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Erosion Control With Recycled Materials

by Timothy Barkley

Texas produced an award-winning program for using compost to control soil erosion along roadways.

The use of compost to control roadway soil erosion is a growing trend, thanks in large measure to fertile minds at the Texas Department of Transportation (TxDOT) and its sister agency, the Texas Commission on Environmental Quality (TCEQ). Compost has proven to be extremely effective in preventing soil runoff during and after roadway construction. It not only minimizes soil erosion but also helps prevent water contamination. And its use in the TxDOT transportation community also has created a dynamic market for locally produced compost. In fact, *Biocycle* magazine contends that TxDOT is the largest market for the material in the Nation, using more than 306,000 cubic meters (400,000 cubic yards) of compost in fiscal year 2003.

The Lonestar State's award-winning program encourages the environmentally safe use of compost along the rights-of-way of federally funded highwaysthe type of innovation envisioned by the Intermodal Surface Transportation Efficiency Act of 1991, which recognized that transportation planning must proceed with care for both human and natural environments.

In this April 2003 demonstration, conducted on I27 in Amarillo, TX, workers using pneumatic blowing equipment apply compost to control erosion.

How It Began

Controlling erosion means stopping soil movement at its source. Rapid revegetation of disturbed ground has long been recognized as one of the best and most economical ways to minimize the loss of soil and

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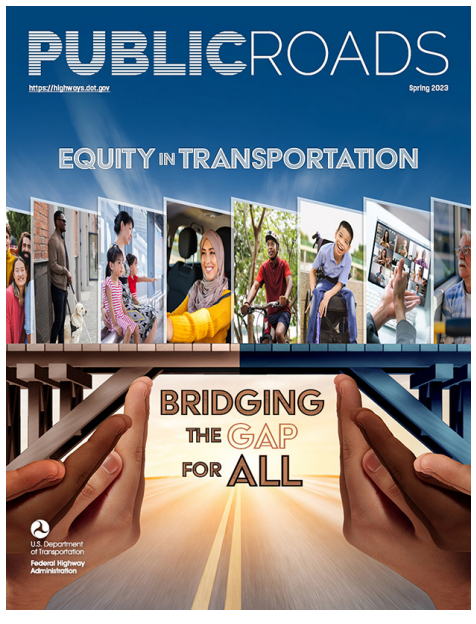

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the resulting pollution of water resources. This measure is especially important in highway construction, which historically has been viewed as a major contributor to nonpoint source pollution, or water runoff contaminated by multiple diffuse sources rather than a single pipe or industrial plant.

Planting quick-growing grasses from seed is the most common way to revegetate slopes in highway construction. This method frequently is accompanied by manual placement of harvested straw or erosion control blankets.

But Texas soil is often of poor quality, and State highway builders historically have had difficulty revegetating roadsides after construction. With little or no organic material available to help retain moisture and provide nutrients to sustain vigorous plant growth, many projects have caused severe erosion. Correcting this erosion has proven to be expensive, both in terms of remediation costs and in environmental fines issued for failure to control runoff.

This situation might have continued if it had not been for a chance meeting between TxDOT Landscape Architect Barrie Cogburn and TCEQ Program Specialist Scott McCoy at a seminar on compost conducted by McCoy's agency in 1996. Cogburn recalls listening to the speakers: "What really struck me was the volume of organic material that we put in our landfills every year. I knew from years of working in the field that on many projects we must clear vegetation and it goes into our landfill and a few years later we bring that same product back in the form of mulch or a wood-fiber blanket, and to me we're paying for it twice. We have such problems getting grass established because we don't have organic matter in our soil, yet here is this waste that's going to the landfill."

TCEQ had been telling Cogburn that the agency had been trying to convince cities in Texas for years to compost their organic waste. Many were giving it away to the public, but most of them were unable to find a market for the great volume of material. Cogburn adds that she thought, "They can't get rid of this organic product, and we can't get enough of what we need. There's got to be some bridge here."

Cogburn and McCoy discussed the situation and began thinking of ways that TxDOT might use compost in roadway construction. Since it was a win-win situation for both agencies, the idea made perfect sense. TxDOT officials believed the idea was at least worth a try. But there was a hurdle to overcome.

"The very first thing we had to do was write some kind of specification," TCEQ's McCoy explains. "To get [TxDOT] to buy into this, we had to provide them with a tool they could use."

Writing a compost specification, though, turned out to be far more complex than either Cogburn or McCoy had expected. "Barrie is a landscape architect, and I'm a plant soil scientist," McCoy says, "and neither one of us is a specification writer. So we called in composters from across the State and looked at everything we could find, including information from other States and the U.S. Composting Council, and we put it together. It took us about 6 months from start to finish."

