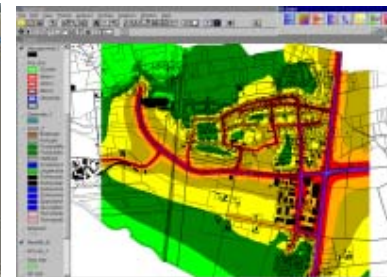
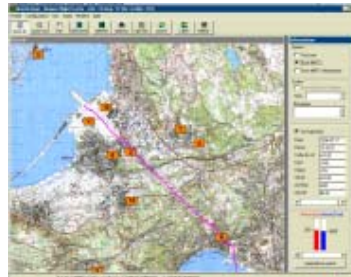
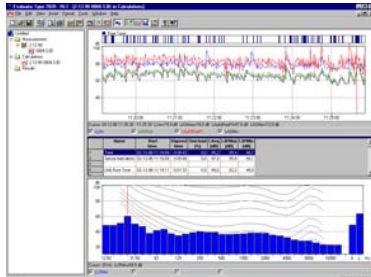




Environmental Noise Management Sofia December 2006

Brüel & Kjær S&V
Torben Munk



Environmental Noise Management

Why?



東名・東京料金所 1968年

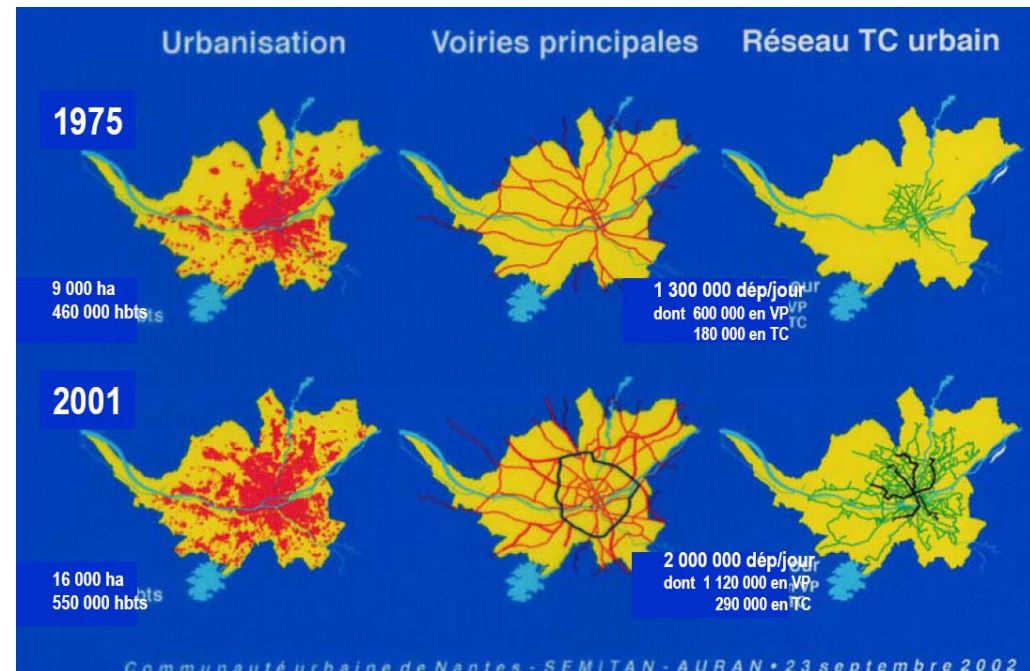


東名・東京料金所 1998年

Filename

Imagine a city today...

- Increasing traffic flows
- Bad conditions of road surfaces
- Inadequate network of public transport
- No network for bicycles
- No pedestrian streets
- No convenient parking places
- No restrictions on construction sites
- Heavy vehicles are allowed in the main streets (no ring)



Imagine a city today...

- That city is strongly affected by noise:

- Road traffic noise
- Congestions are “pushing” traffic to residential areas
- Major noise sources:
 - » national road crossing the city
 - » Railway



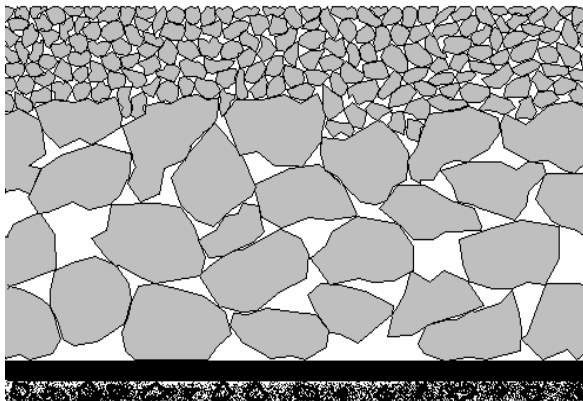
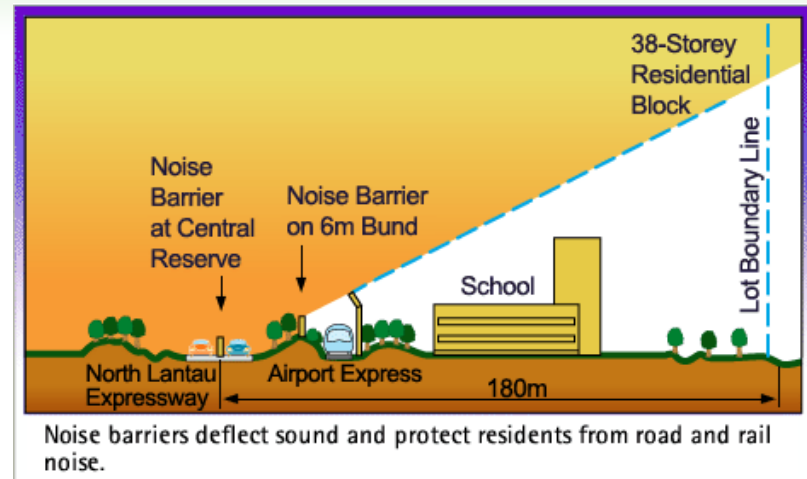
- Consequences:

- People move to the countryside
- People continue working inside the city
- More noise
- More costs for noise mitigation
- Less taxes



Action planning

- Noise mitigation principles
 - Traffic planning
 - Noise reduction at the source
 - Noise reduction at transmission path



