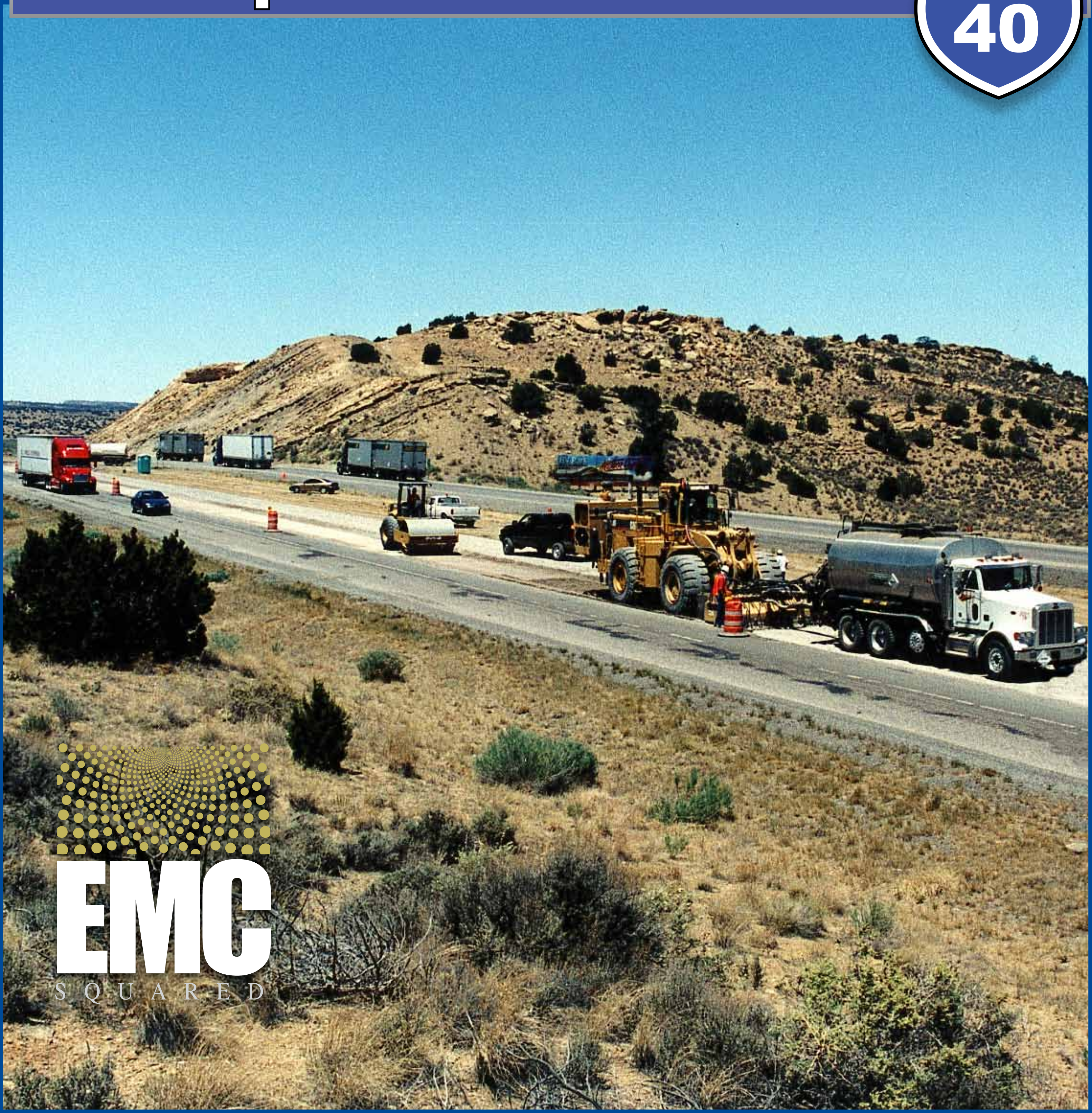
# EMC SQUARED® System

## Stabilization Treatment for Recycled Pavement Materials

# Full Depth Reclamation