Edinburgh, Scotland
EURONOISE 2009
October 26-28

Enjoy the silence

Ivonne Verstappen[a]
Norconsult AS, Sandvika, Norway

Eirik Wiggen [b]
Norconsult AS, Sandvika, Norway

ABSTRACT

Maintaining tranquil areas is important for the well-being of people as most people like or even need, to get away from the constant buzz of everyday life now and then. Consequently, every city or county encounters conflicts when they want to develop areas for housing, infrastructure or industry since these generally result in an increase of noise levels. But avoiding such developments as a preventative measure is also not desirable, so it is necessary to find a balance. Maintaining enough quiet areas in Norway might seem an easy task because it's not a densely populated country. However, around the bigger cities the opposite is actually true.

In this article, we consider development opportunities in a nature reserve southeast of Oslo, which is part of the Oslo Marka. The Marka is a large wilderness area around Oslo, where maintaining tranquillity is an important requirement. Motorway E6 crosses parts of this area, which means that a noticeable noise level is already present. In addition, there are plans to develop an industrial area along this motorway. We evaluate the noise levels in the present situation in relation to area guidelines. Next, we take a closer look at the value of this nature reserve, and define what is important for such an area. Is it a problem if you can hear the motorway or will people enjoy being outside nevertheless? Finally, we discuss the possibilities for development in the area. We look at noise-related problems that could arise and discuss how they can be handled.

1. INTRODUCTION

The tranquil area we will evaluate in this paper is roughly located between Oslo and Ski municipality. It is important to determinate the value of this area as a recreational area for the residents of the nearest residential areas, in relation to the current noise levels. Figure 1 below shows the area (in pink) where the new industrial buildings are being planned. The area is part of the Oslo Marka, which is the capitals most important recreational and tranquil area. The Marka is roughly indicated as the green area in figure 1. The most important part of the tranquil area is located on the east side of the motorway.

[a] Email address. ivonne.verstappen@norconsult.com
[b] Email address. eirik.wiggen@norconsult.com

