



**Kumar & Associates, Inc.®**  
Geotechnical and Materials Engineers  
and Environmental Scientists

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### **An Employee Owned Company**

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Office Locations: Denver (HQ), Parker, Colorado Springs, Fort Collins, Glenwood Springs, and Summit County, Colorado

October 13, 2026

The Garrett Companies  
Attn: Sean Reisman  
1051 Greenwood Springs Boulevard  
Greenwood, Indiana 46143

Subject: Geotechnical Engineering Recommendations, Aggregate-Surfaced Emergency Vehicle Access Road/Pad, Dawson Trails Multi-Family Development, Southwest Corner of Dawson Trails Boulevard and Blanca Peak Parkway Castle Rock, Colorado

Project No. 25-1-808

Dear Mr. Reisman:

This letter provides geotechnical engineering recommendations for aggregate-surfaced emergency vehicle access road/pad to be constructed as part of the proposed Dawson Trails Development. We understand the Castle Rock Fire Department has requested a short fire apparatus access road/pad will be constructed between Buildings 5 and 6 to ensure fire apparatus can be positioned within sufficient hose reach of all exterior portions of both buildings. The access road/pad will have a length of about 40 feet and a width of about 20 feet and will need to be capable of supporting fire trucks and other emergency vehicles weighing up to approximately 95,000 pounds. We understand the access road/pad is intended to be a permanent emergency access/parking area and is not planned to be temporary. We also understand The Garrett Companies wishes to utilize a Gravelpave 2 product, or approved equivalent, in lieu of paving the area with concrete or asphalt.

Kumar & Associates, Inc. (K+A) previously completed a geotechnical engineering study for the subject project. The results of that study were presented in a report under our Project No. 25-1-808, with a revised date of October 8, 2026 (Report). Our recommendations are based on the subsurface information and laboratory testing results presented in the Report and our experience with similar projects.

Based on the results of our subsurface exploration program performed as part of the Report, subgrade conditions are anticipated to consist primarily of new clay fill soils placed as part of the subgrade preparation recommended below buildings. Groundwater is not anticipated to be encountered within about 20 feet of the access road/pad subgrade.

Per page 8 of the attached Gravelpave 2 brochure, a minimum of 12 inches of aggregate base course (ABC) is recommended below the Gravelpave 2 ring-on-grid system. The ABC thickness was selected based on a subgrade soil California Bearing Ratio (CBR) of 2 for the site soils, a "Heavy Fire Turck & H-20 Loading Max 130 psi 95,000 lb", and infrequent passes. The ABC should be compacted to at least 95% of the modified Proctor (ASTM D1557) maximum dry density at a moisture content within 2% of the optimum. The ABC should meet the requirements for CDOT Class 6 ABC.

Prior to placing the ABC, the upper 12 inches of the subgrade should be thoroughly scarified and well-mixed and recompact to at least 95 percent of the standard Proctor (ASTM D698) maximum dry density at a moisture content between the optimum moisture content and 3 percentage points above optimum. The prepared subgrade should also be proofrolled to detect any soft spots, which should be removed and replaced with site grading fill placed and compacted as recommended above.

The access road/pad should be designed to promote surface water drainage away from the adjacent buildings (Buildings 5 and 6) and to a proper collection point. Allowing ponding of water or significant surface water infiltration in the area of the access road/pad is not recommended. As discussed in the Report, the site soils are expansive and promoting water away from the buildings is considered critical to the performance of the buildings. Recommendations regarding surface drainage are also presented in the Report.

In our opinion, an emergency access road/pad constructed as outlined above will support the design fire trucks and other emergency vehicles. The access road/pad may require maintenance over the life of the access road/pad to provide the required support characteristics. Adequate drainage away from the roadway/pad surface should also be maintained. If you have questions or need further information, please call.

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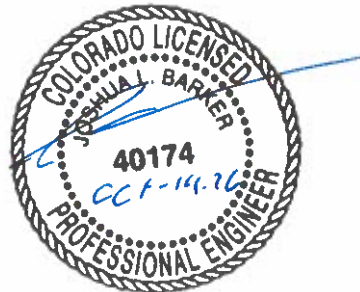
Sincerely,

KUMAR & ASSOCIATES, INC.

  
Justin Cupich, P.E.