on INTERSTATE 40



EMC SQUARED

Stabilization Products LLC

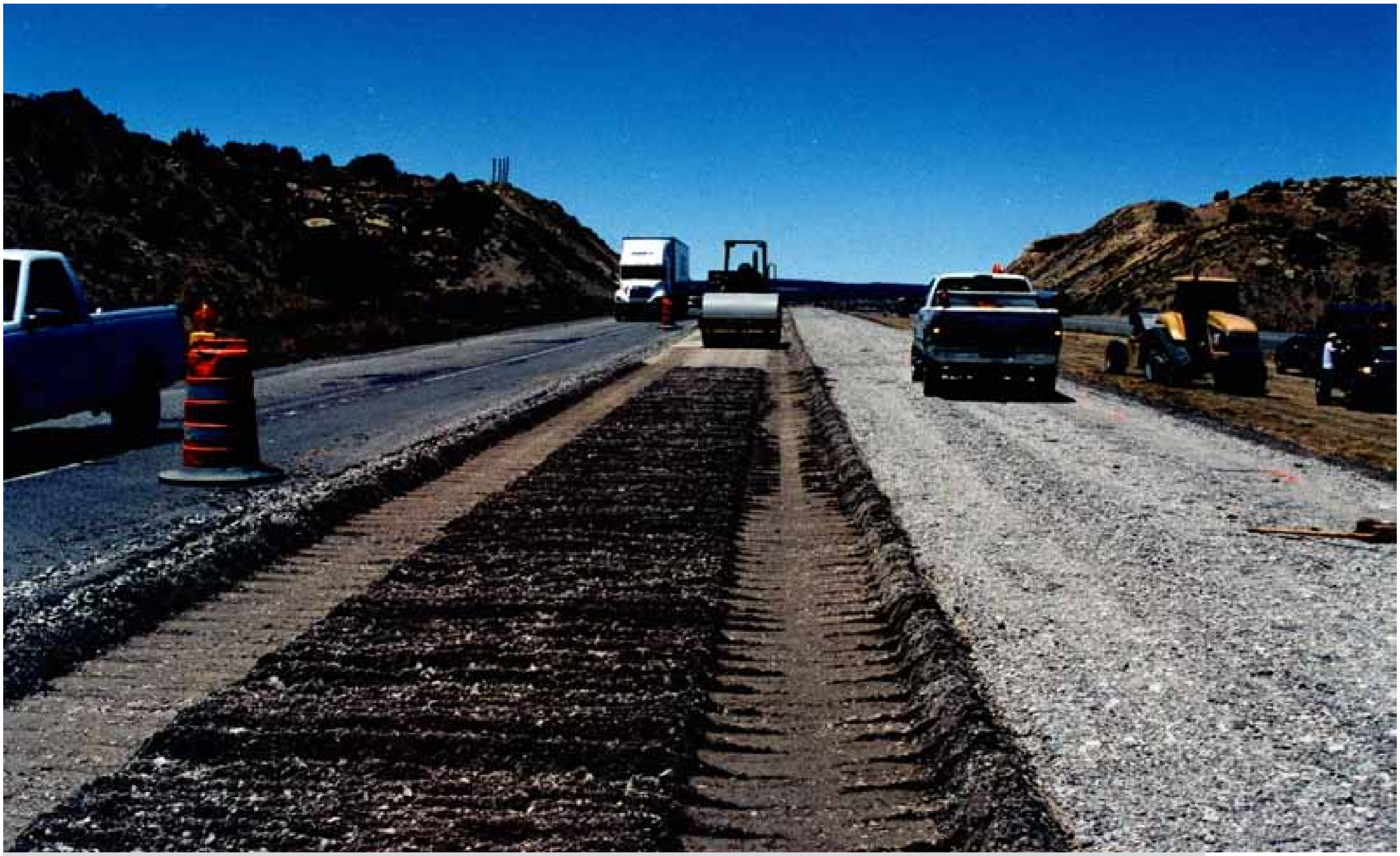
# Full Depth Reclamation on INTERSTATE 40

