Taršos šaltinis Nr. 606, LKS-94:

6055701.73	592126.78
6055925.15	592158.49
6055923.46	592177.00
6055924.76	592220.98
6055922.73	592259.76
6055917.67	592297.85
6055909.98	592317.37
6055883.06	592325.01
6055860.04	592327.13
6055812.41	592322.75
6055693.43	592313.11
6055685.13	592307.44
6055672.08	592393.67
6055666.40	592442.61
6055663.40	592454.50
6055656.56	592461.59
6055642.64	592464.96
6055501.45	592439.04
6055514.66	592363.77
6055526.69	592296.45
6055448.20	592280.49
6055396.99	592270.08
6055449.31	592096.40
6055449.86	592094.56
6055452.93	592084.38
6055474.91	592091.14
6055499.01	592014.49
6055507.64	591986.46
6055638.86	592012.99
6055672.21	592058.24
6055688.41	592076.09
6055694.20	592087.98

1 pav. Statybvietė (neorganizuotas stacionarus oro taršos šaltinis)

European Environment Agency

Category		Title
NFR	2.A.5.b	Construction and demolition
SNAP	040624	Public works and building sites
ISIC	4510	Site preparation
	4520	Building of complete constructions or parts thereof; civil engineering
	4530	Building installation
	4540	Building completion
Version	Guidebook 2016	

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average duration of the construction. Since the affected area is usually not directly available from statistical sources, a means of estimating affected area based on other statistical data is suggested. The method offers the further option to correct for the soil moisture content and the soil particle size distribution (which both affect dust sensitivity).

3.2.1 Algorithm

The US EPA Tier 1 approach to estimating total fugitive PM emissions uses the following equation:

$$EM_{PM_{10}} = EF_{PM_{10}} \cdot A_{affected} \cdot d \cdot (1-CE) \cdot \left(\frac{24}{PE}\right) \cdot \left(\frac{s}{9\%}\right) \qquad (1)$$

PM10 emission factor	Affected area	Construction duration	1 - control efficiency	Correction for soil moisture	Correction for silt content

Where:

$EM_{PM_{10}}$	=	PM_{10} emission (kg PM_{10})
$EF_{PM_{10}}$	=	the emission factor for this pollutant emission (kg PM_{10}/[m² · year])
$A_{affected}$	=	area affected by construction activity (m²)
d	=	duration of construction (year)
CE	=	efficiency of emission control measures (-)
PE	=	Thornthwaite precipitation-evaporation index (-)
s	=	soil silt content (%)

3.2.2 Default emission factors (EF_{PM10})

Default PM_{10} emission factors for uncontrolled fugitive particulate matter (PM) emissions from the four main types of construction activities are provided in Tables 3.1 to 3.4. The default emission factors are derived from the US EPA tier 1 PM_{10} emission estimation method.

As is often the case for dust emissions of mechanical origin, geological dust suspended by construction activities has a relatively low content of $PM_{2.5}$ in PM_{10}. According to MRI (2006), the overall $PM_{2.5}$ fraction in PM_{10} of construction emissions varies between 5 and 15%, while Muleski et al. (2005) measured 1 – 10% (average 3%) for several specific sources. For construction as a whole, it is recommended that the average $PM_{2.5}$ content of PM_{10} should be assumed to be 10%. TSP emission is estimated to be roughly three times the PM_{10} emission, based on a reported content of PM_{10} in TSP of 30% (US EPA 1999).

Table 3.1 Tier 1 emission factors for uncontrolled fugitive emissions for source category 2.A.5.b Construction and demolition – Construction of houses

Tier 1 default emission factors		
	Code	Name
NFR Source Category	2.A.5.b	Construction and demolition – Construction of houses (detached single family, detached two family and single family terraced)
Fuel	NA	

Not applicable	NOx, CO, SOx, NH_3, NMVOC, BC, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, HCH, PCBs, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, HCB				
Not estimated	NA				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
TSP	0.29	kg/[m²· year]	0.03	0.9	WRAP 2006, MRI 2006
PM_{10}	0.086	kg/[m²· year]	0.009	0.3	WRAP 2006, MRI 2006
$PM_{2.5}$	0.0086	kg/[m²· year]	0.0009	0.03	WRAP 2006, MRI 2006

Table 3.2 Tier 1 emission factors for uncontrolled fugitive emissions for source category 2.A.5.b Construction and demolition – Construction of apartment buildings

Tier 1 default emission factors					
	Code	Name			
NFR Source Category	2.A.5.b	Construction and demolition – Construction of apartments (all types)			
Fuel	NA				
Not applicable	NOx, CO, SOx, NH_3, NMVOC, BC, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, HCH, PCBs, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, HCB				
Not estimated	NA				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
TSP	1.0	kg/[m²· year]	0.1	3	WRAP 2006, MRI 2006
PM_{10}	0.30	kg/[m²· year]	0.03	0.9	WRAP 2006, MRI 2006
$PM_{2.5}$	0.030	kg/[m²· year]	0.003	0.09	WRAP 2006, MRI 2006

Table 3.3 Tier 1 emission factors for uncontrolled fugitive emissions for source category 2.A.5.b Construction and demolition – Non-residential construction

Tier 1 default emission factors					
	Code	Name			
NFR Source Category	2.A.5.b	Construction and demolition – Non-residential construction (all construction except residential construction and road construction)			
Fuel	NA				
Not applicable	NOx, CO, SOx, NH_3, NMVOC, BC, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, HCH, PCBs, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, HCB				
Not estimated	NA				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
TSP	3.3	kg/[m²· year]	0.3	10	WRAP 2006, MRI 2006
PM_{10}	1.0	kg/[m²· year]	0.1	3	WRAP 2006, MRI 2006
$PM_{2.5}$	0.1	kg/[m²· year]	0.01	0.3	WRAP 2006, MRI 2006

Table 3.4 Tier 1 emission factors for uncontrolled fugitive emissions for source category 2.A.5.b Construction and demolition – Road construction

Tier 1 default emission factors		
	Code	Name
NFR Source Category	2.A.5.b	Construction and demolition – Road construction
Fuel	NA	

Not applicable	NOx, CO, SOx, NH_3, NMVOC, BC, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, HCH, PCBs, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, HCB					
Not estimated	NA					
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
TSP	7.7	kg/[m²· year]	0.8	20	WRAP 2006, MRI 2006
PM_{10}	2.3	kg/[m²· year]	0.2	7	WRAP 2006, MRI 2006
$PM_{2.5}$	0.23	kg/[m²· year]	0.02	0.7	WRAP 2006, MRI 2006

3.2.3 Estimation parameters (d, CE, PE and s)

In order to produce acceptable results, a number of calculation parameters have to be set in accordance with country-specific conditions. These parameters are: the duration of the construction (d); the control efficiency of any applied emission reduction measures (CE); the Thornthwaite precipitation-evaporation index (PE); and the soil silt content (s). All these parameters may vary considerably and have a profound influence on the outcome of the methodology. In this section, some guidance is given on how to set these parameters. In addition default values are suggested, in case information is lacking.