Traffic planning

- Reduction of road traffic density
 - Improvement of public transport
 - Creation of cycle tracks
 - Parking management outside the city in connection with public transport
 - Traffic relocation (creation of a ring)
- Traffic restrictions on heavy vehicles
 - Restricted hours
 - Designation of heavy vehicles roads



Noise reduction at the source

- Reduction of speed/traffic calming
 - Designation of 30 km/h zones
 - Pedestrian streets
 - roundabout
- Renewal of quieter buses and trams
- Change of road surface



Before



after

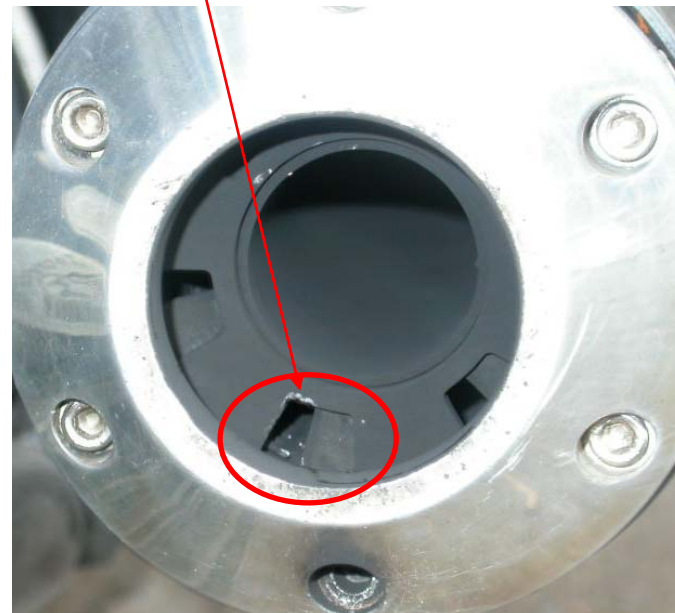


Example of Noise policing

- Adjustment of exhaust “sound”
 - Holes closed $L_{Arep} = 95$ dBA
 - Holes opened $L_{Arep} = 108$ dBA



Can be moved with a screwdriver



Noise reduction at propagation path

- Noise barriers
- Building structures
- Creation of tunnels and troughs
- Closing gaps between existing buildings

