



By Jeff Zagoudis
Associate Editor

Shoot for the Moon

Cold in-place recycling fixes mountainous Calif. highway

By the beginning of 2014, Mooney Road through California's Sierra Nevada Mountains bore a strong resemblance to its lunar namesake.

"The road gets lots of heavy truck traffic for logging, plus lots of snow and ice build-up in the winter, so the whole thing was wheel-rutted out," Weston Hutchings, operations manager for Hat Creek Construction, told *ROADS & BRIDGES*. On top of the logging trucks, Mooney Road serves as a cutoff between highways 36 and 44, carrying vacationers through Lassen Volcanic National Park to Lake Almanor in the summer.

"It had deteriorated to the point where an overlay wasn't going to fix it," said Hutchings of the 7-mile stretch in question, though the base and subgrade were at least stable. Officials in Lassen and Plumas counties worked with the Central Federal Lands Highway

Division to devise a plan. They knew their window was short in the high altitude of the Sierra Nevadas, so they needed a quick but lasting solution. According to Doug Hecox, public affairs specialist for the Federal Highway Administration, cold in-place recycling (CIR) had been used successfully on another portion of Mooney Road, so the design team opted to try it again. Hat Creek was more than willing to tackle CIR, having completed two previous projects using the innovative method. This time around, the result was chosen as a 2015 *ROADS & BRIDGES/ARRA Recycling Award* winner.

Clearing the way

All of that snow and ice meant the road was fairly frozen as the project was entering the construction phase. Running through the heart of the national park, the entire length of Mooney Road is surrounded by heavy timber forest consisting of various pine and fir tree species. In most places, the trees nearly

butt right up to the edge of the pavement, and on one particular 1-mile stretch, according to Hutchings, they actually blocked much-needed sunlight that could help with the spring thaw. "So the very first thing we did was go in there and remove all of it," Hutchings said. Clearing began in January and was finished by the end of February to avoid disturbing any nesting birds when they showed up in the spring, an environmental requirement for the project. Then the project team had to wait for the roadway to thaw enough to where it could be torn up and replaced, so work did not kick off in earnest until early May.

Twists and turns

Pavement Recycling Systems (PRS) out of Jurupa Valley in southern California was subcontracted to execute the CIR. The twisting mountain road provided a challenging course, with the width, cross slopes and shoulder conditions varying from one portion to the next. In general, though, PRS and Hat Creek were able to mill and pave at a width of 16 ft. The 102-ft-long recycling train was led by a 4-ft miller handling the outer edge when needed, followed closely by a 12.5-ft Caterpillar PR-1000 milling machine. Both pieces of equipment milled off 3 in. of the existing failing pavement.

Thanks to the forest around them, it was impossible to turn the train around at the end of a pass, which meant unhooking it at the end of each day and starting over. "We would go down one side and do 2 miles, then we'd back up and do 2 miles on the other side," Hutchings said. "You had to plan your work, know your targets and know what you were going for because you've got to go park a 120-ft train everyday on a rural two-lane road without much of a shoulder."

Following behind the milling machines was a Cedarapids CR551 rubber-tire paver, which picked up and replaced the recycled asphalt. Even with the added inconvenience of stopping and starting, Hutchings said the



Two Caterpillar rollers were used for asphalt compaction on the Mooney Road project, allowing the project team to achieve 92% smoothness for an incentive bonus.

milling and paving was completely finished in just eight or nine days.

The mix design for the recycled pavement was 3% mixing water and 1.4% HFMS-2p emulsion content, which Hecox said was one of the key elements the design team discussed. The hot-mix asphalt (HMA) overlay consisted of Superpave with 20% recycled asphalt pavement (RAP), PG 64-28 binder and nominal size aggregate of $\frac{3}{4}$ in. Two layers of overlay were placed on top of the recycled asphalt.

Recycling and revitalizing the existing pavement also saved the project team from having to haul materials in and out of the jobsite—a perk considering the site's remote, mountainous location. As it was, Hutchings said, "The oil was coming from $3\frac{1}{2}$ to 4 hours away," meaning they tried to stockpile as much onsite as they could, and they were using as many as four loads a day. "You had to get your loads of oil timed so you didn't run out of oil but you didn't order too much either," Hutchings explained.

Mother Nature kept everyone on their toes as well, with frequent thundershowers in the area that would force production to shut down until they passed. "That can really screw up your production for the next day and when you're trying to unhook everything," Hutchings admitted.

While fairly remote, Mooney Road generates enough traffic that the project team had to keep the connector open throughout the duration of construction. According to Hecox, they could have a maximum delay of just 15 minutes per day.

Just keep rolling

A pair of rollers were required for compaction of the recycled asphalt. First through was a Caterpillar PS200 nine-wheel pneumatic, the heavier of the duo, to handle the initial compaction. It was immediately followed by a Caterpillar 534D double-drum roller. "We used that to finish up the compaction and smooth out any irregularities behind the paver," Hutchings said.

Hat Creek and PRS had targets for smoothness and density on the asphalt overlays set by FHWA, which meant ensuring that the CIR subgrade was as smooth as possible.

"So what we did was we profilographed it and found any bumps that were there and ground them down with a grinder ahead of time before we put the asphalt overlay down," Hutchings told ROADS & BRIDGES. Once the first overlay was down, an inertial profiler truck made a second

You had to plan your work, know your targets and know what you were going for.

— Weston Hutchings,
Hat Creek Construction



pass to find any new bumps, which were then smoothed out before the second asphalt overlay was dropped.

Testing was handled by CGI Technical Services (formerly CurryGroup Inc.). Final smoothness ratings equaled 175 in./mile, while density came in at 92%. Both numbers

were good enough to earn Hat Creek and PRS bonuses for the project totaling \$6,048. They also received a \$115,000 incentive for material quality.

In the end, any concerns about the short project window evaporated in the mountain air, as Hat Creek and PRS wrapped

everything up by early September, a full six weeks ahead of schedule. FHWA and Lassen County put the cherry on top by building new embankments at three locations to replace the guardrails, which were set just 3 ft off from the roadway and had accumulated heavy damage from snowplows as a result.

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Far Left: A Wirtgen W 1900 was one of two cold mills tackling the 7-mile stretch of Mooney Road.

Middle Left: The narrow roadway and surrounding timber forced Hat Creek Construction to unhook the recycling train and back it up at the end of each day.

Left: A Lincoln 660H windrow elevator deposits the revitalized asphalt ahead of the paver.

The new guardrails are 10 ft offset from the edge of the pavement.

The final project cost was approximately \$4.4 million—\$296,000 lower than listed in the initial construction contract award. When the eliminated costs of removing and replacing the existing pavement are factored

in, a total of \$785,000 was saved by using CIR. Most importantly, Hecox said that the roadway and shoulder width are now consistent throughout the 7-mile stretch.

Hutchings attributed the project's success and expedited completion to a total team effort. "We were very lucky that we didn't

have any mechanical failures; we had a very good subcontractor, a good working relationship with the feds and a great lab that was turning our results around quickly," Hutchings said. **R&B**

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