

Buying an 'EMF safe' Property

This article is separated into 6 sections, each of which can be individually downloaded. It is a 'work in progress' incorporating new information whenever time permits.

Section 4 Electrified Railways

1. Introduction; The need for more housing and potential EMF effects; Powerfrequency EMF exposure sources; Radiofrequency EMF exposure sources; how microwaves reflect off building surfaces and into buildings; impact on property value; location maps; in the face of uncertainty, measure and take action if necessary; references
2. Powerlines and pylons; when are powerlines 'needed?'; an easement; a wayleave; references; equipment for measuring powerfrequency electric and magnetic fields; summary of safety points to do with powerlines; powerlines worksheet (2 sides)
3. Substations and transformers; junction boxes; net currents; stray currents; references; equipment for measuring powerfrequency electric and magnetic fields; summary of safety points to do with substations and transformers; substations and transformers worksheet (2 sides)
4. Electrified railways; overhead lines; third rail; diesel; references; summary of points to do with railway lines; equipment for measuring electric and magnetic fields; meters for measuring microwave radiation; electrified railways worksheet (1 side)
5. Mobile Phone base stations or masts; what base stations may look like, including hidden ones; effect on house prices; distance from the source where the microwave radiation meets the ground; drums; TETRA antennas; amateur radio operator's equipment; equipment for measuring microwave radiation; summary of safety points to do with mobile phone base stations; Mobile Phone Base Stations worksheet (2 sides)
6. EMFs inside buildings (including flats and caravans); wiring; electrical appliances; caravans; summary of safety points to do with your home, school, office, etc.; equipment for measuring electric and magnetic fields; equipment for measuring microwave radiation; EMFs inside buildings worksheet (2 sides)

Buying an “EMF Safe” Property

Electrified railways

Most railway lines in the UK, are electrified. Both overhead and third rail systems create high magnetic fields for rail travellers, and these fields have been associated with an increased risk of miscarriage for women who travel regularly, especially in the first three months of pregnancy (Lee [2002](#)).

Overhead powerlines



Overhead lines

Railway lines with overhead power are going to produce high fields near to the lines themselves - both electric fields from the 25,000 volts on the overhead wires, and magnetic fields from the current being drawn by trains. As the feed (overhead) and return (the metal rails) are separated, the magnetic fields travel a greater distance than for 3-rail systems. All EMFs reduce with distance and have generally fallen off to background levels by a distance of between 30 and 50 metres depending on the particular railway.

The distance needed for EMFs to reduce is measured in a straight line between the overhead power cables and the property and its garden. If the railway line is in a cutting, overhead lines could be a problem if the house is close to them. If the house is closer than 30 metres, we would advise measuring the fields.

Third rail power



Third rail

An electrified railway line powered by a third rail will not normally create high electromagnetic fields in a property at a reasonable distance (i.e. over about 10 metres) away from the nearest rails. Houses built right next to the lines are likely to have high transient fields when trains are passing by.

If the railway line is in a cutting, fields from a third rail are almost certain to be lower than if they were level with the property, as earth absorbs some of the electric fields. If the railway is on an embankment, fields from a third rail will only be reduced by the distance to the edge of the property boundary.

AC & DC power

As railway systems are interconnected by the rails they can be prone to ‘net error currents’ where there are many lines within a few miles of each other such as around greater London, Manchester, Birmingham and other cities with large railway networks. Alternating current (AC) is easier to transmit over long distances. Direct current (DC), on the other hand is often used for shorter lines, urban systems and tramways. Some companies, such as Connex South Eastern, the London Underground, and some other rail companies elsewhere in the UK, use Direct Current (DC) electricity to power their trains on their 3-rail systems. This can cause a high magnetic field disturbance when trains draw power (i.e. when the motors are actively pulling). In one case we investigated in North East Kent, colours on televisions in nearby houses (within about 30 metres from the line) went haywire each time a fast train passed by - this is a clear indication of a severe magnetic field disturbance which might have long-term health consequences. This particular problem was due to the rail layout in the area and the location of the main electricity sub-station for the local railway lines.

Diesel trains



Diesel train in Holt, Norfolk

Diesel-electric trains produce EMFs very close to the engines only.

If the property is near enough to a station for passing trains to have to slow down or be in the process of speeding up, there may be transient EMFs as the trains take power. There has been some evidence that transient field levels can be problematic, though it is an aspect of EMF exposure which has received little study.

One of the known non-EMF hazards from living near to railway lines is chemical pollution from the sprays used to keep down weed growth on railway property. These sprays are being used less, but there may be some residual traces in the soil. Someone who lived in such a situation, and grew vegetables near to the railway land boundary, found their carrots were very undersized. It may be worth while taking a decision not to grow vegetables and fruit (anything that you eat) near the boundary with a line, or allow young children to play next to the boundary fence, without getting a soil analysis made.