Duration of construction (d)

The duration d is the duration of the construction activity, as specified in the building permit for example. This parameter means the total duration of all activities from land clearing and/or demolition to the finishing of the structure. In general, a more complex structure requires a longer construction time. The following average values may be used as default when no country-specific information is available.

Type of construction	Estimated duration (year)
Construction of houses (detached single family, detached two family and single family terraced)	0.5 (6 months)
Construction of apartments (all types)	0.75 (9 months)
Non-residential construction (all construction except residential construction and road construction)	0.83 (10 months)
Road construction	1 (12 months)

Control efficiency of applied emission reduction measures (CE)

Watering of temporary unpaved roads is a simple and effective emission control measure that is widely used in construction in Europe, especially during very dry periods. The effect of watering is the highest directly after spraying and then decreases again as the road surface dries. WRAP, (2006) reports an overall efficiency of about 50% on average. It is assumed that in general watering routinely takes place in heavy construction activities during dry periods, resulting in an overall emission reduction of 50%. This translates to the following control efficiencies by type of construction, which may be used as default for Europe in cases where no country-specific information regarding building practices is available.

Type of construction	Fractional overall control efficiency (-)
Construction of houses (detached single family, detached two family and single family terraced)	0
Construction of apartments (all types)	0

European Environment Agency

Category		Title
NFR	1.A.2.g vii	Mobile Combustion in manufacturing industries and construction
	1.A.4.a.ii	Commercial/institutional: Mobile
	1.A.4.b ii	Residential: Household and gardening (mobile)
	1.A.4.c ii	Agriculture/Forestry/Fishing: Off-road vehicles & other machinery
	1.A.4.c iii	Agriculture/Forestry/Fishing: National fishing
	1.A.5.b	Other, Mobile (inc. military, land based and recreational boats)
SNAP	0808	Other mobile sources and machinery — Industry
	0809	Other mobile sources and machinery — Household and gardening
		Other mobile sources and machinery — Agriculture
	0806	Other mobile sources and machinery — Forestry
	0807	Other mobile sources and machinery — Military
	0801	
ISIC		
Version	Guidebook 2016	
Update History	May 2017	For details of past updates please refer to the chapter update log available at the online Guidebook website

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2.9 Controls

Gaseous emissions can be controlled by two mechanisms: control of the combustion technology which can be combined with exhaust gas treatment and control of the fuel quality. Both these measures are used for non-road mobile machinery (NRMM).

A number of technical control technologies are available, including exhaust gas recirculation (EGR) and selective catalytic reduction (SCR) to control NO_x emissions, and diesel particulate filters (DPF) to control PM emissions. These technologies are better developed for the diesel engines used in road transport (particularly powering heavy-duty vehicles) and are currently only rarely used in conjunction with NRMM.

Within Europe emissions from NRMM are regulated by the non-road mobile machinery directives. The emission directives list specific emission limit values (g/kWh) for CO, VOC, NO_x (or VOC + NO_x) and TSP, depending on engine size (kW for diesel, ccm and kW for gasoline) and date of implementation (referring to engine market date). Stage V legislation, currently being finalised, includes further reductions of emission limits, and also introduces emission limits for particle numbers, to control emissions of ultrafine particulates.

For diesel, Directives 97/68/EC and 2004/26/EC relate to non-road machinery other than agricultural and forestry tractors and the directives have different implementation dates for machinery operating under transient and constant loads. The latter directive also comprises emission limits for railway machinery. For tractors the relevant directives are 2000/25 and 2005/13. For gasoline, Directive 2002/88/EC distinguishes between hand-held (SH) and non hand-held (NS) types of machinery. New Stage V emission limits (EU, 2016)) include a wider range of machinery types, and in particular machinery at the low and high ends of the power rating range.

In recent years there has been a recognition that testing emission performance by using portable emission measurement systems provides an improved assessment of real-world emissions. The Stage V documentation, refers to the future adoption of such a testing methodology (see Chapter 2.7.2).

The following tables provide an overview of the EU emssion limits implemented through different Directives. The tables present emission limits for diesel and petrol engined non-road mobile machinery respectively.

Table 2-3 Overview of EU directive requirements relevant for emissions control from diesel-fuelled non-road machinery

Stage	Engine size	CO	VOC	NO_x	VOC+NO_x	PM	Diesel machinery			Tractors	
							EU Directive	Implement. date		EU Directive	Implement. Date
	[kW]			[g/kWh]				Transient	Constant		
Stage I											
A	130<=P<560	5	1.3	9.2	-	0.54	97/68	1/1 1999	-	2000/25	1/7 2001
B	75<=P<130	5	1.3	9.2	-	0.7		1/1 1999	-		1/7 2001
C	37<=P<75	6.5	1.3	9.2	-	0.85		1/4 1999	-		1/7 2001
Stage II											
E	130<=P<560	3.5	1	6	-	0.2	97/68	1/1 2002	1/1 2007	2000/25	1/7 2002

F	75<=P<130	5	1	6	-	0.3		1/1 2003	1/1 2007		1/7 2003
G	37<=P<75	5	1.3	7	-	0.4		1/1 2004	1/1 2007		1/1 2004
D	18<=P<37	5.5	1.5	8	-	0.8		1/1 2001	1/1 2007		1/1 2002
Stage IIIA											
H	130<=P<560	3.5	-	-	4	0.2	2004/26	1/1 2006	1/1 2011	2005/13	1/1 2006
I	75<=P<130	5	-	-	4	0.3		1/1 2007	1/1 2011		1/1 2007
J	37<=P<75	5	-	-	4.7	0.4		1/1 2008	1/1 2012		1/1 2008
K	19<=P<37	5.5	-	-	7.5	0.6		1/1 2007	1/1 2011		1/1 2007
Stage IIIB											
L	130<=P<560	3.5	0.19	2	-	0.025	2004/26	1/1 2011	-	2005/13	1/1 2011
M	75<=P<130	5	0.19	3.3	-	0.025		1/1 2012	-		1/1 2012
N	56<=P<75	5	0.19	3.3	-	0.025		1/1 2012	-		1/1 2012
P	37<=P<56	5	-	-	4.7	0.025		1/1 2013	-		1/1 2013
Stage IV											
Q	130<=P<560	3.5	0.19	0.4	-	0.025	2004/26	1/1 2014	1/1 2014	2005/13	1/1 2014
R	56<=P<130	5	0.19	0.4	-	0.025		1/10 2014	1/10 2014		1/10 2014
Stage V[A]											
NRE-v/c-7	P>560	3.5	0.19	3.5		0.045	2016/1628		2019		2019
NRE-v/c-6	130≤P≤560	3.5	0.19	0.4		0.015			2019		2019
NRE-v/c-5	56≤P<130	5.0	0.19	0.4		0.015			2020		2020
NRE-v/c-4	37≤P<56	5.0			4.7	0.015			2019		2019
NRE-v/c-3	19≤P<37	5.0			4.7	0.015			2019		2019
NRE-v/c-2	8≤P<19	6.6			7.5	0.4			2019		2019
NRE-v/c-1	P<8	8.0			7.5	0.4			2019		2019
Generators	P>560	0.67	0.19	3.5		0.035			2019		2019

A = For selected machinery types, Stage V includes emission limit values for particle number.