A Demonstration Project

With the specification in hand, Cogburn and McCoy could conduct a compost demonstration project at an actual road construction site. The location they selected was a slope on Interstate 20 near Big Spring, in west Texas. But Cogburn and McCoy encountered an unexpected problem. "The wind was blowing about 40 miles per hour [64 kilometers per hour], and we were worried that the compost would blow away," McCoy says. "So what we decided to do was blend wood chips at 50 percent in the compost. This worked so well that it eventually became our erosion control specification [which should not be confused with the compost specification]."

These soil erosion blankets along Spur 208 in the Dallas area failed to establish grass.

The slope where Cogburn and McCoy applied the compost and wood chips had been plagued by erosion problems since 1968. Over the years, TxDOT had tried a variety of traditional products that temporarily protected the slope but did little to improve the soil. Cogburn and McCoy's mixture produced dramatic results. Within 8 weeks, vegetation was reestablished on the slope, and Cogburn and McCoy's compost solution was validated for that test case.

Despite the difficulty Cogburn and McCoy had in writing the initial compost standard, Cogburn acknowledges that their strict selection was worthwhile in the end. "It was a good lesson," she says. "I know now that a strong specification solves so many problems. If we just accepted any old compost, we'd be getting some at job sites that was of good quality and some that wasn't, and it wouldn't be fair to the good-quality producers to compete with the people who were just hauling a 'bag of dirt.'"

Composted dairy manure is applied to Spur 208 in Dallas.

Full-Scale Use

Today, composted manure makes up about half of the compost used in Texas road projects statewide, followed by composted yard trimmings and biosolids (organic sewage matter treated and processed for fertilizer). Projects in San Antonio use yard trimmings and composted biosolids produced by the city, while only yard trimmings are used in Houston. TxDOT's standards allow the use of Class A biosolids treated sewage but not Class B biosolids.

As shown in this demonstration, another way of applying erosion control compost uses side discharge equipment that distributes compost evenly in a wide pattern.

There is a big difference between these two classes, Cogburn notes. Class A biosolids are those that the U.S. Environmental Protection Agency (EPA) has deemed clean enough to sell to the public to put on vegetable gardens. Producers must prove that the material has reached an internal temperature of 73 degrees Celsius (132 degrees Fahrenheit) and has stayed that hot or hotter for 15 days, the theory being that all pathogens are eliminated. Class B biosolids have been treated, but not to the same degree, so it is illegal to sell them to the public.

To date, Cogburn and McCoy have held more than 30 workshops for TxDOT employees throughout the State. In addition to educating employees about compost, the workshops enabled Cogburn and McCoy to combat preconceptions that the material has an offensive odor. Attendees had a chance to smell the compost up close.

"It smells like good, earthy soil, not like any of its original constituents," Cogburn says. That's important, she notes, because if TxDOT employees understand that crews are putting down a safe and aesthetically acceptable material on roadsides, they will be able to alleviate any concerns raised by nearby residents.

The original TxDOT compost specification was superseded by a new specification effective in February 2003, which draws on TxDOT's experience in acquiring compost since the program's inception. "Prior field tests proved unreliable, and the new test methods were better suited for testing compost," Cogburn says. She notes that the other major change mandated by TxDOT is the approval of the Seal of Testing Assurance (STA) program, administered by the U.S. Composting Council for any compost used for erosion purposes.

McCoy adds, "We thought this was a good way to have an even playing field for all the composters. We were the first State DOT to approve the STA program. All the composters have to go through the same lab and the same protocol."

A mulch filter sock protects inlets along I10 near Junction, TX. Once the job is completed, the sock is split

along the top, the material is left onsite, and the only waste is the sock material.

TxDOT uses three compost applications. One is general-use compost, which is 100 percent compost. This is the compost specified by landscape architects for purposes such as amending soil for a tree-planting project. General-use compost is also the kind of compost that TxDOT's maintenance personnel might use to top dress a roadside park.

The second is compost-manufactured topsoil, used in fairly flat locations with poor soil quality and shallow slopes. "We can mix in about an inch of compost over the top and drag a till through it to kind of incorporate it lightly," says Cogburn. "And the third situation is where we have a steep slope, and we would traditionally have used a soil-retention blanket. In those areas, we're advocating what we call erosion control compost, which has a 50-50 blend with wood chips."

