



# EMF Survey Report

**Conducted at**  
Alpine Boulevard  
Alpine, CA 92901

**Conducted for**



Alpine Education Foundation  
2710 Alpine Blvd., Suite 0-101  
Alpine, CA 92901

**Survey Date**  
March 18, 2016

**ET&T Project No. 164435**

**Report Date**  
April 5, 2016

EMF&RF Solutions is a Division of  
Environmental Testing & Technology, Inc. (ET&T)



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## INTRODUCTION

ET&T conducted an initial electromagnetic field (EMF) survey at multiple locations along Alpine Boulevard in the community of Alpine, California. It was reported to ET&T that a 230 kV underground transmission line runs along Alpine Boulevard in an East to West direction. Concerns have been raised by the Alpine Education Foundation about EMF levels at locations near the underground power line. This survey was performed to obtain data on the EMF levels at representative areas along Alpine Boulevard. The EMF survey was performed by Mr. Andrew Jordan and Mr. Brad Murico, Industrial Hygienists with ET&T on March 18, 2016 between approximately 1:00pm and 3:00pm. There were two (2) data logging devices placed at 1830 Alpine Blvd. to record fluctuations of EMF levels from March 8, 2016 to March 14, 2016.

## EMF INSTRUMENTATION AND METHODOLOGY

A grid type system was designed at locations along Alpine, Blvd. to define measurement locations. Perpendicular lines extending from the curb at the edge of the street were created at five (5) locations along Alpine Blvd. and one (1) location approximately 500 feet away (1508 Midway Dr). The measurements extended perpendicularly out from Alpine Blvd. approximately 300 feet to the either to the North or South edge of the street. Spot Measurements were conducted at 20 foot increments. EMF levels were recorded at these points at approximately 3 feet above ground level.



The spot measurements for extremely low frequency alternating current (AC) magnetic fields (EMF) were conducted with a tri-axial magnetic field meter to assess the magnetic flux density (EMF levels). A *Teslatronics Model 710* instruments and a *Holiday HI 3627* were used for these spot measurements. The frequency range for these instruments is 30 to 2000 Hertz (Hz). There were *EMDEX light* instruments used for data logging EMF levels at the site. The unit for magnetic flux density (EMF levels) measurements is milliGauss (mG). The equipment was calibrated prior to the survey according to the manufacturer's recommendations.

## INTRODUCTION TO EMF'S

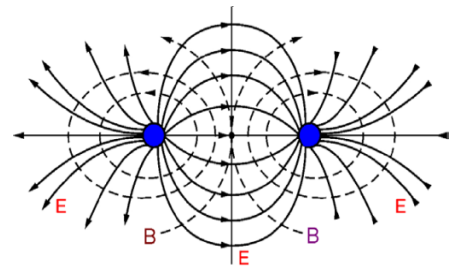
EMF's are magnetic fields emitted from electrical wiring systems, appliances, transmission lines and transformers. Electrical current traveling through electrical wiring (line sources) or equipment such as motors and transformers (point sources) create magnetic fields. The strength of the generated magnetic field is dependent on a number of factors:

- Distance to the field source
- Amount of current flow (referred to as load or power usage)
- Distance between the conductors (lines, wires)
- Conductor configuration
- Presence of net current flow
- Whether it is a point source or line source

The detected magnetic field at any location is a result of the interaction of the applicable factors. All factors being equal, the higher the current flow, the higher the magnetic field. The strength of the magnetic field depends on current flow and the levels will fluctuate depending on the electrical load. The further one moves away from any source, the lower the magnetic field.

## POWER FREQUENCY ELECTRO-MAGNETIC FIELDS (EMF)

Electrical power distribution systems use alternating currents (AC) to provide electricity for our use. Power is transported through transmission and distribution lines into our buildings to the end users. Current flow on the conductor (wire) creates magnetic fields. Often these fields are low and of no concern. Common sources for high magnetic fields are power transmission and distribution lines, transformers, electrical rooms, circuit breaker panels, improper wiring or bonding, motors and appliances.