Tier 1 emission factors				
Fuel	NFR sector	Pollutant	Units	Emission factor
		Nickel	mg/kg fuel	0.07
		Selenium	mg/kg fuel	0.01
		Zinc	mg/kg fuel	1.00
		Benz(a)anthracene	µg/kg fuel	75
		Benzo(b)fluoranthene	µg/kg fuel	40
		Dibenzo(a,h)anthracene	µg/kg fuel	10
		Benzo(a)pyrene	µg/kg fuel	40
		Chrysene	µg/kg fuel	150
		Fluoranthene	µg/kg fuel	450
		Phenanthene	µg/kg fuel	1200

Notes:

For land based military emissions, use emission factors for 1.A.2.g.vii as no other data are available.

Black carbon: For agriculture, forestry, industry and gasoline/LPG machinery, the following BC fractions of PM (f-BC) are used: 0.57, 0.65, 0.62 and 0.05, c.f. Appendix E.

SO_2: The emissions of SO_2 are estimated by assuming that all sulphur in the fuel is transformed completely into SO_2 using the formula:

$$E_{SO2} = 2 \sum_j \sum_l k_{S,l} \, b_{j,l}$$

where

$k_{S,l}$ = weight related sulphur content of fuel of type l [kg/kg],

$b_{j,l}$ = total annual consumption of fuel of type l in [kg] by source category j.

For the actual figure of $b_{j,l}$ the statistical fuel consumption should be taken, if available.

PM: These PM factors represent total PM emissions (filterable and condensable fractions)

Lead: Emissions of lead are estimated by assuming that 75 % of lead contained in the fuel is emitted into air. The formula used is:

$$E_{Pb} = 0.75 \sum_j \sum_l k_{Pb,l} \, b_{j,l}$$

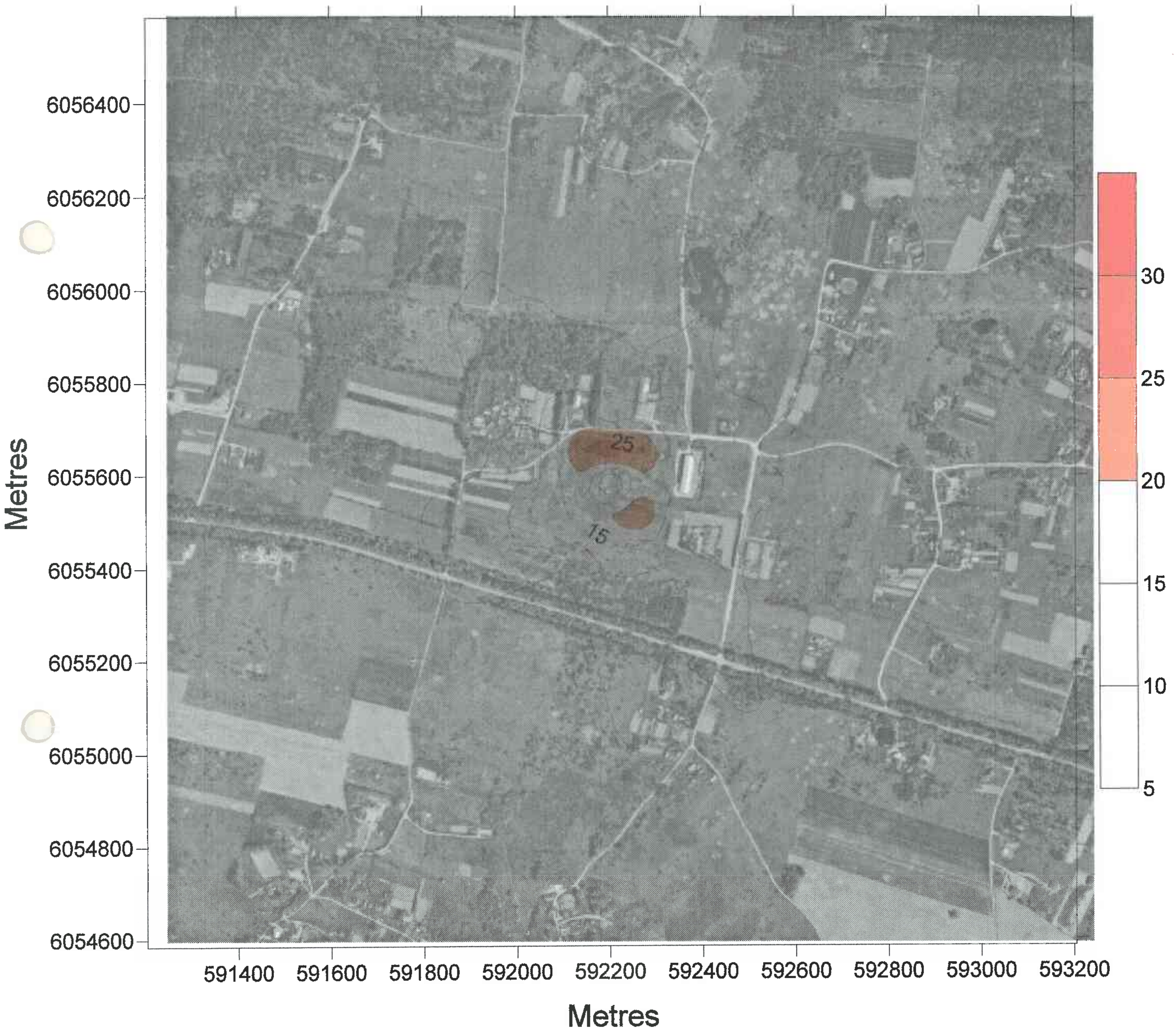
where

$k_{Pb,l}$ = weight-related lead content of fuel of type l in [kg/kg].