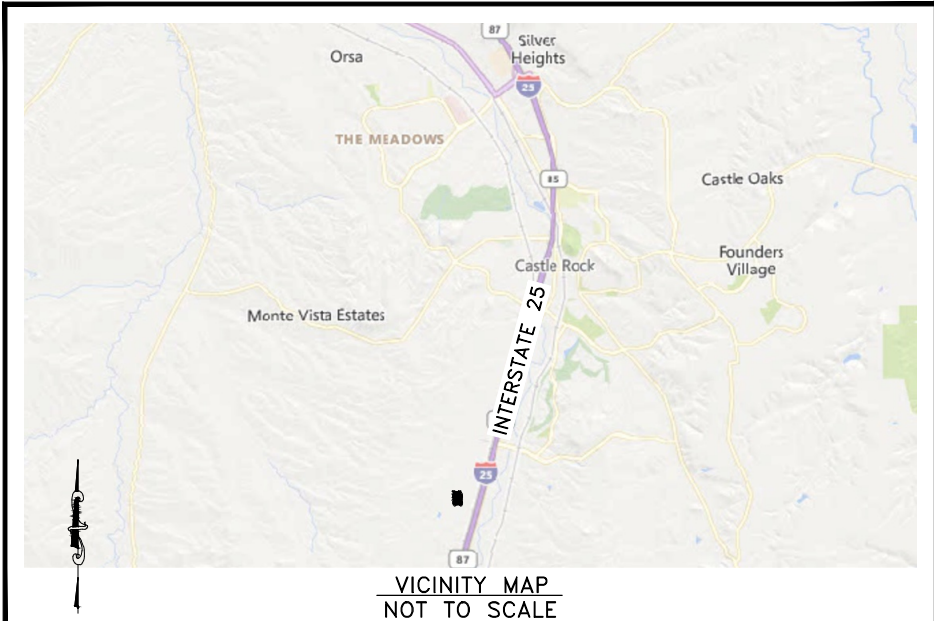
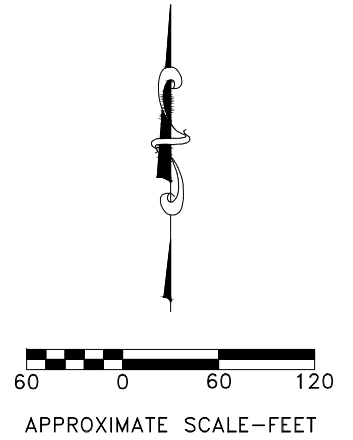
Reviewed By:  
Joshua L. Barker, P.E

JDC/lis  
REV: JLB  
cc: File, book



August 25, 2026 -- 09:01am  
V:\Projects\Den ARC 2021-2025 (ENG)\2025\25-1-808 Dawson Trails Multi-Family Development\Drafting\251808-A1.dwg

DAWSON TRAILS BLVD



25-1-808

Kumar & Associates

DAWSON TRAILS MULTI-FAMILY – SW DAWSON TRAILS BOULEVARD &  
BLANCA PARKWAY, CASTLE ROCK, COLORADO

COMPACTION TEST LOCATIONS

Fig. 1

**APPENDIX A**

**GRAVELPAVE 2 BROCHURE**



**GRAVELPAVE2**  
BY INVISIBLE STRUCTURES™



**THIS  
POROUS  
PAVING  
ROCKS**

## PAVING THE WAY

The trusted choice for low maintenance porous paving since 1991, Gravelpave2® provides remarkable compressive strength (15,940 psi / 2,295,000 psf—five times that of concrete) and can support the weight of virtually any vehicle. Gravelpave2 is crafted with a 100% recycled plastic, ring-on-grid structure with a fabric backing that acts as a vegetation barrier, a dust inhibitor and provides true containment since it will never come off or disintegrate. A 92% void space allows for rapid stormwater drainage and filtration of environmental toxins through bioremediation.



## MEETING STORMWATER REQUIREMENTS AND EROSION CONTROL

Because of our innovative design and specifications, you can meet Stormwater Requirements in less square footage than most porous paving types using Gravelpave2.

## WHAT IS POROUS PAVING?

Porous paving is a type of pavement or surface material that allows water to pass through it, rather than creating a solid, impermeable surface. It enables rainwater to infiltrate the ground, reducing surface runoff and helping to return water to natural aquifers and restore groundwater.



ADA-certified and tested to meet the DOJ ADA requirements for a smooth and stable exterior surface.



