EMF Assessment for ECI Development

Gran Pacifica, Nicaragua

January 2024

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Executive Summary

Overview:

- Cathy Cooke (EMRS, BBEC, CRMI, BCHN) was hired to conduct an initial Electromagnetic Radiation (EMR) survey for a proposed 'Low-EMF' community located inside the Gran Pacifica Resort, Nicaragua.
- Measurements were collected between the dates of January 4th, 2024, to January 8th, 2024.
- The proposed community is currently undeveloped land with no infrastructure.
- Radio Frequency, magnetic fields and electric fields were measured throughout the proposed area on four different occasions with the meters listed above.
- Radio Frequency, magnetic fields, electric fields and microsurge electrical pollution were all measured throughout the already existing neighborhoods on numerous different occasions with the meters listed above.

Summary of Findings:

- Radio Frequency (RF) levels inside the Isla community were consistently in the 'No' to 'Slight' concern range. (See building biology guidelines throughout this report.) An average of peak measurements over four different metering sessions was between 0.5-4 $\mu W/m^2$.
- On one occasion a pulse of 25 $\mu W/m^2$ was measured inside the proposed area. This was the highest radio frequency level measured and was during the highest traffic time (Saturday afternoon). This is considered a 'Severe' concern range.
- Due to the density of building materials measured in the existing homes (concrete cinder blocks) it is fully expected that measurements inside the homes will be reduced by approximately 95%.
- No electric or magnetic fields were identified. This is to be expected as no electrical infrastructure has been laid.
- RF readings on the developed areas of the property were found in the 'Extreme' range due to personal items like cell phones, Wi-Fi, and a cell tower near the entrance of the property.
- Elevations of microsurge electrical pollution were also identified in the developed properties due to LED lightbulbs, mini splits, and solar panels.

- Elevated levels of electric fields were also found in the existing homes. These could be easily reduced to the 'No' concern range by manipulating breakers.
- No wiring errors or excessive magnetic fields were identified on the property.
- Elevations in magnetic fields were identified in one 'Tiny Home' in the Eva community due to the placement of the breaker panel near the master bed.

1. Client Objectives

Measure and identify EMF levels on undeveloped Isla neighborhood on the Gran Pacifica property. Analyze data to determine if the property is appropriate for a 'Low-EMF' community.

2. Building Biology Principles

Investigation, techniques and protocols are based in the 25 Bau-Biology principles .

Site and Community Design

1. Verify that the site is free of naturally-occurring and human-made health hazards.

2. Place dwellings so occupants are undisturbed by sources of human-made air, soil, water, noise and electro-pollution.

3. Place dwellings in well-planned communities that provide ample access to fresh air, sunshine and nature.

4. Plan homes and developments considering the needs of community, families and individuals of all ages.

Electromagnetic Radiation Health

5. Provide an abundance of well-balanced natural light and illumination while using color in accordance with nature.

6. Minimize building material interference with vital cosmic and terrestrial radiation.

7. Adopt appropriate strategies to minimize exposure to harmful Electromagnetic radiation generated as a result of building electrification

8. Adopt appropriate avoidance and shielding strategies to minimize exposure to radio frequency radiation generated by wireless devices within the building and from wireless sources outside the building.

9. Avoid use of building materials that have elevated radioactivity levels.

Indoor Air and Water Quality

10. Assure low total moisture content and rapid desiccation of wet construction processes in new buildings.

11. Provide for ample ventilation.

12. All building materials shall be non-toxic with neutral or pleasant natural scents using natural and unadulterated building systems and materials.

13. Use appropriate water and moisture exclusion techniques to prevent interior growth of fungi, bacteria and dust mites. Techniques to favor mass flow-through envelope enclosures with high hygric buffering capacity.

14. Assure best possible water quality by applying purification technologies if required

Occupant Well-being

15. Allow natural self-regulation of indoor air humidity, sound attenuation and healthy ion balance using hygroscopic (humidity buffering) and sorbent materials and finishes.