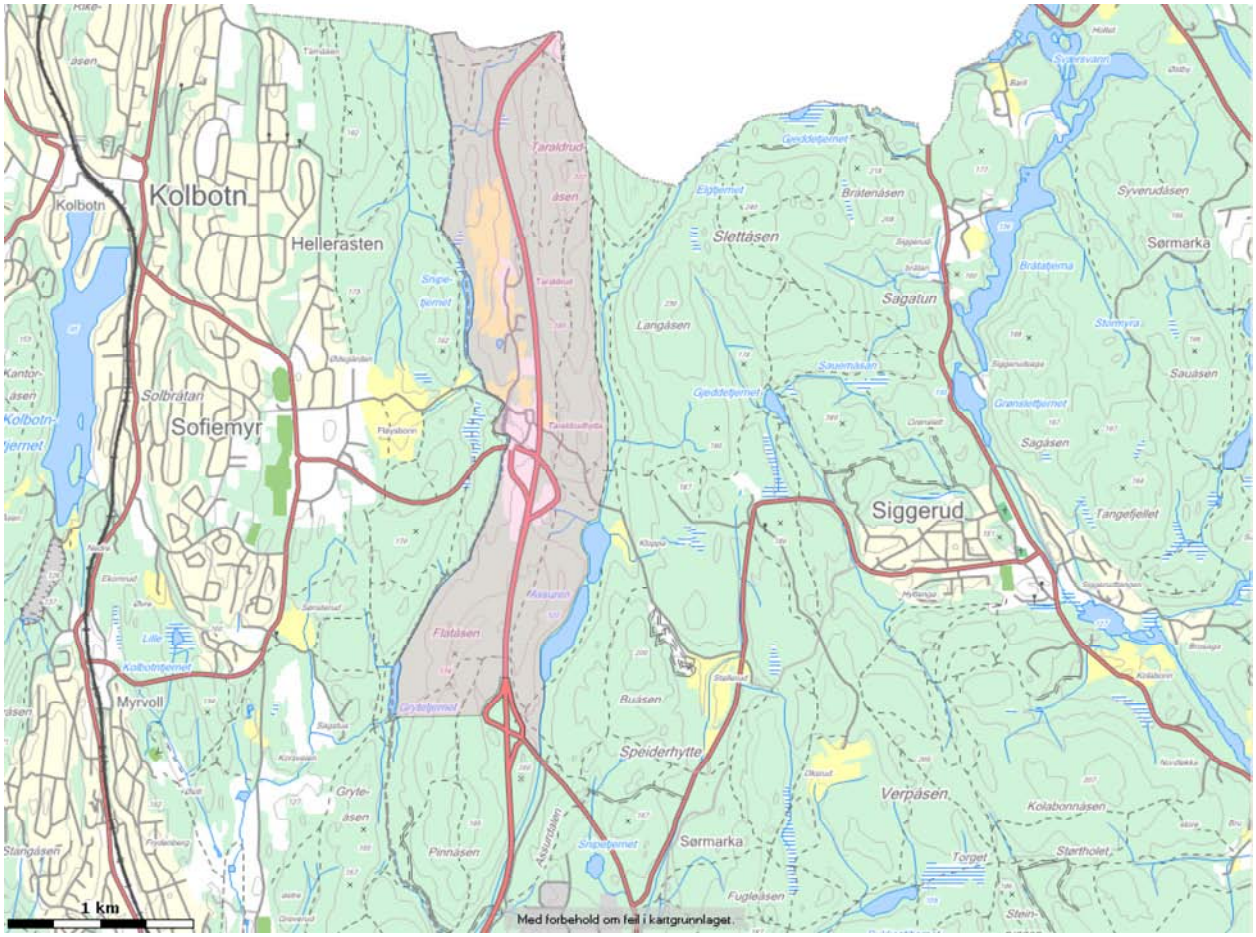

Figure 1: Index map with plan area.

Different forms of outdoor recreation (so called friluftsliv[1]) are important for virtually the entire Norwegian population. Approximately 90% of the population exercise outdoor activities one or more times a year, aimed at having a change of environment and experiencing nature. Surveys show that to experience nature's silence and peace and to come out in the fresh nature, away from noise and pollution is an important reason to go hiking[2]. Physical activity is one of the most important health factors. If you live in the central areas further away from nature, access to parks is important to achieve some of the same experiences.

2. PRESENT SITUATION

The evaluation we conduct will provide a basis for making a decision if the plan area should remain a recreational area and a part of the Marka, or if parts of the area can be used as an industrial area. An important consideration is what the value as a tranquil area means in this particular case. To find out we have first of all carried out noise calculations for the present situation. The results are presented in the figure below. Calculations are performed for the current situation in 2009, for both the day- and evening time, for a receiver height of 2 meters above the ground.