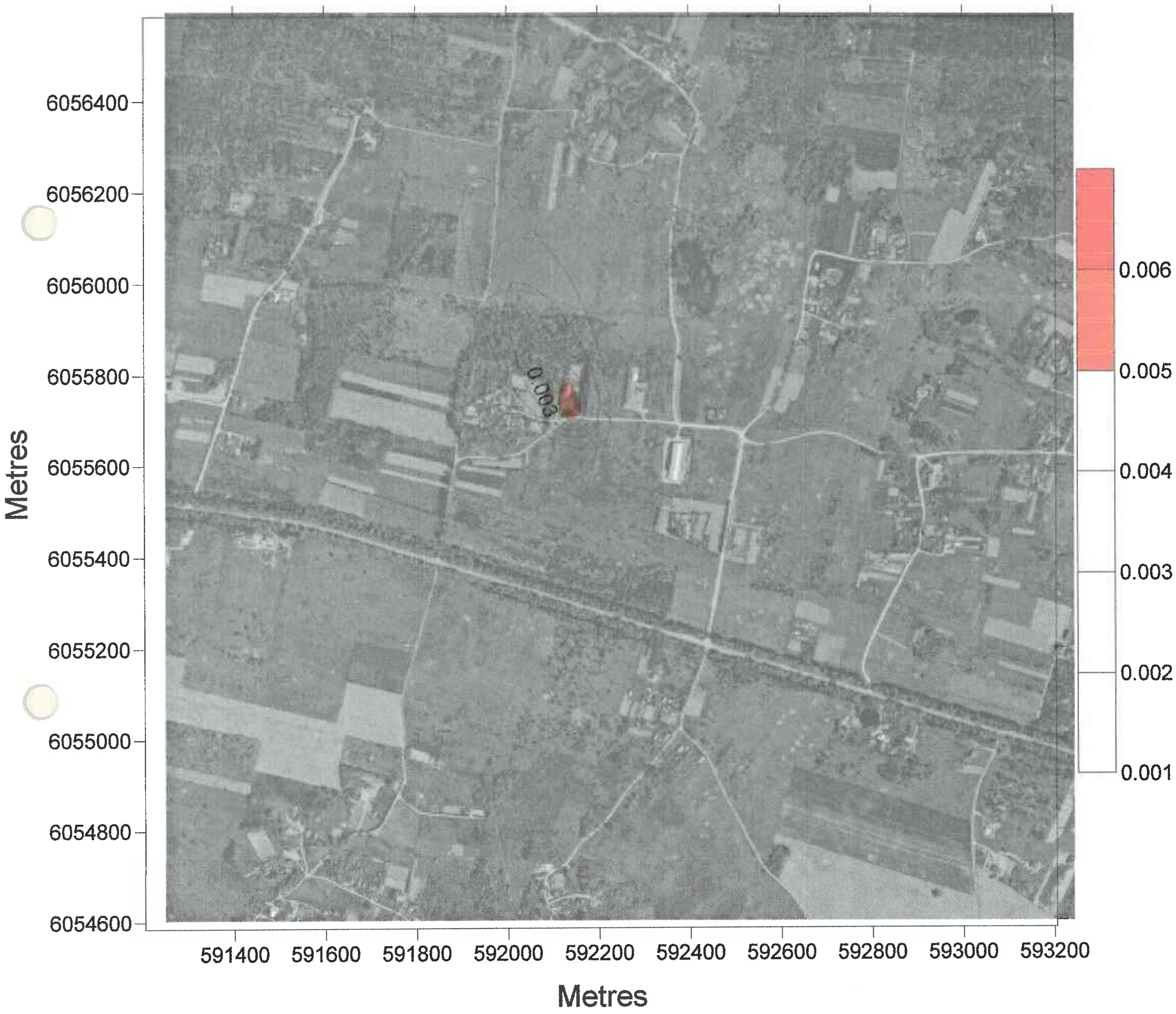
Since the simple methodology outlined above averages over different types of engines, using different types of fuels, it can provide only broad estimates at best.

ORO TARŠA GRIOVIMO METU (BE FONO)

