FEMA

Mitigation

...in New Hampshire

Mitigation (mit.i.ga.tion) n.—measures taken to reduce adverse impacts.

"Mitigation focuses on breaking the cycle of disaster damage reconstruction, and repeated damage."
FEMA.gov website, 2006

The following grants are available in New Hampshire:

- The Hazard Mitigation Grant Program (HMGP) provides a percentage of total Disaster Assistance funds for mitigation measures to be implemented during the immediate recovery *after a disaster.*
- The Flood Mitigation Assistance (FMA) Program provides funding to states and communities for measures that reduce or eliminate the long-term risk of *flood damage* to buildings, manufactured homes and other structures insured under the National Flood Insurance Program (NFIP).
- The Pre-Disaster Mitigation (PDM) Program provides competitive grants to states, tribal governments and local governments for cost-effective hazard mitigation that complements a comprehensive mitigation program.

Bartlett Loop Road work protects public safety, waterway

Emergency Management Director Edward Mical and Public Works Director Allan Brown show the placement of geosynthetic material in the roadbed of Bartlett Loop. Photo by Bridget Weber, FEMA.

Below green hills, streams meander through valleys, where small towns nestle. A landscape that is emblematic of the New Hampshire countryside. Though picturesque, this setting is also susceptible to flooding.

When the April 2007 spring rains fell on top of an 18-inch snowfall, extensive flooding damaged homes, businesses and infrastructure in the Town of Warner. However, local emergency responders and public works department crews had one less problem to deal with on Bartlett Loop Road.

A reconstruction project conducted after the 2006 Mother's Day flood included measures that allowed the floodwaters from Willow Brook to flow through the culvert unimpeded. The measures, were funded under FEMA Public Assistance 406 Mitigation program.

Prior to the mitigation work, a weather system dropped an accumulated 10 inches of rain and overwhelmed the 5-foot culvert under Bartlett Loop Road. The surging floodwaters pushed gravel fill and boulders downstream. A gaping hole replaced the roadbed. Floodwaters deposited hundreds of yards of gravel downstream in wetlands, changing the course of the stream over 160 foot reach.

"It was a continuing issue," said Edward Mical, Emergency Management director for the town of Warner. "So we asked the question why keep spending money on rebuilding the road after every storm when we can spend a bit more to fix it right? And not even a year later it showed that it worked."

Public Works Director Allan Brown remembered at one time a wooden plank bridge had covered Willow Brook. According to Brown, the flooding problem started years ago when the bridge was replaced with a 5-foot diameter culvert that allowed far less water to pass through.

He reported that over the years the road had washed out often, including four

(Continued on page 3)

***Inside**: Mutual aid **On the back**: drainage, drainage, drainage*

Temple tackles road problems with high-tech materials

When a heavy rain drenches southwest New Hampshire's Monadnock Mountain range, much of it finds its way downhill to the town of Temple. The usually placid streams fill with runoff and grow wider than their banks, pushing against too-small culverts and roadways. The high water generally leaves behind washed out gravel or sections of roads.

But each year, the number of road washouts gets smaller. For the last 20 years the town's road agent, public works crew and town select board have reduced road damage by taking the initiative to rebuild stronger, one road at a time. New materials and technical assistance have helped in their mitigation endeavors, as well as federal funding provided during recovery after declared disasters, according to Road Agent Timothy Fiske.

Technical assistance has come by way of the Technology Transfer Center, or T^2 Center as it is commonly called, which manages the state's Local Technical Assistance Program (See related article on LTAP on page 3).

The T^2 Center gave Fiske his first experience with geotextiles back in 1988. Geotextiles are permeable fabrics, engineered to control drainage. When used in association with stone and soil, they have the ability to separate, filter, reinforce, protect, or drain. Geotextiles yield benefits in public works projects involving roads, embankments, retaining structures, bank protection and coastal engineering. The center recommends working with engineers familiar with geotextiles when designing road mitigation projects.

Advisors at the T^2 Center wanted to demonstrate how geotextiles help drainage when used in the right place and were looking for a volunteer road agent with a muddy road. Fiske volunteered a narrow, boggy gravel road that turned into foot-deep mud every spring. The demonstration involved help from six different town road agents who then learned how to install the material for that particular problem. Fiske said he hasn't had a problem with the road since.

