

SOIL DIAGNOSTIC ASSESSMENT

Community Garden

Community garden partner site

Cowboys and Apaches

El Paso, Texas

Sample GARDEN-001 | Field ID: AC-13FEB26

Prepared by:

AURUM TECH, LLC

El Paso, Texas

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Executive Summary

Aurum Tech, LLC conducted a comprehensive soil and water diagnostic assessment of a community garden partner site in El Paso, Texas. This assessment integrates three complementary analytical methods: standard soil chemistry, Haney Soil Health testing, and Phospholipid Fatty Acid (PLFA) microbial community analysis, supplemented by a full irrigation water chemistry panel. The multi-method approach provides both chemical and biological perspectives on soil function.

FINDING: Soil biology is healthy and functional. However, the irrigation water source presents severe salinity and sodicity that will progressively degrade soil quality and limit crop production without active management.

Critical Findings

Finding	Severity	Data Source
Severely saline irrigation water (EC 11.81 mmhos/cm)	CRITICAL	Water Chemistry
High sodium in irrigation (SAR 16.5, Na 1874.8 mg/L)	CRITICAL	Water Chemistry
Toxic chloride in irrigation (2,500 mg/L)	CRITICAL	Water Chemistry
Alkaline pH (8.3) with HIGH lime buffering	HIGH	Soil Chemistry
Elevated soil sodium (244 ppm, 4% base sat.)	CRITICAL	Soil Chemistry
Low microbially active carbon (24.9%)	MODERATE	Haney
Anomalous copper (18.87 ppm DTPA)	HIGH	Soil Chemistry

Positive Indicators

Despite the severe water quality challenge, this site has significant biological strengths:

Site Background

This assessment covers a community garden site in El Paso. Soil and water samples were collected on February 13, 2026 from the garden plot area (0-5" depth) along with a well water sample from the on-site irrigation source.

Irrigation Source

The site is irrigated with well water. Laboratory analysis reveals severely elevated salinity (EC 11.81 mmhos/cm, TDS 9,448 mg/L) with high sodium (1874.8 mg/L, SAR 16.5) and chloride (2,500 mg/L). This water quality is an ongoing and primary management concern for crop production at this site. A detailed water analysis is presented in the Diagnostic Findings section below.

Sample Inventory

Lab ID	Field ID	Sample ID	Depth	Analysis	Date
2216	AC-13FEB26	GARDEN-001	0-5"	Soil Chemistry	2/18/2026
2216	AC-13FEB26	GARDEN-001	0-5"	Haney Soil Health	2/18/2026
2216	AC-13FEB26	GARDEN-001	0-5"	PLFA Microbial	2/18/2026
29	AC-13FEB26	WELL-001	-	Water Chemistry	2/18/2026

Diagnostic Findings

Soil Chemistry

Parameter	GARDEN-001	Optimal
pH	8.3	6.0-7.0
EC (mmho/cm)	0.4	<1.0
Organic Matter (%)	2.2	3.0-5.0
Excess Lime	HIGH	None-Low
CEC (me/100g)	28.9	-
Sodium (ppm)	244	<50
Sodium (% Base Sat.)	4%	<3%
Phosphorus (ppm)	46	>25
Potassium (ppm)	432	>150

Interpretation:

pH: The soil is strongly alkaline (pH 8.3) with HIGH lime buffering, meaning pH correction will be slow and difficult. At this pH, micronutrient availability is significantly reduced.

Sodium: At 244 ppm (4% base saturation), sodium is above the critical threshold of 100 ppm. This level poses a direct risk to soil structure and plant health.

Organic Matter: At 2.2%, organic matter is below the minimum target of 3.0%. The relatively higher OM here compared to other arid sites reflects some history of organic inputs.

Micronutrient Availability

Iron (12 ppm) and manganese (4.7 ppm) are marginal by the alkaline pH. At pH > 7.5, these nutrients convert to plant-unavailable forms regardless of total concentration. Garden crops, particularly leafy greens and fruiting vegetables, are at risk of interveinal chlorosis without targeted micronutrient management. Zinc at 1.59 ppm is marginal.

Irrigation Water Quality

Parameter	Value	Threshold / Notes
pH	7.1	6.5-8.4 normal
EC (mmhos/cm)	11.81	<0.75 none; >3.0 severe
TDS (mg/L)	9,448	<500 ideal; >2000 severe
Sodium (mg/L)	1,874.8	<70 ideal; >200 severe
SAR	16.5	<6 low; >12 severe sodicity
Adj. SAR	27.81	Carbonate-adjusted
Chloride (mg/L)	2,500	<140 none; >350 severe
Boron (mg/L)	1.4	<0.7 none; >2.0 severe
Bicarbonate (mg/L)	566.7	<120 normal

Interpretation:

This irrigation water is unsuitable for agricultural use without active salt management. EC of 11.81 mmhos/cm (TDS 9,448 mg/L) exceeds severe restriction thresholds by a wide margin. Sodium at 1874.8 mg/L with a SAR of 16.5 (Adj. SAR 27.81) creates direct sodicity risk, degrading soil structure over time. Chloride at 2,500 mg/L is toxic to most crops through both root absorption and foliar contact. Boron at 1.4 mg/L may restrict sensitive crop growth.