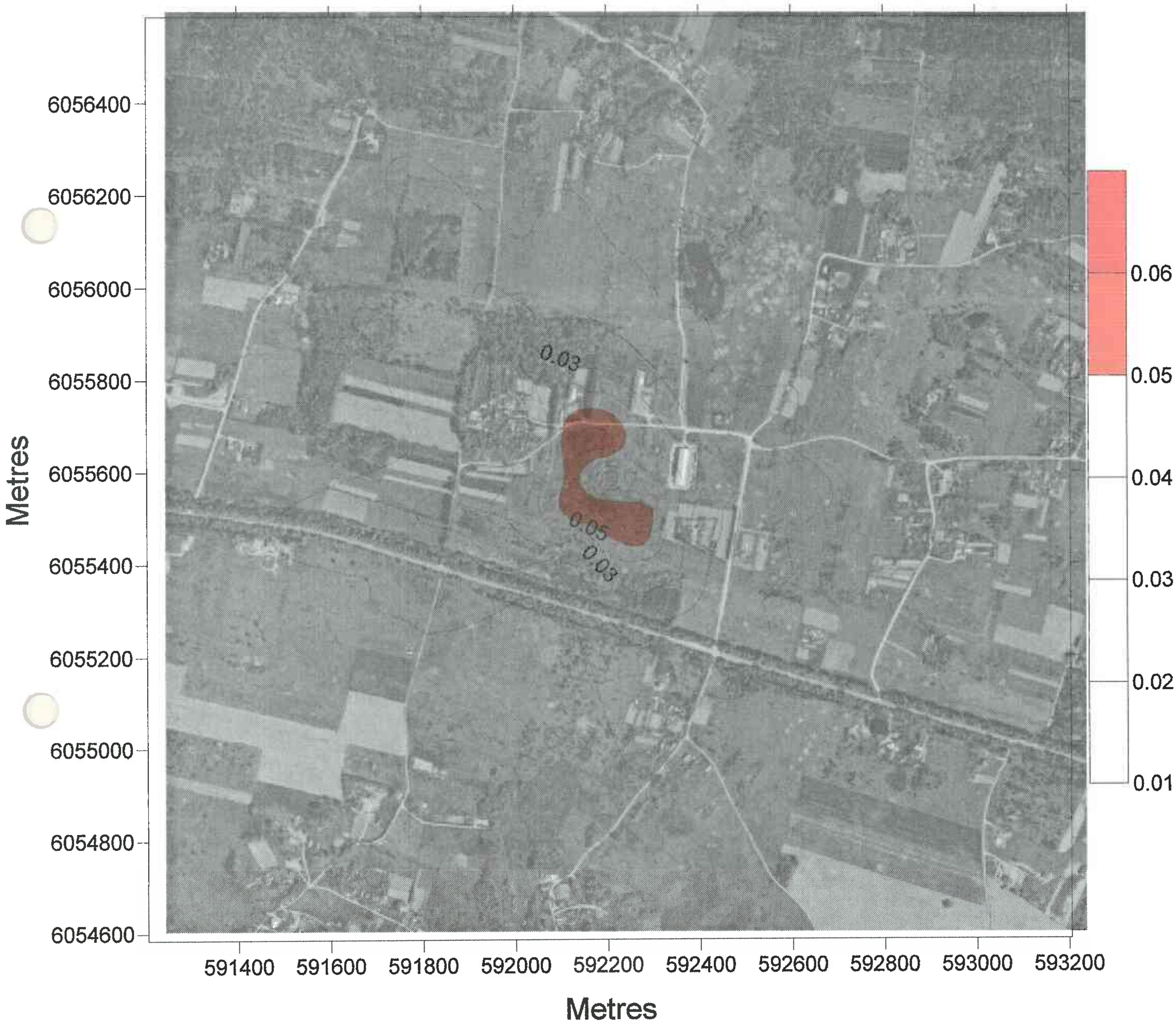
P100.00µg/m³ CO BE FONO Z=1.5m r 8hrs



P 98.50µg/m³ KD (išskyrus deginant) BE FONO Z=1.5m - 1hr



P100.00µg/m³ KD (išskyrus deginant) BE FONO Z=1.5m - 24hrs



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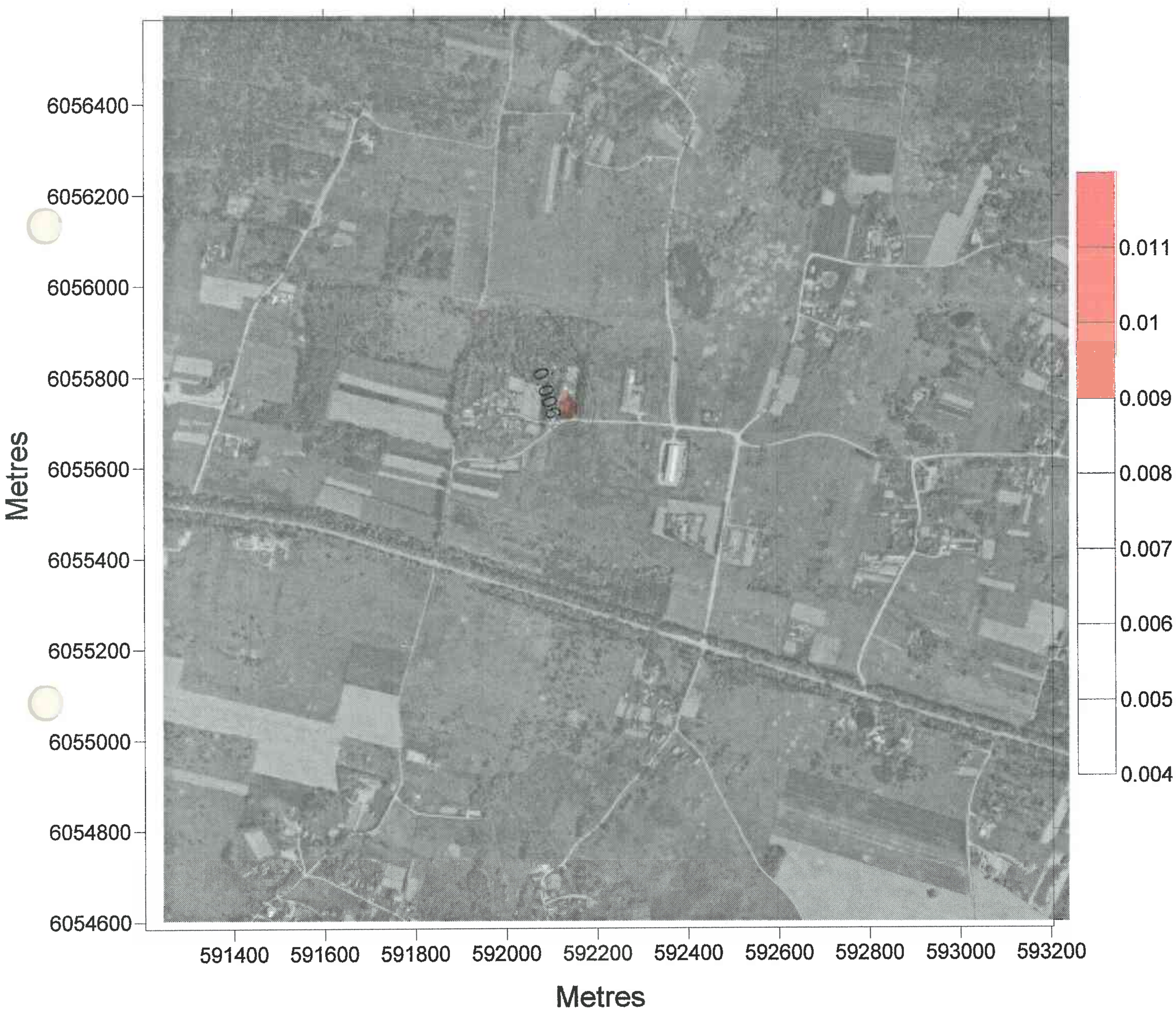

