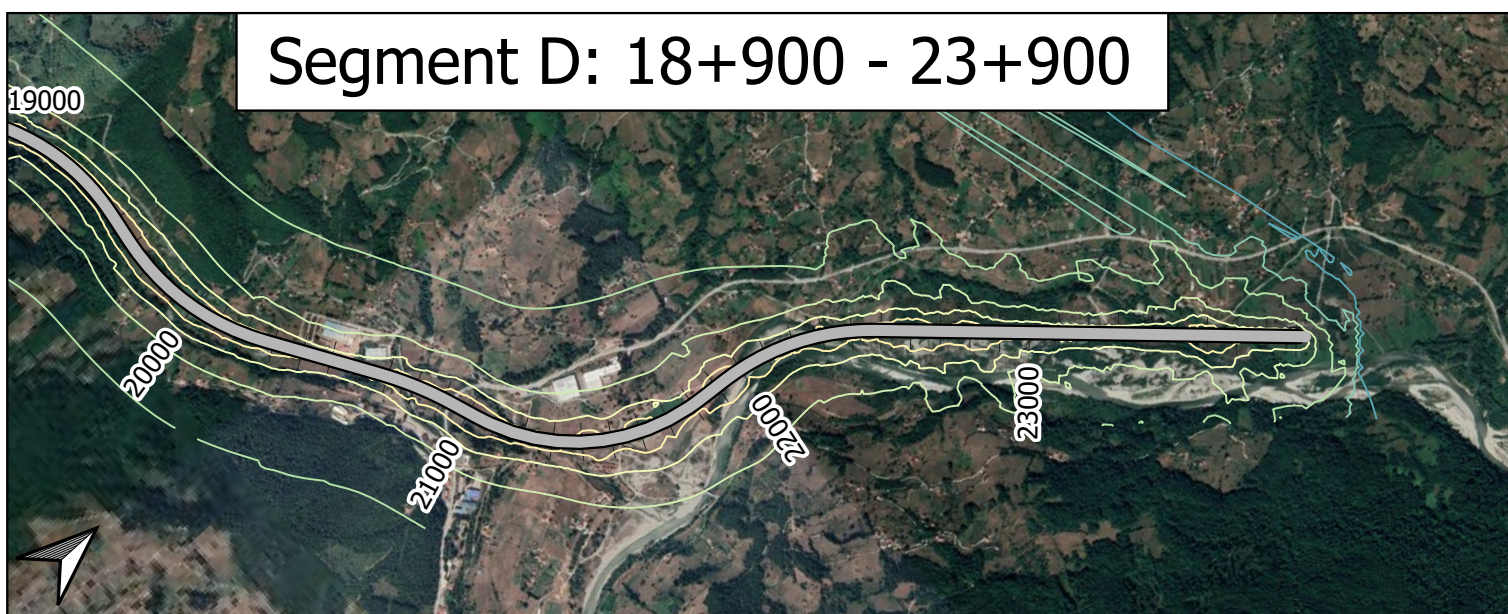
Segment B: 7+100 - 14+800



Segment C: 13+500 - 20+400



Segment D: 18+900 - 23+900

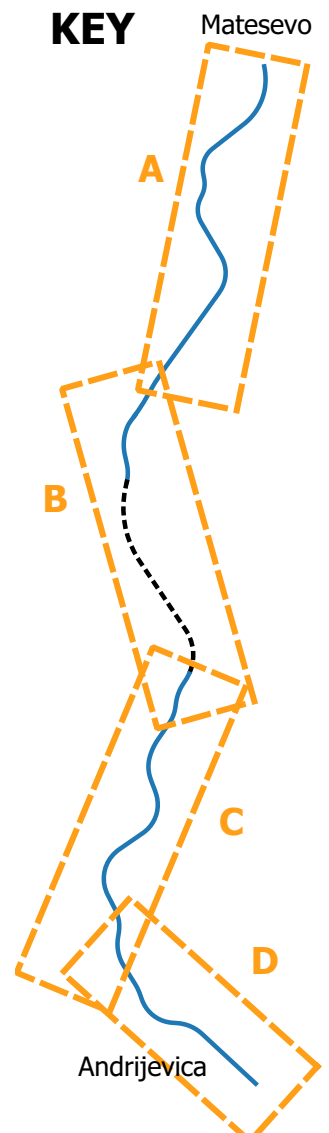


LEGEND

I1ZNOX

- 10
- 20
- 50
- 100
- 200
- 500

SEGMENTS KEY



Western Balkans Investment Framework
Infrastructure Project Facility
Technical Assistance 7 (IPF 7)

