Noise related to operation of Réseau express métropolitain

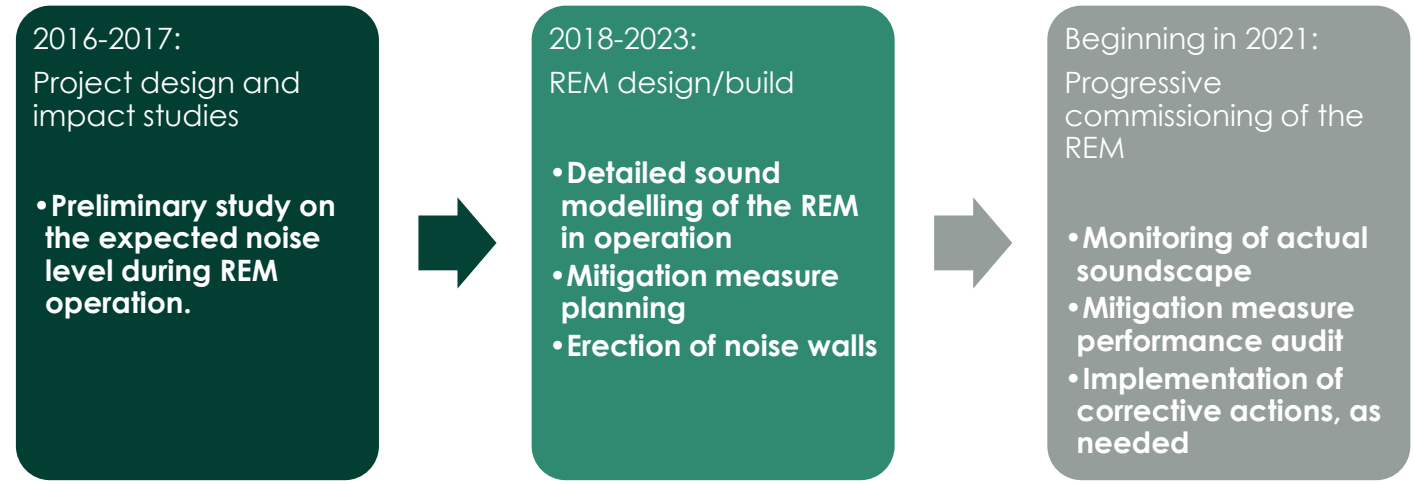
A decree governing the REM's sound monitoring during the operating phase

The decree establishing the REM's conditions for authorization mandates the use of a sound model of the REM in operation, the implementation of required mitigation measures, as well as the execution of an ambient noise monitoring program. This obligation is listed under condition #6 of the environmental decree, quoted hereunder:

> "CDPQ Infra Inc. must develop and carry out an ambient noise monitoring program for the operating phase. This program must validate the forecasts obtained with the modelling already carried out and, where applicable, evaluate the implementation of mitigation measures when significant impacts are measured at sensitive receptors according to the approach used for the MTMDET's noise impact assessment. It must carry out noise surveys during the summer one, five and ten years after commissioning. The location and number of sampling points must be representative of sensitive areas.

Detailed modelling to determine required mitigation measures

In 2016, CDPQ Infra commissioned a preliminary study on the anticipated ambient noise level during REM operation. Then, a more detailed sound model was produced by NouvLR, the consortium selected for REM construction. The intent of this detailed modelling was to determine what mitigation measures would be required, i.e. erection of noise walls.