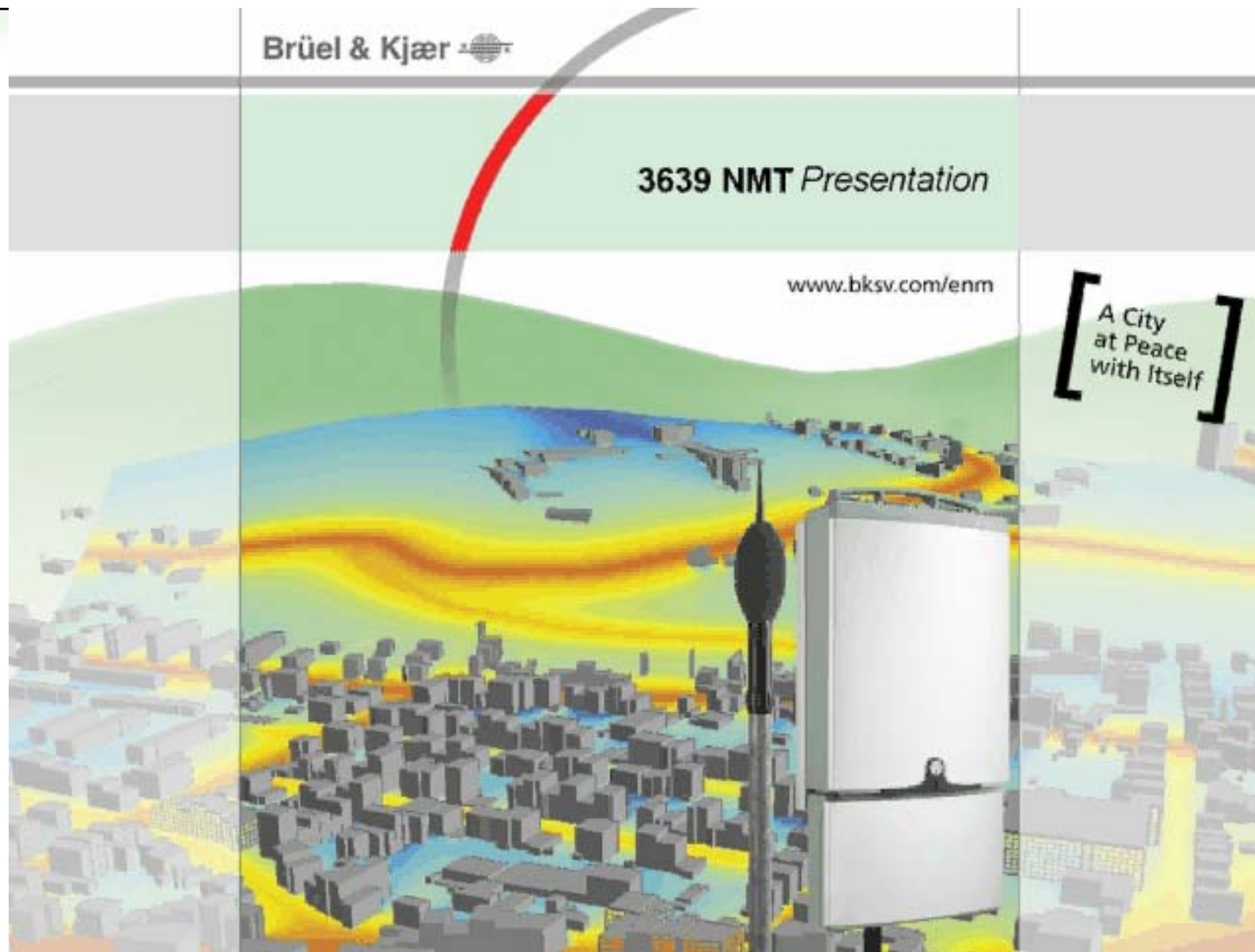


Brüel & Kjær Environmental Noise Management (ENM) Solutions

Noise Monitoring Terminals



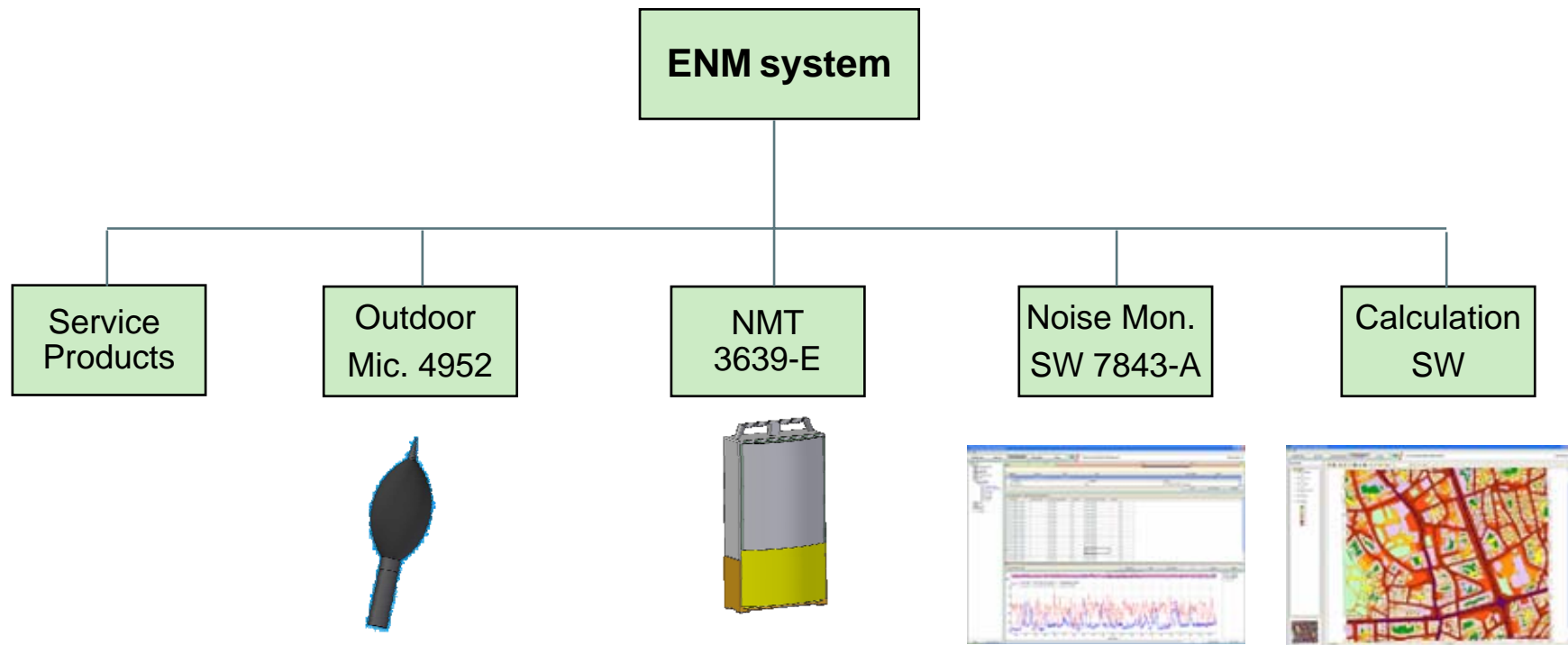
Nonoise Sofia December 2006



ENM Concept

When will the B&K ENM Concept be developed:

A large project for development of the B&K ENM concept was initiated in 2004 – having a high number of new products for Environmental noise mapping, monitoring, measurement, and management.



Noise Monitoring Terminal type 3639-E

Acoustical capabilities

- Instrument is Type 1 approved
- Measurement (1/2 s, 1/3 Octave Spectra, Hourly, daily, weekly, monthly and user defined statistics, Short period statistics <1 hour, Event, Calibration)
- Periodical automatic calibrations (up to 4 times a day)

Additional capabilities

- Sound recording (MP3)
- Weather monitoring with up to 6 parameters
- GPS for positional information
- Video surveillance via WEBCAM (upon request)



Noise Monitoring Terminal type 3639-E

Communication capabilities

- ISDN (realtime or dial-up)
- Leased lines (realtime)
- PSTN (realtime or dial-up)
- GSM (dial-up)
- Wireless LAN / LAN (realtime)
- Radio modems (realtime or dial-up)

General capabilities

- Remote support (software maintenance by dial-up)
- Battery backup 28 hours as standard, and connection for solar panels
- All parts are fast replaceable



Noise Monitoring Terminal type 3639-E

Conforms with the following standards:

- IEC60651 (1979) Type 1 plus Amendment 1
- IEC60804 (1985) Type 1 plus Amendment 2
- EN/IEC 61260 (1995) Octave and 1/3-Octave Bands Class 1
- EN/IEC 61672-1 (2002) Class 1
- ANSIS1.4 - 1983 Type 1
- ANSIS1.43 - 199X Type 1 (Draft 1993)
- ANSI S1.11 - 1986 Octave and 1/3-Octave Bands, Order 3, Type 0-C, Optional Range
- GB9660-88 & GB 9661-1988 (WECPNL)