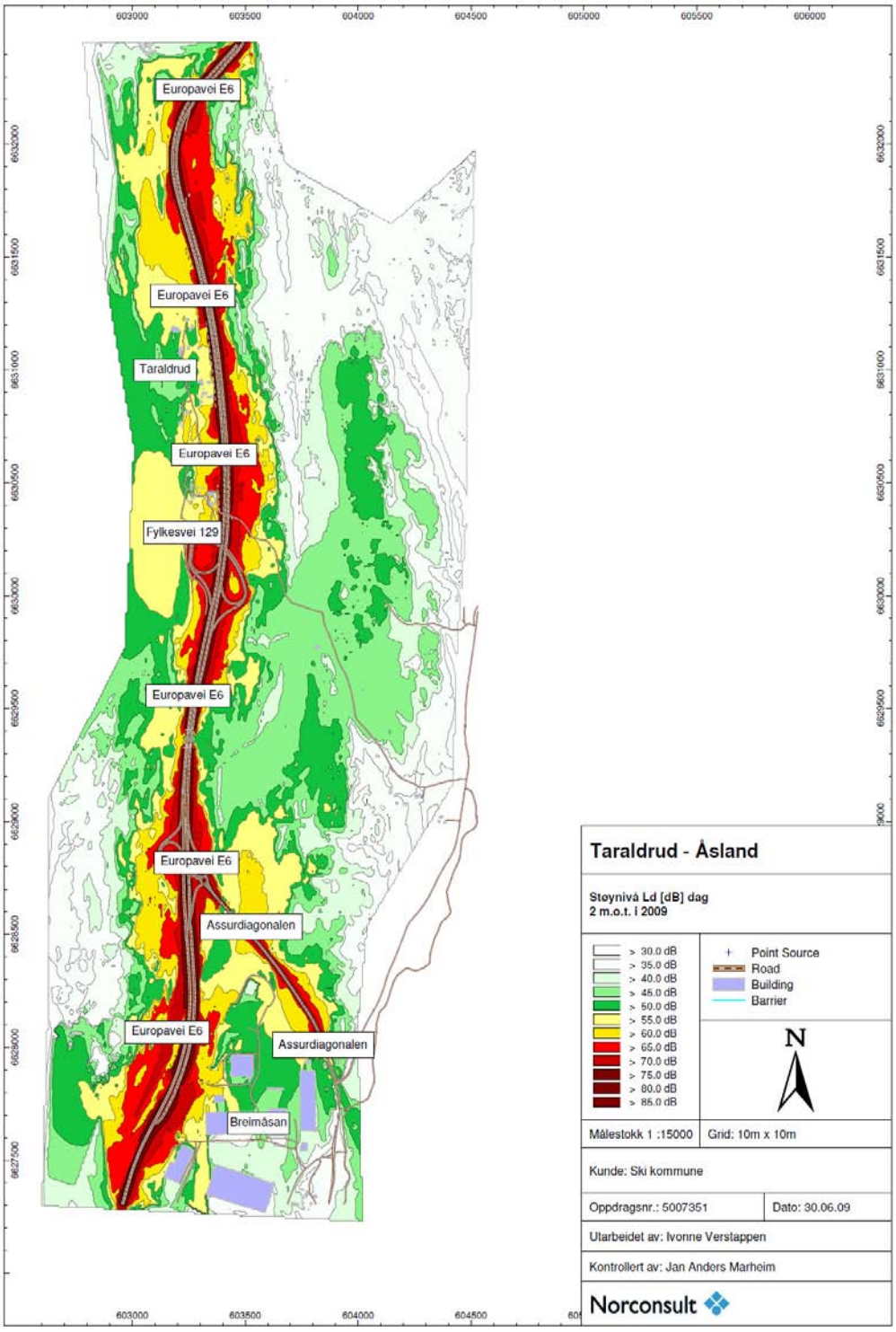

Figure 2: Current situation, L day 2 meter over terrain.

We have used different colours to show the relevant noise levels, important in relation to tranquil areas are:

- Dark green: noise level between 50 and 55 dB
- Green: noise level between 45 and 50 dB
- Light green: noise level between 40 and 45 dB
- White: noise level below 40 dB

The results show that the noise contribution from the motorway is higher on the west side of the road than on the east side of the road. That has to do with the terrain. On the east side a mountain ridge, Taraldrudåsen, acts as a natural noise barrier. The average noise level 200 m east of the motorway is lower than 55 dB and large parts have noise levels lower than 45 dB. Noise levels below 40 dB which are desired for tranquil areas only occur in few parts of the area. In the evening (between 7pm and 11pm) the noise level is slightly lower than during the day (between 7am and 7pm), but during the day slightly higher noise levels are easily accepted.

3. FRAMEWORK

The question is how to appraise the occurring noise levels in relation to the desired use as a tranquil area. For that we can make use of the legal framework, but also more qualitative factors are important.

A. General

Since 2005 a guideline for handling noise in relation to land use planning (Retningslinje for behandling av støy i arealplanlegging), T-1442, is implemented in Norway[3]. In this guideline different situations regarding noise are described, mostly related to development of new sources or new receiver areas. Additionally this guideline focuses on the evaluation of tranquil areas. This guideline has however no legal status until it is part of a zoning plan.

