



# Impacts of ENVIRONMENTAL REGULATIONS ON HIGHWAY MAINTENANCE

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**O**fficials with highway maintenance departments across the country are developing a variety of innovative ways to comply economically with an increasing number of environmental regulations being enacted at federal, state, and local levels.

These are the findings of a group of Alabama researchers who have compiled a report on the effects of environmental regulations on highway maintenance and how state departments are dealing with these directives. The report is a product of a study on Impacts of Environmental, Health, and Safety Regulations on Highway Maintenance, NCHRP 14-9(5), commissioned by the Transportation Research Board and conducted by the Highway Research Center, Department of Chemical Engineering, Auburn University.

The study examined the dilemma faced by transportation departments throughout the United States during the past several years caused by the rapidly increasing number of environmental, health, and safety regulations issued by organizations at all governing levels. The organizations often do not possess a full comprehension of the impacts such regulations have on maintenance department activities and resource allocation.

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Regulatory compliance can force maintenance personnel to change long-standing maintenance practices and spend more money to implement new maintenance methods and equipment. A recent study by Thomas D. Hopkins of the Rochester Institute of Technology (1) noted that the total cost for departments to comply with environmental regulations in 1990 was \$99 billion, compared with \$41 billion for compliance in 1977. He further estimated that the amount would rise to approximately \$167 billion by the year 2000.

Auburn researchers evaluated questionnaires submitted by maintenance personnel throughout the country, closely examined several maintenance programs tailored to confront specific maintenance problems, and conducted numerous interviews with highway employees to pinpoint 17 crucial areas of concern to highway maintenance personnel.

The economic and practical dilemmas faced by highway maintenance departments in dealing with some of these 17 areas, along with innovative methods used to address the problems involved, are described in the following sections.

## Herbicides

Right-of-way vegetation management programs offer sound, economical maintenance practices for controlling and managing right-of-way vegetation. Vegetation

control can be accomplished by biological means (using animals, birds, insects, and competing plants), physical methods (cultivating, trimming and mowing), and chemical applications. According to the Auburn study, the latter technique is widely regarded as the most effective, economical method of vegetation control; however, growing public concerns and regulatory restrictions have prevented or seriously limited the use of some herbicides.

Study researchers pointed out that herbicide use has been most affected by water quality and health standards, which have caused departments to modify the ways they apply chemicals, and by hazardous materials regulations, which have limited the ways transportation departments can dispose of herbicides.

Cited in the report were tests conducted at roadsides where chemicals had not been used for two years, indicating that the roadsides could not be maintained by physical methods alone. Maintenance costs for these areas have increased by 400 percent, and vegetation is still not adequately controlled.

A University of Florida study found that mowing as often as once every two weeks would be required to maintain proper weed control in certain areas, whereas the Florida Department of Transportation (DOT) presently mows its rights-of-way 5 to 7 times a year. Improper weed control could endanger the traveling public and the mowers themselves, but increasing the

number of mowings per year would drastically increase costs. It would be infeasible to maintain the same quality of service with mowing as is now possible with herbicide control.

The Auburn report details the kinds of problems other states have experienced with herbicides. In Iowa, herbicide application and mowing have been affected by a new regulation restricting the spraying of noxious weeds if mowing is a practical alternative. The regulation has resulted in a \$250,000 increase in mowing costs.

In Oregon, regulations prohibiting the use of pesticides on lands controlled by the

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U.S. Forest Service and the Bureau of Land Management (approximately 50 percent of Oregon is federally owned) have resulted in difficult maintenance procedures and soaring labor, equipment, materials, and disposal costs. In Maryland, Occupational Safety and Health Administration standards for noise and chemical exposure and personal protective equipment have affected vegetation control procedures and driven up costs.

The debate among federal lawmakers, lobbying organizations, and national environmental groups over the fate of pesticide use is also having profound effects on other fronts. Manufacturers, distributors, retailers, and applicators must deal with new laws and regulations affecting agricultural chemicals. The National Agricultural Chemical Retailers Association has estimated that distributors will each spend \$77,000 annually during the next 10 years to comply with environmental rules; that figure is up from \$23,000 in 1990. Efforts to educate the public and promote positive opinion regarding herbicides are designed to help DOTs effectively carry out vegetation control at lower costs.