TA2017050 R0 IPA
Bar-Boljare highway (SEETO Road Route 4),
Montenegro

Subsection:
Mateševo - Andrijevisa
WB17-MNE-TRA-02

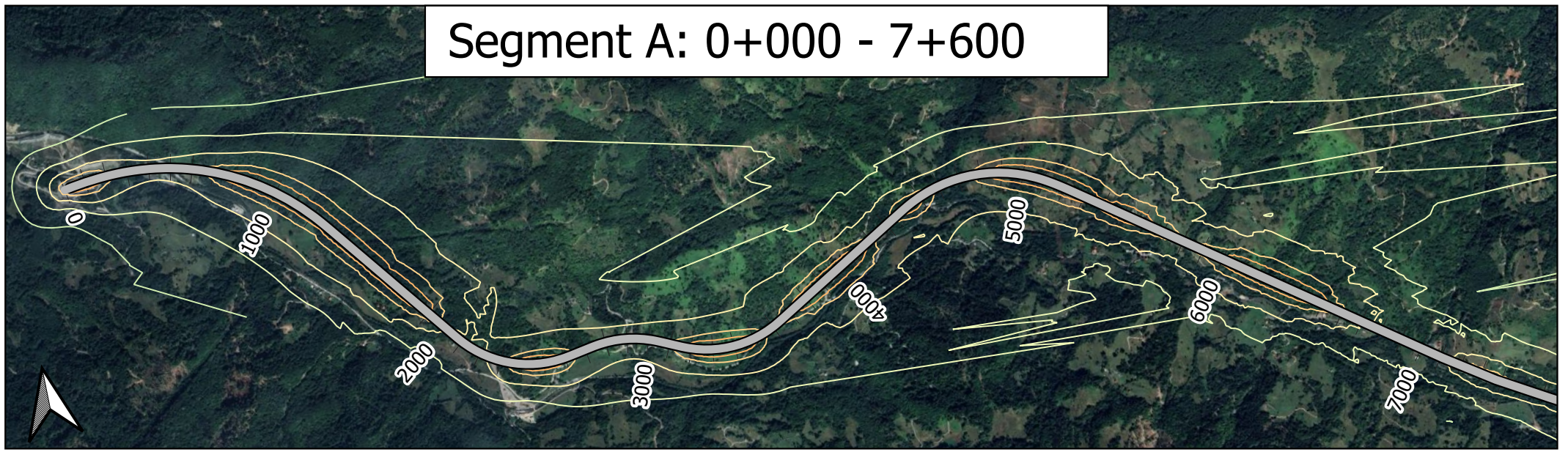
Noise & Air Pollution Modelling for
Preliminary design and Environmental
and Social Impact Assessment (ESIA)

