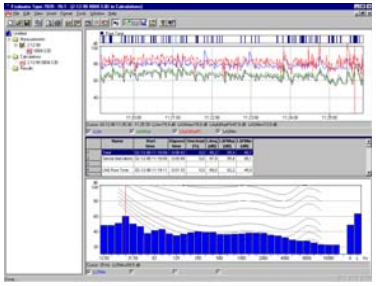
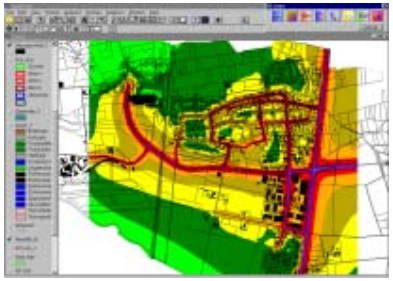
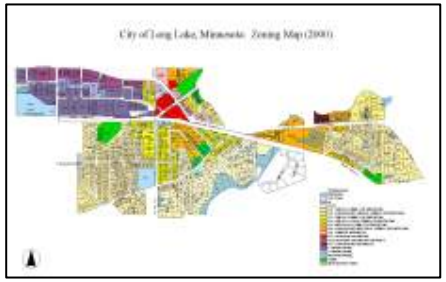
Environmental Noise Management
Sofia December 2006

Brüel & Kjær S&V

Torben Munk







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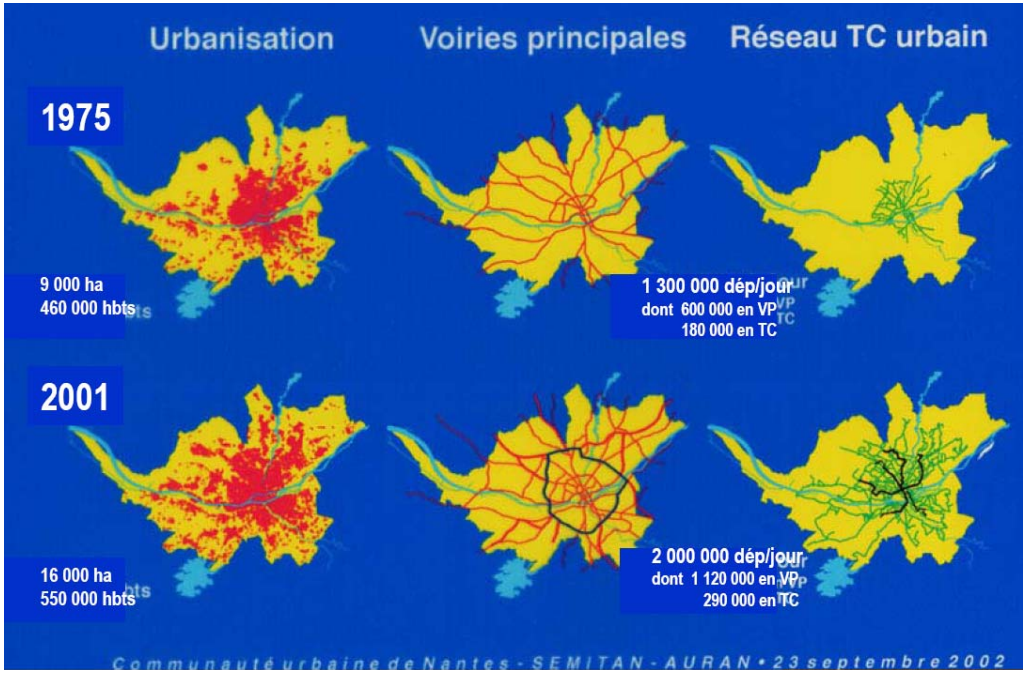
Environmental Noise Management

Why?

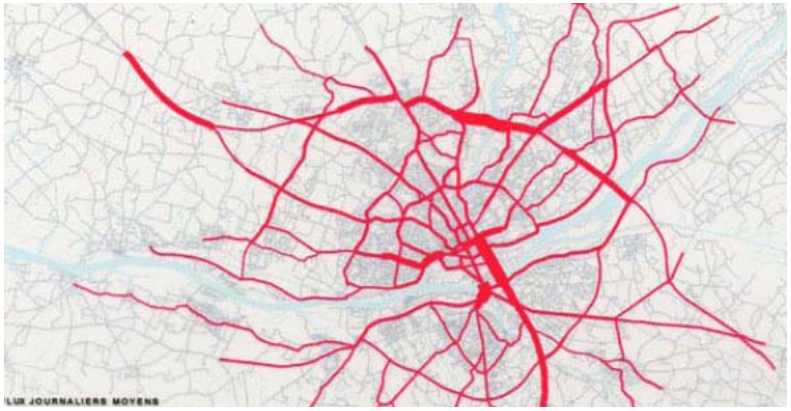
Imagine a city today…



- 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…

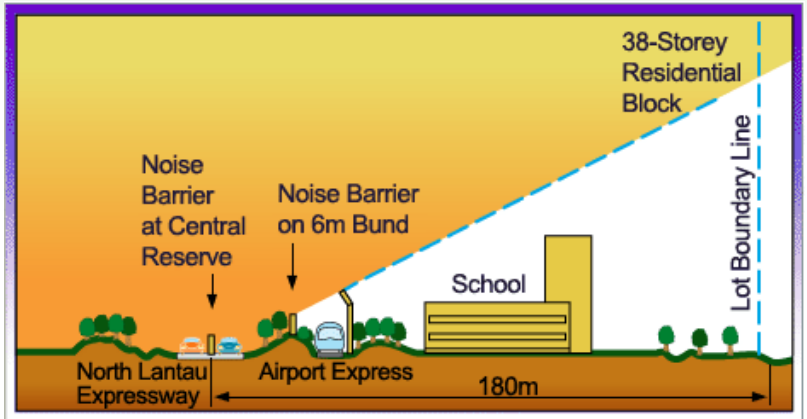
- That city is strongly affected by noise:
  - Road traffic noise
  - Congestions are “pushing” traffic to residential areas
  - Major noise sources:
    - » national road crossing the city
    - » Railway



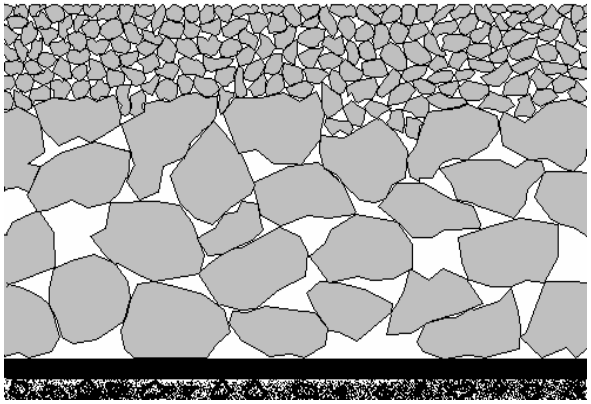
- Consequences:
  - People move to the countryside
  - People continue working inside the city
  - More noise
  - More costs for noise mitigation
  - Less taxes

Action planning

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



Noise barriers deflect sound and protect residents from road and rail noise.