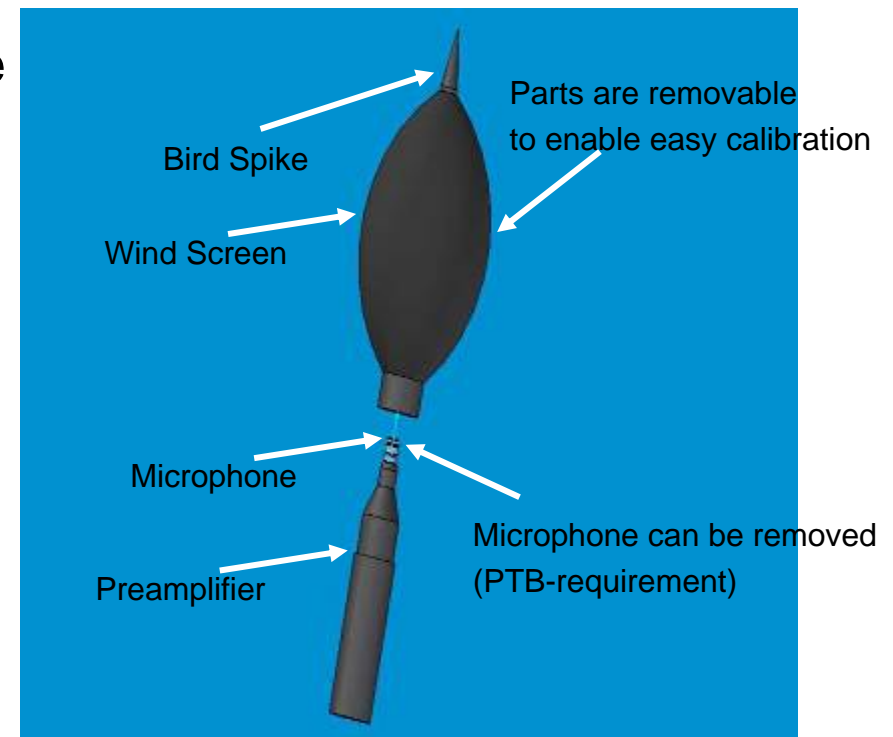
4952 Microphone – Design details

Outdoor Microphone type 4952 is suitable for long periods of unattended outdoor use.

The complete exterior housing is made of chemical resistant plastic material providing an extremely high protection.

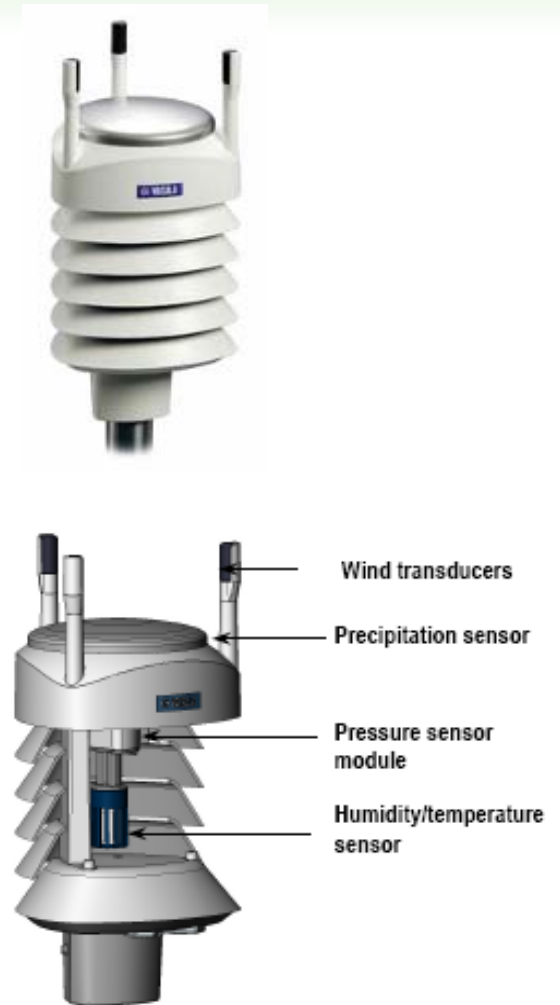
The microphones long time stability guarantee unattended outdoor use of over 1 year without any significant change in sensitivity.

The frequency response of the 4952 is precisely controlled in such a way that together with appropriate linearization - as for example available in the Brüel & Kjær Noise Monitoring Terminal type 3639 E – the requirements of IEC 61672 Class 1 is fulfilled.



Measurement properties: weather

- Six most essential weather parameters in one instrument
 - wind speed and direction, liquid precipitation (rainfall, intensity, and duration), barometric pressure, air temperature, and relative humidity
- Easy and fast installation with little to no maintenance
- Compact and lightweight
- Durable materials resistant to UV radiation and corrosion
- No moving parts ensure durability and long maintenance intervals
- Low power consumption
- Type #: MM0256



Measurement properties: location

- The GPS option will allow to geo-reference measured data automatically (for mobile stations)
- Download of data into ENM will locate the NMT at the right position
- Type #: ZZ 0249



The screenshot shows a software window titled "BZ5292" with a large digital display showing "39.4". To the right of the display, there is a table of measurement data:

Date:	2005-12-06
Time:	15:13:41:5
Longitude:	12° 31' 59" E
Latitude:	55° 49' 01" N
Altitude:	44.3 m.

Below the table, there are playback controls (play, pause, stop, next, previous, home) and a "Recording" checkbox which is checked. To the right of the controls is a button labeled "Enable local Input/Output".

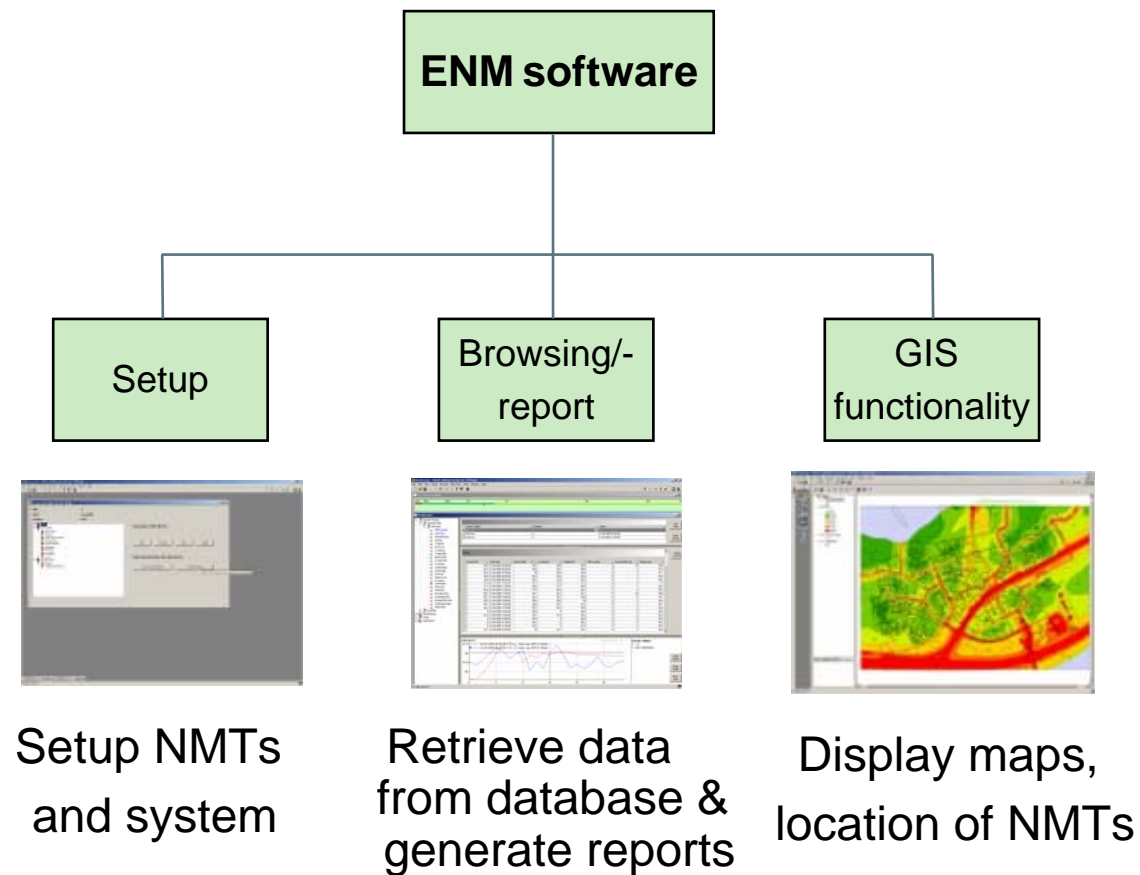
On the right side of the window, there is a "Weather station Control" section with a green indicator light. It lists various weather parameters:

Wind Speed	0.2. m/s.
Wind Direction	181. Dea.
Temperature	24.4. °C
Humidity	28.7. %
Pressure	1001.6. HPa
Rain Gauge	0.06. mm
Internal Temp.	24.9. °C
External Power	15.0. V

At the bottom right of the weather section, it says "Status: Getting Data" and "6.1.0".

7843-A ENM Software - Introduction

Noise management software basically consists of three major software components (visible for the user)



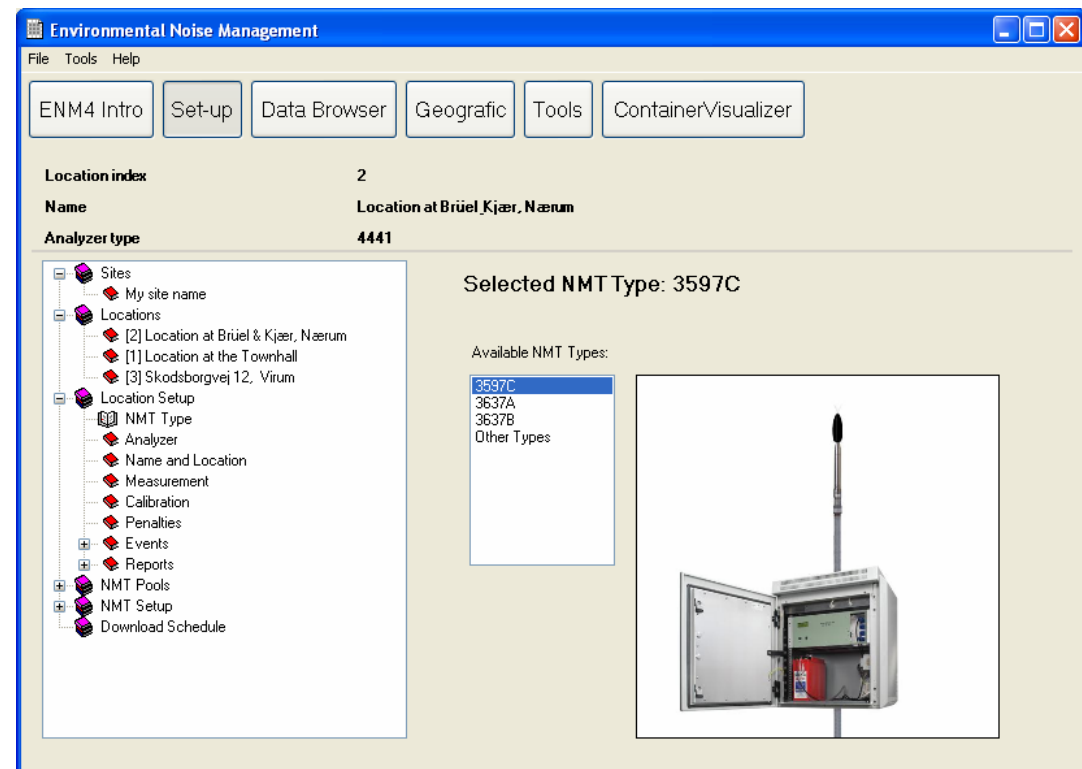
7843-A ENM Software - Setup

An important part of any environmental noise monitoring and management SW is the setup and configuration of the overall system and acquisition devices.

Workflow



The setup display is using a tree structure 'guiding' the workflow in the setup process.



7843-A ENM Software - Browsing

The noise data measured in the Noise Monitoring Terminals are stored automatically in the database for later processing, analysis, report generation etc.

Retrieval of the noise data stored in the database is the most important task in e.g. validation, post-processing, report generation etc. – therefore high focus has been put into development of the data browsing functionality. The development has been using the following set of requirements:

- User friendly
- Easy to setup search criteria
- Possible to personalize display and workflow
- Graphical display of data