The absence of noise is a prerequisite for making use of the full value of outdoor recreation areas and cultural sites. What levels are perceived as annoying depends on the type of area you are in, and the use of the area that is desirable. Local governments should therefore avoid locating new sources in the vicinity of tranquil areas so that valuable tranquil areas won't disappear or be reduced.

In T-1442 you will find a list with recommended noise levels for different types of areas[3]. When there is a plan for establishment of a new project in the vicinity of tranquil areas, this table provides a guideline for the use of noise limits for different type of areas. You can also use it to match an occurring noise level to a possible land use.

Table 1: *Recommended noise limits in the various types of outdoor and recreational areas.*

Area	Recommend noise limits L_{pAeq}
Urban parks and other recreation areas	50 - 55 dB
Hiking trails, city parks, cemetery	45 – 50 dB
Local recreational areas, near sea and rivers	35 – 40 dB

In larger unaffected natural areas, such as national parks, natural areas in the mountains and the core areas of the Oslo Marka all foreign audible sound are in principle, undesirable. When establishing new noisy activities, it should be made visible what the effect of the new activities on these tranquil areas is.

B. Markaloven

On September 1st 2009 a new law will come into force, the Markaloven[4], which applies to the natural areas in Oslo and surroundings known as the Marka. This law will ensure the Marka as a unique resource for outdoor activities, nature and public health. The Marka is perhaps the most important park in the country and it provides outdoor experiences for many people. It is

very important that this will still be available for future generations. In combination with the law a map[5] is issued which determines the border of the Marka, see figure 3. In darker green the area within the Marka is shown, bordered with a red line, grey shows the built-up area of Oslo and surroundings.

