5.5 ELECTROMAGNETIC FIELDS

5.5.1 INTRODUCTION

The threshold used in evaluating whether the BEP and SVRTP alternatives would affect human health is if they would result in direct current magnetic fields that exceed the guidelines of the American Conference of Governmental Industrial Hygienists.

5.5.2 IMPACT DISCUSSION

Human Exposure to New Electromagnetic Fields

No Build Alternative

The No Build Alternative consists of the existing transit and roadway networks and planned and programmed improvements in the SVRTC (see Section 2.6, Related Projects, for a list of these projects). The No Build Alternative would not introduce major new EMF generators into the SVRTC environment. Projects planned under the No Build Alternative would undergo separate environmental review to determine adverse effects to special status species.

BEP and SVRTP Alternatives

These alternatives would result in new sources of EMF generation and exposure of passengers and individuals working on the systems or passing in the vicinity. The main sources of EMF generation would include train power distribution systems; traction power substations with connecting lines to the major utility lines; passenger facilities, with their various electrical systems for lighting, communications, utilities, fare machines, among other systems, and their proximity to power distribution networks; and electrically-powered rail passenger vehicles. Since BART uses DC traction power along the ROW, contributions from BART to the magnetic field levels of the ambient power frequency (60 hertz AC) would be negligible.

Magnetic field measurements were made along existing BART operations at the Lake Merritt Station and near the Dublin/Pleasanton Station that are representative of those expected along the BEP and SVRTP alternatives. DC magnetic field measurements were also made around the perimeter of the BART Dublin substation during early morning operations. Tables 5.5-1 and 5.5-2 show the measured EMF values found above and below BART rails. The values in these tables are well below the guidelines presented in the affected environment section (Section 4.5, Electromagnetic Fields).

EMF intensities associated with trains vary considerably. The greatest potential fields would be within the electric rail vehicle. Therefore, the greatest potential for exposure would be for passengers, train operators, and attendants onboard the train.

Table 5.5-1: Vertical Field Peak Measurements Above Existing, Operating BART Tracks at Hopyard Overpass, Pleasanton

Location	Vertical Field Peak (in Gauss / µT)
Over eastbound I-580 lanes – approximately 14 meters (46 feet) above rails, approximately 35° from rail center	2.1 G / 210 µT
Over eastbound I-580 lanes – approximately 14 meters (46 feet) above rails, directly over rail center	2.1 G / 210 µT

Source: Earth Tech, Inc., 2003.

Table 5.5-2: Vertical Field Peak Measurements Below Existing, Operating BART Pleasanton Line at Rodeo Park Underpass at BART / I-580

Location	Vertical Field Peak (in Gauss / µT)
Approximately 6 meters (20 feet) directly below eastbound rails – no train present	1.7 G / 170 µT
Approximately 6 meters (20 feet) directly below eastbound rails – six-car train moving overhead	1.8 G / 180 µT
Approximately 10 meters (33 feet) directly below and between eastbound and westbound rails.	2.0 G / 200 µT [a]

[a] Fairly constant field, with or without train movement overhead.

Source: Earth Tech, Inc., 2003.

Passengers and workers would also be exposed to EMF fields in stations, and further exposure would occur to workers at traction power substations. Representative field measurements taken outside of existing BART stations are shown in Table 5.5-3. As shown in the table, field strengths of electrified rail systems would be low and below recommended exposure levels. Strong fields that carry a greater possibility of health risks would not be associated with these environments.

Measurements of DC magnetic fields were taken along the south wall of a substation at the Pleasanton Station where public exposure might occur. Additional measurements were taken at all three levels at the Lake Merritt Station. The values found at these BART stations are shown in Table 5.5-4.

Field strengths onboard BART trains, which contain major propulsion equipment below floor level, show measurements ranging from 1,600 to 2,000 mG total (USDOT et al., 2002). These values are equal to 160 to 200 µT, which is well within the ACGIH and ICNIRP guideline thresholds.

Table 5.5-3: Vertical Field Peak and Range Measurements for Reference

Location	Range	Vertical Field Peak (in Gauss / µT)
Church of Christ, Pleasanton parking lot	Approximately 50 meters (164 feet) south of BART rails (with and without trains)	2.0 G / 200 µT
Church of Christ, Pleasanton parking lot	Approximately 100 meters (329 feet) south of BART rails (with and without trains)	1.9 G / 190 µT
Background field measurement between Dublin and Livermore,	15 miles east of the end of BART tracks	1.3 – 1.7 G
Background field measurement between Dublin and Livermore	15 miles east of the end of BART on farm	130 µT – 170 µT

Source: Earth Tech, Inc., 2003.

Table 5.5-4: Vertical Peak Measurements at Representative BART Stations

Location	Vertical Field Peak (in Gauss / µT)
Between Pleasanton Station and BART rails, parking lot center – max. along south wall of substation	2.2 G / 220 µT
Lake Merritt Station – platform level between rail centers	1.3 G / 130 µT
Lake Merritt Station – Level 1, approximately 7 meters (23 feet) directly above southbound rails	1.7 G / 170 µT
Lake Merritt Station – Level 2, street level, approximately 15 meters (49 feet) directly above southbound rails	1.9 G / 190 µT

Source: Earth Tech, Inc., 2003.

The measurements presented in this section demonstrate that exposure levels for BART train passengers and operators, passengers and BART employees in a station, and other BART workers are well below the guidelines for preventing health effects. Therefore, the potential for non-users, businesses, and residences at ground level to experience EMF exposures from BART would be minimal, and present evidence suggests that there would be no demonstrable health risks from exposure to EMF with the BEP and SVRTP alternatives. The following design features and standards will be included for the BEP and SVRTP alternatives to minimize the potential for EMF and EMI effects:

- EMF issues will be included in the preliminary and final project design reviews to evaluate possible effects of the design with respect to DC and low frequency magnetic fields.

- An EMF Control and Test Plan will be included in the general contractor specifications to maintain awareness of the possible effects of BEP and SVRTP alternatives construction and operation, as well as provide field measurement for and confirmation of the final design. The plan will include EMF limits (based on ICNIRP and ACGIH guidelines) in the design and construction specifications and require testing and measurement of the final installed system.

Because EMF intensities and exposures from BART operations are below thresholds indicating potential health risks, no mitigation measures are required for the BEP or SVRTP alternatives.

5.5.3 CUMULATIVE IMPACTS

As discussed in Section 4.5, Electromagnetic Fields, short-term human health effects from exposure to elevated levels of EMFs are well established, such as effects on the central nervous system and heating of the body. Long-term effects from exposure to lower levels of EMFs continue to be studied. Since only short-term EMF levels are considered to have a potential human health effect, EMF effects are not considered cumulative in nature.