Traditional reconstruction of interstate freeways requires detouring traffic from one side of the freeway to the other. A four-lane freeway, for instance, becomes a dangerous and slow two-lane highway with traffic in opposing directions until construction on all four lanes is completed. The need to move all traffic to the other side is necessitated by traditional reconstruction methods that rely on complete removal of the old pavement, base and subgrade materials. This leaves an excavation as deep as two feet or more below pavement elevation, a difference in grade that would be an unacceptable safety hazard if freeway traffic was allowed to continue close to the excavation while construction was in progress on an immediately adjoining lane. The ability to instead keep traffic moving in the adjoining lane, by utilizing in-place pavement recycling and base stabilization, as pictured below, limits the impact of the required detour on freeway traffic in regards to speed reductions and safety hazards. Three of four traffic lanes can remain open to traffic. Construction is greatly speeded by eliminating the need to remove and replace the base and subbase and stabilize subgrade soils. Construction is further speeded and reduced in cost by elimination of temporary detour crossing roads, temporary barriers and other safety measures necessary while the excavation in conventional reconstruction projects remains open. When analyzing the overall savings potential on a seven-mile section of freeway that could result from use of in-place recycling and base stabilization, New Mexico Department of Transportation (NMDOT) engineers forecasted a cost-savings of approximately forty percent. Based upon these economics, the Federal Highway Administration (FHWA) agreed to fund a Demonstration Project on a mile long section of the I-40 eastbound lanes (west of Gallup, New Mexico). The existing structural section to be recycled in-place included the original concrete pavement, eight inches thick with metal dowels between the slabs, and a seven-inch thickness of accumulated asphalt overlays. Included in this recycled mixture would be geotextile fabrics used between the asphalt overlays, accumulated crack sealer placed over the years by state maintenance crews and some cement treated aggregate from the old base course below.

Key to this in-place recycling and base stabilization concept was innovative equipment and stabilizer product technology. A large pavement pulverization machine known as a Roto Trimmer was capable of crushing the full pavement depth (15 inches of asphalt and concrete plus additional base course from below) in a single pass. The EMC SQUARED® System treatment had proven effective in stabilizing recycled aggregate mixtures for use as high-strength flexible base layers. It could be metered into the mixing chamber of the Roto Trimmer during a second mixing and pulverization pass where the recycled aggregate was reduced to a gradation with one (1) inch maximum rock size. In conjunction with

Roto Trimmer applying EMC SQUARED Stabilizer solution in treatment of recycled pavement aggregate material

FHWA Demonstration Project featuring In-Place Recycling of existing asphalt and concrete pavement layers for use as stabilized base course



View behind Roto Trimmer showing compaction of the recycled pavement aggregate material in progress following pulverization and treatment with EMC SQUARED Stabilizer solution

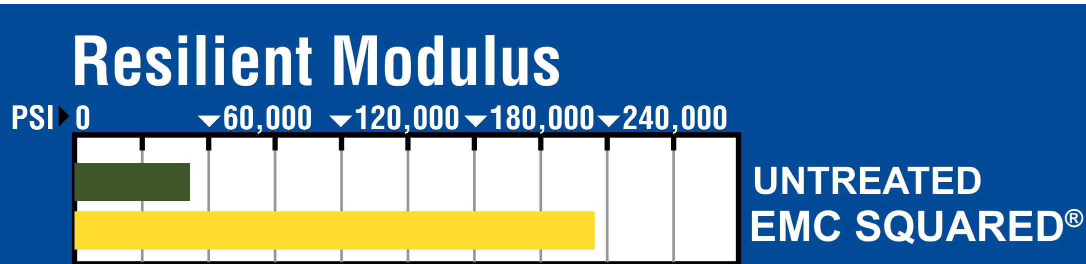
the Roto Trimmer equipment and EMC SQUARED® System stabilization treatment, a unique piece of equipment known as an Impactor was used for multiple functions essential to this project specific construction process. The Impactor is a multi-purpose impact roller towed behind a tractor. It is capable of breaking and rubblizing asphalt and concrete pavement, of compacting thick layers of aggregate base rock to high density, and of compacting native subgrade soils to a depth of four feet or more. All these capabilities were called into play on the I-40 Demonstration Project.