Fiske became a believer in using geotextiles after that first experience and has continued to use different types of geotextiles in road repair when possible. For one particularly pesky road that Fiske remembers washing out 10 times in a dozen years, he worked with a FEMA mitigation technical specialist, Richard Downer, when repairing it in 2005.

At the outset, Fiske had two difficult situations to work with at the site on Fish Road: a stone culvert with historic value and the need to obtain funding for the improvements. The repair of the road was eligible for FEMA Public Assistance funds because the area was included in a federally-declared disaster. A requirement for receiving federal funds is that the applicant must comply with federal, state and local laws that regulate environmental and historic preservation.

Because of the historic nature of the culvert, Fiske had the project reviewed by the state historic preservation officer. The historic character of the culvert would be retained and preserved with little visual impact from the repair by rebuilding with the original stonework. And to help prevent continued damage to the culvert in future flood events, they were able to add a cement culvert beside the stone culvert, engineered to be a secondary flow-through when floodwaters backed up behind the stone culvert.

Road Agent Tim Fiske stands next to a repaired stone culvert on Fish Road where geotextiles were used in the roadbed. Photo Bridget Weber, FEMA.

But Fiske wasn't finished with the job yet. In addition to a larger opening for floodwaters to flow through under the road, the road itself needed help to stay put in the event floodwaters would overtop it. Using geotextiles to hold the gravel roadbed in place and reduce erosion seemed the right option.

First, the roadbed was shaped to confine the overflow to the armored area by making a long shallow depression in the road over the culverts. Fiske and his road crew then installed 400 square feet of geocell on top of the roadbed at that point. The geocell material has cells like a honeycomb and the cells are filled with stone or gravel. The intent is that when water runs over the road, rather than separate pieces of gravel or stone for the rushing water to carry away, the filled geocell material acts as a whole unit to hold the roadbed in place.

"We stretched the geocell over the roadbed, pinned it in place and filled it with crushed stone," explained Fiske. "Then we overlaid it with three inches of crushed gravel."

The extra step of installing the geotextile material added $2,134 to the project that had a total coast of $7,734. FEMA Public Assistance funds covered 75 percent of the cost. The road was tested in the 2007 April nor'easter. Even though floodwaters overtopped the road, it suffered only minimal loss of gravel from the road edge. Fiske estimates each previous washout cost $1,400 to repair the culvert and haul in gravel.

"With the mitigation money, you spend it once and fix the problem right," said Fiske.

Communities work together to repair damages

When public works directors and road agents are looking for better ideas on how to repair roads and fix drainage problems, they often check with the Technology Transfer Center, otherwise known as the T^2 Center, located at the University of New Hampshire, Durham. The T^2 Center manages New Hampshire's Local Technical Assistance Program (LTAP); Congress established LTAP in 1982 to provide public works services to U.S. cities and towns that maintain more than 3 million miles of road and 29,000 bridges.

Mitigation is a hot topic at the T^2 Center. Staff organize workshops on the basics of a good road and techniques for reconstruction projects, such as using geotextiles for drainage projects and repairing roads. Through the Roads Scholar Program, they help people learn about new materials and develop critical skills.

The Center offers those involved with public works projects a place to exchange information about what does and doesn't work. And one of the things people are talking about is geotextiles.

"People are using geotextiles more and more," said Kathy DesRoches, director of educational programs at the T^2 Center. "What I hear from the road agents is that they've been very successful when using the right geotextile product in the right place."

The New Hampshire LTAP also has a national first with the Mutual Aid Program that it manages. New Hampshire was the first state to build a coalition of public works departments for the purpose of sharing resources. "Mutual Aid is used to facilitate quick responses to public works emergencies," said DesRoches, manager of the program.

In an emergency, local officials contact the T^2 Center, which coordinates the dispatching of necessary equipment from other towns to the emergency site. To date, 84 towns, cities and counties participate in the Mutual Aid program and DesRoches hopes all municipalities will eventually be part of the successful initiative.

Many Public Works departments found themselves in need of more equipment to handle all the emergency work required after 13 inches of rain fell in May 2005 in parts of New Hampshire. Mutual Aid Agreements helped six communities locate needed equipment and personnel in partnering towns. Assisting municipalities provided flaggers, trucks and drivers, barricades and backhoes to the affected communities of Allenstown, Bow, Goffstown, New Boston, Newmarket and Milford in the most widespread use of mutual aid agreements in New Hampshire.

