



HARMLESSNESS · NON-TOXICITY · PROOF

# Ecological harmlessness & non-toxicity

*The water that leaves the road does not pollute*

Proudly made in Québec 

## SUMMARY OF TECHNICAL DOSSIER PRV-05

# LL-TEQ™ pavement system

No acute toxicity to aquatic life — demonstrated by a bioassay in an accredited laboratory

**>100 %** **LC50**  
No mortality, even on undiluted runoff (WET bioassay)

**100 %** **NOAEC**  
No observed acute effect concentration — effluent at 100 %

**≈ 10×** **Lower permeability**  
vs untreated soil (ASTM D5084) — water does not pass through

**3** **Federal recognitions**  
USFWS · US Army (NEPA) · Tennessee Valley Authority

# The proof: the direct biological response

01

Safety is not judged by a list of ingredients, but by what living organisms actually do



A material can be judged safe by listing its ingredients, or by measuring what living organisms actually do when exposed to it. The second path is the **stronger proof**: it captures the real biological effect rather than a prediction drawn from chemistry.

The accredited whole-effluent toxicity bioassay on runoff (*WET*) does exactly that: it exposes sentinel aquatic organisms to the rainwater that runs off the treated surface, and measures their survival against a clean-water control.

**Conclusion:** the runoff from the treated surface is not acutely toxic to aquatic life. The composition *explains* this result; the proof is the **survival of the organisms**.

## ✓ In plain terms

A water flea and a small fish — among the organisms most sensitive to water pollution — were placed in the rainwater that ran off the treated road. They lived just as well as in clean water. If the material had released anything harmful, these organisms would have shown it. They did not.

## Direct biological proof — acute WET bioassay

02

NELAP/TNI-accredited laboratory · official EPA methods · program reviewed by a federal agency

Coastal Bioanalysts, Inc. (a NELAP/TNI-accredited laboratory) collected the runoff from a simulated rainfall (50 mm/h for 20 minutes) on treated surfaces, then ran 48-hour static acute tests on two standardized sentinel species.

SENTINEL SPECIES	EPA METHOD	RESULT
<b>Fathead minnow</b> <i>Pimephales promelas</i>	2000.0	LC50 > 100 % · NOAEC = 100 % — no acute toxicity
<b>Water flea</b> <i>Ceriodaphnia dubia</i>	2002.0	LC50 > 100 % · NOAEC = 100 % — no acute toxicity

Even undiluted, the treated runoff caused **no statistically significant mortality**; survival equalled or exceeded that of the untreated-soil control. The laboratory issued a signed certification letter, and the test program was reviewed and approved by a senior toxicologist at the **Tennessee Valley Authority**.

### Honest caveat

The demonstration covers **acute toxicity** (48-hour survival). Chronic harmlessness — the absence of long-term effects on reproduction and growth — remains to be produced or accepted by the regulator for the intended use (see "Scope & limit").

## The nature of the material

An aqueous emulsion — not a hazardous chemical

According to the manufacturer's safety data sheets, the product is an **aqueous vinyl-acrylic polymer emulsion** (pH  $\approx$  4.5, density  $\approx$  1.08). A material that carries no listed carcinogen, that is not a hazardous waste and that is not classified as hazardous has no obvious reservoir of toxicity to release.

STANDARD	PRODUCT STATUS
IARC carcinogens	None at $\geq$ 0.1 % content
RCRA	Not a hazardous waste
OSHA HazCom (29 CFR 1910.1200)	Not classified as a hazardous chemical
TSCA	Inventory-compliant
Transport (DOT · TDG · IATA)	Not regulated
NFPA	Fire 0 · Health 1 · Reactivity 0 — does not burn, stable

### Honest caveat

The safety data sheet does not itself report dedicated ecotoxicological data — this is precisely the gap that the WET bioassay fills empirically. The composition is a manufacturer's declaration, not a third-party chemical verification.

# Containment & low leaching potential

04

If water does not move through the hardened layer, it cannot carry anything out of it

The same closed, unconnected porosity that produces the low permeability **closes off the physical path** by which water could carry substances into the soil and groundwater.

Hydraulic conductivity measured per **ASTM D5084** (S.A.M. Consultants, 2017) on twin specimens of the same soil:



## SPECIMEN

## HYDRAULIC CONDUCTIVITY (ASTM D5084)

Untreated soil

$\approx 6.0 \times 10^{-8}$  cm/s

Structural layer

$\approx 5.9 \times 10^{-9}$  cm/s

Structural + surface layer

$\approx 3.1 \times 10^{-9}$  cm/s

The treatment lowers conductivity by **about an order of magnitude**. The physical cause (a non-toxic, contained material) and the measured effect (non-toxic runoff) agree. *Caveat: permeability is indirect physical evidence; no TCLP test is on file.*

## Federal environmental recognitions

External review by authorities applying their own standards

AUTHORITY	DETERMINATION	CAVEAT / CONDITION
<b>US Fish &amp; Wildlife Service (Alabama, 2017)</b>	Use <b>approved in protected-species habitat</b> (Alabama beach mouse), applied per the manufacturer's guidelines — where the agency otherwise allowed only geoweb, asphalt or concrete.	Any new construction still requires an incidental-take permit or a letter of authorization; scope specific to the targeted habitat.
<b>Sierra Army Depot (US Army, 2015)</b>	<b>NEPA categorical exclusion</b> granted with no extraordinary circumstance; <i>No Effect</i> determination from the USFWS; beneficial effects noted (less CO <sub>2</sub> than cement/asphalt; PM10 control).	Valid only for the approved formulation (OPS25 product MSDS attached to the dossier).
<b>Tennessee Valley Authority</b>	<b>Reviewed and approved</b> the acute-toxicity test program.	The approval covers the test program as documented.

