A. INTRODUCTION

This section addresses the potential impacts due to ^ electromagnetic fields (EMF) from the Proposed Project. The Proposed Project elements that could affect local EMF levels in the Project Area are re-alignment of existing tracks and installation of the third rail, modifications and/or upgrades to LIRR substations, and relocation of PSEG-LI transmission lines, Verizon and Cable TV infrastructure, and LIRR communication, power, and signal systems. Finally, the proposed increase in service anticipated could also affect EMF levels.

B. PRINCIPAL CONCLUSIONS AND IMPACTS

EMF exposure levels from traction power may increase due to increased power consumption from additional trains and closer proximity of electrified third rail to adjacent properties; however, since EMF levels from railroad operations are not considered hazardous to the public, increases in EMF levels at sensitive locations would not be considered significant.

The Proposed Project would also result in some LIRR electrical^ and PSEG-LI utility line relocations; however, EMF levels near relocated utility infrastructure would be anticipated to be well below established exposure standards.

C. BACKGROUND

Magnetic fields are one of the basic forces of nature. Any object with an electric charge on it has a voltage (potential) at its surface and can create an electric field. When electric charges move together (an electric current), they create a magnetic field. The strength of a magnetic field depends on the magnitude of the current, the configuration/size of the source, spacing between conductors, and distance from the source. Magnetic fields decrease in strength as the distance from the source increases.

Magnetic flux density is a measure of the strength of a magnetic field over a given area and is reported in units of gauss (G), or more typically in units of milligauss (mG), which are equal to one-thousandth of a gauss (i.e., 1 mG = 0.001 G). Some technical reports also report magnetic flux densities in the unit of tesla (T) or microtesla (μT; 1 μT = 0.000001 T). The conversion between these units is 1 mG = 0.1 μT and 1 μT = 10 mG.

Magnetic fields can be unchanging in direction (also called static), as in the case of direct current (DC), or alternating in direction, as in the case of alternating current (AC). As an example, static magnetic fields occur in nature. The earth has a natural static magnetic field of about 550 mG (0.550 Gauss) in the New York City area. Some electrical devices operate on a DC system while others operate on an AC system. The magnetic field from AC sources (which include most electrical power lines, electrical equipment, residential wiring, and appliances) changes direction at a rate of 60 cycles per second or 60 Hertz.

The characteristics of magnetic fields can differ depending on the field source. A magnetic field near an operating appliance decreases rapidly with distance away from the device. A magnetic field also decreases with distance away from line sources, such as power lines, but not as rapidly as it does with appliances. Since the magnetic field is caused by the flow of an electric current, a device must be operated for it to create a magnetic field. The magnetic fields for a large number of typical AC household appliances were measured by the Illinois Institute of Technology Research (IITRI) for the U.S. Navy and by the Electric Power Research Institute (EPRI). Typical values for appliances are presented in **Table 16-1**. The EPRI study also found that the mean resultant AC magnetic field in residential U.S. homes was approximately 0.9 mG (at approximately ^ one meter above ground level).

Table 16-1
Magnetic Field (mG) From Household Appliances

Appliance	12 Inches Away	Maximum
Electric Range	3 to 30	100 to 1,200
Electric Oven	2 to 5	10 to 50
Garbage Disposal	10 to 20	850 to 1,250
Refrigerator	0.3 to 3	4 to 15
Clothes Washer	2 to 30	10 to 400
Clothes Dryer	1 to 3	3 to 80
Coffee Maker	0.8 to 1	15 to 250
Toaster	0.6 to 8	70 to 150
Crock Pot	0.8 to 1	15 to 80
Iron	1 to 3	90 to 300
Can Opener	35 to 250	10,000 to 20,000
Mixer	6 to 100	500 to 7,000
Blender, Popper, Processor	6 to 20	250 to 1,050
Vacuum Cleaner	20 to 200	2,000 to 8,000
Portable Heater	1 to 40	100 to 1,100
Fans/blowers	0.4 to 40	20 to 300
Hair Dryer	1 to 70	60 to 20,000
Electric Shaver	1 to 100	150 to 15,000
Color TV	9 to 20	150 to 500
Fluorescent Fixture	2 to 40	140 to 2,000
Fluorescent Desk Lamp	6 to 20	400 to 3,500
Circular Saws	10 to 250	2,000 to 10,000
Electric Drill	25 to 35	4,000 to 8,000

Source: "Household Appliance Magnetic Field Survey," U.S. Naval Electronic Systems Technical Report No. EO6549-3, Illinois Institute of Technology Research Institute, Chicago, March 1984.