## Deicing Chemicals

According to the study, approximately \$1.5 billion is spent each year on highway snow and ice removal programs in the United States. Apart from plowing, the most important element of these programs is chemical deicing, which represents about one-third of winter maintenance expenditures. Chemical deicing helps ensure public mobility and safety by quickly eliminating hazardous road conditions. The study notes that sodium chloride (salt) is the primary deicing agent employed on roads and bridges for snow and ice control; if improperly applied, salt can have adverse side effects including motor vehicle, structural, and roadside (soil and plant) degradation, and infiltration of water tables. The estimated total national cost for salt-related mitigation is nearly \$5.4 billion (1991), or about 14 times the annual national cost for salt purchase and application.

States that are required to clean up salt-contaminated sites have spent millions of dollars each year on remediation cleanup and salt stockpile management, including facility renovation and construction. Most agencies have found no environmentally acceptable product options for deicers or new methods of bulk storage. Some states collect discharge water from washing maintenance vehicles in detention basins

or settling ponds and then reclaim the salt; some are also constructing covered storage areas on impervious concrete loading pads and are considering picking up and reusing sand on decks and bridges.

The Auburn report noted some major state expenditures in this area. These include

- Virginia, which spends approximately \$1 million annually on storage facilities and hundreds of thousands more to ensure chemical containment.
- Tennessee, which purchased five new salt separators at a cost of \$20,000 per unit to meet groundwater pollution laws.
- North Carolina, which has built and renovated facilities to meet groundwater regulations at a cost of \$1.65 million.
- Pennsylvania, which has built and renovated several facilities for ice and snow control and truck washing. Costs have ranged from \$20,000 to \$250,000 per building.
- Massachusetts, which spent \$2.5 million between 1983 and 1990 investigating and remediating salt contamination complaints in water supplies.

Calcium magnesium acetate has tested successfully as a possible deicer, but its cost is 25 times that of salt, thus making it an infeasible option for many agencies. However, although alternatives to salt are ex-



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pensive, many communities are willing to consider these methods in light of the environmental effects of deicing salt.

## Wetlands

The primary federal means of wetland protection is permit issuance for proposed developments. This is carried out under the authority of the U.S. Army Corps of Engineers and the Environmental Protection Agency (EPA), although several federal agencies may be involved in the permitting process. A Corps of Engineers permit is required if an individual or group plans to excavate, locate a structure, or discharge dredged or fill material into U.S. waters.

The study indicated that maintenance and construction expenses can be increased because of delays inherent in the wetland permitting process. Permits can take 60 to 90 days to be issued; time delays and costs can significantly increase if mitigation is involved, or if regulations designed to protect endangered plant and animal species and historical sites are deemed applicable. Denial of a permit can mean having to choose an alternative method of maintenance; a conditional permit may mean that the state must reestablish a wetland area and its contents in a safe, ecologically sound environment. These changes usually mean large expenditures and delays for the affected highway departments. Section 404 of the Clean Water Act excludes "normal" maintenance activities as nonregulated actions, and the Corps of Engineers in most states recognizes this exclusion.

The Auburn study, through close contact with highway department personnel in many states, found that many believe that an exemption—as in a minimum acreage of wetland use for highway purposes—would be a viable, helpful solution to many permitting problems. Departmental representatives have also suggested that issuing more general and nationwide permits would help alleviate some of the permitting costs and problems.

Many states are facing particular difficulties in establishing and maintaining wetlands. For example, Florida must carefully control certain invader weed populations while maintaining wetlands on a "2-to-1"

or more replacement basis. North Carolina has a federal mandate to establish a hardwood "bank" and reestablish wetlands near many maintenance and construction projects. Oregon has experienced a \$150,000 rise in biennial costs to manage wetland mitigation sites in accord with federal regulations and permits. In all, the 37 states examined in this study have

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spent approximately \$100 million on wetland mitigation.

Many federal and state officials and private operators have recommended that federal agencies delegate authority to issue wetland permits to the state agencies in the belief that this would make the permitting process more efficient.

## Underground Storage Tanks

EPA currently regulates approximately 2 million underground storage tanks (USTs) at 750,000 facilities across the United States; another 3 million tanks, mostly containing home heating oil, are exempt from federal regulations. Of these 5 million USTs, an estimated 80 percent are constructed of bare, unprotected steel, which is very susceptible to corrosion and subsequent leakage. EPA has identified 175,000 confirmed tank releases that are potential threats to public health and the environment. This number is expected to rise to almost 400,000 over the next few years.

According to the Auburn report, state UST regulations, many of which are derived from federal regulations, have seriously increased operating costs. For instance, all new tanks and piping must have leak and corrosion protection and spill/overflow prevention systems, which can drive the

cost of a new tank into the \$40,000 to \$60,000 range. Existing tanks must have leak-detection systems installed by December 1993 and corrosion protection and spill/overflow prevention systems by December 1998, or earlier in some states. Cost information gathered from various highway departments has shown that upgrading a single tank can cost \$25,000 to \$45,000.