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

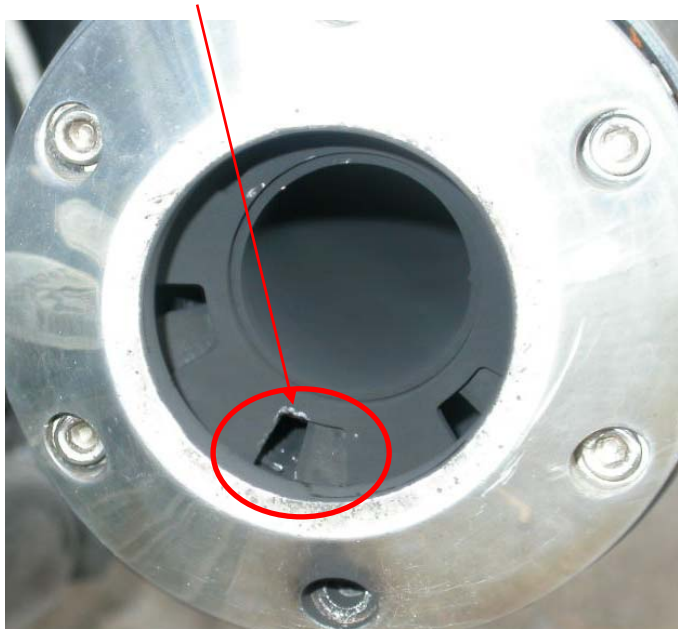
Before

after

Example of Noise policing

- Adjustment of exhaust “sound”
  - Holes closed LA*rep* = 95 dBA
  - Holes opened LA*rep* = 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

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Environmental Noise Management (ENM) Solutions

Noise Monitoring Terminals

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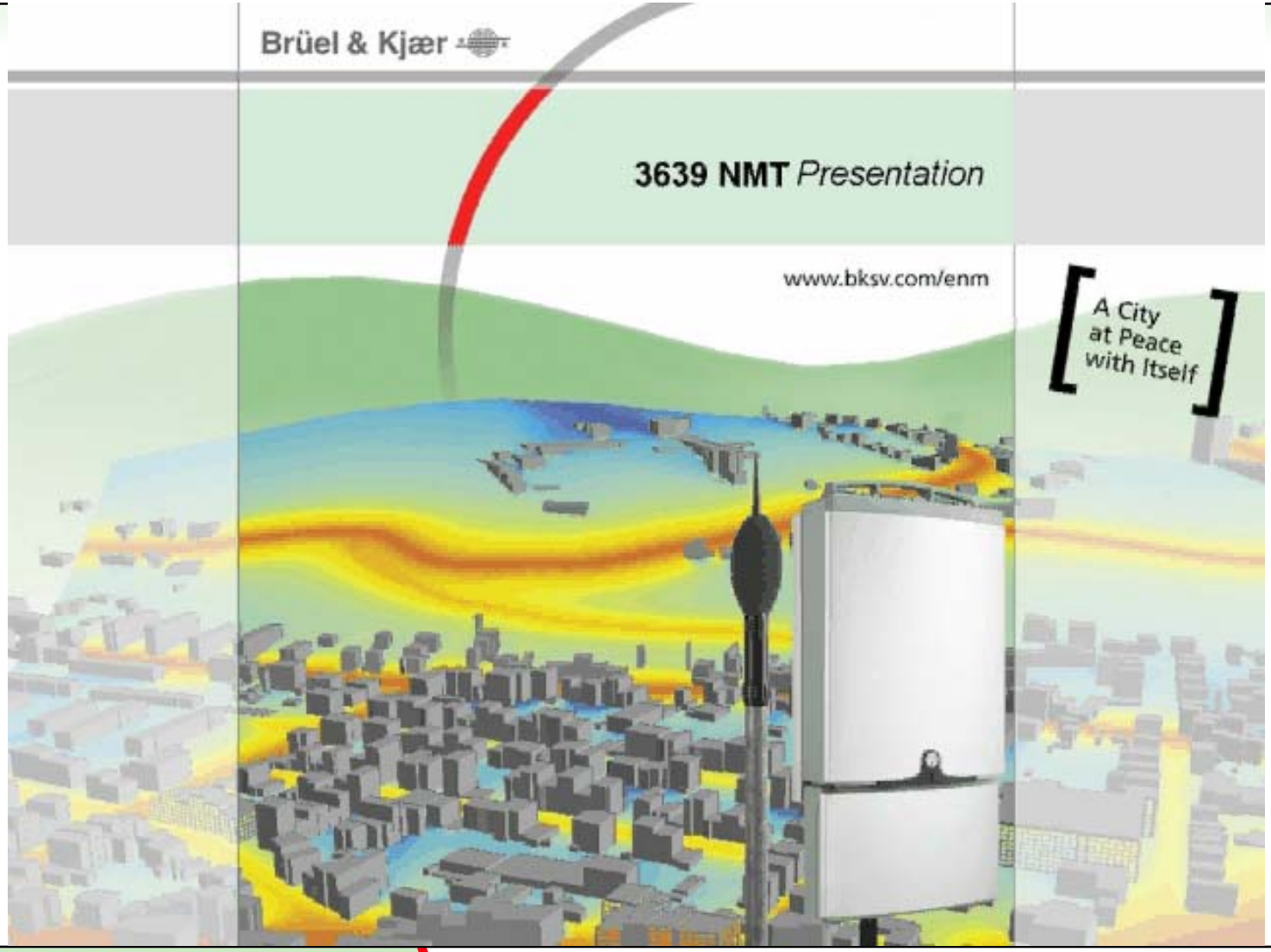
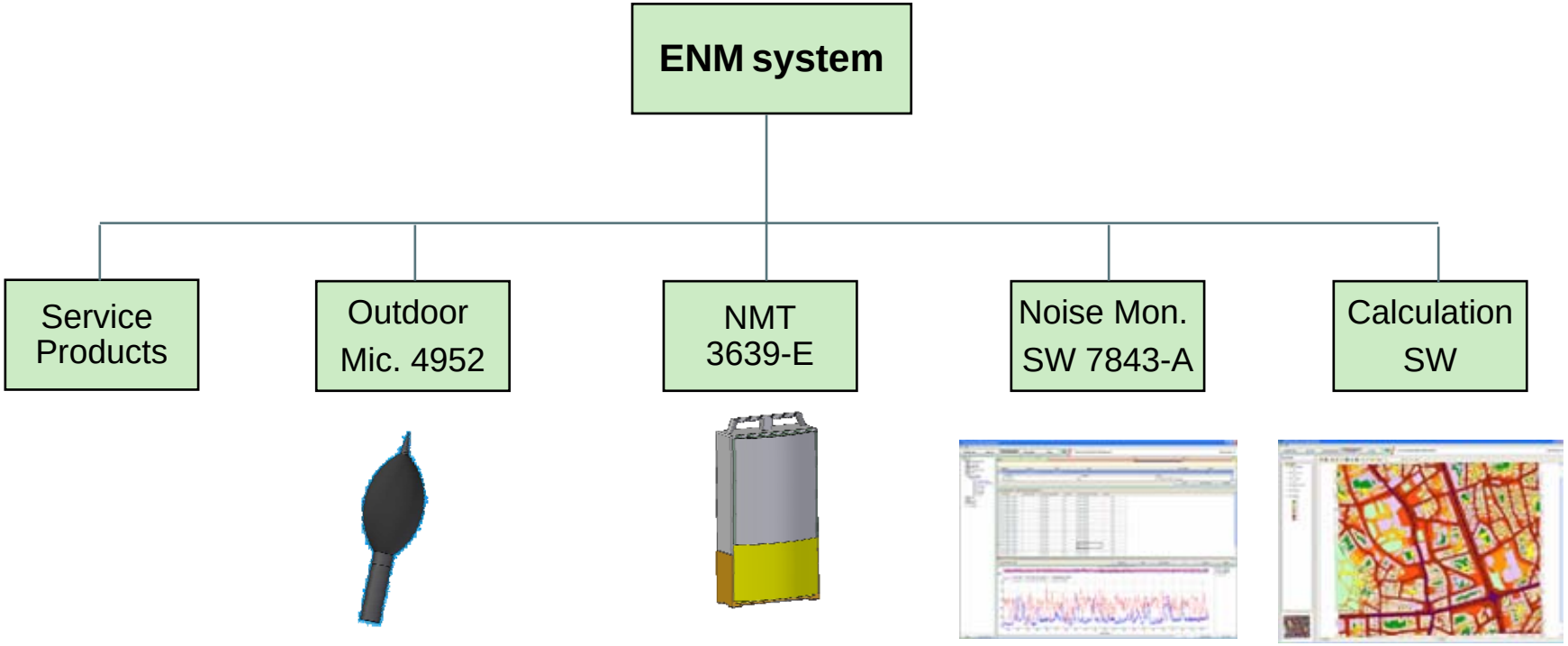
Nonoise Sofia December 2006