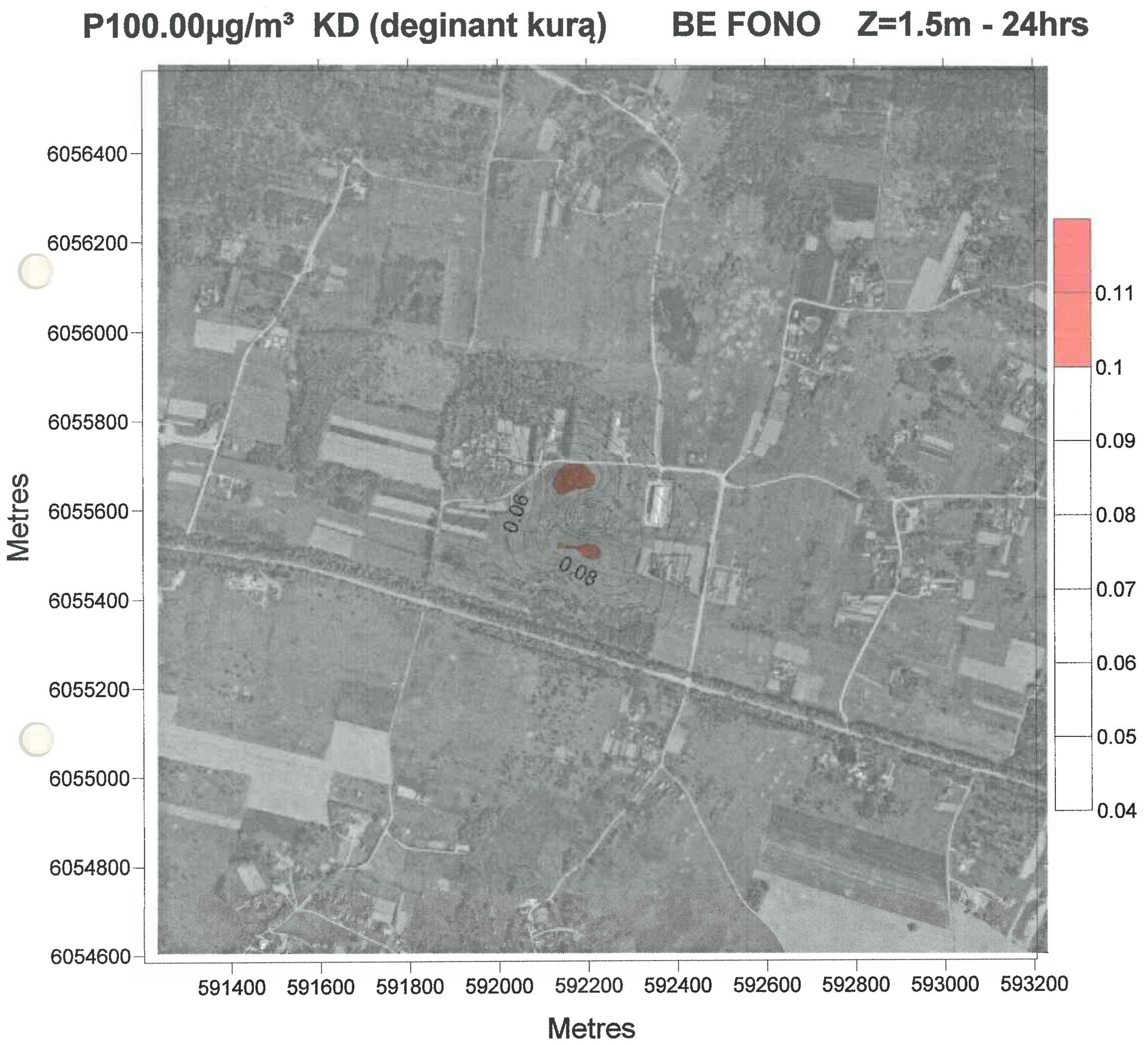
P100.00µg/m³ KD (deginant kurą) BE FONO Z=1.5m - 24hrs
6056400
6056200
6056000
6055800
6055600
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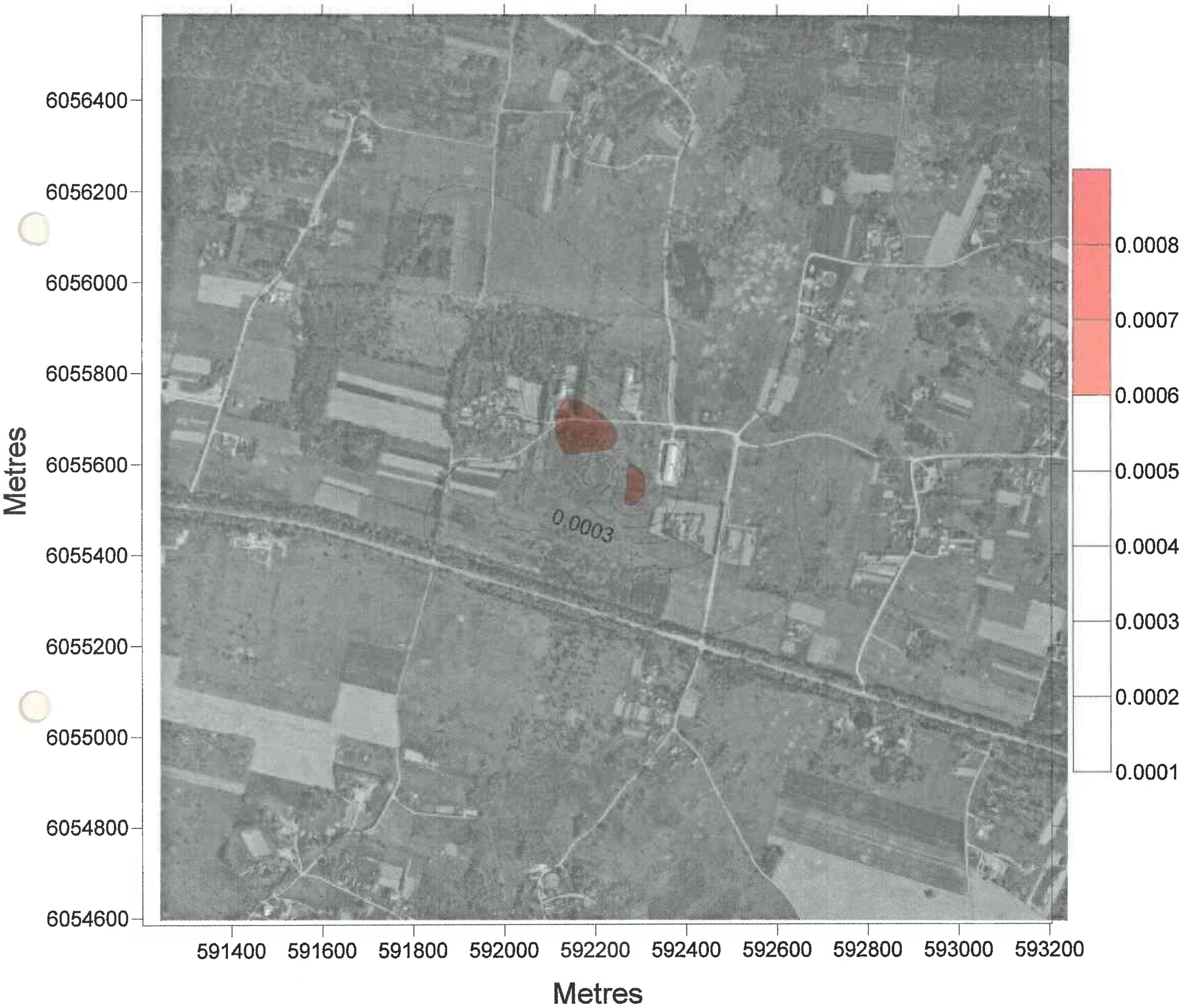
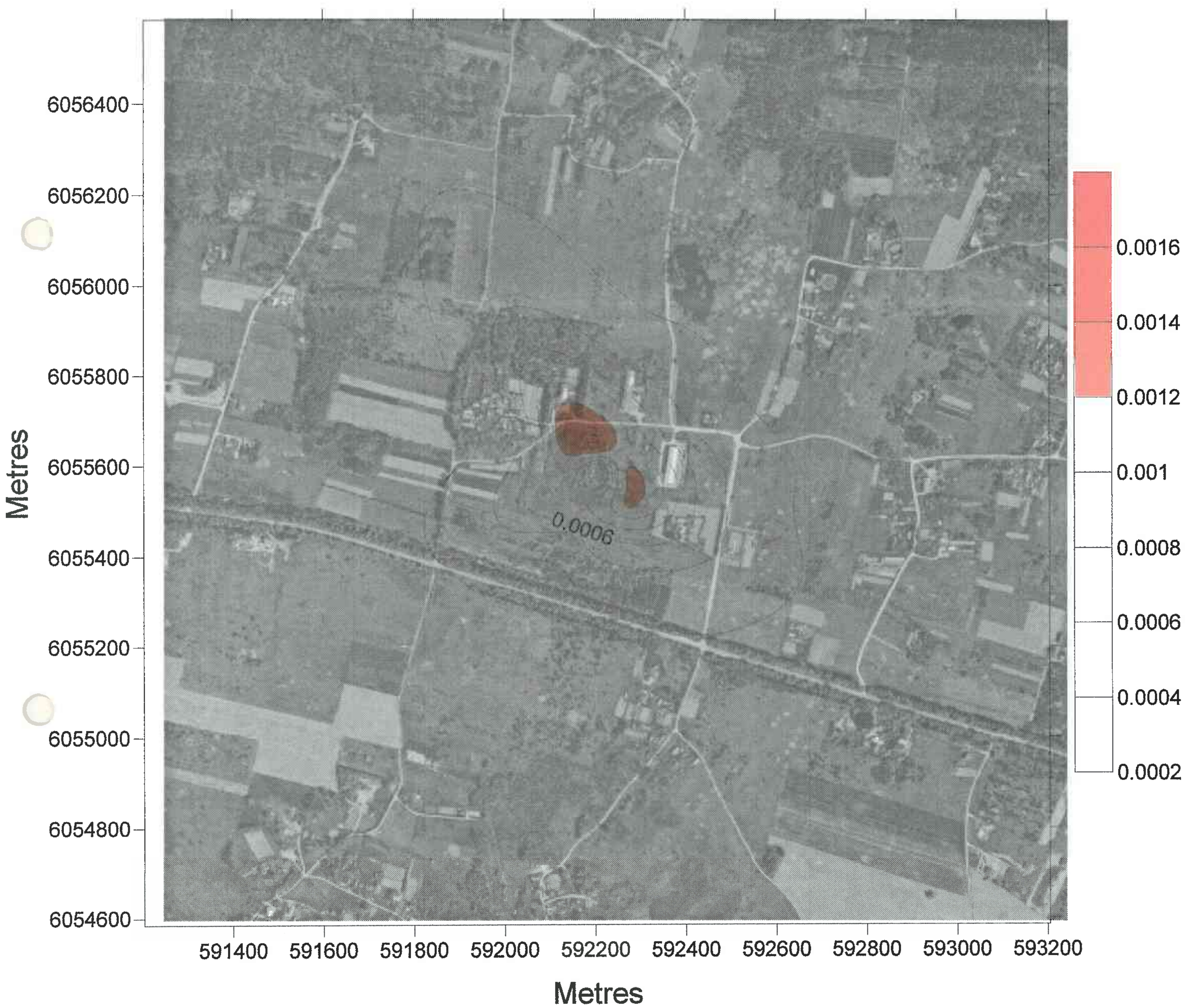
6055200
6055000
6054800
6054600
Metres
591400
591600
591800
592000
592200
592400
592600
592800
593000
593200
Metres
0.06
0.08
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04