16. Design for a climatically appropriate balance between thermal insulation and thermal storage capacity.

17. Plan for climatically appropriate surface and air temperature.

18. Use appropriate thermal radiation strategies for heating buildings including passive solar wherever viable.

19. Provide adequate acoustical protection from harmful noise and vibration.

20. Utilize physiological and ergonomic knowledge in interior and furniture design.

21. Consider proportion, harmonic measure, order and shape in design.

Environmental Protection, Social Responsibility and Energy Efficiency

22. Materials and methods of construction shall promote human health and well-being from the extraction of raw materials, through to end-of-building's life.

23. Avoid the use of building materials that deplete irreplaceable natural resources or are being harvested in an unsustainable manner.

24. Minimize energy consumption throughout the life of the building utilizing climate-based and energy efficient design, energy and water saving technologies and renewable energy.

25. Consider the embodied energy and environmental life cycle costs when choosing all materials used in construction.

* Learn more about Building Biology by going to their website at:
https://buildingbiologyinstitute.org/free-fact-sheets/

3. EMF Measurement Information

3.1. Common Building Biology Measurements and Terminology

The four main Electromagnetic Fields measured are:

Electric fields come from anything that works with electricity. Our highest exposure comes from the wiring in our walls. Voltage gets pushed through the wires, and they can emanate several feet into the room. Anything that has a cord and is plugged in, will create EF.

Magnetic fields which come from wiring errors and electric utility wires. Sources include overhead or underground wires, transformers from the electric utility, and small box transformers on low voltage lighting, cell phone chargers, computers cords and appliances.

Radio frequencies (RF) come from wireless devices such as Wi-Fi, cell phones, wireless routers, baby monitors, appliances, smart meters, cell phone towers and more.

Microsurge Electrical Pollution (MEP) also known as Dirty Electricity. MEP is when the wiring within your walls contains frequencies other than the normal 60 Hz electrical current. The normal sine wave is altered, and there are 'surges' of electricity that emanate into the living space. Certain devices create MEP on your electrical lines: Plasma TV's, Computers, Pool Pumps, Solar Panels, Utility Meters, Light Dimmer Switches, CFL Light bulbs, and many other appliances.

DC electrical and magnetic fields may also be assessed. These are caused by an unhealthy ion balance in the home. Common sources include synthetic materials and metals.

Each different type of EMF/EMR requires specialized sensitive meters. Whole Home and Body Health uses only the highest quality equipment.

3.2. Limitations of the Assessment

The readings and results in this report are based in real time and may not be able to be duplicated at a future date. All results are date and time specific and may differ during different times of a typical 24-hour day and may vary by day of week or even season of the year.

3.3. Building Biology Precautionary Principle

The Building Biology Evaluation Guidelines are based on the precautionary principle. They are specifically designed for sleeping areas associated with long-term risks and a most sensitive window of opportunity for regeneration. In this report, under RF, electric and magnetic sections you will see charts with levels of concern listed as none, slight, severe and extreme. These readings take into consideration the Building Biology evaluation guidelines and are based on the precautionary principle as follows:

No Concern: This category provides the highest degree of precaution. It reflects the unexposed natural conditions or the common and nearly inevitable background level of our modern living environment.

Slight Concern: As a precaution and especially with regard to sensitive and ill people, remediation should be carried out whenever it is possible.

Severe Concern: Values in this category are not acceptable from a building biology point of view, they call for action. Remediation should be carried out soon. In addition to numerous case histories, scientific studies indicate biological effects and health problems within this reference range.

Extreme Concern: These values call for immediate and rigorous action. In this category international guidelines and recommendation for public and occupational exposures may be reached or even exceeded.

Our Guiding Principle: Any risk reduction is worth achieving. Reference values are meant as a guide. Nature is the ultimate standard.

3.4. Building Biology EMF Measurement Guidelines and Sources

	Units	No Concern	Slight Concern	Severe Concern	Extreme Concern
AC Electric (body voltage)	mV	<10	10-100	100-1000	>1000
AC Electric (potential free)	V/m	<0.3	0.3-1.5	1.5-10	>10
AC Magnetic	mG	<0.2	0.2-1	1 – 5	>5
RF (wireless radio freq)	$\mu W/m^2$	<0.1	0.1-10	10-1000	>1000

AC Electric Fields - (V/m) wires in walls, lamps, electric beds, electronics, power lines, power cords

AC Magnetic Fields - (mG) computer equipment, fluorescent lighting, house wiring, 3-way switches wired incorrectly, clock radios, fans, motors, electric breaker panels, power lines

RF Radio Frequency Radiation – ($\mu W/m^2$) cell towers, Smart Meters, wireless computer equipment, cordless phones, cell phones, gaming systems, microwave ovens

Evaluation of DC Electric Fields - carpet, synthetic fibers, dry air

DC Magnetic Fields – degrees^o deviation on compass on beds, metal springs, metal headboards and frames

MEP (microsurge electrical pollution) - (GSU or Volts) – altered sine wave from electronic devices like computers, LED light bulbs, solar panels, pool pumps, utility meters etc.