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.



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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)

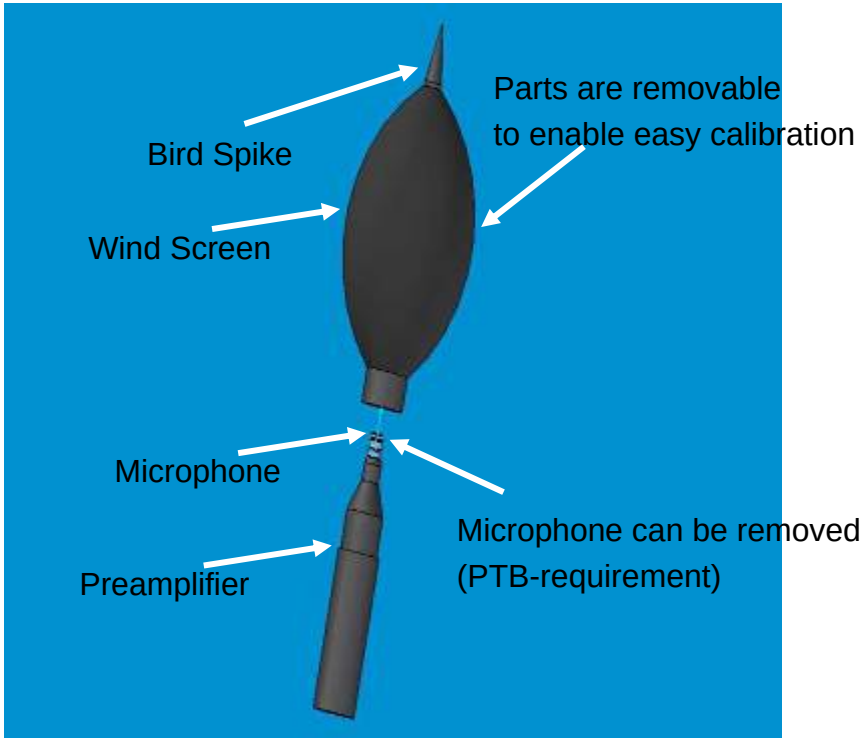
4952 Microphone – Design details

Outdoor Microphone type 4952 is suitable for long periods of un-attended outdoor use.

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

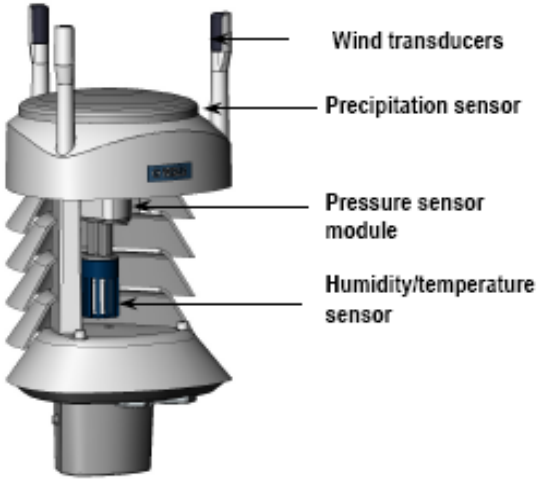
The microphones long time stability guarantee unattended outdoor use of over 1 year without any significant change in sensitivity.

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



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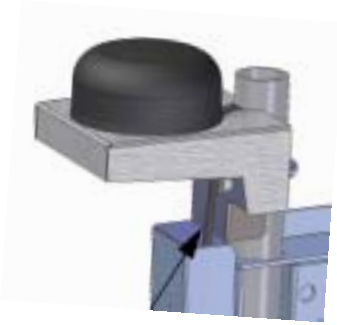
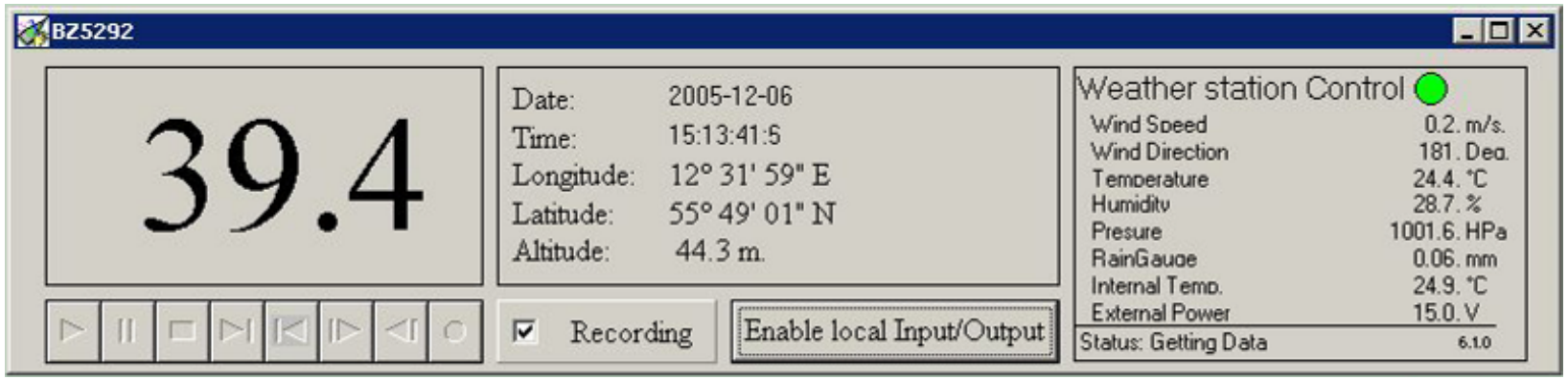
Measurement properties: location