## EMF SURVEY RESULTS

The purpose of the survey was to outline the distribution of the EMF levels extending out from Alpine Boulevard. Perpendicular lines extending from the curb at the edge of the street were created at five (5) locations along Alpine Blvd. and one (1) location approximately 500 feet away (1508 Midway Dr). The measurements extended perpendicularly out from Alpine Blvd. approximately 300 feet to the either to the North or South of the street. Spot Measurements were conducted at 20 foot increments. EMF levels were recorded at these points at approximately 3 feet above ground level:

Diagram 1: Aerial map of Measurement Locations



Table 1: Addresses of EMF Measurement Locations

Location	Direction from Alpine Blvd
1508 Midway Dr., Alpine, CA 91901*	South
1830 Alpine Blvd., Alpine, CA 91901	North
Empty Lot near 1850 Alpine Blvd., Alpine, CA 91901	North
2202 Alpine Blvd., Alpine, CA 91901	North
2605 Alpine Blvd., Alpine, CA 91901	South
3535 Alpine Blvd., Alpine, CA 91901	South

\*1508 Midway Dr. is located approximately 500 ft. away from Alpine Blvd.

Table 2: EMF Spot Measurement Results in milliGauss (mG).

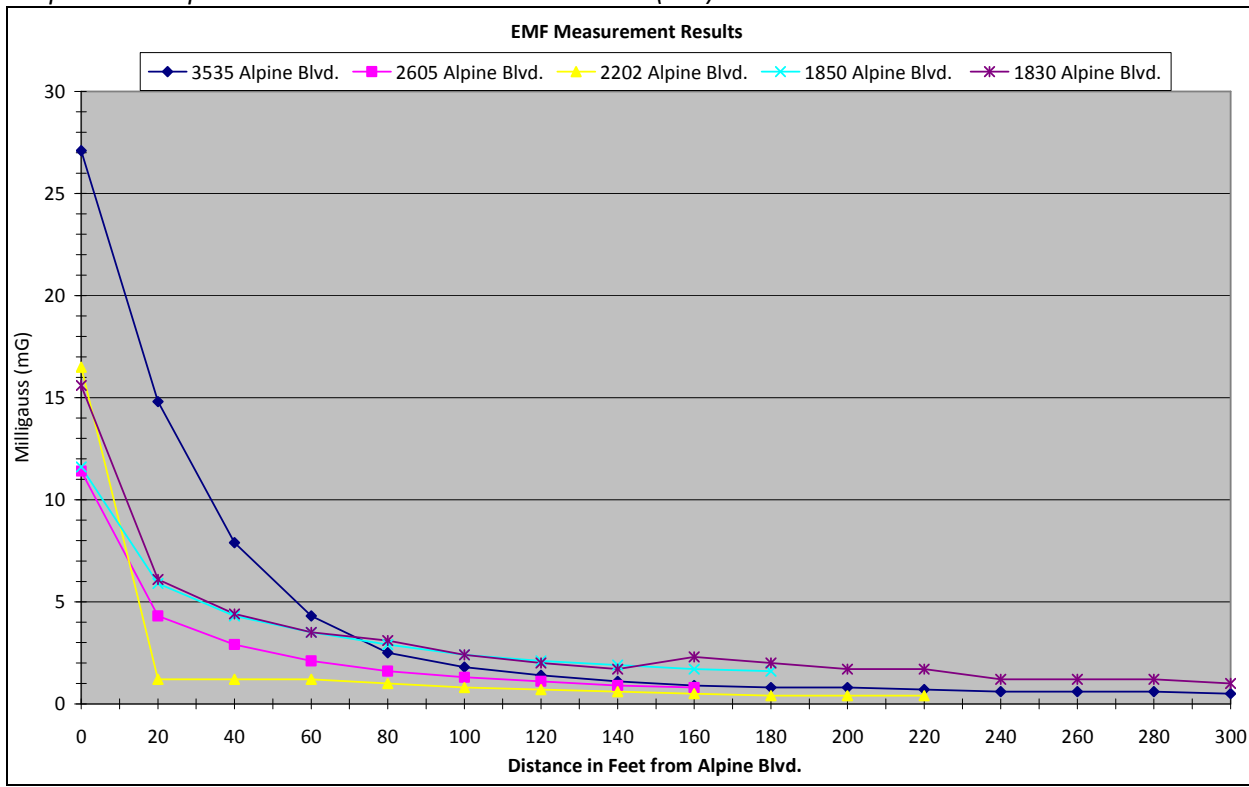
Distance From Alpine Blvd	Location				
	3535 Alpine Blvd	2605 Alpine Blvd	2202 Alpine Blvd	Empty Lot Near 1850 Alpine Blvd	1830 Alpine Blvd
	EMF Measurement Results in milliGauss (mG)				
Far Curb	21.4	8.1	17.9	28.2	17.0
Center of St.	28.2	64.1	24.5	49.5	37.8
Near Curb 0 ft.	27.1	11.4	16.5	11.6	15.6
20 ft.	14.8	4.3	1.2	5.9	6.1
40 ft.	7.9	2.9	1.2	4.3	4.4
60 ft.	4.3	2.1	1.2	3.5	3.5
80 ft.	2.5	1.6	1.0	2.9	3.1
100 ft.	1.8	1.3	0.8	2.4	2.4
120 ft.	1.4	1.1	0.7	2.1	2.0
140 ft.	1.1	0.9	0.6	1.9	1.7
160 ft.	0.9	0.8	0.5	1.7	2.3
180 ft.	0.8	No Access Beyond this Point	0.4	1.6	2.0
200 ft.	0.8		0.4	No Access Beyond this Point	1.7
220 ft.	0.7		0.4		1.7
240 ft.	0.6		No Access Beyond this Point		1.2
260 ft.	0.6				1.2
280 ft.	0.6				1.2
300 ft.	0.5			1.0	