In many states, funds intended for tank cleanups are running short, forcing agencies to expand their funding bases to include revenue sources such as gasoline fees and taxes. For example, the state of Florida was forced to create new taxes to raise an additional \$160 million annually when it found that its original \$50 million cleanup fund would not cover the cost of treating USTs. California, with more than 10 percent of its 200,000 tanks reported as leaking, created a similar cleanup fund that was expected to raise \$180 million by the end of 1992.

Strict UST regulations and subsequent costs have forced many small businesses with storage tanks to close in recent years. The Petroleum Marketers Association of America, with more than 11,000 members, reports that more than one-third of its members have closed stations in the past several years largely because of expenses arising from environmental compliance. The average marketer owns 8 to 10 stations and in 1991 spent nearly \$96,000 for tank upgrades; expenses are certain to be higher for larger operations such as state DOTs.

In addition to regulations pertaining directly to tank maintenance, regulations in 40 CFR, Part 280, Subpart H, require that owners and operators demonstrate financial responsibility by taking corrective action and compensating third parties for injuries and damages caused by accidental releases. Facilities not involved in petroleum production (such as DOTs) but having a monthly throughput of 10,000 gallons or more, are required to carry coverage of \$1 million per occurrence; lesser amounts are applicable for smaller throughputs.

## Storm Water Runoff

The Auburn report could not offer a great deal of information on the impact of storm

water runoff regulations, primarily because they have been in effect only since October 1, 1992. It is unclear how these regulations will affect operations at DOTs. Based on past experience, however, many are expecting significant increases in operating costs.

EPA estimates that approximately 100,000 facilities, including those owned by state DOTs, are covered by the regulatory definition of "storm water discharges associated with industrial activity." However, an Alabama environmental representative has conservatively estimated that there may be 10,000 permit applications

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in that state alone. Thus, the agency's projected number of permit applications nationwide may be low, and the impact of the new regulations appears to be wide ranging.

The report notes that organizations applying for industrial permit coverage for storm water discharges can apply for either individual or general permits. General permits cover several facilities engaged in similar operations, whereas individual permits are tailored to specific facilities. Application for an individual permit can be complex; a sizable amount of material, including site maps, quantitative testing data, and other detailed documents, must be submitted. The total cost of an individual permit application, including the application fee, is approximately \$10,000. In contrast, the initial cost of a general permit is considerably less than for an individual one, although it may still run into several

thousand dollars. The requirements to maintain a general permit include implementing a Spill Prevention, Control, and Countermeasures Plan (SPCC), which can cost \$3,000 to \$4,000 and must be updated and recertified by a professional engineer every three years; enacting best management practices, which may require the purchase of new equipment at a cost of several thousand dollars; and monitoring and reporting storm water discharges and obtaining annual certification that all discharges meet permit standards, all of which can add up to \$300 to \$400 a month in testing costs.

The Auburn study reiterates that although the full extent to which the new storm water regulations will affect highway department operations is not fully known, it appears that costs of compliance will be high and will probably increase in the years to come.

### Lead Paint

The Resource Conservation and Recovery Act (RCRA) has profoundly affected the use of lead-based paints among maintenance organizations over the past several years, and according to the Auburn impact study, the relative newness of regulations pertaining to these paints has resulted in some confusion in the maintenance and painting industries. For example, bids for painting contracts involving the removal of lead paint from bridges or other structures have varied by as much as a factor of 10. Bids from contractors knowledgeable about the regulations are usually about three times higher than those for projects that do not involve removal of lead-based paints.

An example of the effect increasing regulations are having on DOTs and the industry was included in the report. An Alabama company that was unaware of the new regulations recently submitted a bid for a project involving lead paint removal that totaled \$132,500; meanwhile a second company from that state, fully aware of the regulations, submitted a bid of \$397,325, approximately three times higher.

Bridge painting is another area significantly affected by federal environmental regulations, and the report offers several

scenarios illustrating these impacts. For example, Georgia DOT personnel have found that capturing lead paint residue after sandblasting has become so costly that they have been forced to reduce the number of bridges they can attend to each year from 210 to 50. In Connecticut recently, two-thirds of the cost of a bridge painting and rehabilitation project, which cost more than \$10 million, went toward environmental protection. Incredibly, many states have found that it is often more economical to replace an entire bridge than to strip and repaint the existing structure. The impacts of federal environmental regulations on maintenance operations in this area are obvious.