## WHAT IS THE URBAN HEAT ISLAND?

The urban heat island (UHI) effect refers to the phenomenon where urban areas experience higher temperatures than rural regions due to human activities and the modification of land surfaces. Urban areas have a higher percentage of impervious surfaces like asphalt and concrete, which absorb and retain heat more than natural surfaces. Gravelpave2 can make a difference.



## WHY GRAVELPAVE2?

Created by a Landscape Architect, Gravelpave2 has been the trusted choice for low maintenance porous paving since 1991. With a compressive strength five times that of concrete, Gravelpave2 can support the weight of virtually any vehicle. Made from 100% recycled plastic, the lightweight and flexible rolls allow for quick and easy installation and can be easily trimmed for design versatility. Gravelpave2 is available in custom colors, making the possibilities limitless.



## THE GRAVELPAVE2 ADVANTAGES



Gravelpave2



**Stronger Compressive Strength (15,940 psi / 2,295,000 psf)**



**Lifetime Warranty with a Long Lifespan & Low Maintenance**



**Toxin Filtration**



**Rolls Out - Quicker to Install, Saves Labor**



**92% Void Space for Drainage**



**Made From 100% Recycled Plastic**



**Permanent Fabric Backing Prevents Weeds, Rutting and Puddles**

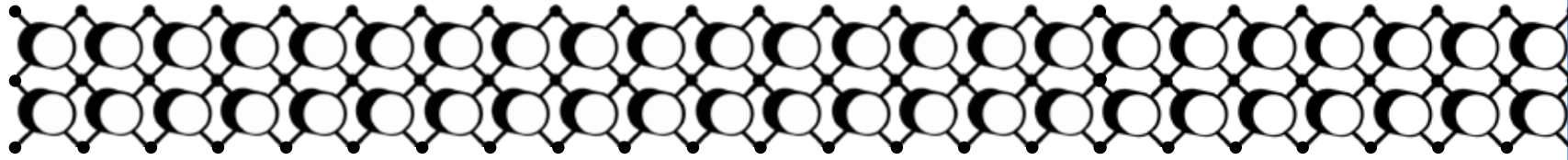


**All-Weather Applications**



**Available in Custom Colors**

## APPLICATIONS



**Fire Lanes, Utility & Emergency Access Roads**



**Parking Lots**



**Driveways**



**Outdoor Event Spaces**



**Paths & Walkways**



**Ramps, Docks & Loading Areas**



**Airplane Taxiing Areas**



**Stormwater Management**

# IT'S EASY BEING GREEN

Sustainability starts from the ground up. Gravelpave2 not only protects the environment, but it also enhances it. All our products are made from 100% recycled plastic—plastic that goes into improving the environment and not into a landfill.

## Other benefits include:

- Reduces erosion and soil migration.
- Reduces site disturbance.
- Contributes to airborne dust capture and retention.
- Promotes the conversion of carbon dioxide (greenhouse gas) into oxygen.
- Has an “air-conditioning effect” to help cool the atmosphere and reduce the Urban Heat Island effect.

## BIOREMEDIATION

Through bioremediation, porous pavers can clean pollutants out of stormwater.

- Heavy metals: 96–99%
- Suspended solids: 95%
- Phosphorous: 65%
- Nitrogen: 82%
- Hydrocarbons: up to 100%

**1.5 MILLION POUNDS**

of recycled plastic are used every year for Invisible Structures products.



Sustainability





## HUG A TREE

Concrete and asphalt suffocate and starve tree roots of air and water. With Gravelpave2, plant or retain as many trees as your site will allow. Gravelpave2 can come within inches of mature tree trunks without damage. Plus, our mats uniquely flex with tree root growth that would otherwise crack hard surfaces.

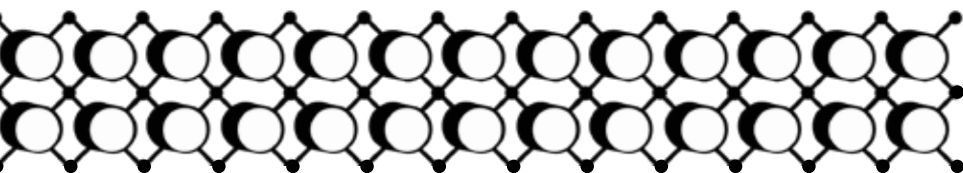


## BEAUTY BELOW THE SURFACE

How can something that's invisible be beautiful? The end result is the real appeal. Gravelpave2 creates a more stunning surface and adds a unique look to a site.