POLLUTANT:
NOx

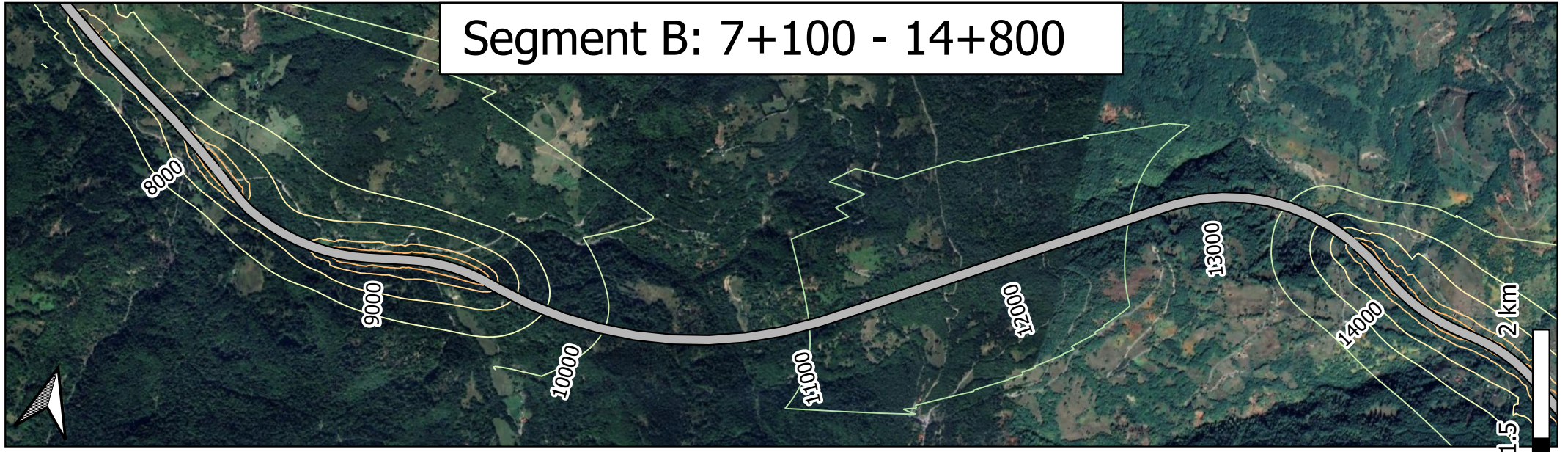
SCENARIO:
Horizon year traffic flow

DATE: December 2024

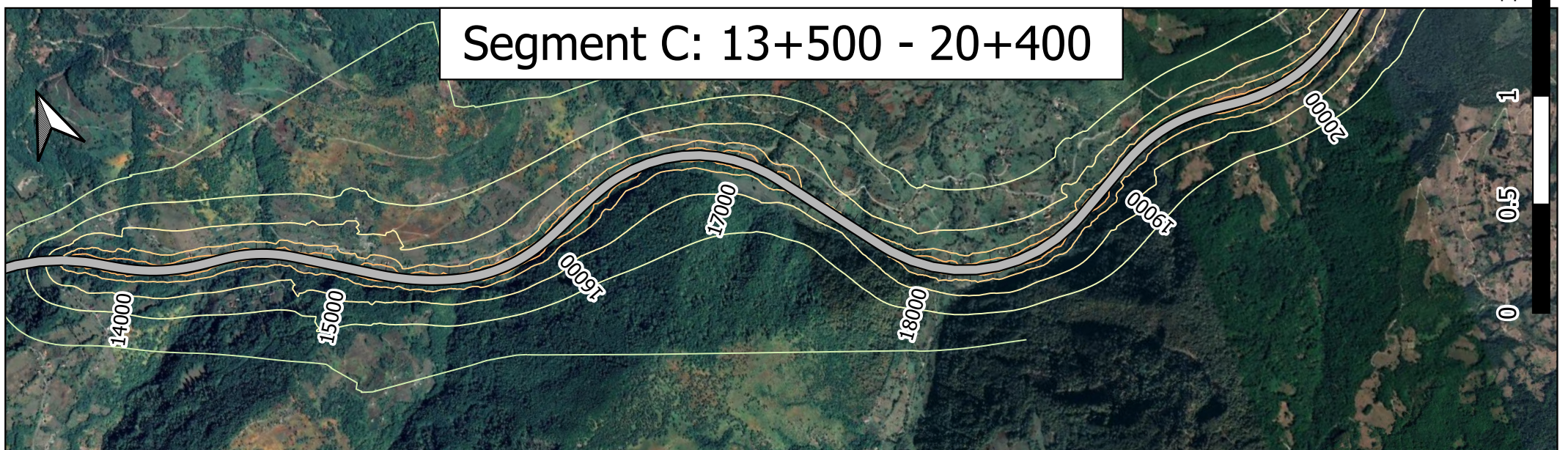
Segment A: 0+000 - 7+600



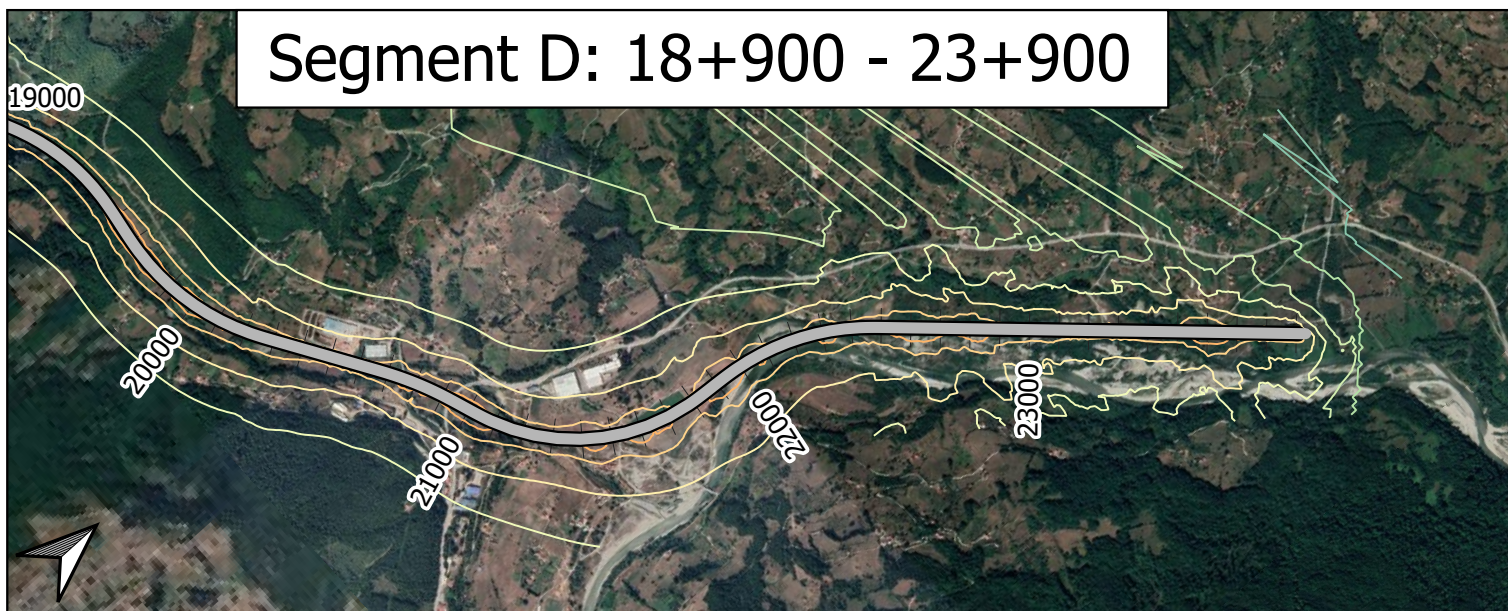
Segment B: 7+100 - 14+800



Segment C: 13+500 - 20+400



Segment D: 18+900 - 23+900

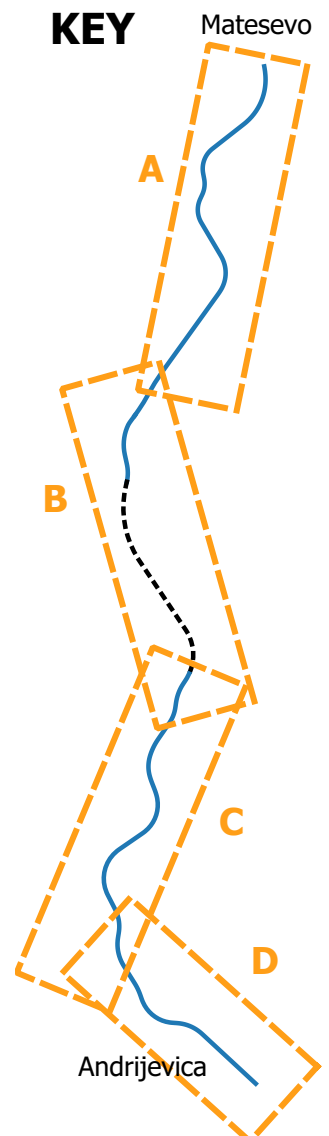


LEGEND

I1ZCO

- 50
- 100
- 200
- 500
- 1,000
- 2,000

SEGMENTS KEY



Western Balkans Investment Framework
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TA2017050 R0 IPA
Bar-Boljare highway (SEETO Road Route 4),
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Subsection:
Mateševci - Andrijevica
WB17-MNE-TRA-02