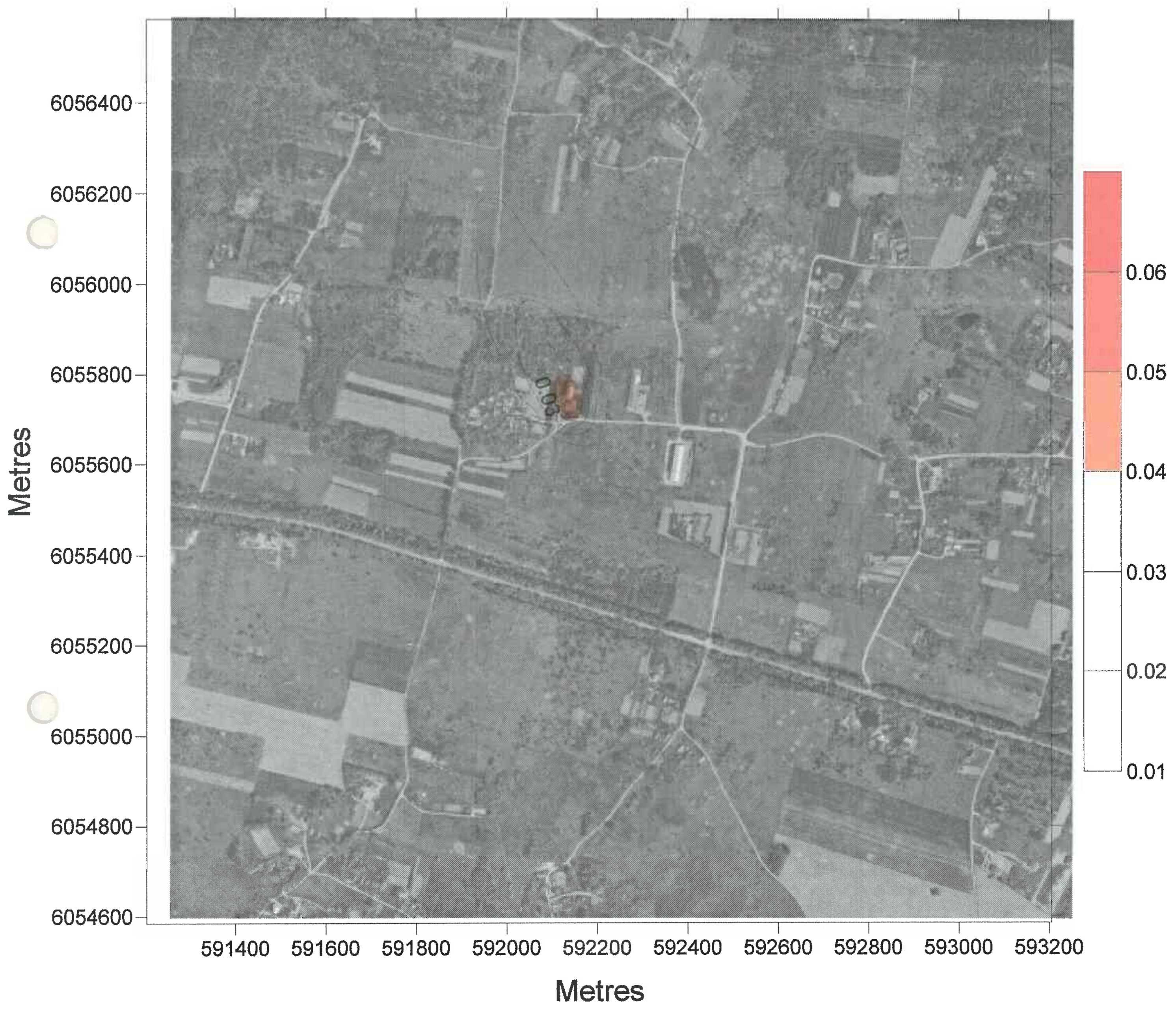
LTConc µg/m³ KD2.5 BE FONO Z=1.5m - 1hr



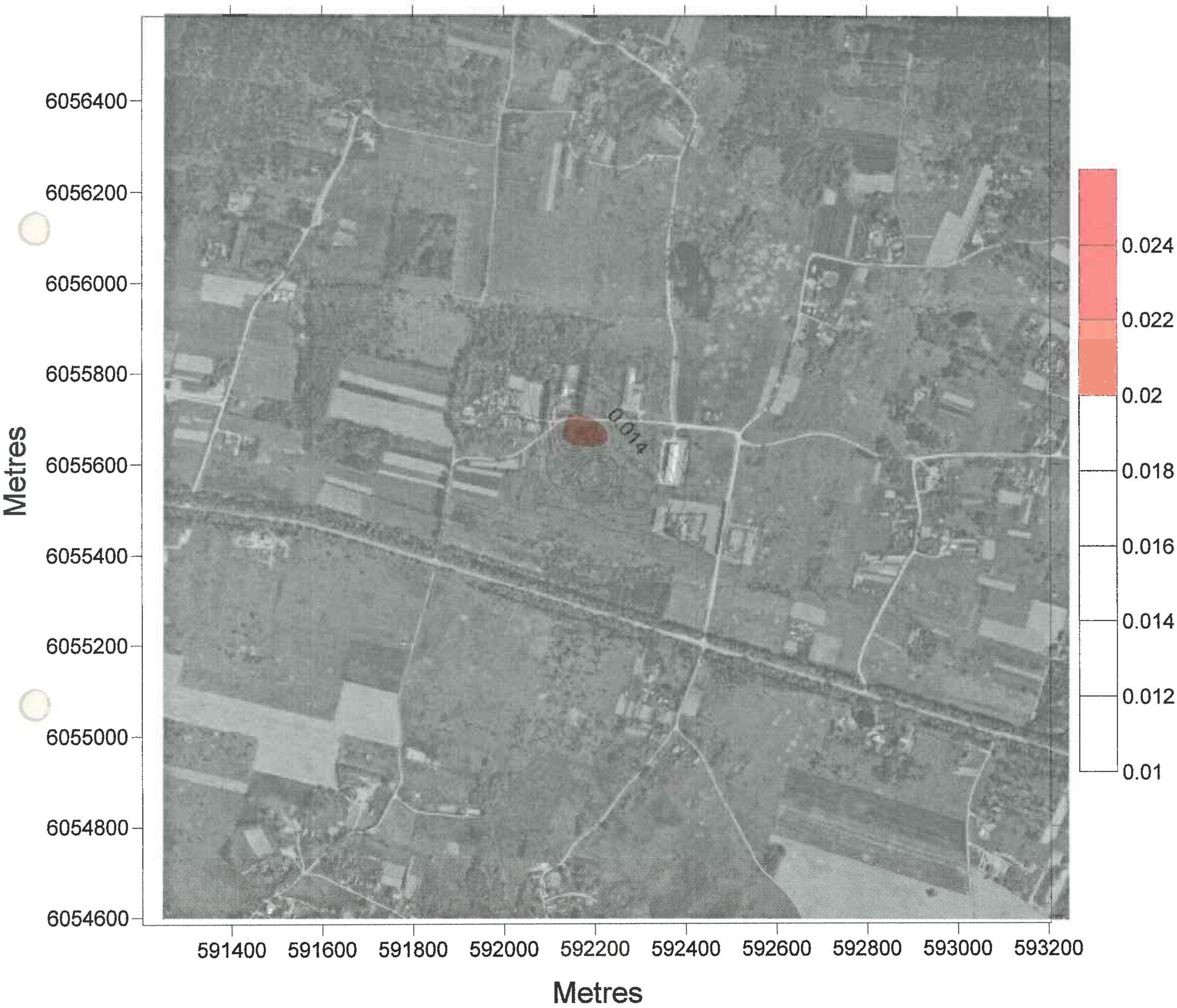
LTConc µg/m³ KD10 BE FONO Z=1.5m - 1hr