- 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





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7843-A ENM Software - Introduction

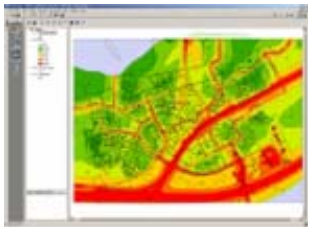
Noise management software basically consists of three major software components (visible for the user)

ENM software

- Setup
- Browsing/-report
- GIS functionality

Setup NMTs and system

Retrieve data from database & generate reports



Display maps, location of NMTs

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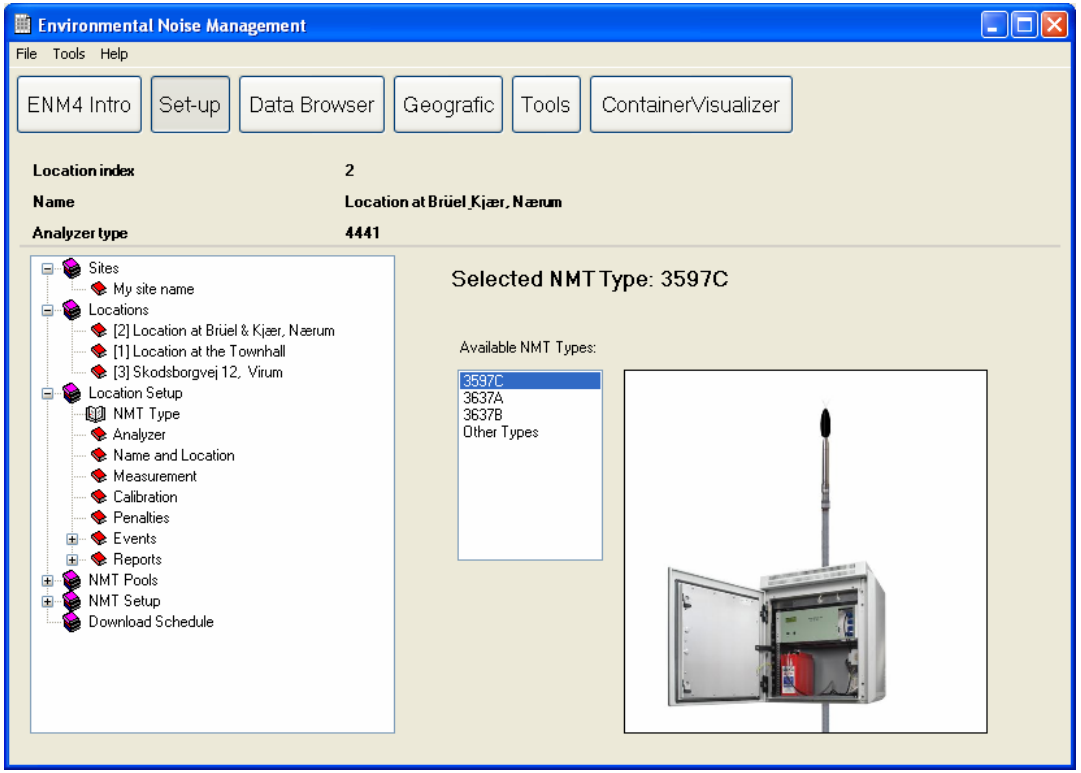
7843-A ENM Software - Setup

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.

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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