### External, independent corroboration

These determinations come from named authorities applying their own frameworks — independent of both the manufacturer and the authors of this dossier.

## Ecological co-benefits

06

Beyond non-toxicity — each benefit backed by a measured test or a named attestation



Stabilization is done **cold and in place**: the system treats the soil and asphalt already present, with no asphalt plant and no hauling of new aggregate. The recycled old pavement is encapsulated in the low-permeability matrix rather than sent to landfill.

### CARBON AVOIDED

#### No Portland cement

Stabilization without clinker firing. Sierra Army Depot records "markedly less CO<sub>2</sub> than cement or asphalt".

### DUST

#### PM2.5 / PM10 control

A sealed surface that no longer releases fugitive dust — backed by the manufacturer, the US Army and Uganda's roads authority.

### SOIL CHEMISTRY

#### No alkalinization

No cement or lime: no lasting rise in the pH of surrounding soils, unlike hydraulic binders.

## HEAT ISLAND

### **Solar reflectance**

In a reflective finish: reflectance 0.49 / SRI  $\approx$  43 (ASTM C1549, CTLGroup), well above new asphalt.

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## CONSTRUCTION

### **Cold & in place**

No heat input, often on 100 % native soil: less hauling, a smaller site footprint.

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## DURABILITY

### **Extended life cycle**

Reference sites in service since 2012; a durable pavement needs fewer rehabilitations, hence less recurring load.

STANDARD / AUTHORITY	APPLICATION TO THE DOSSIER
<b>EPA 2000.0 / 2002.0</b>	WET bioassay on runoff — no acute toxicity
<b>RCRA · TSCA · OSHA HazCom</b>	Non-hazardous / compliant (safety data sheets)
<b>NEPA (32 CFR 651)</b>	Categorical exclusion granted — Sierra Army Depot (2015)
<b>ESA section 7</b>	<i>No Effect</i> from the USFWS; approval in protected habitat
<b>Clean Water Act (§404 · NPDES)</b>	Project-by-project responsibility, informed by the non-toxic runoff
<b>ASTM D5084</b>	Permeability ≈ an order of magnitude below untreated soil

## Québec destination (cross-reference)

For a deployment in Québec, the *Environment Quality Act* (s. 22) requires prior authorization for work in wetlands and bodies of water. The dossier's evidence provides input toward the non-contamination requirement; project authorization remains required and falls to the competent Québec authority.

This dossier is a documentary record of ecological harmlessness established by accredited testing and by federal recognitions. It **does not constitute** a contractual framework, contains no warranty clause, and does not prejudge either the structural design or the project-specific authorizations.

### | Limits stated openly

- The demonstration covers **acute toxicity** (48-hour survival), not chronic harmlessness — which remains to be produced (ECCC methods EPS 1/RM/21 and 1/RM/22) or accepted by the regulator.
- No **chemical analysis** of water that has passed through the material (TCLP test); permeability serves as indirect physical evidence.
- The direct biological proof covers the **surface layer**; the harmlessness of the structural layer rests on an identical safety-data-sheet profile.
- The project-specific **environmental authorization** (NEPA, Clean Water Act, ESA §7; in Québec, EQA s. 22) remains the responsibility of the design engineer.

### ✓ It is this openly stated limit that makes the dossier credible

LANDLOCK Natural Paving, Inc. presents this dossier as the compilation and reasoning of the evidence; the toxicity science is attributed to the accredited laboratory and the named federal agencies.

## Sources & contact

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Third-party data and determinations in the source dossier

ITEM	AUTHORITY / LABORATORY	REF.
Acute toxicity, runoff (EPA 2000.0 / 2002.0)	Coastal Bioanalysts, Inc. (NELAP/TNI)	ENV-3 / SUP-8
Safety data sheets (surface · structural)	LANDLOCK Natural Paving, Inc.	ENV-1 / ENV-2
Hydraulic conductivity (ASTM D5084)	S.A.M. Consultants	STR-7
Solar reflectance (ASTM C1549)	CTLGroup	ENV-5
Approval in protected-species habitat	US Fish & Wildlife Service (Alabama)	ENV-6
NEPA categorical exclusion	Sierra Army Depot (US Army)	ENV-7



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*Summary of technical dossier PRV-05 "Ecological harmless and non-toxicity" (20 March 2026). The full dossier and source records (laboratory reports, agency letters) are available on request; in case of discrepancy, the original source document prevails.*