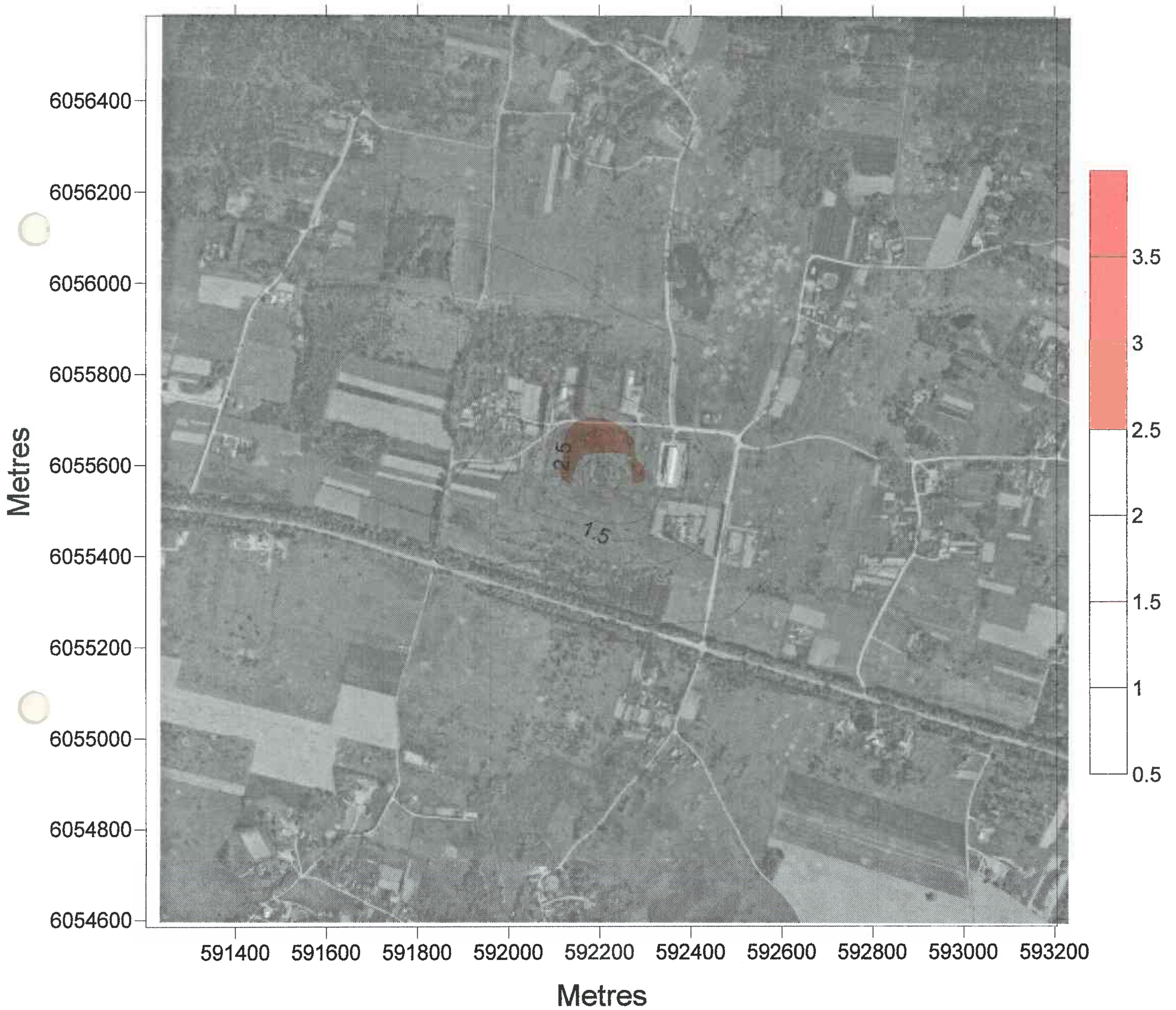
P 98.50µg/m³ LOJ BE FONO Z=1.5m - 1hr



LTConc µg/m³ NOx BE FONO Z=1.5m - 1hr



P 99.80µg/m³ NOx BE FONO Z=1.5m - 1hr



P 99.20µg/m³ SO2 BE FONO Z=1.5m - 24hrs