Typical exposure in the home to man-made EMFs is likely to be greatest from electrical distribution lines, house wiring, electrical appliances, and ground currents in plumbing, gas lines, and steel girders. Exposure to internal and external natural EMFs also occurs, related to the normal physiological functions of the body and geomagnetic field of the earth. As a result, everyone is continuously exposed to EMFs, although intensities of exposure vary widely over time, depending on a person's proximity to electrical devices and wiring.

To date, there is no dose-effect relationship that has been identified for exposure to EMFs, nor has any generally accepted mechanism for interaction with EMFs been identified that may lead to health effects. Studies have been inconclusive in their findings, including epidemiological research that has looked for associations between occupations with presumed greater than average exposure to magnetic fields and adverse health effects.

The Federal government has not established a national standard for either static or extremely low-frequency (e.g., 3 to 3,000 Hz) magnetic field exposure limits. A survey of the body of scientific literature prepared for the Federal Committee on Interagency Radiation Research and Policy Coordination found no convincing evidence that exposure to EMFs with a 30 to 300 Hz frequency range, which encompasses the frequency of the magnetic field associated with the electrified third rail, poses a health hazard.

In evaluating potential electromagnetic fields associated with proposed magnetic-levitation (maglev) transportation systems, the Federal Railroad Administration compared measured EMFs from test vehicles to voluntary guidelines established by the American Conference of Governmental Industrial Hygienists (ACGIH) and the International Commission of Non-Ionizing Radiation Protection (ICNIRP) (which have been endorsed by the World Health Organization). Measured values were well below the 800 mG general public exposure limit from magnetic fields set by ICNIRP and the higher guidelines set by ACGIH. While the traction systems with a maglev vehicle are different from a DC traction motor that propels LIRR trains, the relevant frequency of the electromagnetic field (60 Hz) is comparable between the maglev systems and an electrified third rail system and the analytic results would apply to the different technology.[1]

The New York State Public Service Commission (PSC) has established interim standards for electric and magnetic fields from overhead transmission lines. The current PSC interim standard for electric fields is 1.6 kilovolts per meter (kV/m), and for magnetic fields is 200 mG, measured at one meter above grade, at the edge of the right-of-way.

D. EXISTING CONDITIONS

A total of eight substations are within the Project Corridor:

- Substation G13 in Floral Park, on Plainfield Avenue opposite 111 Plainfield Avenue.
- Substation G14 in New Hyde Park, at Third Avenue and South 9th Street on the south side of the Project Corridor.
- Substation G15, the Merillon Avenue substation, at Atlantic Avenue and Hilton Avenue.
- Substation G16 in Mineola, at the southwest corner of Main Street and Front Street.
- Substation G17 in Carle Place, in the southeast quadrant of Meadowbrook State Parkway and the LIRR just north of Mallard Road.
- Substation G18 in Westbury, southeast of Union Avenue and Sullivan Street on the north side of the Project Corridor.
- Substation G19 in New Cassel, at Broadway and Bond Street on the north side of the Project Corridor.

[1] Federal Railroad Administration, "Electromagnetic Field Characteristics of the Transrapid TR08 Maglev System," DOT-VNTSC-FRA-02-11, May 2002.

- Substation G20 in Hicksville, on the south side of West Barclay Street near Marion Place and adjacent to the LIRR ROW.

Each of the substations is located within the LIRR ROW.

E. FUTURE WITHOUT THE PROPOSED PROJECT

In the future without the proposed project, LIRR would continue to operate in its existing configuration, with increased train service resulting from the completion of the East Side Access Project. Minor increases in EMF levels would be expected due to the additional increase in traction power to provide the additional train service in the future without the Proposed Project.