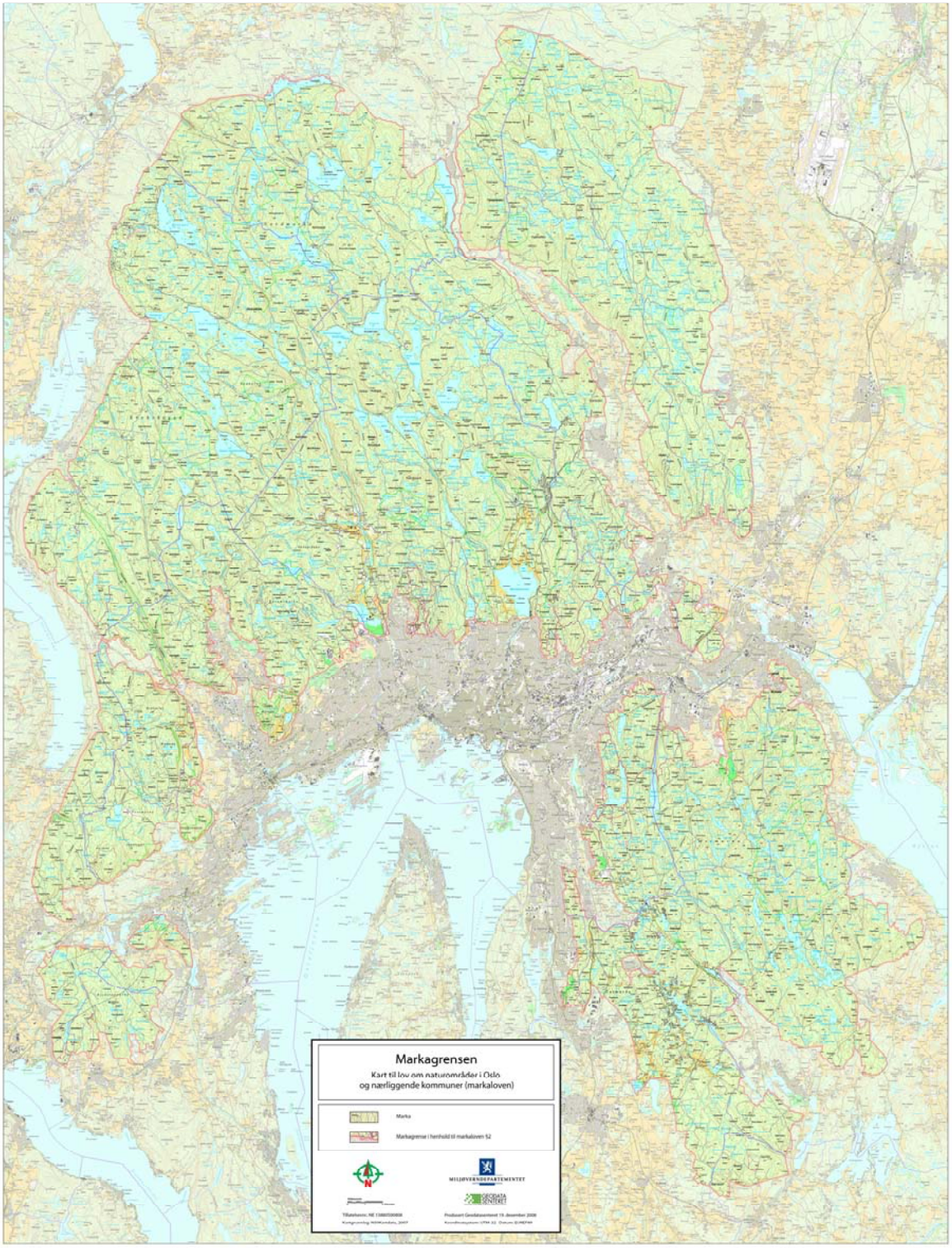

Figure 3: Map with Marka (darker green) border (red line).

The law introduces a general prohibition on building in the Marka. No building activities can be carried out in the Marka without permission in accordance with the Markaloven. Although not mentioned directly in the law, the absence of noise, or the limitation of noise, is a fundamental prerequisite to ensure the area's value for outdoor recreation and nature.

C. Qualitative assessment

In the guideline T-1442 it is recommended that quiet areas that are important for nature and outdoor interests are marked as green zones in zoning plans[3]. Besides calculating noise levels, also a qualitative assessment of the areas is desirable. Not all areas in the green zones need to be completely silent. For example, one should be able to accept that parts of cycle routes and ski trails have substantial noise levels. Inside the Marka it won't be possible to maintain complete silence near for example ski resorts, motorsport tracks or shooting ranges. At the same time, such resorts can be important for the use and availability as a recreational area. Because these often act as a gateway to the Marka through the provision of parking and public transport.

Other factors that could be included in the evaluation of tranquil areas are:

- At what times (of the day / week / year) is the area used for outdoor activities or other noise sensitive activities, in relation to the presence of noise?
- How important is noise for the activity that is carried out in the area?
- How extensive is the use of the area, and what options exist in the surroundings?
- What is the function of the area; areas for stationary stay like camping grounds are more sensitive to noise than areas where one passes through.
- Degree of noise nuisance in the area related to specific needs for silence.
- Degree of untouched nature.

Since the qualitative aspects have such a prominent position, it will often not be possible or desirable to provide permanent, strict noise limits for the tranquil areas. However, when new noise sources are introduced that affect tranquil areas, municipalities can set limit values based on the values in table 1.

4. FUTURE SITUATION

A. Calculations

The noise calculations for the present situation, as shown in chapter 2, are based on traffic volumes for the present situation from The Norwegian Public Roads Administration (Statens Vegvesen). For the traffic distribution over the day the standard distribution conforming T-1442 is used[3]. Basis is the current 4-lane motorway, with speed limit 90 km / h. For the future situation in 2020 estimated traffic numbers are used. Future developments in the surroundings are taken into account in these numbers. Furthermore are various plans and drawings used, including a 3D terrain model. Existing noise barriers on the west side of the E6 are included in the model. The calculations are conducted in line with the Nordic calculation method for road traffic[6] by using the program CadnaA[7] and presented in the form of noise maps. The calculations are performed for a receiver height of 2 meters above the terrain. Because activities take place both during the day as well as in the afternoon / evening, calculations are conducted for both periods. In this article we will present only the noise maps for the situation in the daytime.