In the actual construction sequence, the pavement was first broken up, or rubblized by multiple passes of the Impactor, then pulverized by the Roto Trimmer and stabilized with the EMC SQUARED System treatment on a second pulverization and mixing pass. The treated recycled aggregate mixture was then given five passes with the Impactor to compact the treated layer and to consolidate the compressible subgrade soils below. Once this was completed, the treated recycled aggregate was trimmed down several inches to paving elevation and compacted with a smooth drum vibratory roller in preparation for placement of nine inches of asphalt pavement surface course. The excess stabilized recycled aggregate was used to extend the highway shoulder.

Due to the extremely saturated native subgrade conditions under this section of freeway, only one of the two lanes of the demonstration project was completed using this in-place recycling and stabilization process. The adjoining lane was reconstructed by conventional methods with as much as six-foot deep excavations to remove wet soft subgrade soils. While the in-place method could have been continued on top of these worst-case native subgrade conditions by applying slightly less compactive force through the stabilized layer, state engineers elected to err on the side of caution and resort to their conventional approach. For the conventional section, two feet of subgrade soil was removed throughout, with some problem areas subject to deeper excavation. The excavation was then backfilled with untreated asphalt millings and covered with geotextile separation fabric. A sixteen-inch layer of untreated recycled aggregate base (from the in-place recycled aggregate produced by the Roto Trimmer) was placed, followed by nine inches of asphalt pavement surface course.

The FHWA Area Engineer for the Demonstration Project, and subsequently Area Engineer for another federal agency in New Mexico, continued to monitor project performance through visual observation and review of the annual IRI, or profilometer, monitoring conducted by NMDOT as mandated by FHWA. Three and a half years after construction, he reported that the pavement constructed on top of the stabilized recycled base had remained the smoothest running in that segment of freeway. The performance of this FHWA Demonstration Project on Interstate 40 is most interesting as NMDOT engineering staff had reported that this particular section had a historic recurrence of three years between full depth reconstruction due to a frequency of highly saturated expansive clay soil deposits under the freeway alignment. In fact, NMDOT engineering staff associated with this project admitted during a later meeting that they had Ground Penetrating Radar (GPR) data available for the subgrades under the full length of Interstate Highway 40 located in their district. They had selected this specific one mile length of highway for the demonstration project because it had extremely deep soft subgrade problems and presented their worst case situation. The adjoining lane constructed by conventional construction (excavation and import) was significantly rougher riding and it required full-depth repair in three areas. He also reported that the demo project had been buried under new highway construction as the elevation was raised several feet in conjuction with a new bridge and freeway undercrossing structure. According to the NMDOT engineer monitoring the new construction, the stabilized base course was in excellent condition when the asphalt pavement was removed prior to raising the grade to accommodate the new undercrossing.

Samples of the stabilized recycled aggregate mixture were collected during construction and subjected to Resilient Modulus testing at the Materials Research Center and the University of New Mexico (UNM) ATR Institute under the supervision of research engineer R. Gordon McKeen. While untreated virgin aggregate typically tests in the range of 20,000 to 50,000 psi, the stabilized recycled aggregate tested at 234,000 psi, closer to the modulus of typical hot mix asphalt materials.




**Interstate 40 - New Mexico**
Recyled Pavement Aggregate
Materials Research Center
University of New Mexico, ATR Institute



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