Table 3: EMF Spot Measurement Results in milliGauss (mG) at 1508 Midway Dr\*.

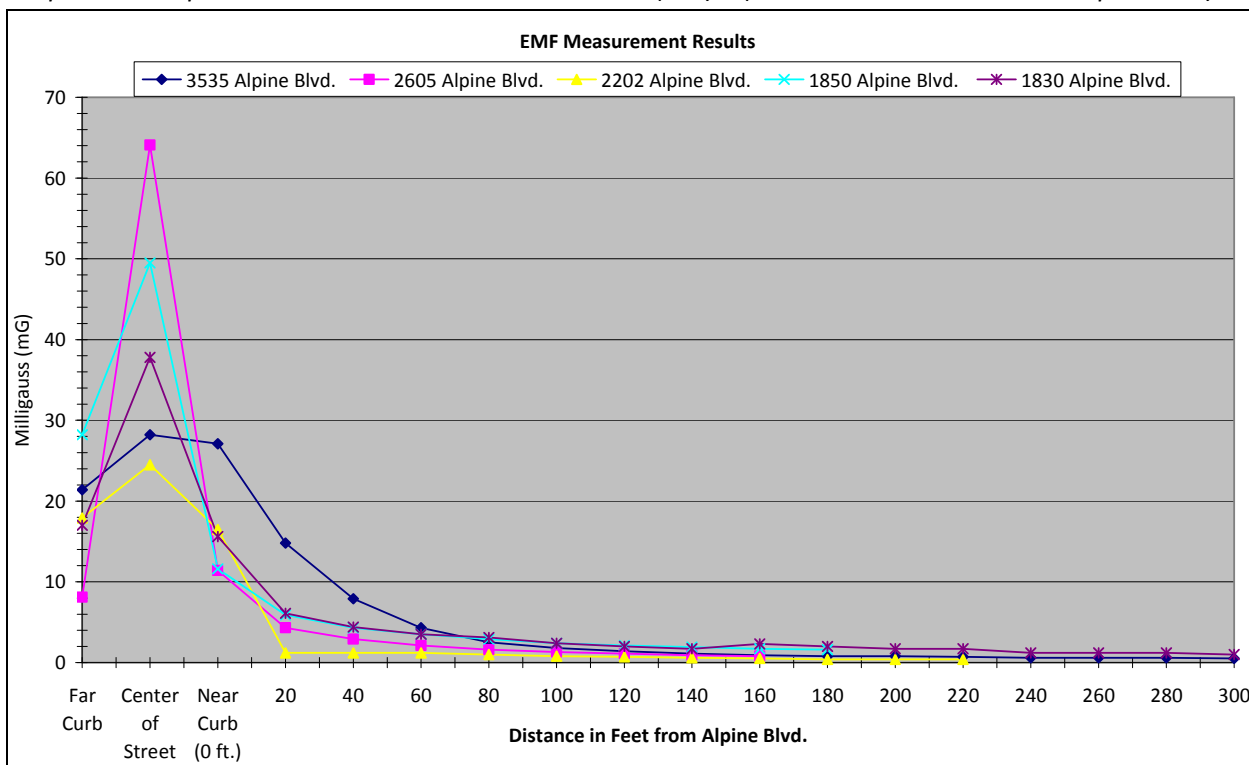
Location	EMF Measurement Results in milliGauss (mG)
North Side of Property	0.7
Center of Bldg.	0.8
Northwest Corner of Bldg.	0.8
Northeast Corner of Bldg.	0.8
Southeast Corner of Bldg.	0.8
Southwest Corner of Bldg.	0.8