B. Results

Without the development of the industrial area, traffic numbers will increase based on a global increase of traffic from approximately 33.100 cars per day in 2009 to approximately 46.800 cars

in 2020. This means an increase in noise level of approximately 1.5 dB. When also the industrial area is developed traffic numbers will increase from approximately 33.100 cars in 2009 to approximately 52.700 in 2020. This means a total increase in noise level of approximately 2.0 dB. Figure 4 shows the results for the future situation with the global increase of traffic, but without the development of the industrial area.

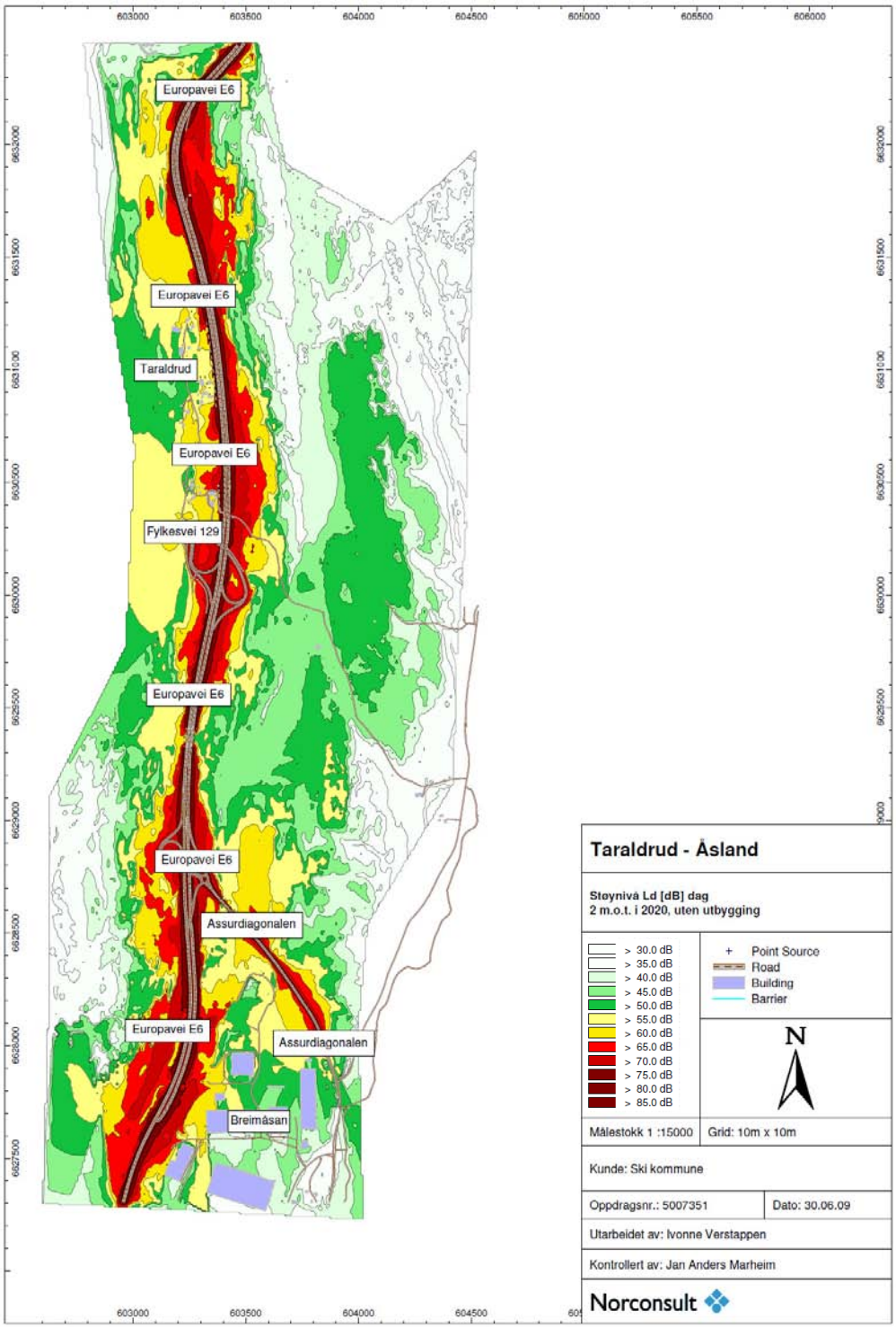

Figure 4: Future situation, without industrial site, L day 2 meter over terrain.