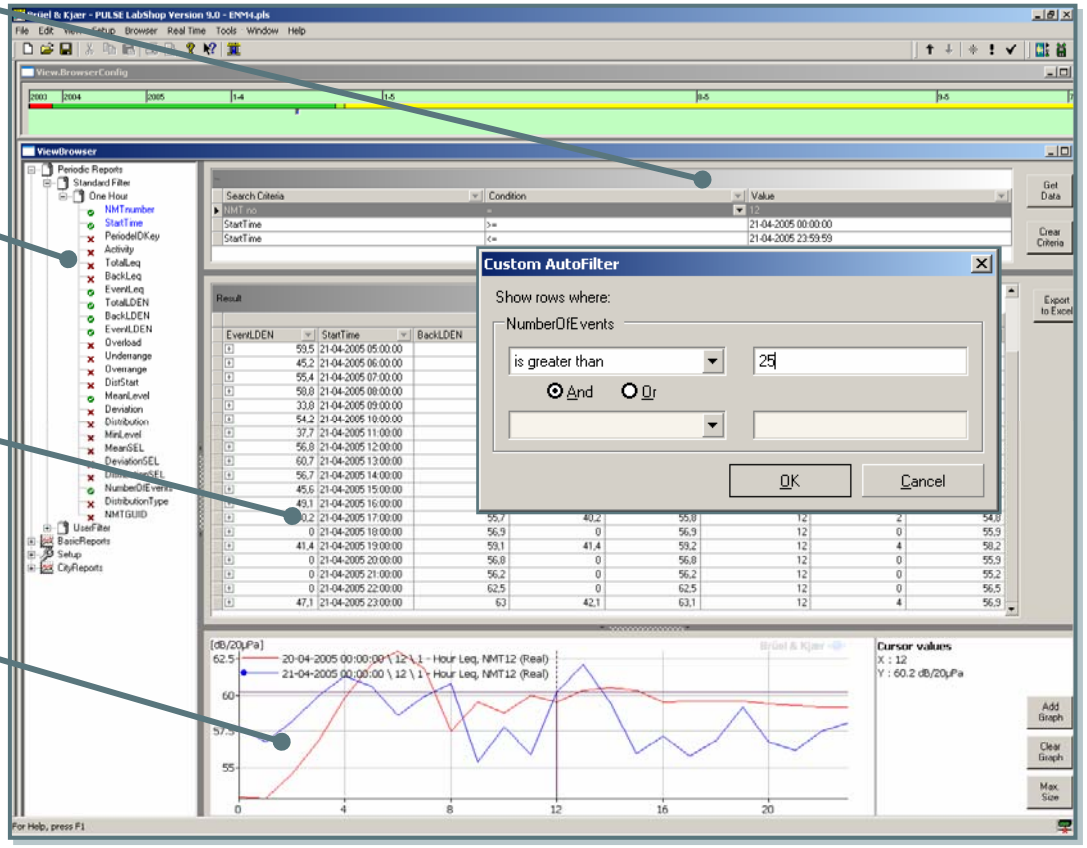
Data browser

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



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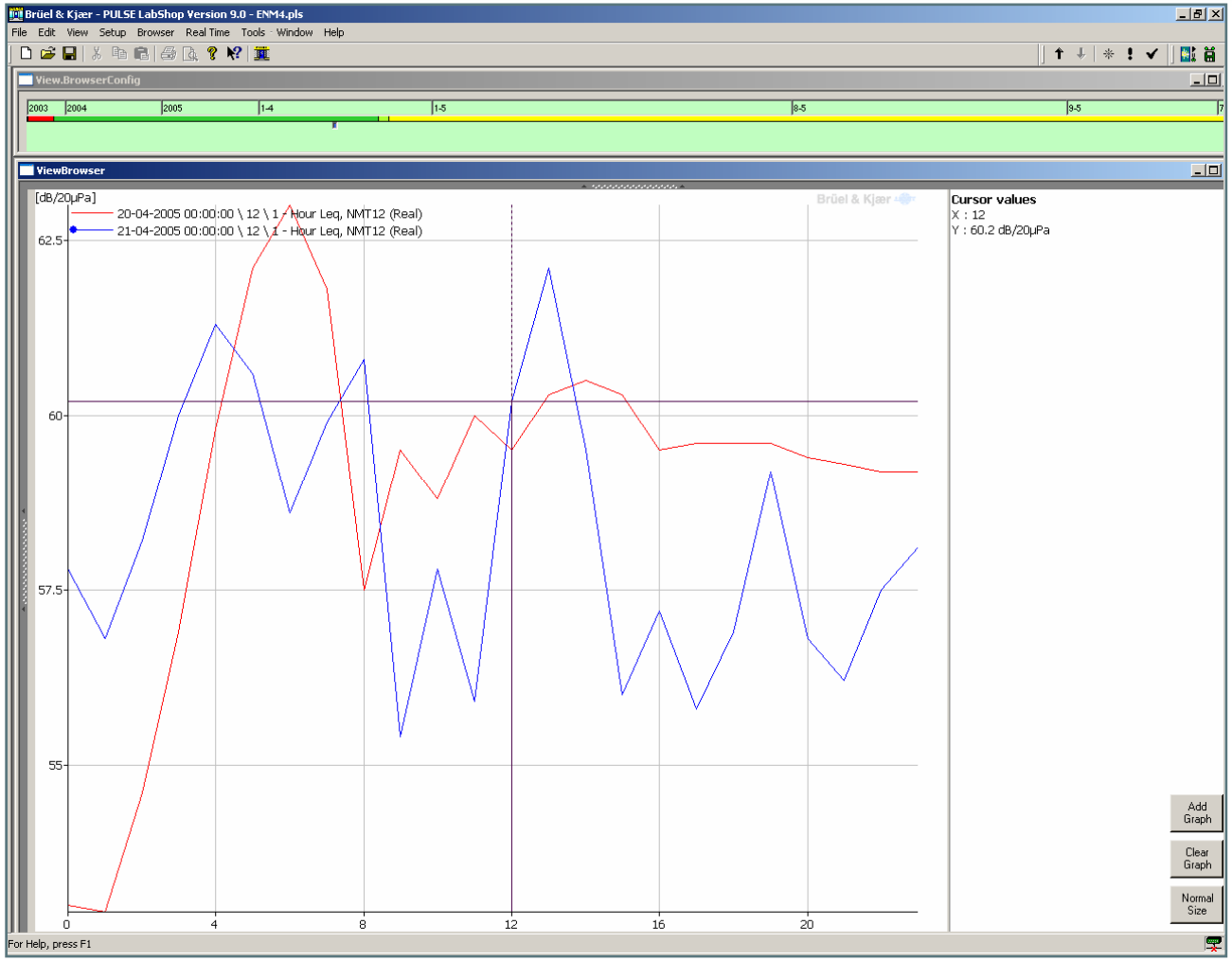
Noise Level Comparison

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



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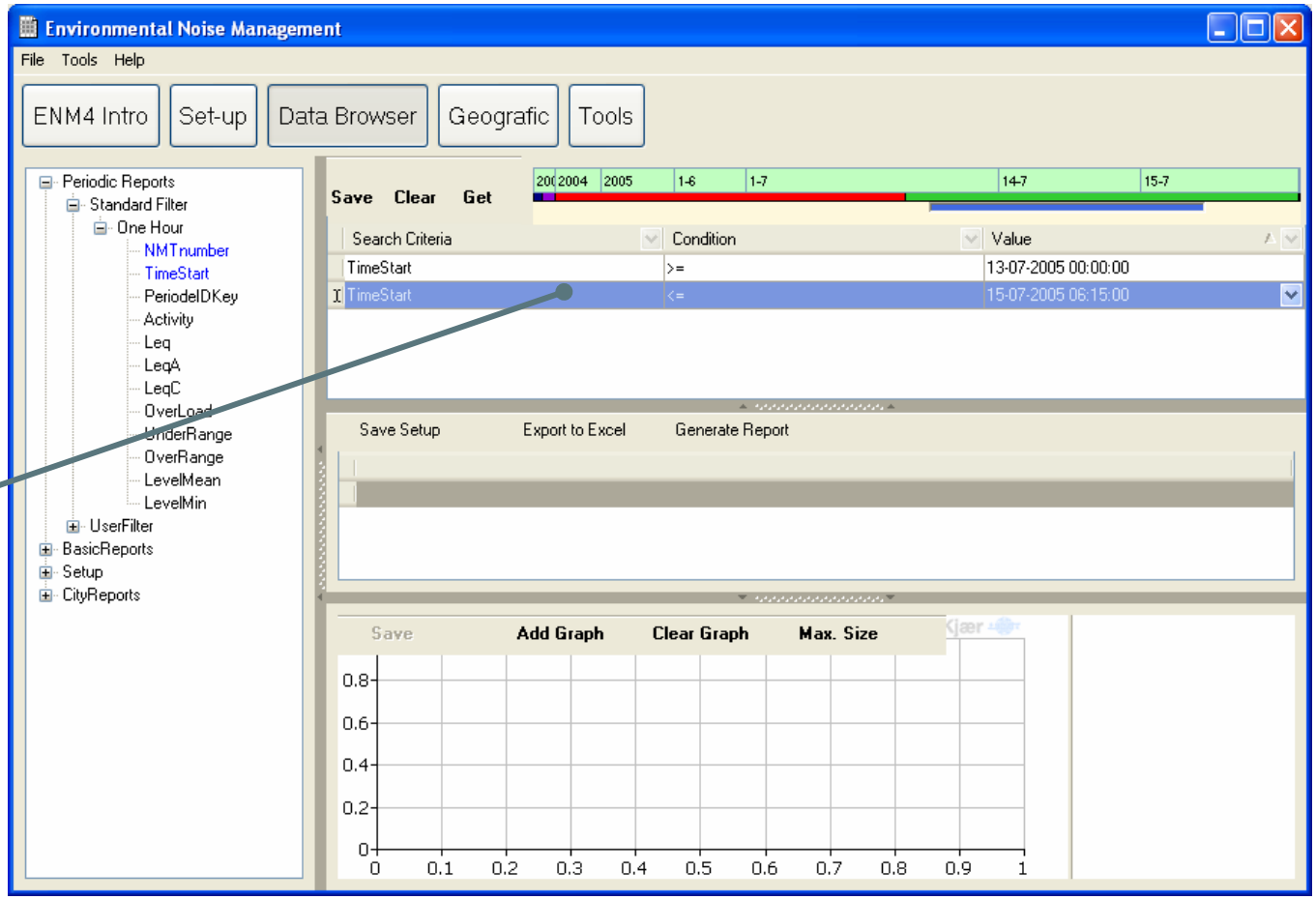
Generate a noise report