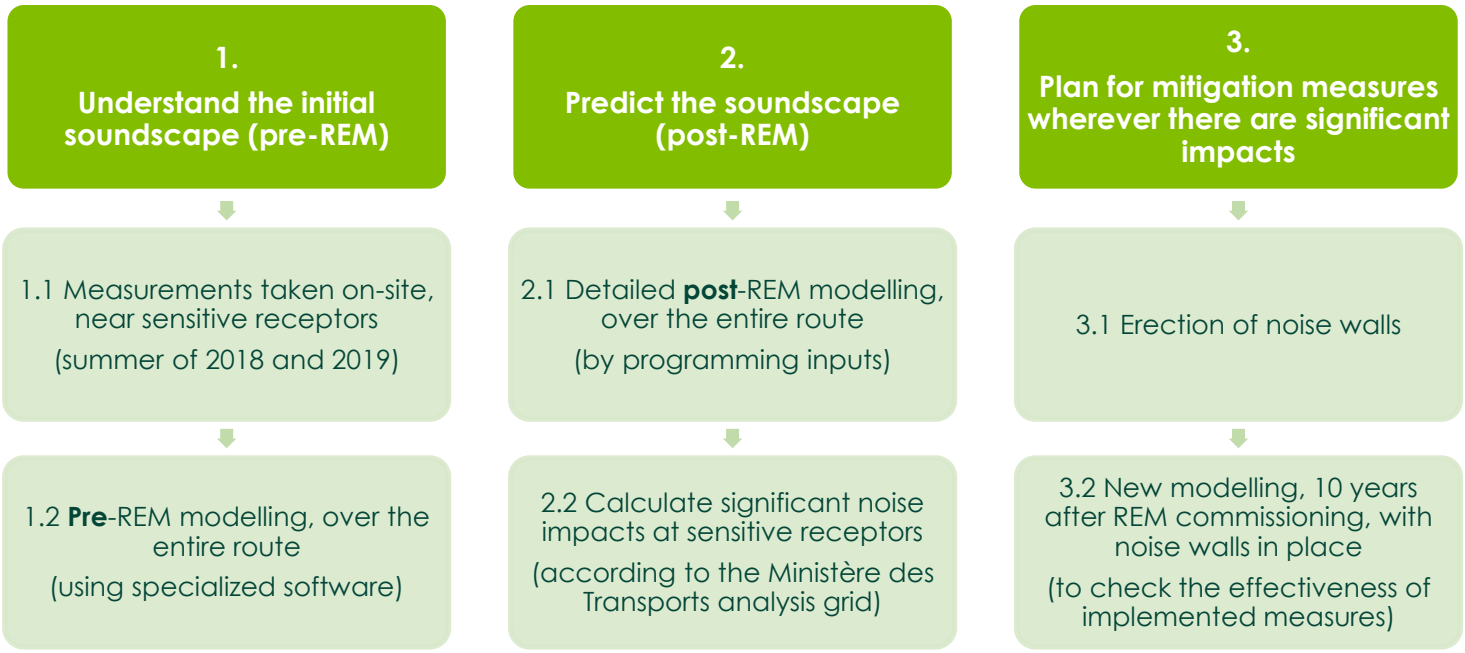
Responsible for impact studies: **CDPQ Infra / REM**

Responsible for modelling: **NouvLR**

Responsible for monitoring during operations: **GPMM**

Sound modelling in three steps

Detailed sound modelling consists of three major steps, as illustrated below:



A large number of inputs were programmed into a specialized software to produce the sound model of the REM in operation, including:

- Removal of noise from exo trains on the Deux-Montagnes line
- Addition of noise from the REM, taking into consideration the frequency and speed, structure elevation, route curves, etc.
- Taking into account of ambient noise, road traffic, topography, proximity of residential areas, etc.

It should also be noted that three operating scenarios were used in modelling:

- REM when it is stopped
- REM running at a speed higher than normal (called "catch-up speed")
- REM travelling around a curve

This method ensures that the mitigation measures implemented will be effective, even in exceptional circumstances such as elevated "catch up speed" and in curves.

What qualifies as a "significant" noise impact?

In modelling, the noise impact of the REM in operation is evaluated at property limits of sensitive receptors, i.e. residential, recreational and institutional (school, hospital, etc.) buildings located along the route. The *Politique sur le bruit routier* (Road noise policy) requires the implementation of mitigation measures when the noise impact evaluated at sensitive receptors is "significant."

The impact is considered significant when the difference between the actual and projected noise levels has a strong or medium impact according to the Ministère des Transports du Québec analysis grid:

Actual noise level (average over a 24-hour period)	Increase in noise level before generating a significant noise impact and requiring the implementation of mitigation measures
Between 45 and 51 dBA	11 to 5 dBA
Between 52 and 61 dBA	4 dBA
62 dBA	3 dBA
Between 63 and 69 dBA	2 dBA
From 70 dBA	1 dBA

See scale of noise levels in Appendix 1.

In the case of stationary sources, such as station fans, the thresholds set by the Ministère de l'Environnement et de la Lutte contre les changements climatiques in its Instruction Note 98-01 apply.

Instruction Note 98-01 is a tool that establishes noise limits to be respected, depending on the type of land use (residential, park, agricultural, industrial, etc.) and on whether it is day or night.

Zone	Noise criteria (dBA)	
	Day (7 a.m. to 7 p.m.)	Night (7 p.m. to 7 a.m.)
I: Land zoned for detached or semi-detached single-family dwellings, schools, hospitals or other educational, health or convalescent service establishments. Land of an existing dwelling in an agricultural zone	45	40
II: Land zoned for multi-dwelling units, mobile home parks, institutions or campgrounds	50	45
III: Land zoned for commercial or recreational park use	55	50
IV: Land zoned for industrial or agricultural purposes	70	70

The REM's role: validating the model

Once modelling was completed, NouvLR submitted it to the REM team, who then validated that:

- The modelling was carried out in accordance with government directives, namely the requirements of the Ministère des Transports du Québec and its *Politique sur le bruit routier* (Road noise policy).
- The mitigation measures mitigate the significant impacts and help to comply with governmental requirements along each separate REM branch.