3.5. Meters Used in Your Assessment

Many different tools and meters may be used. But these are the main instruments I used in your assessment to adequately identify the EMF situation throughout the Gran Pacifica property.

*** Equipment used for this project consisted of minimal metering tools. Careful consideration was used to choose a minimal yet effective array of meters considering the possibility of immigration challenges and potential confiscation.**

Safe and Sound Pro II by Safe Living Technologies.

A radio frequency meter measuring 400 MHz to 7.2 GHz and a +/- 6dB accuracy level. Displays digital readings up to 2,500,000 µW/m² and down to 0.001 µW/m²

Gigahertz Solutions NFA 1000.

Electric and Magnetic Field meter with Datalogging capabilities. Measures 3D AC Electric Fields and 3D AC Magnetic Fields - Uses "NFASoft" Data Analysis Software

Klein Tools CL150 Clamp Meter

AC Electrical Tester with 18-Inch Flexible Clamp, True RMS Readings and Auto Ranging. Measures AC current up to 3000A.

PicoScope 2204A

Oscilloscope and spectrum analyzer used with laptop computer to measure electromagnetic interference and Microsurge Electrical Pollution in the 60 Hz waveform up to 10 MHz bandwidth.

Radio Shack AM/FM pocket radio 1200586.

Used to locate electromagnetic interference in the air from specific sources. Not used to quantify or analyze specifics of Microsurge Electrical Pollution.

4. Testing Results on Gran Pacifica Property

All four fields were tested various times throughout the property over the course of four days. Testing results for each of the four fields are documented below.

4.1. Radio Frequency - Isla

	Units	'No Concern'	'Slight Concern'	'Extreme Concern'	'Severe Concern'
Radio Frequency	$\mu W/m^2$	<0.1	0.1-10	10-1000	>1000

- Meters used for measuring Radio Frequency were the Safe and Sound Pro 2 (SSP).
- Measurements were taken at 4 different intervals throughout the Isla Neighborhood (the proposed community). Measurements shown are the averages of the peaks.