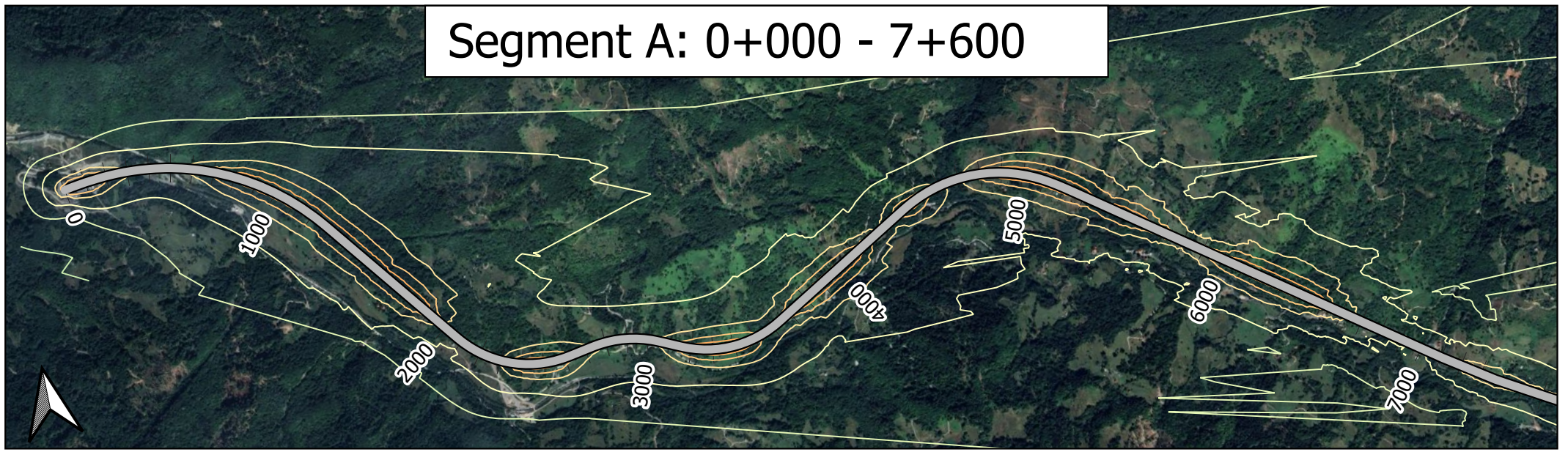
Noise & Air Pollution Modelling for
Preliminary design and Environmental
and Social Impact Assessment (ESIA)