Data browser

Search criteria

User defined criteria for data retrieval

Tree structure

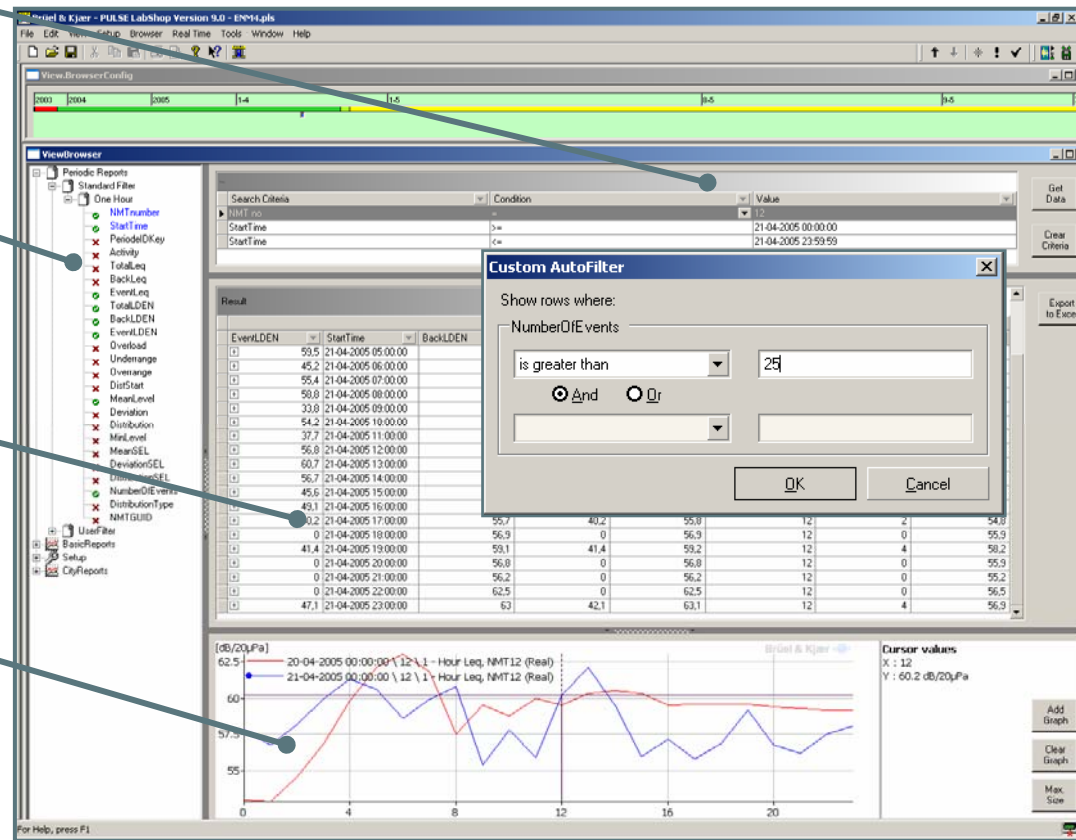
Standard and user defined data views

Tabular result

The extracted data

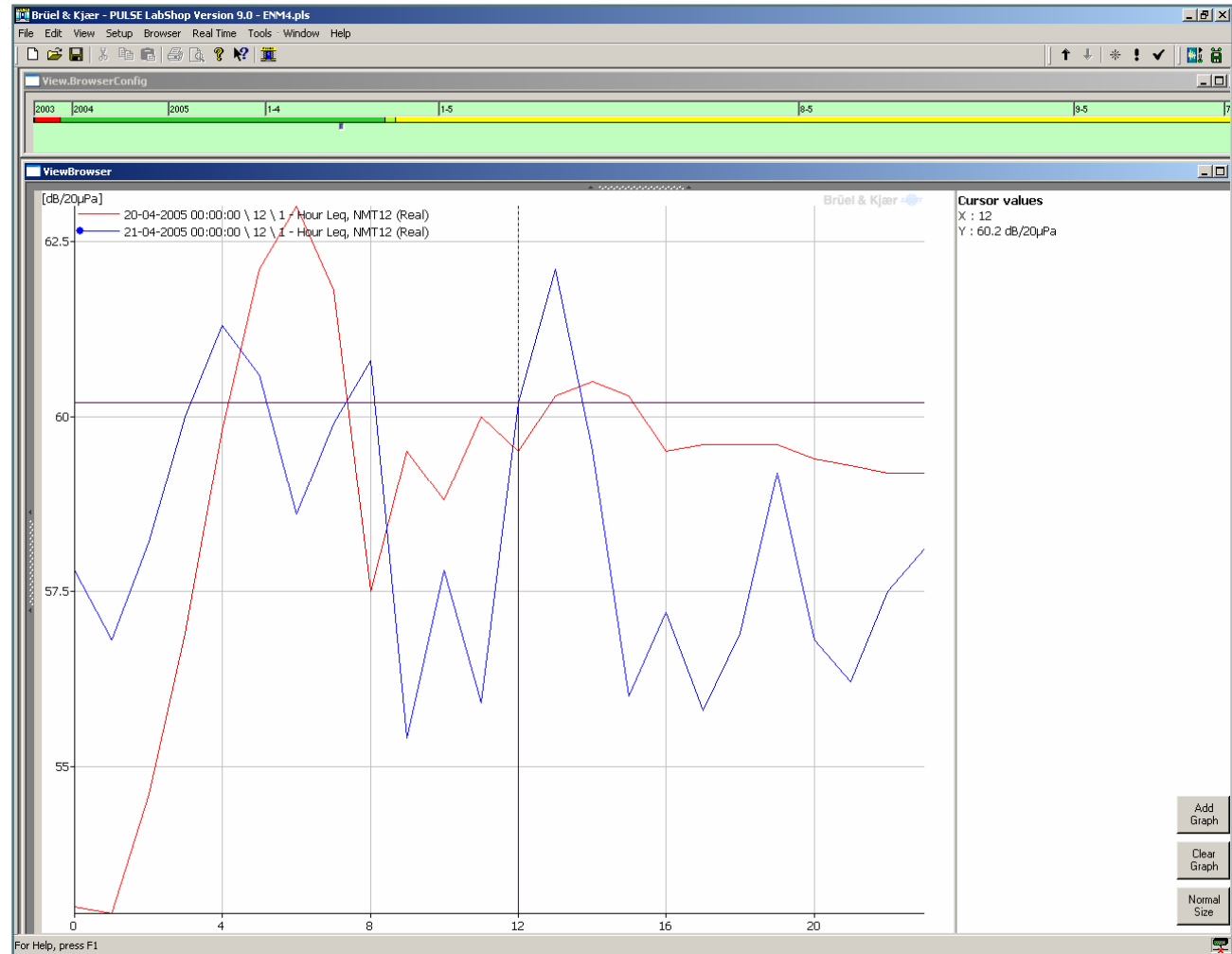
Graphical result

Graphical display



Noise Level Comparison

The graphical viewer accepts multiple searches in order to make long term comparisons.



Generate a noise report

The screenshot shows the 'Environmental Noise Management' software interface. On the left is a tree view under 'Periodic Reports' with 'Standard Filter' expanded to 'One Hour'. The 'TimeStart' field is highlighted in blue. A callout box labeled 'Select data' points to this field. The main area contains a search criteria table with columns for 'Search Criteria', 'Condition', and 'Value'. The table has two rows: one for 'TimeStart' with condition '>=' and value '13-07-2005 00:00:00', and another for 'TimeStart' with condition '<=' and value '15-07-2005 06:15:00'. Below the table are buttons for 'Save Setup', 'Export to Excel', and 'Generate Report'. At the bottom is a graph area with a grid and axes ranging from 0 to 1 on the x-axis and 0 to 0.8 on the y-axis.