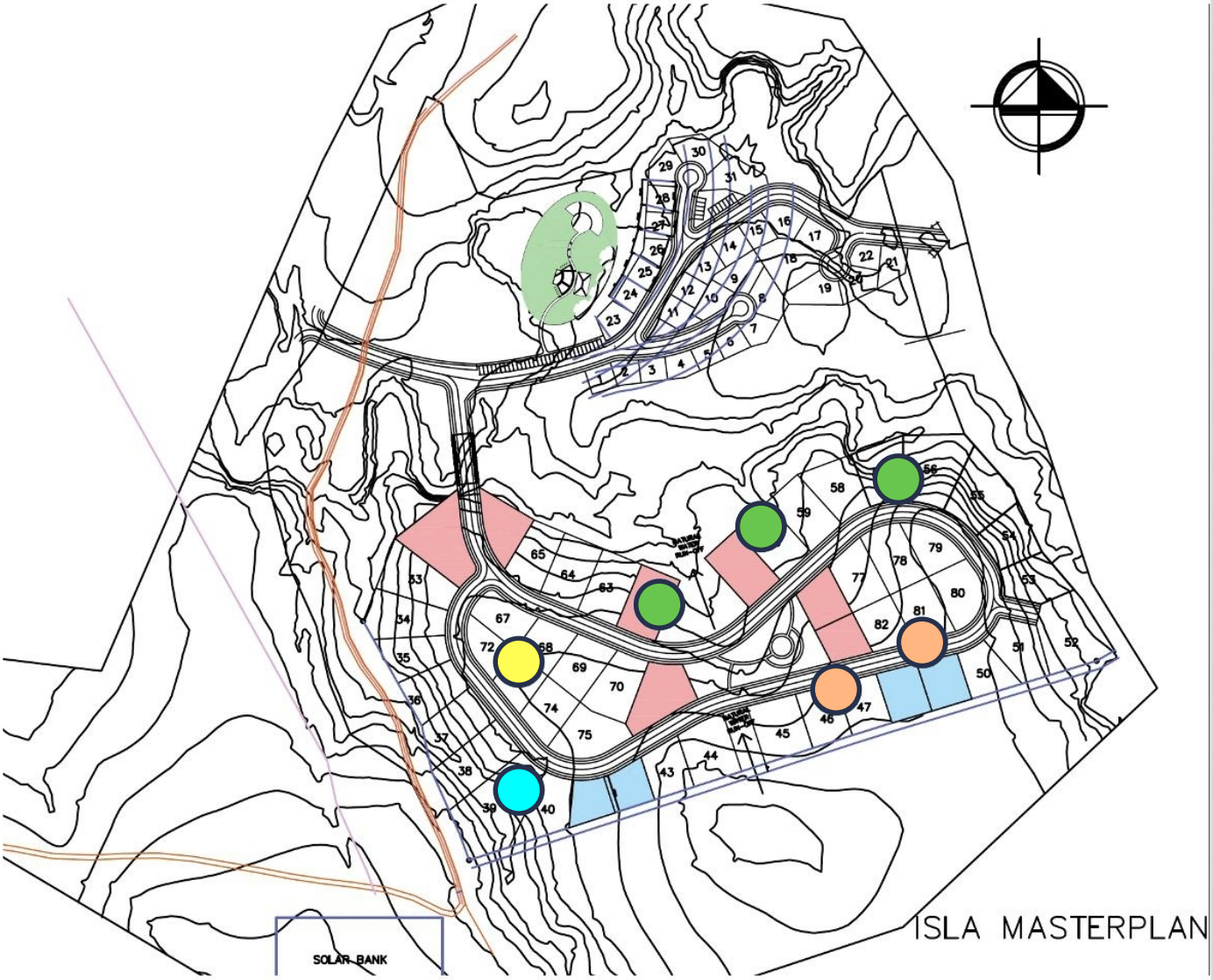
January 4th, 2024		.01-6 $\mu W/m^2$		
January 5th, 2024		.01-5 $\mu W/m^2$		
January 6th, 2024			.01-25 $\mu W/m^2$	
January 7th, 2024		.01-4 $\mu W/m^2$		

Highest peak recorded:
25 u µW/m²

Average peaks between:
0.1-2 µW/m²

Lowest average peaks::
0.1-1 µW/m²

Average peaks between:
0.1-4 µW/m²



4.2. Radio Frequency - Surrounding Areas

Measurements were taken in the EVA 'Tiny House' community, the San Diego neighborhood and at the pool and restaurant at numerous intervals.

- All measurements are outdoors.
- Areas were occupied at the time of the measurements.
- These are general measurements. As RF sources were in use (cell phones, smart watches, WI-FI routers etc.) levels reflect an ambient exposure within a 'normal' traffic situation.
- Higher levels were measured within a few feet or inches of said devices. These levels have not been included as that is to be expected.
- Levels on the beach varied widely depending on location and occupancy. Walking away from the property, levels dropped to zero quickly. When occupied, levels increased due to personal devices like cell phones. At the time of the inspection, the beach was largely unoccupied most of the time.

San Diego				1,200-6,000 $\mu W/m^2$
Restaurant				250-6,500 $\mu W/m^2$
Pool			100-370 $\mu W/m^2$	
Eva				150-1,500 $\mu W/m^2$
Beach			0 – 250 $\mu W/m^2$	