## THE FAULTS OF ASPHALT

Most paving solutions, like asphalt and concrete, distract and detract from the surroundings in the name of functionality. But Gravelpave2 gives you design flexibility to integrate your paving with your setting for a stunning, complementary solution.



## GREAT SHAPE

Our trademark ring-on-grid design is what gives our products a competitive advantage. Evenly spaced rings make for a flexible yet strong structure with independent weight distribution and no stress points. You can create curves or customize layouts with pruning shears. It's a beautifully simple solution.



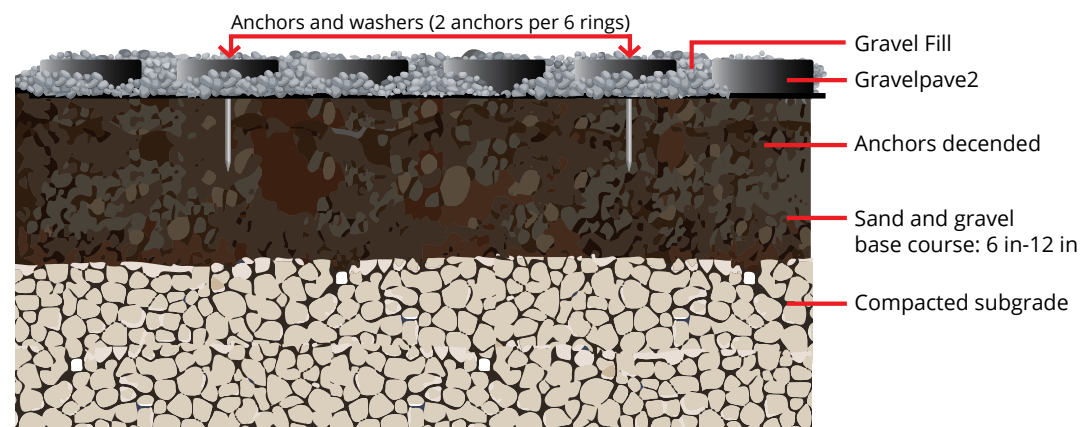
### AVAILABLE COLORS

Gravelpave2 is available in five colors (Granite, Black, Tan, Gray and Terra Cota). Granite is our newest color, and we highly recommend it, as it blends with just about any color of aggregate.

### HARDWARE MADE EASY

All water-safe, galvanized steel, 8" landscape anchors and washers needed for your project are included with every order, and no other geotextile is required for installation. We've got you covered.

### GRAVELPAVE2 INSTALLATION CROSS SECTION



## ALWAYS ON A ROLL

Due to our trademark design and proprietary blend of HDPE 100% recycled plastic, our products offer distinct design and installation advantages.

### Installation and Maintenance:

- Install 430 square feet of product with one person in five minutes.
- A full installation of the same size can be completed in about an hour.
- Trim with pruning shears or use our curve chart to easily create curves or customize layouts.
- The recommended max slope for Gravelpave2 is 5% for fire lanes, 8% for cars and lighter weight trucks and 15% – 20% for golf carts, pedestrian use and trails. For a slope greater than 20%, Slopetame3 may be used (up to 45%) and will support pedestrian and light vehicular traffic.



Installation

## INVISIBLE STRUCTURES—STANDARD PRODUCT ROLL SIZES

|       | WIDTH |     | LENGTH |      | ROLL DIAMETER |     | AREA           |                 | WEIGHT |     |
|-------|-------|-----|--------|------|---------------|-----|----------------|-----------------|--------|-----|
| Model | m     | ft  | m      | ft   | m             | ft  | m <sup>2</sup> | ft <sup>2</sup> | kg     | lbs |
| 1010  | 1     | 3.3 | 10     | 32.8 | .5            | 1.7 | 10             | 108             | 24     | 53  |
| 2020  | 2     | 6.6 | 20     | 65.6 | .8            | 2.7 | 40             | 430             | 96     | 212 |