Protecting public safety, waterway

(Continued from page 1)

times in the wet year of 2005.

Brown and his crew worked with FEMA and the state to prepare an application for FEMA Public Assistance showing that the benefits of the mitigation would outweigh the cost. He estimated that each time the town repaired the road in a declared disaster they were reimbursed approximately $30,000 in Public Assistance funds. The environmental damage to wetlands caused by the deposit of road debris was also figured into the formula to meet the criteria for eligibility for the mitigation grant.

"Why keep spending on rebuilding the road after every storm when we can spend a bit more to fix it right?" asked Brown.

The mitigation measures which included a hydrology study, added an additional $31,000 to the estimated $63,898 total cost of the project. The work crew installed a standard aluminum multi-plate box culvert with much higher flow capacity. The crew installed a rubber membrane between the culvert and the road bed to prevent salt from corroding the aluminum culvert. And true to the thrifty nature New Englanders are known for, the project came in $8,000 under budget at $55,784, with Public Assistance providing a grant of $41,838 to the town for the project.

During the 2007 nor'easter Brown checked the Bartlett Loop Road, as he or his Public Works crew normally would during a storm, but this time he took pictures of the successfully mitigated culvert rather than setting out bright orange cones and "road closed" signs again.

"It makes you feel good to do something that works," said Brown.

The floodwaters from the 2006 Mother's Day Storm tore a hole through Bartlett Loop road. Photo by Bridget Weber, FEMA.

Disaster Mitigation dollars help drain away recurring road problems

New Hampshire communities spend a good portion of their tax dollars on maintaining roads during normal weather cycles. But natural disasters often can take a toll on workers and budgets, adding the additional hardships of road washouts and public safety hazards.

The first priority in road maintenance is to get water away from the road. Water weakens materials during normal rainfall and destroys roads when swollen streams smash through roads with inadequate culverts or poorly engineered drainage systems.

Proper drainage is a fundamental building block of a good road. And good design is basic to getting that proper drainage.

FEMA 406 Mitigation provides additional funding to do disaster damage site mitigation to prevent future losses.

In the rebuilding phase after washouts, road managers can employ proven strategies to improve drainage and build stronger roads that will lessen the damage from future storms. The small communities of New Durham and Newmarket installed larger culverts with mitigation funding.

Rick Malasky (right) shows FEMA mitigation officer George Brosky (left) the larger culvert that was installed on Langs Lane in 2006. Photo by Bridget Weber, FEMA.

Langs Lane fix prevents washout in nor'easter

"Langs Lane was damaged in '96 and '98 and in 2006 it totally washed the entire road away," said Rick Malasky, Newmarket Public Works Department director and fire chief. "So we decided it was time to fix the problem."

The solution to the reoccurring problem was to replace the culvert with a larger one. The crew installed a larger, 48-inch culvert and provided additional shoulder protection to prevent erosion. The mitigation measures added $3,885 to the cost of the project, bringing the total price tag to $25,401.

Malasky said the road remained open for emergency vehicle traffic through the pounding of the April 2007 nor'easter. "If we wouldn't have fixed the culvert the road would have washed out again. And we would have had two to three 12-hour days of work to make it passable."

New Durham upgrades failing culverts

In May 2006, severe storms and flooding from the Mother's Day Storm left gaping holes in several roads in New Durham. The town combined funds with FEMA assistance to mitigate three damaged sites Quaker Road and another on Drew Road. Mitigation measures included installing new, larger culverts and adding an additional culvert to one of the sites. All the culvert upgrades proved effective in handling the water flow during the 2007 spring flood event.

Mark Fuller, road agent for the New Durham Highway Department, said "Last year we were down to one lane on Quaker Road for a week. This year we were back to normal in a few hours."

The four mitigation sites have demonstrated cost-effectiveness. As of July 2007, benefits in avoided damages were estimated to be $3,000 to 6,000.

The upsized culvert on Quaker Road is stabilized with New Hampshire granite. Photo by Darby Duffin.

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This newsletter is a publication of the U.S. Department of Homeland Security, FEMA, produced in cooperation with the State of New Hampshire Homeland Security