Transportation agencies must now use nonlead paint on all steel structure bridges. The study reports that the Missouri DOT recently attempted to use nonlead paint on some bridges with unsatisfactory results. The lead-free paint cost three times more and lasted only half as long, and disposal costs for residue were twice as much as before. However, states now have no alternative but to use lead-free paints. The total financial impact of these regulations

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on state DOT budgets is estimated to be in the hundreds of millions of dollars nationwide.

### Hazardous Materials and Wastes

Since 1976, RCRA has served to protect public health and the environment from improper hazardous waste management practices by determining guidelines for shipping hazardous waste off-site, storing



it on-site, and other practices. According to the impact study, dozens of products used by highway departments are considered to be hazardous, including products used to clean, operate, and maintain equipment and vehicles, and those used to clean various surfaces. Not surprisingly, regulations

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regarding these types of materials are becoming stricter. One of the major concerns addressed in the regulations is proper storage of hazardous materials to prevent environmental threats, particularly to ground water. Many states are having to meet regulatory compliance by constructing new storage facilities at significant cost. For example, the Florida DOT spent nearly \$1 million during fiscal year 1992 to build hazardous materials storage facilities. Similar expenditures are expected in numerous states.

The report further details the expense of hazardous waste disposal. For example, Florida pays about \$200 to \$400 to dispose of each 55-gallon drum of waste. But a container of waste remains the property of the company or state that generated it even after disposal. This made for an unwanted surprise when a site was discovered in Florida at which approximately 1,000 drums of hazardous waste originally generated by the state had been improperly disposed of by another party more than a decade earlier. Cleanup and remediation of the site initially cost \$4 million, and the department continues to invest nearly \$1 million for continued cleanup per year.

The report also highlights the steep costs involved in transporting hazardous wastes, including costs for insurance and testing of waste materials. Each laboratory

test can cost several hundreds of dollars, and various tests must be performed monthly. Transportation costs depend on the amount of waste shipped and the distance to the landfill; insurance coverage of \$1 million or more is often required. The report notes that some states have addressed this problem in part by attempting to recycle wastes such as used oil and solvents into useful products.

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## Waste Management

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An effective waste management strategy ensures that DOT programs and policies remain in compliance with changing requirements. Program analyses and interviews conducted through the impact study revealed a number of important aspects of a successful waste management program. They include a standardized reporting system, comprehensive employee training and contingency plans, shrewd purchasing, regular environmental compliance audits of current operations, and commitment by top-level management to carry out these objectives. This kind of program ensures an economically smart and efficient waste management program. However, the study found that even application of these beneficial principles will not fully offset the consequences of the rapid promulgation of regulatory laws and statutes.

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## Conclusion

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The Auburn study concludes with a summary of the dilemma facing highway maintenance personnel in all regions of the country. The researchers' overall assessment is that the outlook for highway maintenance departments is not good. Costs caused by the increased number of federal environmental regulations are hefty at present and will continue to rise in the future. The dual problems of constantly changing and proliferating regulatory laws and the costly modifications they dictate, coupled with the ever-tightening budgets confronting most departments, have hampered the ability of agencies to perform standard maintenance activities without diminishing quantity or quality of work. Millions of dollars are being spent on efforts simply to comply with regulations.

The report cites examples in which one area of departmental responsibility must often be neglected to meet more urgent regulatory demands in another area. The effect of this practice, known as "deferred maintenance," is yet to be fully determined. However, the Auburn study concludes, it is safe to assume that costs of regulatory compliance will continue to mount in the future, affecting travelers and taxpayers.

For information concerning availability of a handbook detailing tactics and strategies employed by various highway maintenance personnel to meet the challenges of environmental regulations economically and efficiently, contact the National Cooperative Highway Research Program, telephone (202-334-3225) and refer to NCHRP Project 14-9(5). For further information, contact Jim Wheatley or Kellie Shumack at Auburn University (telephone 205-844-2003).

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## Reference

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1. Environmental Regulations Expanding Fastest; Air Rules To Pace Growth in 1990s. *BNA Environmental Reporter*, Vol. 22, No. 39, Jan. 24, 1992, p. 2179.

### TRB Special Report on Highway Deicing

At the request of Congress to the U.S. Department of Transportation, the Transportation Research Board conducted a study on the direct and indirect costs of road salt, the most popular chemical deicer in the United States, and a possible replacement, calcium magnesium acetate (CMA). The committee concluded that the widespread use of CMA as a general replacement for salt is unlikely and unwarranted but did not rule out its use on a more selective basis in corrosion-prone and environmentally sensitive areas. The committee's findings are presented in *TRB Special Report 235—Highway Deicing: Comparing Salt and Calcium Magnesium Acetate*.