Search Criteria	Condition	Value
TimeStart	>=	13-07-2005 00:00:00
TimeStart	<=	15-07-2005 06:15:00

Select data

Generate a noise report

The screenshot shows the 'Environmental Noise Management' software interface. At the top, there are menu options: File, Tools, Help. Below the menu is a toolbar with buttons for 'ENM4 Intro', 'Set-up', 'Data Browser', 'Geographic', and 'Tools'. A progress bar shows the current status with years 2003, 2004, 2005, and time periods 1-6, 1-7, 14-7, and 15-7. Below the progress bar are search criteria fields: 'Search Criteria', 'Condition', and 'Value'. The search criteria are set to 'TimeStart' with conditions '<=' and '>=' and values '13-07-2005 00:00:00' and '15-07-2005 06:15:00'. Below the search criteria are buttons for 'Save Setup', 'Export to Excel', and 'Generate Report'. The 'Generate Report' button is highlighted with a blue circle and a line pointing to a text box on the left. Below the buttons is a data table with columns for 'TimeStart', 'Leq', 'LeqA', and 'LeqC'. The table contains 20 rows of data, with the row for '13-07-2005 19:00:00' highlighted in blue.

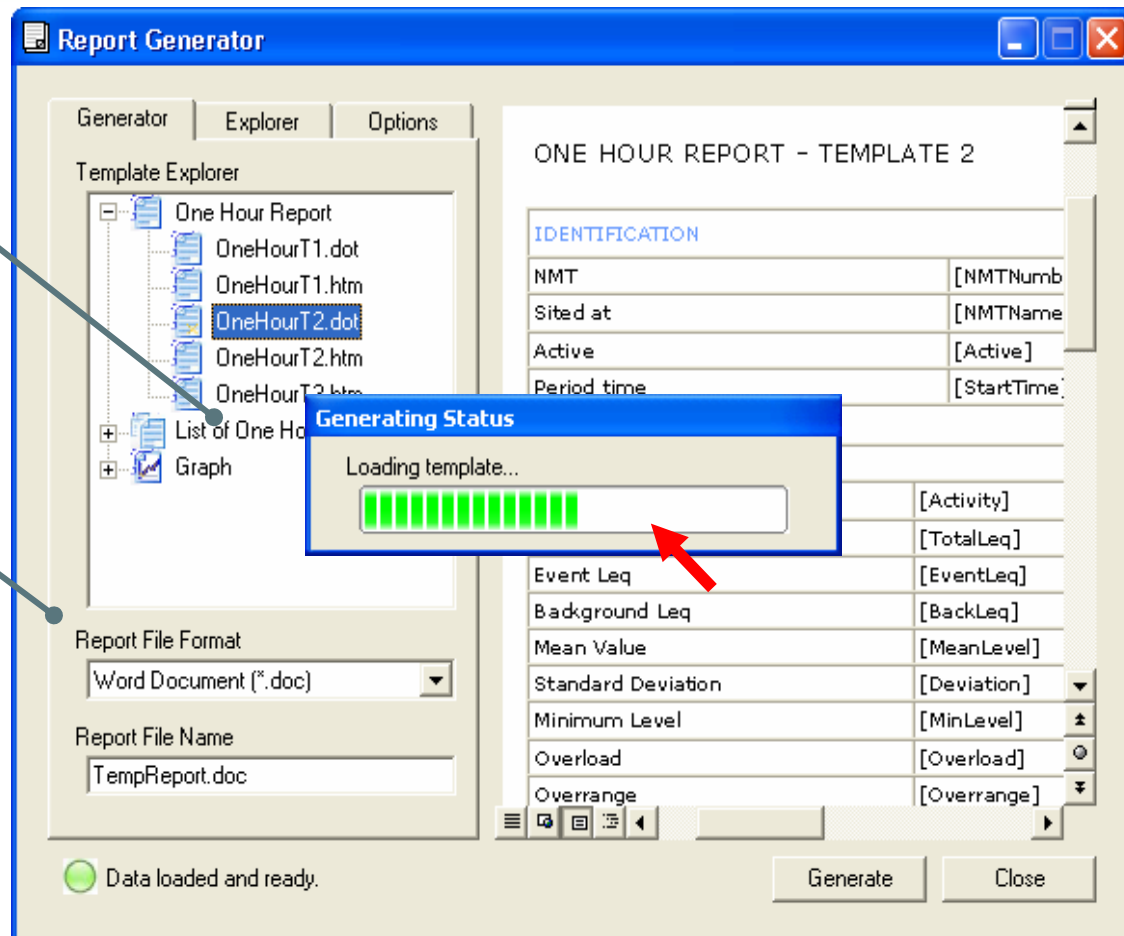
TimeStart	Leq	LeqA	LeqC
13-07-2005 15:00:00	50,9916	0	50,9916
13-07-2005 16:00:00	46,79366	0	46,79366
13-07-2005 17:00:00	42,81724	0	42,81724
13-07-2005 18:00:00	39,98218	0	39,98218
13-07-2005 19:00:00	36,03901	0	36,03901
13-07-2005 20:00:00	36,22249	0	36,22249
13-07-2005 21:00:00	35,94712	0	35,94712
13-07-2005 22:00:00	35,72587	0	35,72587
13-07-2005 23:00:00	36,22329	0	36,22329
14-07-2005 00:00:00	35,78447	0	35,78447
14-07-2005 01:00:00	35,94555	0	35,94555
14-07-2005 02:00:00	36,0193	0	36,0193
14-07-2005 03:00:00	36,0348	0	36,0348
14-07-2005 04:00:00	36,08707	0	36,08707
14-07-2005 05:00:00	36,01561	0	36,01561
14-07-2005 06:00:00	36,02598	0	36,02598