Figure 5 shows the results for the future situation with the global increase of traffic in combination with the effect of the development of the industrial area. This contains not only an extra increase in traffic but also an alternation of the terrain.

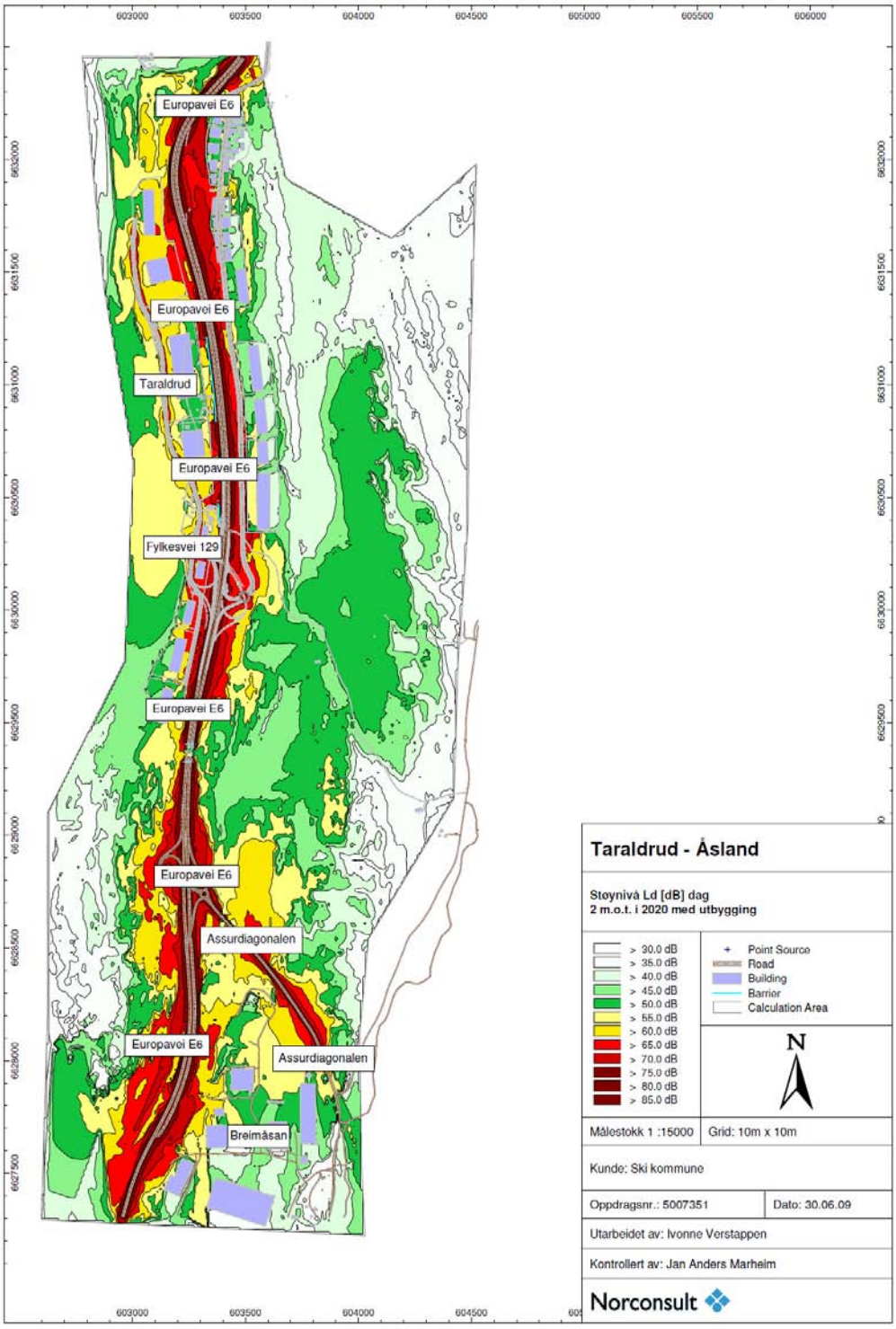

Figure 5: Future situation, with industrial site, L day 2 meter over terrain.