POLLUTANT:
CO

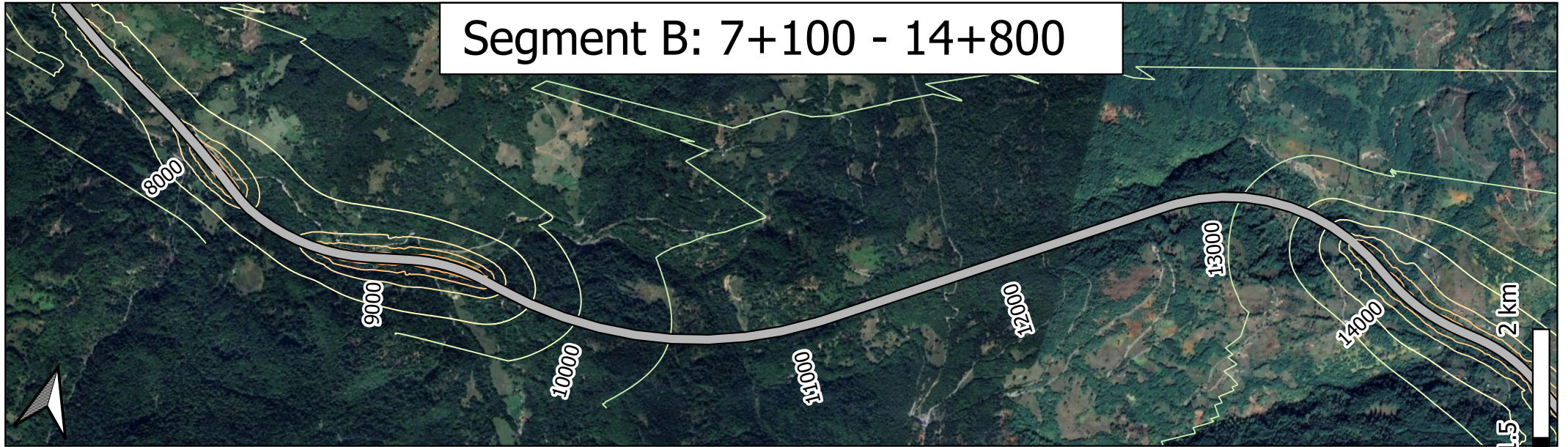
SCENARIO:
Horizon year traffic flow

DATE: December 2024

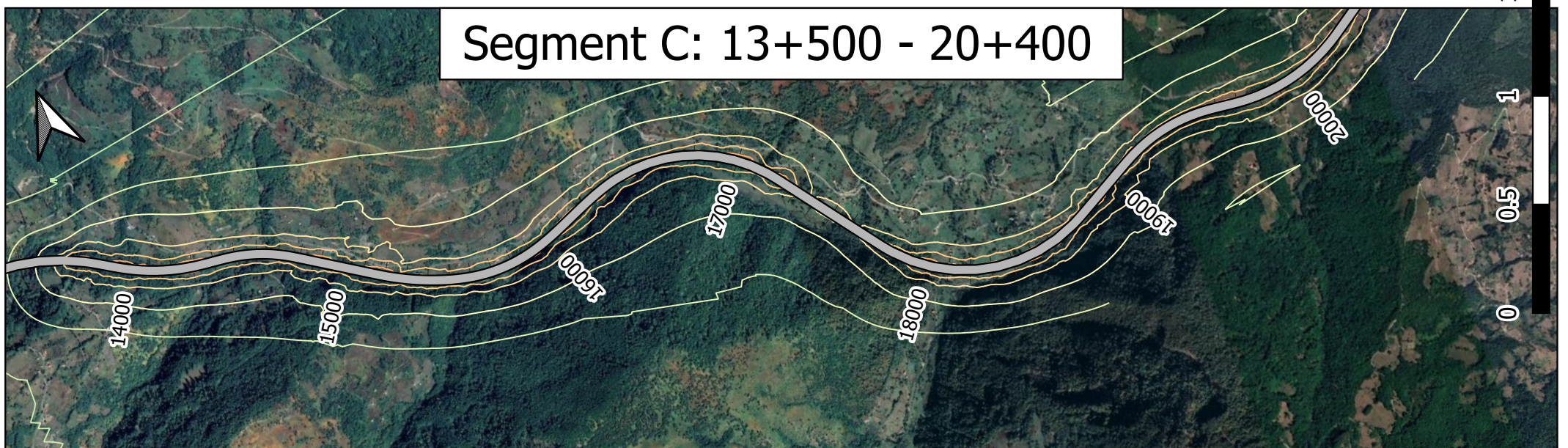
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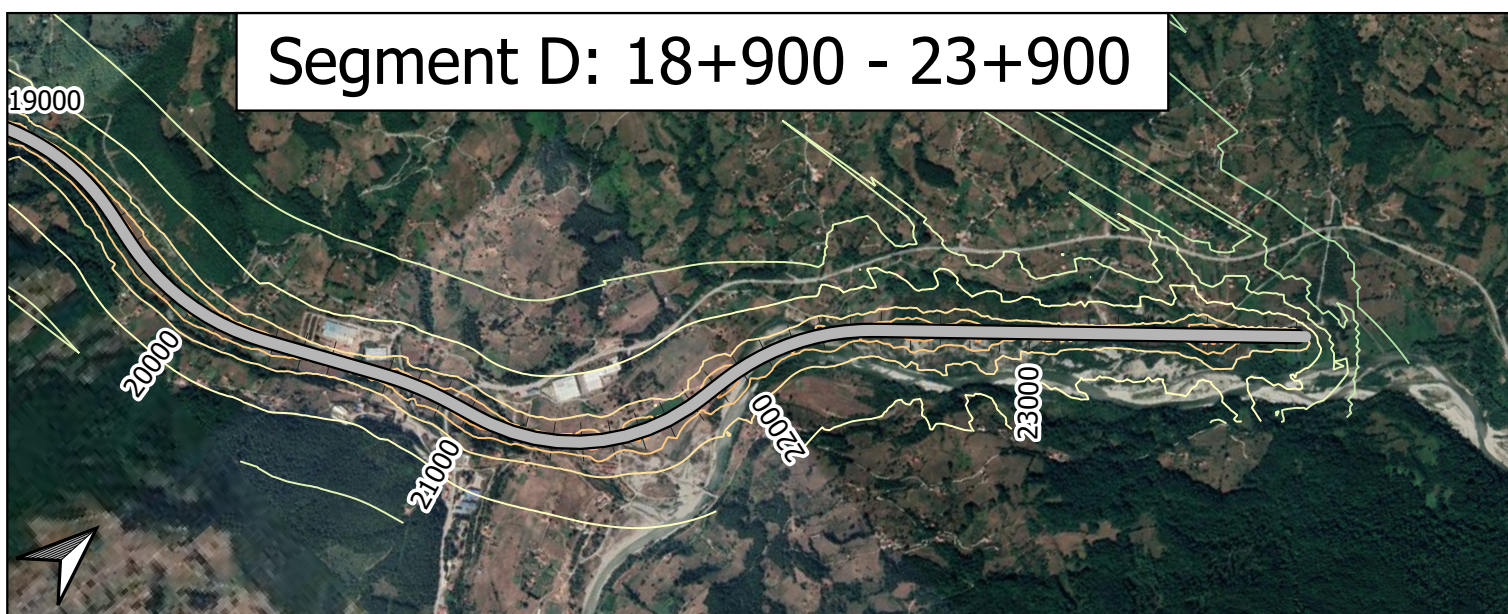
Segment B: 7+100 - 14+800