Select data



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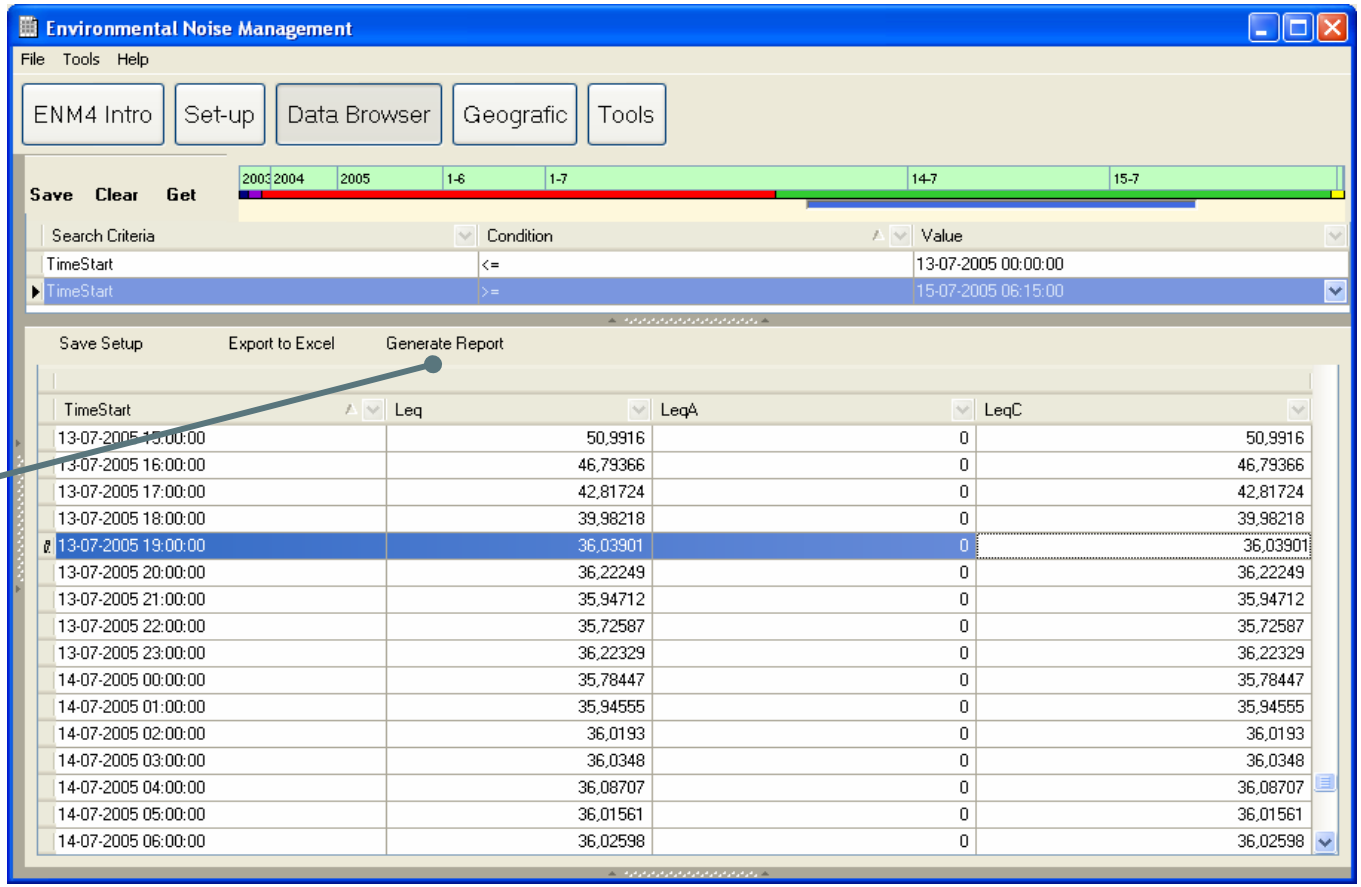
Generate a noise report

Generate the report



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

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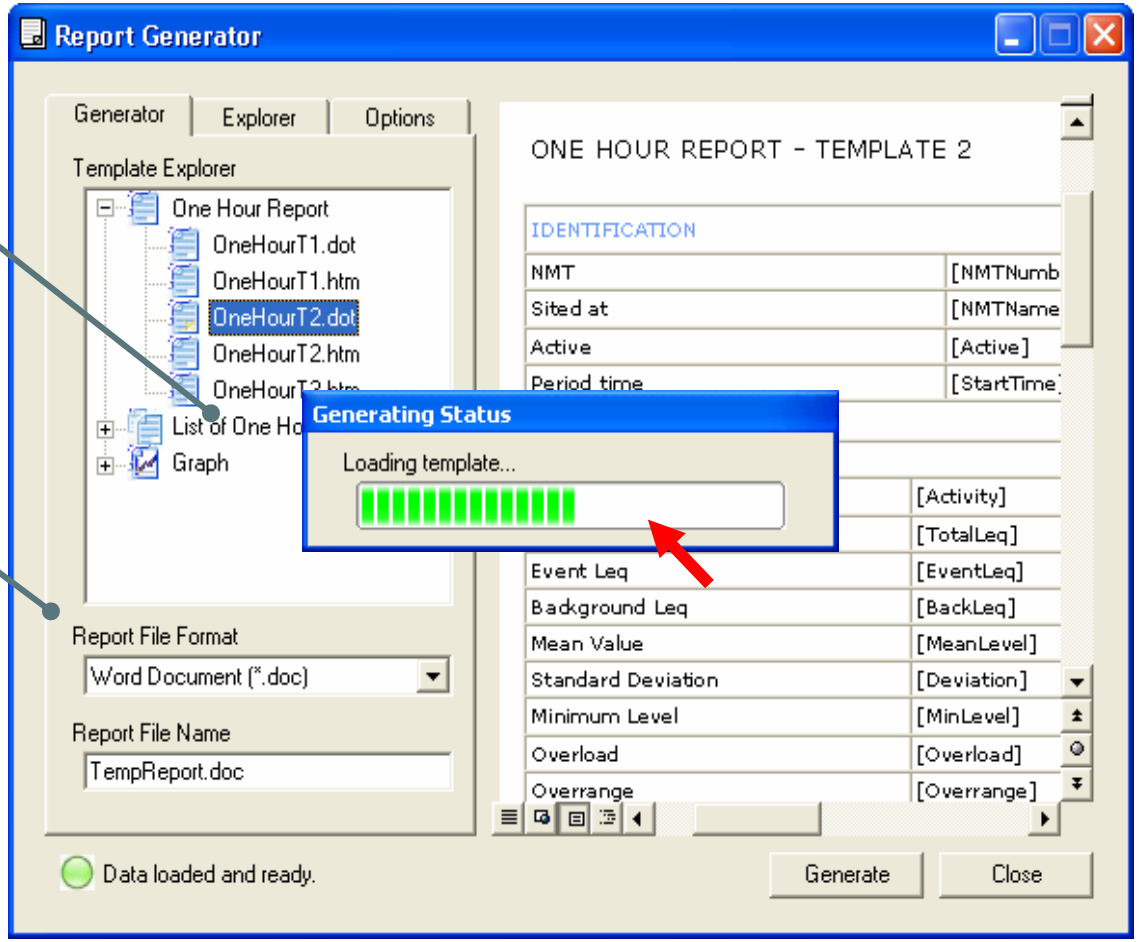
Generate a noise report