Generate the report

Generate a noise report

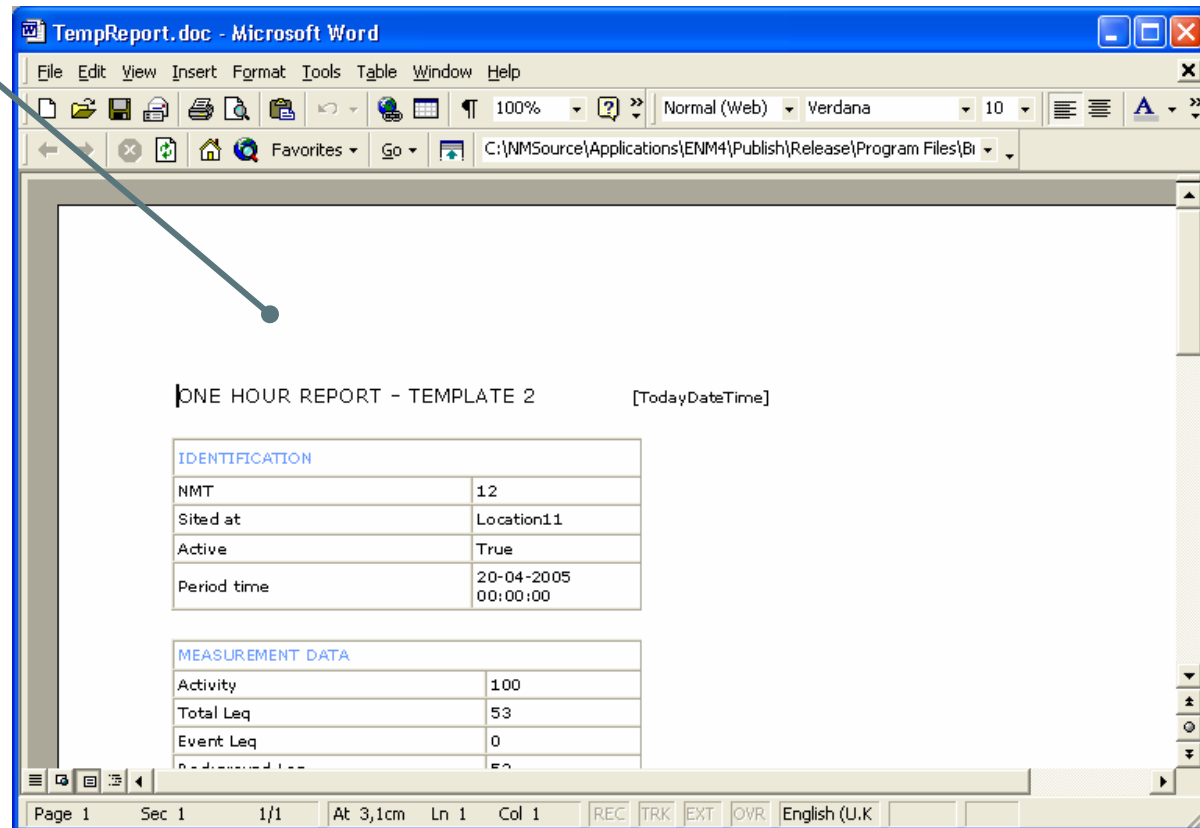
Select the report

Choose the file format



Generate a noise report

Report in MS word or in HTML format.



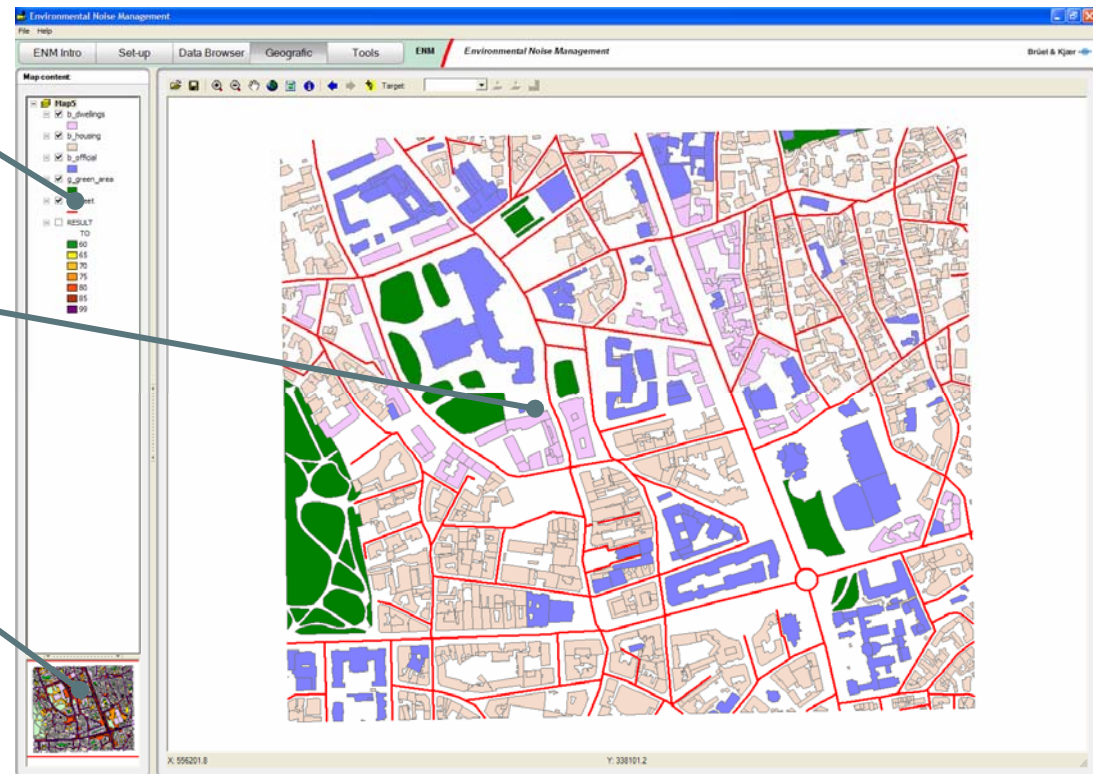
Geographical Information System

The GIS (Geographical Information System) functionality is important in any modern monitoring system. ENM is build using ArcGIS Engine from ESRI making the GIS functionality an integrated part of the SW.

Layer information and configuration

Main view – active layers visible

Overview map – active layers can be configured



GIS with calculated noise map layer and NMTs

- 1- Calculated noise map from Predictor/Lima can be integrated as an additional layer
- 2- NMT layer can also be displayed