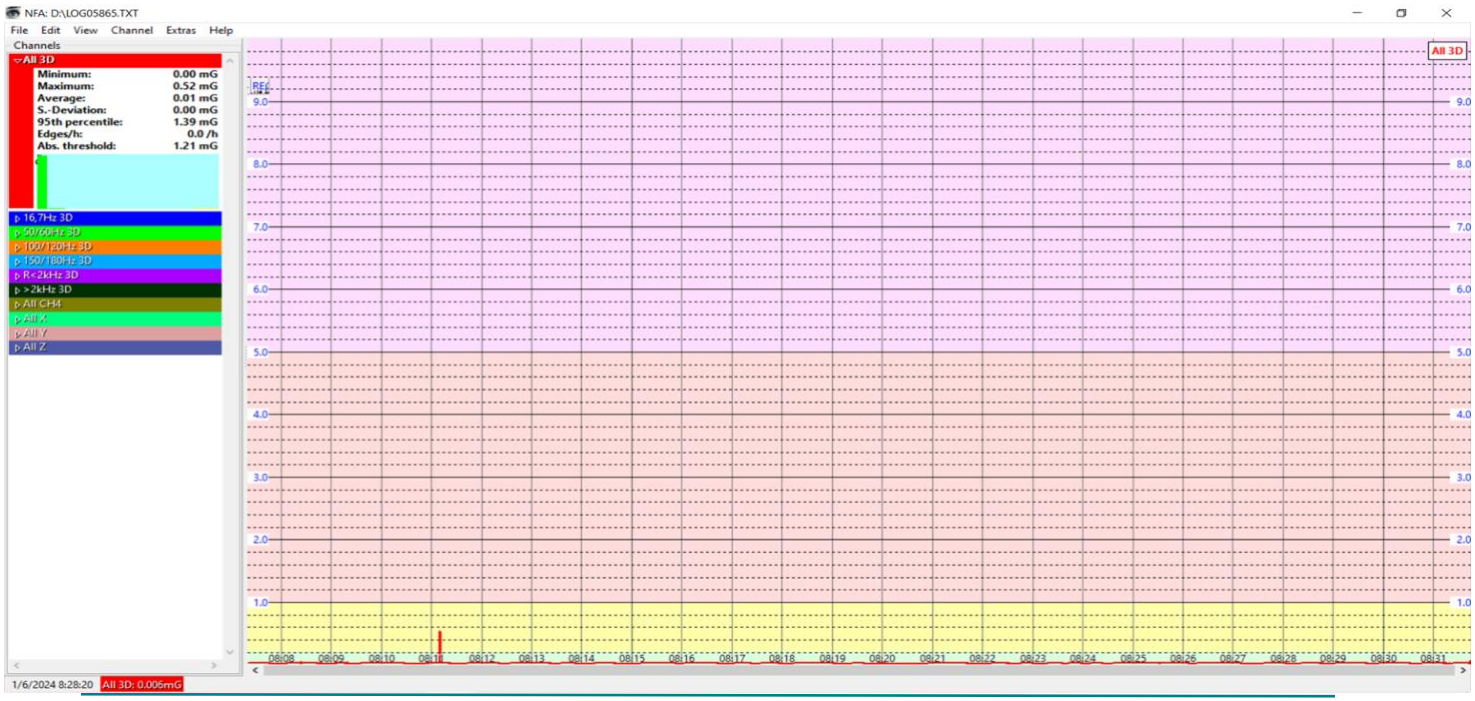
4.3. Magnetic Fields

Magnetic fields were measured on the Isla property and in the already developed areas.

	Units	'No Concern'	'Slight Concern'	'Extreme Concern'	'Severe Concern'
Magnetic Fields	mG	<0.2	0.2-1	1-5	>5

- Meters used for measuring magnetic fields were the Gigahertz Solutions NFA 1000.
- No magnetic field readings were identified in the proposed Isla community.
- Data logs were taken as seen here.

*Note one elevation of .5 mG was due to movement of the meter.



4.4. Electric Fields

Electric fields were measured on the Isla property and in the already developed areas.

	Units	'No Concern'	'Slight Concern'	'Extreme Concern'	'Severe Concern'
AC Electric Fields (body voltage	mV	<10	10-100	100-1000	>1000
Ac Electric Fields (potential free)	V/m	<0.3	.03-1.5	1.5-10	>10

- Meters used for measuring electric fields were the Gigahertz Solutions NFA 1000.
- Levels of 0 - 1.2 V/m were measured at pillow level in two separate tiny homes.
- No electric fields were identified in the Isla community.
- Levels of 5-16 V/m were measured at pillow level in the San Diego community. These levels were reduced by turning off the breaker to the bedroom.