Continued use of this water without leaching fraction irrigation, gypsum application, and regular soil monitoring will result in progressive salinization of the root zone.

Soil Health Indicators (Haney Test)

Parameter	GARDEN-001	Interpretation
Soil Respiration (ppm CO ₂ -C)	33.2	Good (>30)
Soil Health Calculation	7	Good (>7.0)
Microbially Active C (%)	24.9	Below ideal (50-75%)
C:N Ratio	12.98	Good (8-15 ideal)
Available N (lbs/A)	21.1	Haney-estimated plant-available N
Available P (lbs/A)	26.5	Haney-estimated plant-available P

Soil respiration of 33.2 ppm exceeds the 30 ppm good threshold, indicating a biologically active soil. The Soil Health Calculation of 7 meets the good threshold. The C:N ratio of 12.98 is well within the ideal range. Microbially active carbon at 24.9% is below the ideal range (50-75%), suggesting that while biology is present, much of the soil organic carbon is in stable, recalcitrant forms rather than labile pools.

Microbial Community (PLFA Analysis)

Parameter	GARDEN-001	Reference
Total Biomass (ng/g)	3728.8	VERY GOOD (>1500 Good)
AMF (Mycorrhizal Fungi)	193.5	Present and active (>20 Good)
Protozoa	22.1	Present
Fungi:Bacteria Ratio	0.4787	EXCELLENT (0.25-0.50 Good)
Overall Rank	VERY GOOD	-

Interpretation:

The microbial community is robust. Total biomass of 3729 ng/g ranks VERY GOOD. AMF colonization is strong at 193.5 ng/g, critical for nutrient uptake in garden crops. Protozoa are present (22.1 ng/g), indicating a functional food web. The fungi-to-bacteria ratio of 0.48 is excellent, suggesting a mature, diverse community. Stress indicators are low across the board, confirming the existing biology is healthy and not environmentally stressed.

Root Cause Analysis

The diagnostic findings reveal the following hierarchy of constraints:

SEVERE IRRIGATION WATER SALINITY (EC 11.81 mmhos/cm)



Progressive sodium accumulation in soil (currently 244 ppm, 4% base sat.)



Soil structural degradation and dispersion risk



Chloride and boron toxicity to crops



CROP YIELD LIMITATION AND POTENTIAL FOOD SAFETY CONCERN (Cu 18.87 ppm)

The soil biology at this site is a significant asset. The primary threat is the irrigation water, which will progressively undo the biological function if salt accumulation is not actively managed. The anomalous copper reading (18.87 ppm) is a separate concern that requires source investigation before expanding food crop production.

Recommendations

Priority 1: Irrigation Water Management

The irrigation water source is the single greatest risk to this site. At EC 11.81 mmhos/cm with SAR 16.5, every irrigation event adds salt load to the root zone. Without mitigation, soil sodicity will increase regardless of other interventions.

Aurum Tech recommends: leaching fraction irrigation (15-20% above crop ET), gypsum application to supply calcium and improve infiltration, monitoring soil EC and sodium at regular intervals, and evaluation of alternative or blended water sources where feasible.

Priority 2: Micronutrient and pH Management

At pH 8.3 with HIGH lime, micronutrient availability is reduced. Foliar applications may be needed during active growth if chlorosis symptoms appear.

Priority 3: Copper Investigation

The copper reading of 18.87 ppm DTPA is anomalously high for a garden soil. Copper accumulation can result from repeated fungicide applications, CCA-treated lumber in raised beds, contaminated fill, or industrial legacy. For a food production site, this warrants targeted investigation. Aurum Tech recommends identifying the source before expanding production.

Expected Outcomes

With proper water management implementation, Aurum Tech expects:

Timeline

Irrigation water management should begin immediately. Soil sodium and EC should be re-tested at 6-month intervals to track salt accumulation trends. Copper source investigation should be completed before the next planting season.

Next Steps

Aurum Tech recommends the following immediate actions:

Dr. Joshua Ortiz-Guzman

Signature: _____

Date: 30 March 2026

Prepared by Aurum Tech, LLC | El Paso, Texas | February 2026

Appendix: Complete Analytical Data

The following tables contain the full laboratory datasets for reference. Key parameters discussed in the body of this report are highlighted.