GSM communications masts have been erected along most railways in the country. This is in part to carry out the improvements in safety communication recommended following the Paddington crash in October 1999. The system used is almost identical to the normal GSM mobile phone base station networks.

Planning permission is not needed on Network Rail land, even for a 33 metre mast. The companies that own the masts are allowed to sub-let space to any of the normal mobile phone companies – so a rail mast can then host more Operators, though they tend not to. It is not clear whether co-hosting would require planning permission, but even if it did, Local Planning Authorities are encouraged to allow mast-sharing, especially on existing structures. Unfortunately, for maintenance reasons amongst others, sites may be selected at existing stations, which can be in the middle of a village or next to a school.

References

[1] Lee GM et al 2002 - *A nested case-control study of residential and personal magnetic field measures and miscarriages* Epidemiology 13(1):21-31

Summary of safety points to do with railway lines

- Is the railway line electrified?
- Is it powered by AC or DC electricity?
- Is it in a cutting or on an embankment?
- Is it near to a station?
- If your prospective house is closer than 30 metres to overhead wires, we recommend measuring the field levels.
- Magnetic field levels are only reduced by distance, they cannot be shielded against. Electric fields are partially absorbed by materials such as earth, trees, fences, walls, etc. but windows allow electric fields in.
- Check what environmental sprays are being used (if any), for vegetation control by the railway land owner

- Is there a railway mobile phone (GSM-R) communications mast within 2 kilometres (1 km in hilly country)? If not, one may be erected nearby. The rail communications part is likely to be quite tightly focussed up and down the railway line, but we have come across masts which ‘splatter’ quite high fields towards local houses. Mobile phone companies may be offered space on the mast, which will increase microwave exposure in the vicinity of the mast. Mobile phone companies may be offered space on the mast, which will increase microwave exposure in the vicinity of the mast. Mobile phone companies may be offered space on the mast, which will increase microwave exposure in the vicinity of the mast.

Equipment for measuring electric and magnetic fields



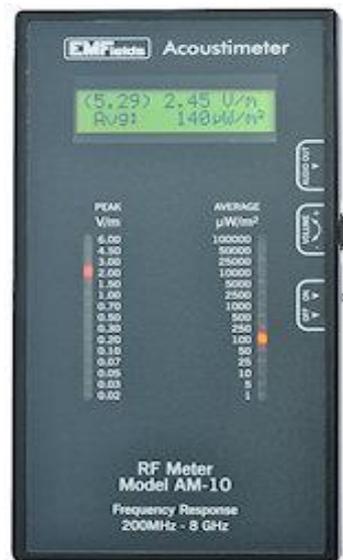
Pocket PF5 Meter

To measure both electric and magnetic fields, you can buy the EMFields Pocket PF5 meter. It has been designed by Alasdair Philips (Powerwatch) and Andrew Cohen (EMFields).

The PF5 meter measures 5 - 200 V/m electric fields and 0.02 - 2.0 microtesla magnetic fields or (0.2 - 20 milligauss magnetic fields).

With this meter you can measure the EMFs in your property or the property you are considering buying and outside in the garden from railway lines, pylons substations and other external sources of power frequency EMFs.

Meters for measuring microwave radiation



Acoustimeter



Acousticom 2

If you are concerned about the RF fields from telecommunications masts along the railway line, you can buy or hire an Acoustimeter microwave meter. The readings are shown on both an LCD display and two series of graduated LED lights, which display peak, peak hold, and average levels of radio frequency electromagnetic fields. The LEDs update rapidly, and allow you to quickly gauge the levels in an area and find any hot-spots. The LCD display offers high accuracy with a lower update speed, giving you time to take note of the readings. You could, instead, buy an Acousticom 2, which displays peak levels of radio frequency electromagnetic fields.

They are easy-to-use, hand-held and arrive complete with simple instructions for use. They are intended for the non-scientist who needs to have no understanding of the physics or technology involved.

For details of the cost of buying the Acoustimeter and the Acousticom 2, see the EMFields website www.emfields-solutions.com. You can also purchase online.

Meters are sent out by 1st class recorded delivery.

Worksheet Electrified Railways – 1 sheet

Is the line powered by overhead cables or a third rail?

Is the line powered by AC or DC electricity?

i.e. overhead wires (25 kV a.c.) or 3-rail (DC - mainly Southern & S.Eastern railways)

At the nearest place to your property, is the railway:

On an embankment? Yes / No

In a cutting? Yes / No

How far away is it from the house to the cable or rail?

How far away is it from the garden to the cable or rail?

Is there a station nearby? Yes / No

What are the maximum field levels when the train passes your property?

Electric field V/m

Magnetic field microtesla

What are the levels when the train has passed?

Electric field V/m

Magnetic field microtesla

Is the garden next to the railway land? Yes / No

Plan where you may want to grow things that you and your family will then eat.

Is there a telecommunications mast visible from the property? Yes / No

What are the maximum RF field levels?

In the house

In the garden