A 13kV feeder, maintained by PSEG-LI, which supplies power to three substations along the LIRR ROW in the Study Area, has been programmed for relocation. The feeder must be maintained at all times to each of the three substations in order to avoid compromising the power supply to the LIRR. Relocating this feeder during construction of the Proposed Project will require extensive coordination between LIRR and PSEG-LI, especially in locations where ROW is restricted, in particular, immediately east of Roslyn Road and east of the Carle Place Station. One segment of the feeder (Mineola Feeder Replacement) has been scheduled for replacement in the near future. PSEG-LI may consider rescheduling implementation of this initial feeder segment replacement in order to better coordinate ^ with the Proposed Project.

With the exception of the recent replacement of LIRR Substation G13 in Floral Park in 2010, the remaining seven LIRR substations are approximately 40 years old, and nearing the end of their expected operating service life. As such, in the Future Without the Proposed Project it is likely that LIRR would have to replace each of the substations.

F. POTENTIAL IMPACTS OF THE PROPOSED PROJECT

The Proposed Project would involve modifications to track alignment along the Project Corridor. The additional track would be fully electrified along its entire length. As a result of the additional track and widening of the LIRR ROW in certain areas, EMF exposure levels from traction power may increase due to closer proximity to the public spaces. However, since EMF levels from railroads are not considered hazardous, these increases would not be significant.

The Proposed Project would also result in some PSEG-LI electrical ^ transmission line relocations. ^ A description of these ^ relocations is presented in Section D of Chapter 9, "Utilities and Related Infrastructure."

^ Typical magnetic field strength directly below a 69 kV power transmission line is 10 to 30 mG, and 3 to 9 mG at a distance of 50 feet from the line,[2] and at a distance of 100 feet from the transmission line centerline, the strength of the magnetic field would typically drop to less than 2 mG,[3] Field strength decays with distance, and consequently at distances beyond 100 feet, the magnetic field would be expected to be 0 to 1 mG.

Magnetic field levels in nearby buildings would vary depending upon the contribution from other indoor sources, e.g., appliances and wiring. However, at all locations adjacent to relocated

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[2] Electric and Magnetic Fields, PSEG.

[3] Southampton to Bridgehampton Transmission Line and Expansion of Bridgehampton Substation Project, Final Environmental Impact Statement, Chapter 14, "Electric and Magnetic Fields," 2008.

transmission lines, the strength of the magnetic field would be significantly below the interim exposure value established for the general population by the ICNIRP.

For the track sections where relocation of PSEG-LI transmission lines is required, the future utility transmission towers in certain cases would be taller in height than the current wood towers since PSEG-LI policy requires the use of composite steel and concrete utility poles approximately 90 feet high. Therefore, even if the PSEG-LI transmission lines were closer to publicly accessible areas in the future with the Proposed Project, due to the additional height of the poles EMF exposure would not be considered significantly greater than existing conditions.

As discussed in Chapter 9, "Utilities and Related Infrastructure," with the exception of the recent replacement of ^ Substation G13 in Floral Park in 2010, the remaining seven substations are about 40 years old, nearing the end of their expected operating service life. Replacement substations would occupy the same parcels as the present equipment. Prefabricated substation equipment would be used to expedite the implementation of the new units. It is anticipated that the replacement substations would provide greater EMF shielding compared to the existing substations.

Typical maximum magnetic ^ field strength at locations immediately adjacent to new substations would be expected to be in the range of 1 to 25 mG, and maximum fields would be expected to be within 0 to 2 mG at distances of 100 feet or more from the substation.[4] At all locations near the proposed site of the expanded ^ substations, off LIRR property, the maximum strength of any magnetic field would be significantly below the exposure values established for the general population by the PSC and the ICNIRP.

G. MITIGATION FOR THE PROPOSED PROJECT

Because no significant adverse EMF impacts are anticipated, no mitigation is necessary for the Proposed Project with respect to EMF conditions. ✷

[4] Southampton to Bridgehampton Transmission Line and Expansion of Bridgehampton Substation Project, Final Environmental Impact Statement, Chapter 14, "Electric and Magnetic Fields," 2008.