*Note that all wiring inside the proposed Isla community will be shielded to keep the electric fields as low as possible.

4.5. Dirty Electricity

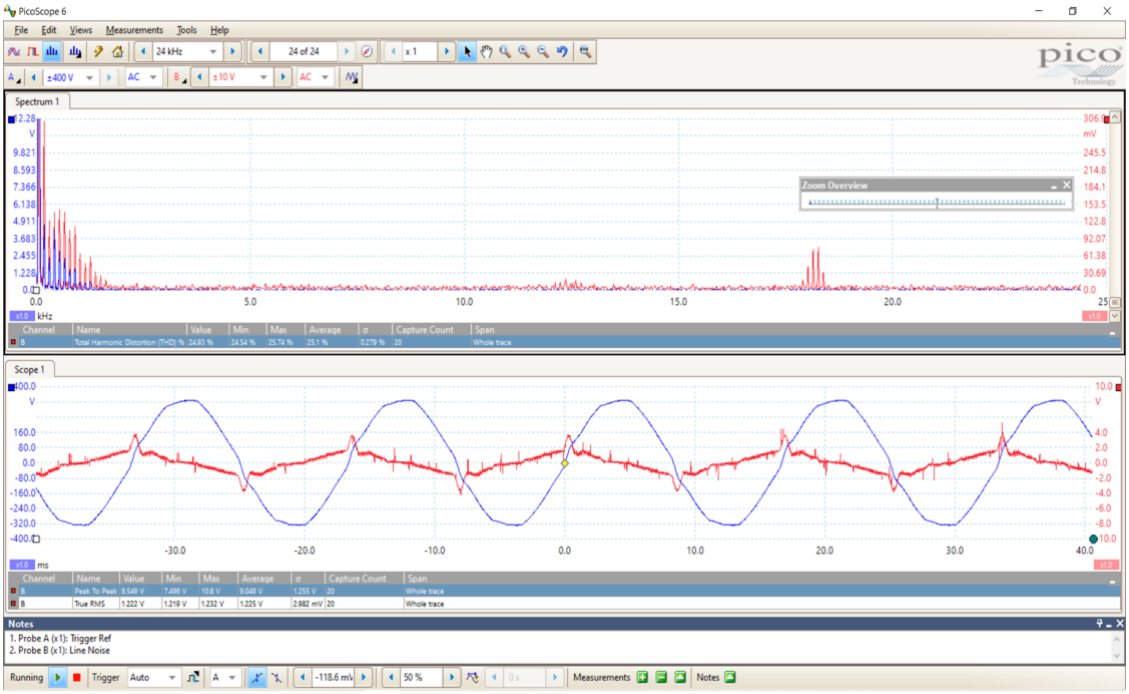
Dirty Electricity was only measured in the already developed areas as infrastructure does not yet exist in the Isla community.

**Note that the 'concern' levels listed here are not agreed upon by the Building Biology Institute. Threshold levels are still in development. These levels are reflective of my professional experience and are subject to change.*