## BASE COURSE DEPTH RECOMMENDATIONS

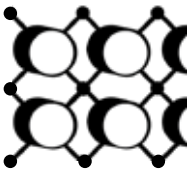
|                                                                     | NORMAL TRAFFIC |          | ROLL DIAMETER |         | INFREQUENT PASSES |          |
|---------------------------------------------------------------------|----------------|----------|---------------|---------|-------------------|----------|
|                                                                     | CBR 2-4        | CBR > 4  | CBR 2-4       | CBR > 4 | CBR 2-4           | CBR > 4  |
| Heavy Fire Truck & H-20 Loading<br>Max 130 psi 95,000 lb            | 14 in          | 12-14 in | 12-14 in      | 12 in   | 12 in             | 10-12 in |
| Light Fire Truck & H-15 Loading<br>Typical 85 psi 60,000 lb         | 12 in          | 10-12 in | 10 in         | 8-10 in | 8-10 in           | 8 in     |
| Utility & Delivery Truck & H-10<br>Loading Typical 60 psi 40,000 lb | 8-10 in        | 8 in     | 8-10 in       | 6-8 in  | 6-8 in            | 6 in     |
| Cars & Pick-Up Truck Access<br>Typical 45 psi 8,000 lb              | 6-8 in         | 6 in     | 6 in          | 4-6 in  | 4-6 in            | 2-4 in   |
| Trail Use and Cart Paths <1,000 lb                                  | 2-4 in         | 2-4 in   | 2-4 in        | 0-2 in  | none              | none     |

## QUICK REFERENCE GUIDE FOR GRAVELPAVE2

| DESCRIPTION                                   | CONNECTABLE RING AND GRID SYSTEM                                                 |
|-----------------------------------------------|----------------------------------------------------------------------------------|
| Description                                   | Connectable ring, grid, and permanent fabric backing                             |
| Also Included                                 | Water-safe, galvanized steel, 8" landscape anchors and washers                   |
| Available in Large, Flexible Rolls            | Yes, various sizes                                                               |
| Colors                                        | Black, gray, tan, terra cotta, granite, custom colors extra                      |
| Components Needed for System                  | Base course, 1 1/4" (3.2cm) of 3/16in to 3/8in decorative gravel, and labor      |
| Traffic                                       | Low speed, unlimited use                                                         |
| Compressive System Strength                   | Filled: 15,940 psi (2.29 million per sq ft / 109,906 kPa)                        |
| Life Span                                     | Lifetime with proper maintenance                                                 |
| Recommended Maximum Slope                     | 5% fire lanes, 8% car/light truck, 15-20% golf carts, pedestrian use, and trails |
| Stormwater Storage                            | Yes                                                                              |
| Clean Pollutants through Bioremediation       | Good                                                                             |
| Air-Conditioning Effect                       | No                                                                               |
| Heat Island Mitigation                        | Yes with light colored gravel fill—Albedo .16                                    |
| Reduces Runoff and Non-Point Source Pollution | Yes                                                                              |
| Recycled Content                              | 100% recycled HDPE plastic with recycled remnant fabric                          |
| Erosion Control                               | Yes                                                                              |
| Airborne Dust Capture and Retention           | Good                                                                             |
| Promotes and Retains Tree Growth              | Yes                                                                              |
| Recharges Groundwater                         | Yes                                                                              |

### PSI STRENGTH

See additional technical resources here:



## FEATURED CASE STUDIES

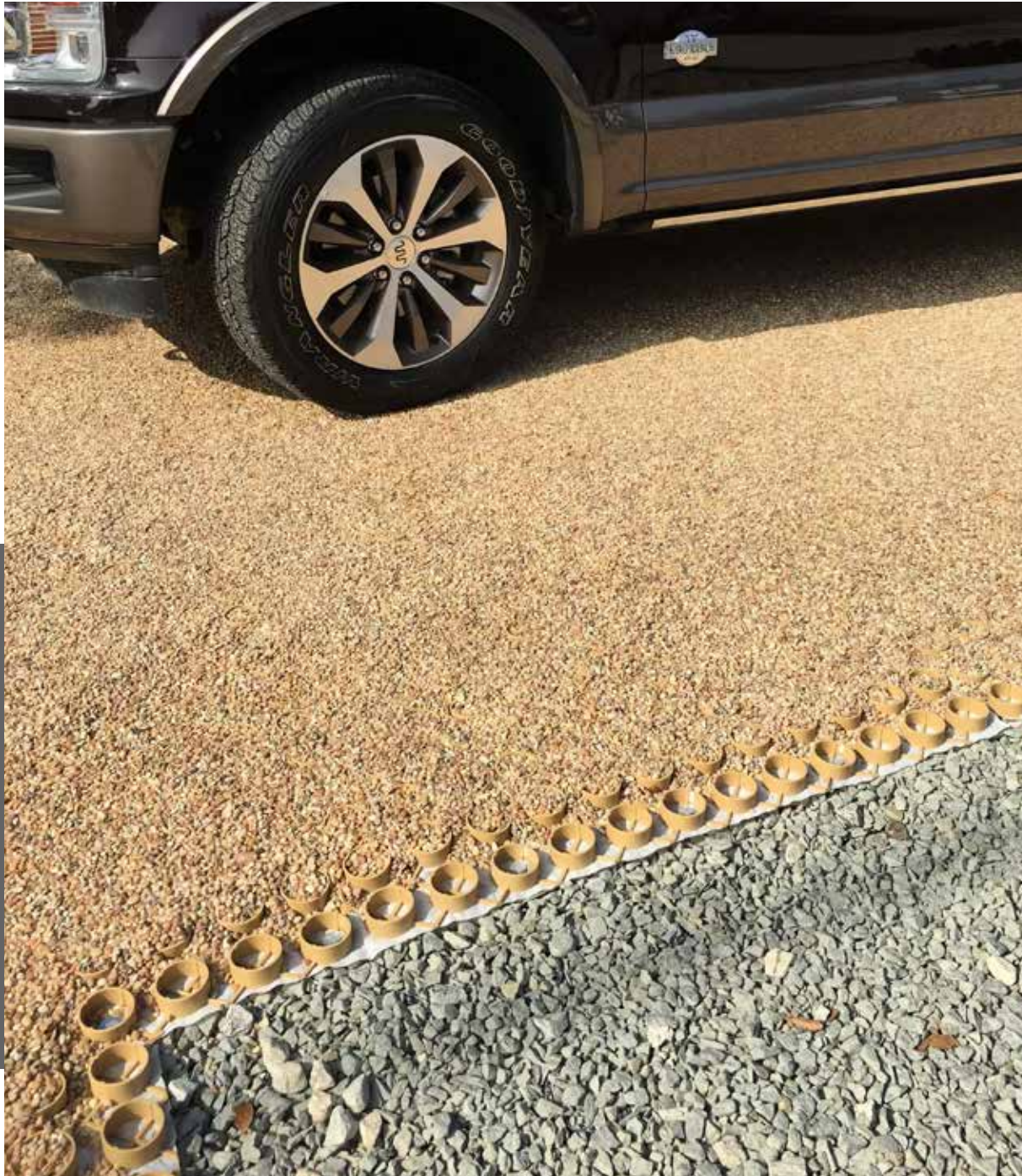
### IDEA CAMP RIO

See how Gravelpave2 reduced the runoff coefficient with maximum infiltration, while providing support for fire trucks, bus traffic and other vehicles.



Idea Camp Rio  
Case Study Online





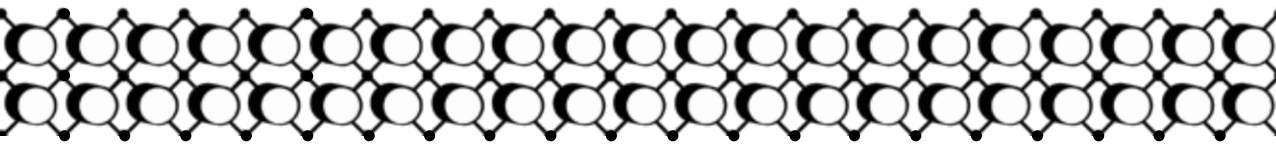
## **PRIVATE RESIDENCE, CULVER CITY, CALIFORNIA**

Gravelpave2, Grasspave2 and Rainstore3 were all used in this project to replace the cracking concrete and clay soil, which became slick and oily when wet. The yard space was increased, and the concrete driveway was eliminated to create a beautiful, sustainable environment for people and pets.



Culver City Private Residence  
Case Study Online





## GROUNDING IN PERFORMANCE™

Invisible Structures is the leader in porous paving and stormwater management solutions. We enhance your project and the planet with strong, stylish, and streamlined solutions for:

### **GRASSPAVE2** | Grass Porous Paving



### **GRAVELPAVE2** | Gravel Porous Paving



### **RAINSTORE3** | Underground Stormwater Storage



### **SLOPETAME3** | Erosion Control



### **DRAINCORE2** | Drainage



### **BEACHRINGS2** | Portable ADA Access Mats

How long can an Invisible Structures product last? We'll get back to you. All maintained installations are still functioning and beautiful!



Gravelpave2 is the BMP choice for the EPA, US Army of Engineers, Center for Watershed Protection, and many other Federal and state agencies.

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