\*1508 Midway Dr. is located approximately 500 ft. away from Alpine Blvd

Graph 1: EMF Spot Measurement Results in milliGauss (mG)



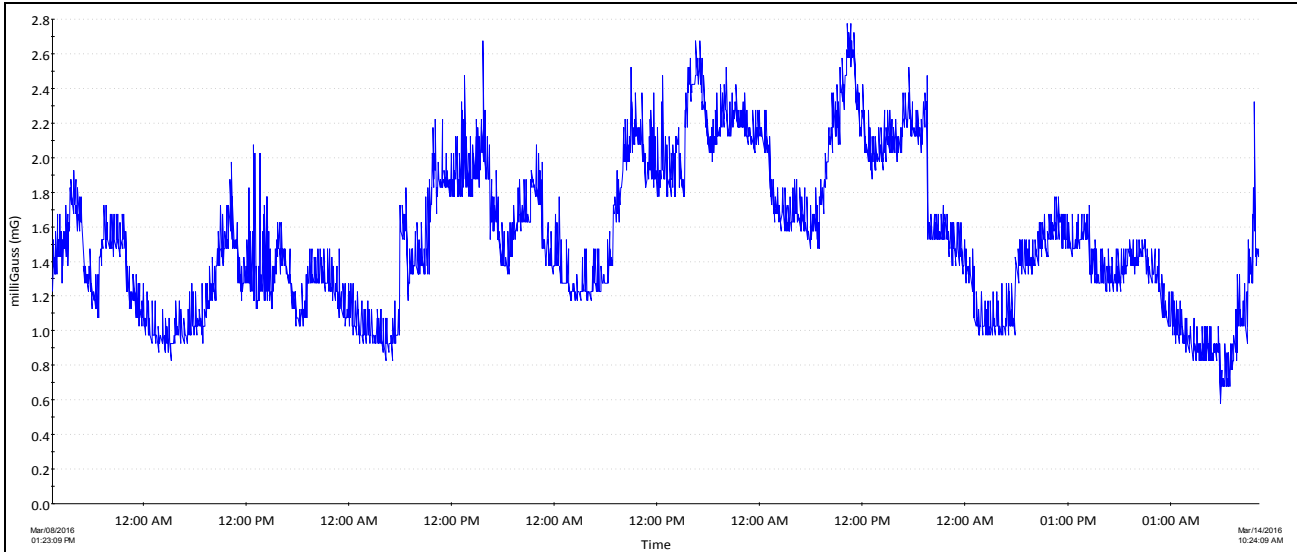
Graph 2: EMF Spot Measurement Results in milliGauss (mG) – (includes measurements on Alpine Blvd)





There were two (2) data logging devices placed at 1830 Alpine Blvd. to record fluctuations of EMF levels over a period from March 8, 2016 to March 14, 2016. There was one data logger (Unit A) placed inside the building approximately 180 ft. from street. The second data logger (Unit B) was placed inside the building approximately 300 ft. from street. The EMF data logging yielded the following results:

Graph 3: Unit A – EMF Data Logging Results at approx. 180 ft. in milliGauss (mG).



Graph 4: Unit B – EMF Data Logging Results at approx. 300 ft. in milliGauss (mG).