Select the report

Choose the file format



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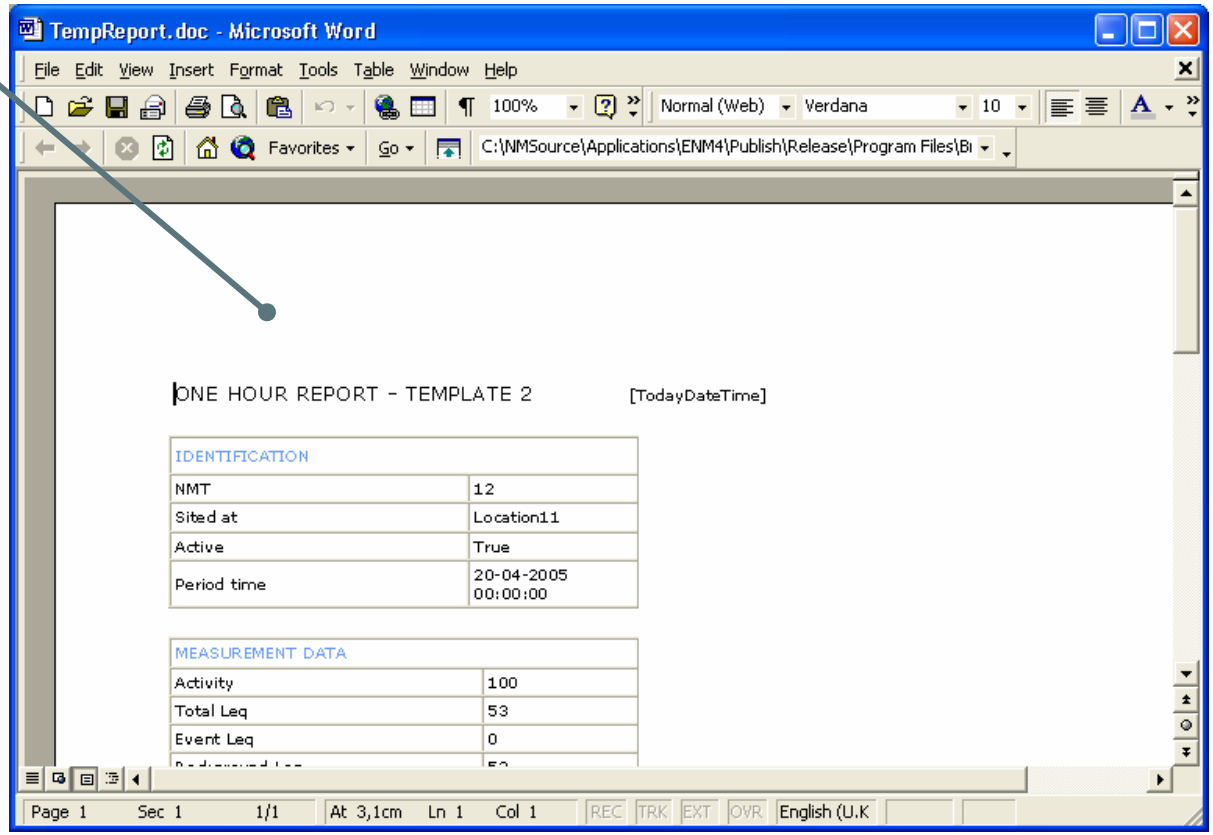
Generate a noise report

Report in MS word or in HTML format.



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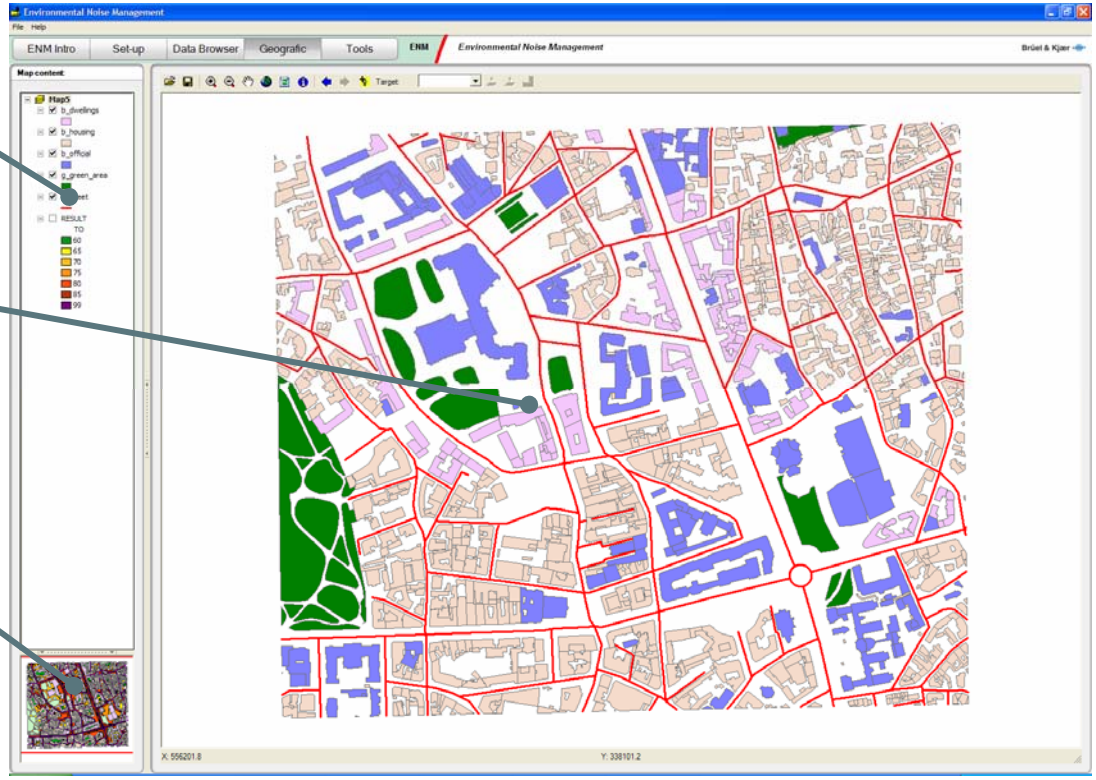
Geographical Information System