The results in figure 4 and 5 show that the noise contribution from the motorway is still higher to the west side of the road than to the east side of the road. The mountain ridge, Taraldrudåsen,

still acts as a natural noise barrier, despite the terrain alternations. In addition, also the new commercial buildings act as noise barriers, especially on the east side of the road. Noise levels increase compared to the current situation, but this has mostly to do with the overall traffic increase as shown in figure 4.

5. EVALUATION

The area is mainly used as a recreational area of the residents in residential areas situated to the north and west. When you compare the area's location to the definitions used in table 1, it should be placed in the category "local recreational areas", where the recommended noise level is 35-40 dB. But it is important to take into account the different uses and different user groups of this specific area.

An important user group is those who use this area for traditional outdoor pursuits, where the silence (the absence of noise) is an essential quality. This usually contains trips out in the forest, where enjoying the silence is important. These trips can also have special purposes, such as picking berries and mushrooms, studying nature's bird and animal life or swimming. Another important user group is those who use the area for different exercise / training purposes, on foot, by bike or on skis. For these people noise tolerance will often be much higher, since the purpose of the trip is completely different. An extreme example is those running with headphones.

This shows that it is not easy to make a clear assessment of how the area's value as a recreational area is affected by traffic noise from the motorway and by the future developments. Is the main purpose exercise / training, then an increase of noise will be not so important or plague some. For those user groups the noise levels in the current situation are in accordance with their use.

But for outdoor activities more generally, the value of the area is already in the present situation significantly reduced, when you compare it to the recommended noise limits. Large parts of the area have noise levels of 40 dB, which are not desirable for a recreational area. In relation to the limit values this area matches the description "city parks" with noise levels between 45 and 50 dB. If one agrees that the most important use of this area is "local recreational areas", the noise level in the current situation should be in accordance with this. Moreover, an increase of noise levels for the future is not desired at all.

Calculations show that a global increase in traffic in this area means an increase in noise level of approximately 1.5 dB. Typically, increases of more than 3 dB are noticeable, but because of the function as "local recreational areas" an increase of 1.5 dB is probably noticeable here.

Large areas on the west side of the motorway have noise levels between 45 and 50 dB. In the current situation, you can find areas on the east side of the road with noise levels below 40 dB, but with increased traffic, only small areas with noise levels below 40 dB remain.
Development of the industrial area has however not really a negative impact on the experience of the area, since the alternations on the terrain in combination with the new buildings continue to provide a good noise barrier to the east.

Also on the west side of the motorway, the new buildings provide a fairly good noise barrier. However, since there are also plans for a new entrance road, the noise contribution increases slightly. The total effect is almost unchanged. One could change the position of the road and the new buildings, thereby achieving a greater effect that the buildings can have as a barrier against traffic noise.

6. CONCLUDING REMARKS

The calculations and evaluation we performed in relation to the recreational area show that it is not desirable or even possible to conduct a rigid assessment of tranquil areas. One has to take into account the general use of the area and the expectations of the people who use it.

It is also clear that not all developments mean a devaluation of a tranquil area. In this specific case, the alternations on the terrain in combination with new buildings continue to provide a good noise barrier for the surrounding areas. Because of this, the noise situation with or without the development of the industrial area is actually quite similar. In addition, the global increase in traffic in this area is much higher than the increase in traffic because of this particular plan. The increase in noise levels is therefore more due to the overall increase in traffic than due to this development.

When maintaining tranquil areas it is therefore important to look at the bigger picture. In order to improve on an existing noise situation, it's better to focus on preventing the global increase in traffic because that has a much bigger impact than the small local plans.

REFERENCES

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