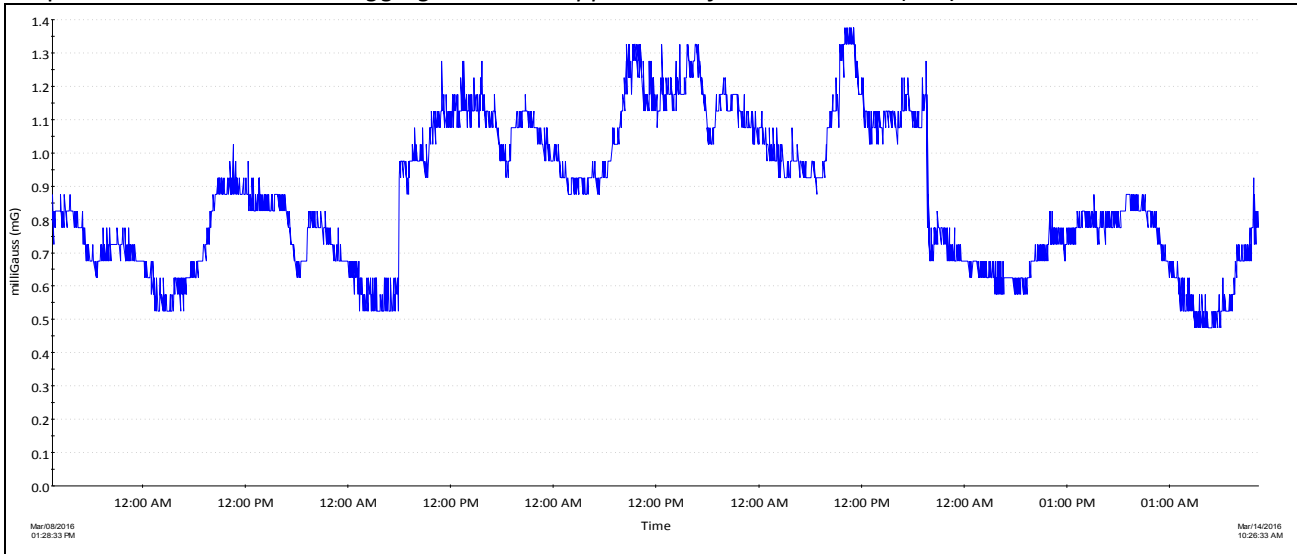


Table 4: EMF Data Logging Results from March 8, 2016 to March 14, 2016.

Location	Minimum	Maximum	Average	Median
Unit A – N. Wall	0.6	2.8	1.5	1.5
Unit B – S.W. Corner	0.5	1.4	0.9	0.8

- The highest EMF levels were at times from approximately 12:00pm to 3:00pm.

## SUMMARY

Spot measurements were conducted on March 18, 2016 between approximately 1:00pm and 3:00pm. There were two (2) data logging devices placed at 1830 Alpine Blvd. to record fluctuations of EMF levels over a period from March 8, 2016 to March 14, 2016.

The strength of the magnetic field depends on current flow and the levels will fluctuate depending on the electrical load. The higher the current flow, the higher the magnetic field. The further one moves away from any source, the lower the magnetic field.

### EMF Spot Measurements:

- Refer to pages 4 – 6 of this report for EMF spot measurement results and locations.
- The EMF levels at the curbs on the edge of the street ranged from 8.1 – 28.2 mG.
- The EMF levels center of the street ranged from 28.2 – 64.1 mG.
- In general, the EMF levels are higher towards Alpine Boulevard.
- There is a significant decrease in the EMF levels within 40 – 60 ft. away from the edge of Alpine Blvd.
- The EMF levels were less than 2.5 mG all of the locations at approximately 80 – 100 ft. away from the edge of the street.
- At 1830 Alpine Blvd. the EMF levels slightly increased and then began to decrease again approximately 140 – 200 ft. out from the street. There appears to be an underground distribution line in this area of the property which may supply the building.

### EMF Data Logging:

- Refer to page 7 of this report for EMF data logging results and locations.
- There were two (2) data logging devices placed at 1830 Alpine Blvd. to record fluctuations of EMF levels over a period from March 8, 2016 to March 14, 2016
- Unit A was placed inside an office in the building approximately 180 ft. from street.
  - The highest EMF levels were at times from approximately 12:00pm to 3:00pm.
  - Minimum: 0.6 mG
  - Maximum: 2.8 mG
  - Average: 1.5 mG
  - Median: 1.5 mG
- Unit B was placed inside a storage room in the building approximately 300 ft. from street.
  - The highest EMF levels were at times from approximately 12:00pm to 3:00pm.
  - Minimum: 0.5 mG
  - Maximum: 1.4 mG
  - Average: 0.9 mG
  - Median: 0.8 mG
- The data logging measurements yielded fluctuations of EMF levels that show a similar pattern from day to day.