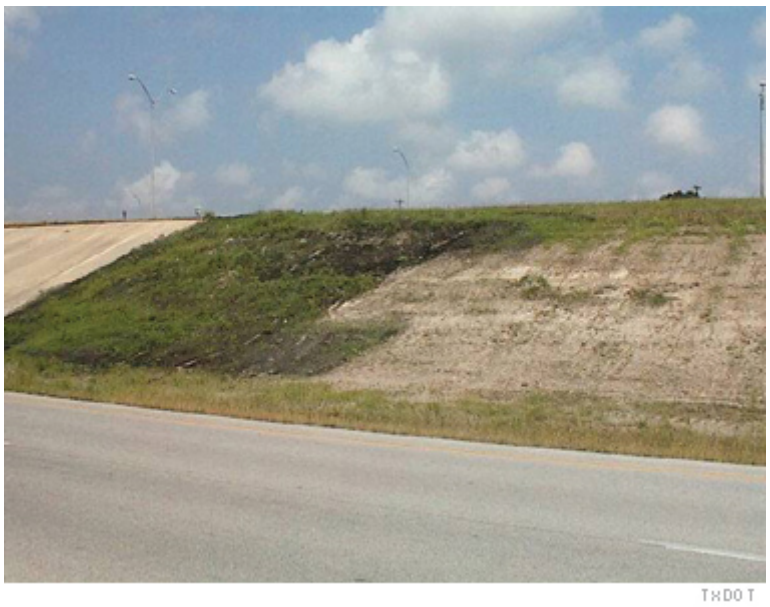
Economic, Environmental Benefits

The TxDOT program has created a substantial market for compost, but it has been an entirely in-state market, since it is not economical to haul compost long distances. TxDOT currently is paying about $1.50 per 0.8 square meter (1 square yard) for 51 millimeters (2 inches) of erosion control compost and $1.15 per 0.8 square meter (1 square yard) for compost-manufactured topsoil. Last year, TxDOT used 356,490 cubic meters (466,000 cubic yards) of compost. Before this project started, TxDOT's purchase was 383 cubic meters (500 cubic yards) statewide. "So this has become a huge market," says McCoy.

Another economic benefit of the program was the development of a new industrysubcontractors who use truck-mounted pneumatic pumps to apply compost. Three years ago there were no contractors in Texas doing this kind of work; today, there are 12 within the State.

"This kind of application is so efficient and easy, and if you're on a steep slope it's the only way I know of to do it right," Cogburn notes. "You don't want more equipment up there creating the possibility of erosion. So it has created another niche in the industry, and I think general contractors recognize the efficiency of this method of applying compost and are willing to bid out that portion of the job to this new segment of the contracting industry."

(Before) Erosion along State Highway 47 in College Station, TX, threatens this riprap slope. Left alone, the erosion would be expensive to repair.



(After) TxDOT smoothed the slope and applied erosion control compost. This photo shows the same slope 2 weeks after compost was applied.

The compost program has resulted in savings for TxDOT in several other areas. Because compost retains moisture, there is less need for watering. Successful revegetation means that construction barricades can be removed sooner, and contractors can proceed with the next phase of work or move on to other jobs. In addition, avoiding surficial slope failures and mass wasting means that maintenance dollars can be spent on future road projects rather than remediation of earlier ones.

Perhaps the most significant economic benefit of the compost project is the opportunity it provides to influence environmental decisions. Concerns about contamination of drinking water in the Bosque-Leon watershed near Waco, for example, led to a partnership between TxDOT, TCEQ, and EPA to divert cow manure to the compost program. Seven TxDOT regions agreed to buy 153,000 cubic meters (200,000 cubic yards) of compost from dairy manure composters over a 3-year period, spurred by a rebate program of $5 per 0.8 cubic meter (1 cubic yard) off the original price. This incentive was implemented not only to offset the freight cost but also was returned to the district that initiated the purchase. Cogburn says the regions will actually buy about 230,000 cubic meters (300,000 cubic yards) before the program ends next year.

Partnership Is Key

The TxDOTTCEQ compost program has received its share of national attention. Among the awards it has earned are the 2002 President's Award (environmental category) from the American Association of State Highway and Transportation Officials and the 2002 Making a Difference Award (State quality initiative category) from the National Partnership for Highway Quality.

The U.S. Composting Council has termed the program "one of the more sophisticated and aggressive compost use and specification programs in the United States." The publicity from the awards and the numerous articles written about the program have meant that Cogburn and McCoy have found themselves fielding inquiries about compost from across the country, Canada, and Mexico.

Cogburn and McCoy view the awards and articles as ways of spreading the word about a product that can benefit highway construction projects throughout North America. But their primary focus continues to be ensuring that their agencies take full advantage of compost's benefits.

Clearly, this is already happening at TxDOT. The Vegetation Management Section of the Maintenance Division included a compost component in its revegetation training program, and the Environmental Affairs Division is including the specification of compost berms as a best management practice to provide a filter for improved

water quality. In addition, the TxDOT Bridge Division is participating in research that will develop guidelines and specifications for the proper application and placement of compost filter berms.

At TCEQ, McCoy is exploring such innovations as the use of compost in new housing subdivisions. Looking back over the 7-year history of the compost project, McCoy concludes that the real secret of the project's success has been cooperation. "The partnership between TxDOT and my agency was what made this work," he says.

Timothy Barkleyis a marketing and technology deployment specialist with FHWA's Resource Center in Atlanta. He has 23 years of experience and has been with FHWA for 2.5 years. He has a B.A. in advertising and design from Columbus College of the Arts.

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