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



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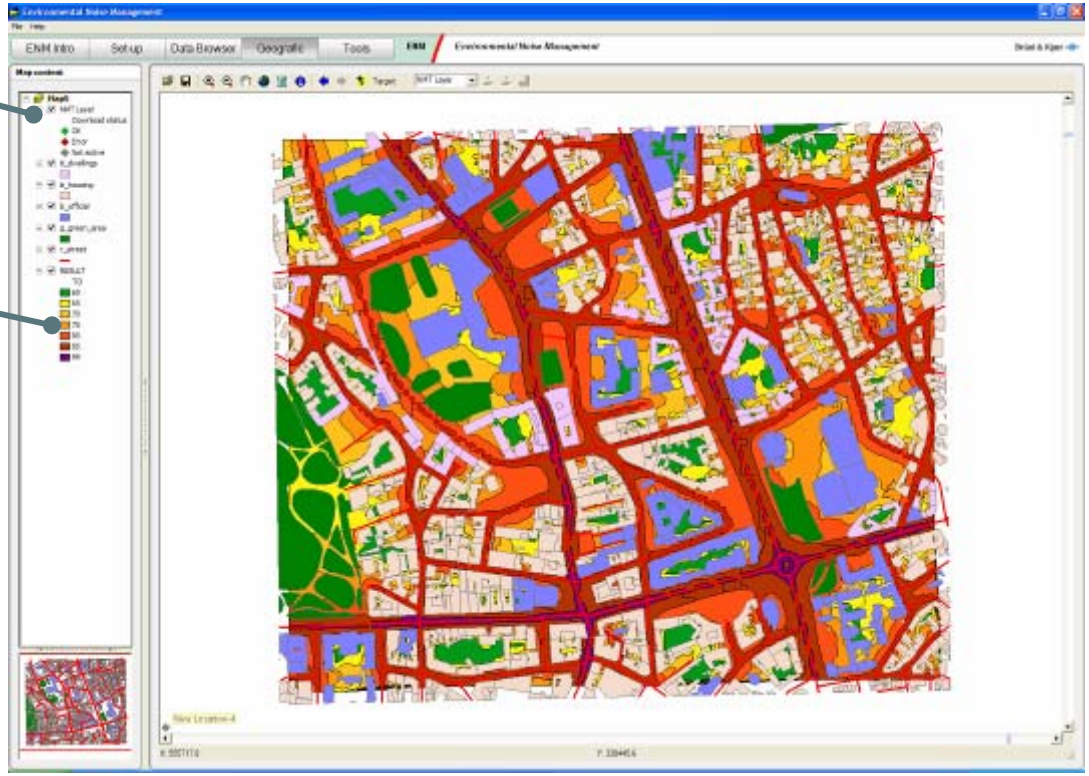
GIS with calculated noise map layer and NMTs

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

2- NMT layer can also be displayed

NMT Layer

Noise contour layer



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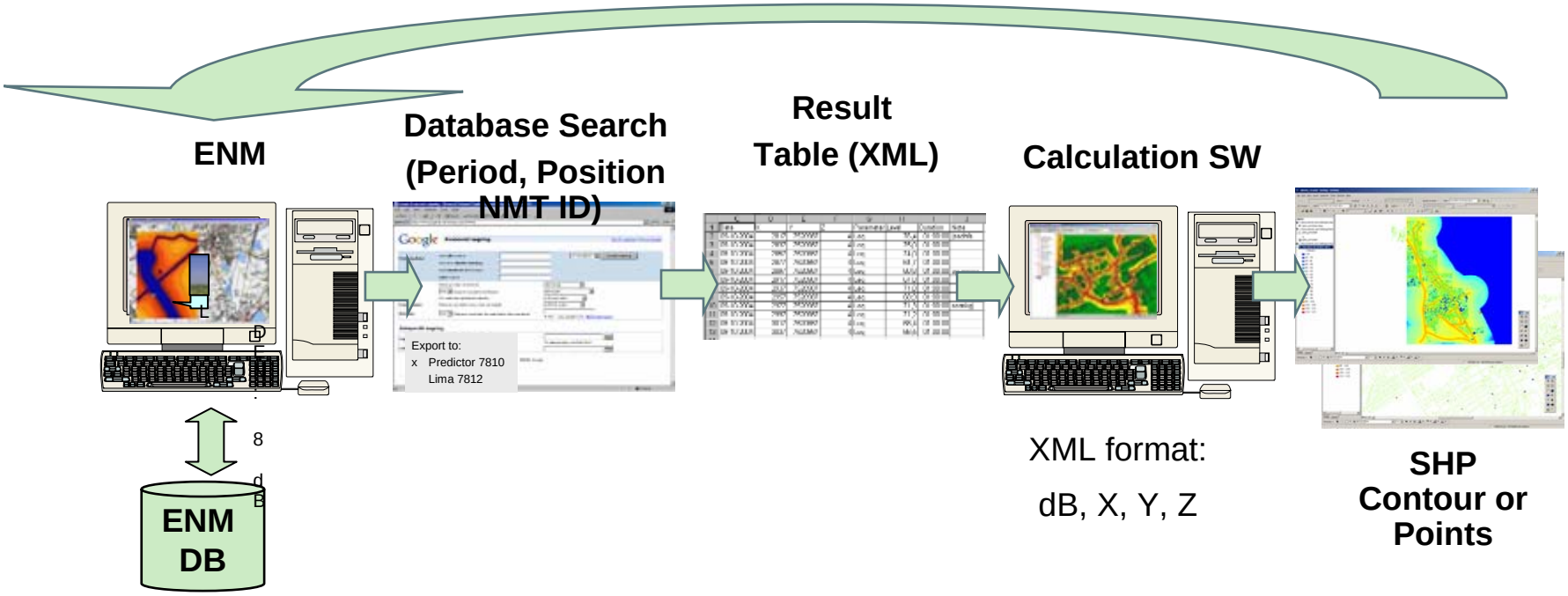
ENM Concept

Interaction between measurements and calculation:

The data stored in the ENM system can be exported to 7810 Predictor and 7812 Lima for calculation and calibration of noise maps using Reverse Engineering method.



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