## REFERENCE DATA

Tables 5 & 6 you with some EMF reference data regarding precautionary action levels recommended for residential, commercial and institutional buildings where people spend long periods of time based on EPRI (Electric Power Research Institute) funded studies, suggested recommendations by national and international unions, working groups or governmental entities.

Table 5: EMF Reference Data in milliGauss (mG).

Levels	Source
0.1 – 0.5 mG	Common background levels in residential not close to power lines and without wiring problems causing high fields (ET&T data).
0.9 mG	Average background level in residential buildings in a nationwide residential measurement survey of 1000 US homes (Luciano Zaffanella, 1994). Includes homes next to power lines and with wiring problems.
<1.0 mG	BioInitiative Report – EMF Working Group (US)
1.25 mG	California Department of Education’s (CDE) design goal for school environment
<1.25 mG	Average EMF levels in US schools (L. Zaffanella study, 1998)
<2.0 mG	TCO - Swedish labor union standard for acceptable magnetic field emission for computer operator
<2.5 mG	MPR 2 Swedish governmental standard for acceptable magnetic field emission for computer operator

## REGULATORY PERMISSIBLE EXPOSURE LEVELS

The Occupation Safety and Health Administration regulate exposure issued for employees at work sites in the United States. It used an 8-hour work shift for exposure assessments and maximum allowable exposure levels for numerous chemical compounds and physical parameter.

Extremely low frequency (ELF) fields include alternating current (AC) fields and other electromagnetic, non-ionizing radiation from 1 Hz to 300 Hz. ELF fields at 60 Hz is produced by power lines, electrical wiring, and electrical equipment. OSHA and CAL/OSHA have currently no specific EMF standards that address extremely low frequency (ELF) magnetic fields.

Some epidemiological studies have suggested increased cancer risk associated with long-term magnetic field exposures near electric power lines. However, these studies focus on childhood leukemia and long-term exposure (24 hours/365 days) at residential buildings. Some organizations have published proactive action levels for residential buildings and office workers with long-term exposures.

Industrial hygiene and other professional organizations have developed guidelines for electric and magnetic field exposures in the ELF frequency range for work places. Some European countries have established regulatory maximum exposure levels for workers. Listed below are suggested guidelines (GL) for magnetic field exposure by different organizations and regulatory maximum exposure limits (REG) for controlled work environments.

Table 6: EMF Reference Data in milliGauss (mG)

Source	EMF Levels	Type
American Conference of Governmental Industrial Hygienists (ACGIH)	1000 mG	GL
World Health Organization (WHO)	1000 mG	GL
International Radiation Protection Agency (IRPA)	1000 mG	GL
Switzerland (NISV)	1000 mG	REG
Austria ÖVE/ÖNORM E 8850	5000 mG	REG

## LIMITATIONS

A diligent inspection of normally visible and accessible areas and measurements were made in accordance with the scope of work. The measured values are reflective of the conditions present at the time of the survey and may change with the installation of electrical wiring, additional usage and additional equipment. However, due to the inherent limitations of the physical inspection process and short-term measurements, Environmental Testing & Technology, Inc. cannot report, or accept responsibility for, materials or conditions, which may exist in areas that were inaccessible at the time of its inspection. Changes in technology and research, the introduction of new products and sources in the indoor and outdoor environment may alter the evaluation of the values measured at the time of the survey.

This inspection is not intended to reflect the structural integrity, or value of the property, nor do we make any representation as to the advisability of purchase or the suitability for use. We do not assume responsibility for choices or decisions made regarding the purchase or rental of properties, mitigation or potential legal action, based on our measurements. The inspection is not intended to be technically exhaustive, and is not to be used as a guarantee or warranty, expressed or implied, regarding the adequacy, performance, or condition of the inspected structure.

If you have any further questions, please feel free to contact us at (760) 804-9400.

Sincerely,



Andrew M. Jordan, BA  
Industrial Hygienist



Brad E. Murico, BS  
Industrial Hygienist