Segment C: 13+500 - 20+400



Segment D: 18+900 - 23+900

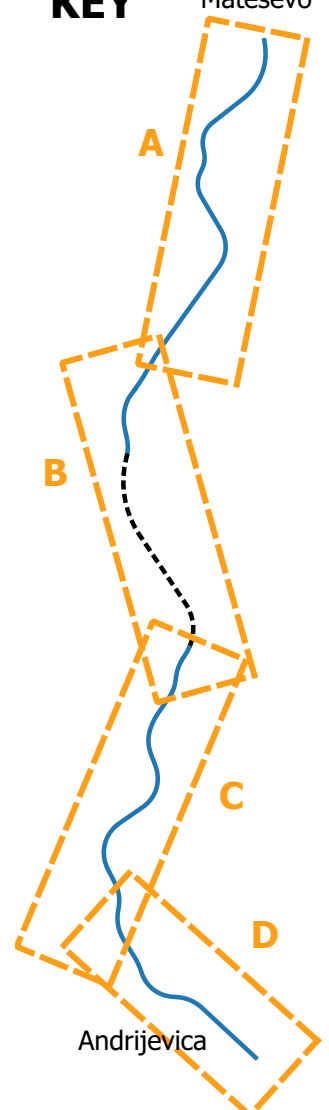


LEGEND

I1ZPARTICL

- 0.5
- 1.0
- 2.0
- 5.0
- 10
- 20

SEGMENTS KEY



Western Balkans Investment Framework
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Noise & Air Pollution Modelling for
Preliminary design and Environmental
and Social Impact Assessment (ESIA)

POLLUTANT:
PM

SCENARIO:
Horizon year traffic flow

DATE: December 2024