A. Standard Soil Chemistry

Lab #2216 | Sample: GARDEN-001 | Depth: 0-5" | Field: AC-13FEB26

Parameter	Value	Units	Method
Soil pH	8.3	S.U.	1:1 H2O
Excess Lime	HIGH	-	Rating
Soluble Salt (EC)	0.4	mmho/cm	1:1 H2O
Organic Matter	2.2	% LOI	LOI
Nitrate-N	1.1	ppm	1N KCl
Nitrate-N	2	lbs/A	1N KCl
Phosphorus	46	ppm	M3
Potassium	432	ppm	NH4OAc
Calcium	4513	ppm	NH4OAc
Magnesium	495	ppm	NH4OAc
Sodium	244	ppm	NH4OAc
CEC	28.9	me/100g	NH4OAc
Base Saturation	100%	%	NH4OAc
% Ca	78%	% Sat.	NH4OAc
% Mg	14%	% Sat.	NH4OAc
% K	4%	% Sat.	NH4OAc
% Na	4%	% Sat.	NH4OAc
Sulfur	92.02	ppm	M3
Zinc	1.59	ppm	DTPA
Iron	12	ppm	DTPA
Manganese	4.7	ppm	DTPA
Copper	18.87	ppm	DTPA
Boron	0.38	ppm	H2O

B. Haney Soil Health Analysis

Lab #2216 | Sample: GARDEN-001 | Depth: 0-5"

Nitrogen (H3A + H2O Extracts)

Parameter	Value	Units	Notes
Nitrate-N (H3A)	1.9	ppm	
Ammonium-N (H3A)	1.9	ppm	
Inorganic N	3.8	ppm	NO3-N + NH4-N
Total N	13.5	ppm	
Organic N	10.3	ppm	
Org N : Inorg N	3.15	-	
Org N Released (H2O)	10.2	ppm	Water-extractable
Org N Reserve	0	ppm	
Available N	21.1	lbs/A	Estimated plant-available

Phosphorus (H3A Extract)

Parameter	Value	Units	Notes
Total P	12.2	ppm	
Inorganic P (PO4-P)	9.4	ppm	
Organic P	2.8	ppm	
Org P Released	2.1	ppm	
Org P Reserve	0.7	ppm	
Available P	26.5	lbs/A	Estimated plant-available

Soil Health Metrics (H2O Extract)

Parameter	Value	Units	Notes
Soil Respiration	33.2	ppm CO2-C	>30 good
Organic C	133	ppm C	
Microbially Active C	24.9	%	50-75% ideal
C:N Ratio	12.98	-	8-15 ideal
Soil Health Calculation	7	-	>7 good

Fertility (H3A Extract)

Parameter	Value	Units	Notes
Potassium	216	ppm	
Calcium	2622	ppm	

Magnesium	269	ppm	
Sodium	189	ppm	
Zinc	0.03	ppm	
Manganese	3.7	ppm	
Iron	8	ppm	
Copper	0.5	ppm	
Aluminum	15	ppm	
Sulfur	51.85	ppm	

C. PLFA Microbial Community Analysis

Lab #2216 | Sample: GARDEN-001 | Depth: 0-5" | Overall Rank: VERY GOOD

Biomass & Community Breakdown

Functional Group	Value	% Biomass	Rank
Total Biomass	3728.85 ng/g	-	VERY GOOD
Diversity Index	1.427	-	GOOD
Total Bacteria	1319.13 ng/g	35.38%	
Gram +	497.57 ng/g	13.34%	
Actinomycetes	55.55 ng/g	1.49%	
Gram -	766.01 ng/g	20.54%	
Total Fungi	631.42 ng/g	16.93%	
AMF	193.54 ng/g	5.19%	
Saprophytic	437.88 ng/g	11.74%	
Protozoa	22.05 ng/g	0.59%	
Undifferentiated	1756.26 ng/g	47.10%	

Community Ratios

Ratio	Value	Rank	Notes
Fungi:Bacteria	0.4787	EXCELLENT	0.25-0.50 Good
Protozoa:Bacteria	0.0167	VERY GOOD	Predator-prey activity
Gram+:Gram-	0.7221	GRAM-DOM	~1.0 ideal

Stress Indicators

Indicator	Value	Rank	Interpretation
Sat:Unsat	1.0213	LOW	Low = healthy
Mono:Poly	13.0917	GOOD	Membrane fluidity
Pre 16:Cyclo 17	All Pre16:1	VERY ACTIVE	Active precursors = low stress
Pre 18:Cyclo 19	12.9793	ACTIVE	Active precursors = low stress

D. Irrigation Water Chemistry

Lab #29 | Sample: WELL-001 | Field: AC-13FEB26

Analyte	Value	Units
pH	7.1	-
Electrical Conductivity	11.81	mmhos/cm
Est. Total Dissolved Solids	9,448	mg/L
Nitrate-N	0.1	mg/L
Calcium	791	mg/L
Magnesium	114	mg/L
Total Hardness	2,444	mg/L
Potassium	20.8	mg/L
Sodium	1,874.8	mg/L
Sulfur	899.8	mg/L
Iron	3.97	mg/L
Chloride	2,500	mg/L
Boron	1.4	mg/L
Carbonate	0	mg/L
Bicarbonate	566.7	mg/L
Total Alkalinity	464.4	mg/L
SAR	16.5	-
Adj. SAR	27.81	-