In 2020, the REM validated the model. NouvLR then became responsible for implementing the required mitigation measures, i.e. the erection of noise walls. Construction began in the fall of 2020 between the Canora and Du Ruisseau stations; similar work will begin in the other sectors.

Erection of noise walls to mitigate significant impacts

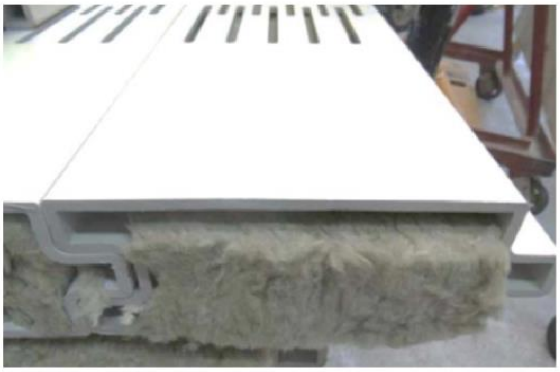
Noise walls will be built in locations where the model indicated there would be significant impacts. Since the primary source of noise comes from the interaction between the wheels and the rail, noise walls are generally installed within the REM corridor, near the rails. When the noise wall is installed in close proximity to the noise source, effectiveness is increased and wall height can be decreased.

Here is a preview of the noise wall selected (view from the public's side):

- Noise walls will be erected on foundations, to protect them during the winter.
- They are pre-fabricated of 100% white PVC, and installed on galvanized steel posts.

- The panels are filled with noise insulation that absorbs the sound and prevents it from reverberating.

Railway face



Acoustic insulation

View where noise walls will be erected in your sector:

Info-travaux REM

- Between the Canora and Côte-de-Liesse stations
- Between the Côte-de-Liesse and Du Ruisseau stations
- In other sectors: Works Info coming soon

Monitoring during operating phase

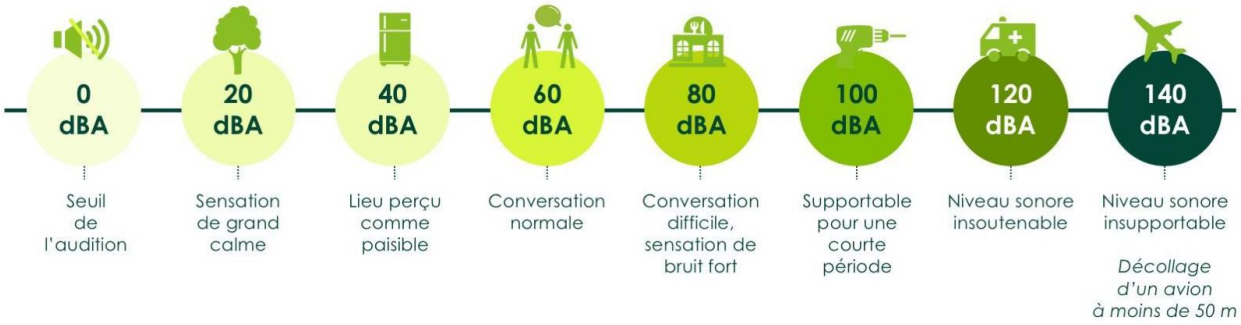
During REM operation, a sound monitoring program will be implemented to ensure that mitigation measures are effective and noise levels are consistent with the detailed modelling. If this monitoring program reveals other significant impacts, additional measures will be implemented.

Under the environmental decree, sound monitoring must be carried out during the summer period, after the 1st, 5th and 10th year of REM operation.

Appendix: Additional noise concepts

Sound intensity is measured in decibels (dB). This is a logarithmic scale. For example, an increase of 3 dBA is easily perceptible to the human ear, while an increase of 10 dBA is perceived as twice the initial noise level.

The scale below shows some examples of noise levels.



Sources of noise produced by a train

In reference to noise produced by a train, we generally distinguish three categories of noise sources:

Noise emission source	Train speed at which this noise is predominant
Machinery noise (motor, ventilation, etc.)	At low speed or when stopped (at station entrance and exit)
Noise from interaction between wheels and rails	At medium to high speed (when trains/metros are running)
Aerodynamic and friction noise	At very high speed, i.e. over 250 km/h (does not apply to the REM)

The technology chosen for the REM is an automated light rail system. This type of technology is quieter than heavy trains (no whistle at station arrival or alarm at grade crossings, electric brakes, etc.).