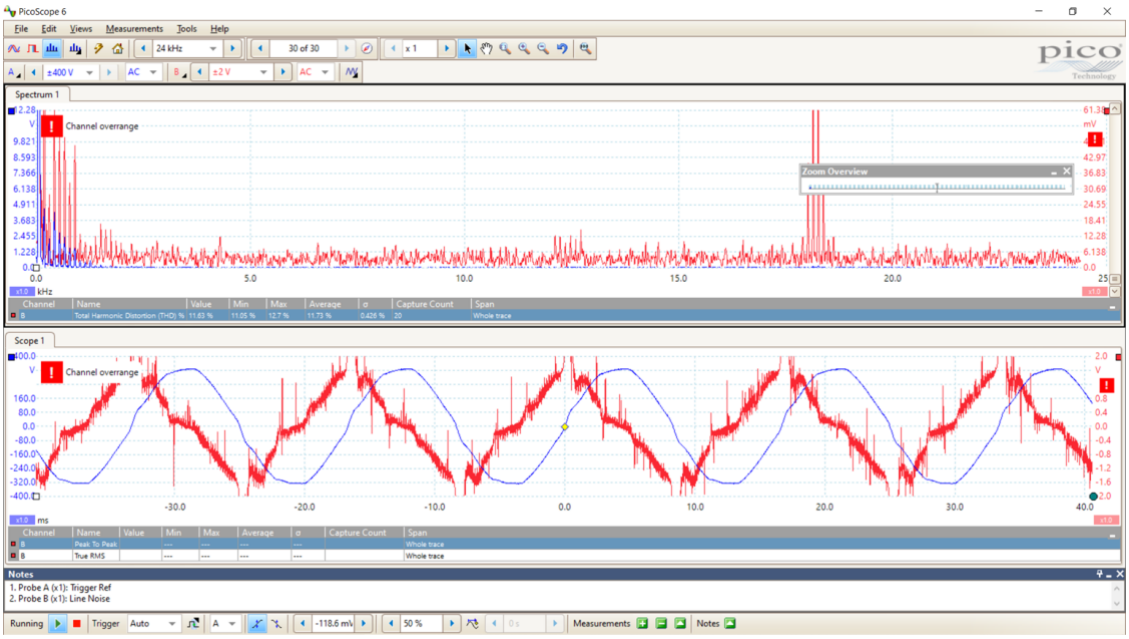
	Units	No Concern	Slight Concern	Severe Concern	Extreme Concern
Alterations to 60Hz	GSU's	<30	30-100	100-200	>200
	mV	<300	300-500	500-1V	>1V

- Meters used for measuring microsurge electrical pollution (MEP) were the PicoScope 2204A connected to laptop computer.
- No microsurge electrical pollution (MEP) was measured in the proposed community.
- High levels up to 5,000 mV were measured in the existing homes throughout the property.
- Sources of the elevations were the LED light bulbs, solar panels, and mini splits air conditioning units.

Screenshot of oscilloscope trace with mini split turned off.



Screenshot of oscilloscope trace with mini split turned on.



5. Conclusions

- Measured radio frequency levels in the proposed 'Low-EMF' Isla community were all very low as compared to any populated urban or suburban area.
- Given the density of the building materials to be used in construction, levels inside the homes are expected to be 1µW/m^2 or lower.
- These levels are in the 'No Concern' range and suitable for the large majority of people, including those sensitive to EMF.
- Though these levels are sufficient for most, they will not be low enough for everyone.
- Magnetic fields, electric fields and microsurge electrical pollution were not identified in the proposed community as the electrical supply does not yet exist.
- When electricity is supplied to the area via the grid and solar, these levels will naturally increase.
- Several strategies, including shielded wiring, strategic home layout, filtering options at the panel, strict no-tolerance for wireless usage inside the neighborhood boundary, and strategic placement of distribution lines are in development.
- These strategies will assist in creating a very low EMF environment.
- *Though every attempt will be made to create the lowest EMF environment possible, unforeseen events are always possible.

5.1. Limitations of the Report

This assessment was completed by staff of Whole Home and Body Health LLC in accordance with industry standards and guidelines and training received by the Building Biology Institute. Whole Home and Body Health LLC was hired to complete an assessment of the property only. Any remediation work done on the property is not within the scope of Whole Home and Body LLC.

All findings in this report are subject to the specific circumstances on the date of the inspection. Air Quality and EMF exposure vary considerably over the course of a day, changes with weather patterns, seasonal changes, and occupant behavior. Though a complete and thorough assessment was performed on this property, it is possible that some areas containing water damage, microbial growth, elevated moisture, or elevated electromagnetic field readings were not evident or accessible during the evaluation. If necessary, Whole Home and Body Health LLC requests the opportunity to modify findings and recommendations in this report should new information become available.

This report has been created for the sole purpose of the client and is not suitable for the needs of other parties.

Nothing in this report shall be used for legal purposes, nor is suitable for any legal undertakings. This report is not intended to provide any legal counsel or legal information.

Disclaimer: All content presented here is for informational purposes only and is not intended to diagnose, treat, cure or prevent any disease. The information provided here should not be construed as medical or electrical advice, nor is it a substitute for personal care with your licensed medical provider or qualified electrician.

END OF REPORT

Submitted by Cathy Cooke
EMRS, CRMI, BBEC, BCHN
January 26th, 2024