Appendix A

Public Education Database

Table A-1 Public Education Database

Name or Title of Meeting/Presentation	Date of Presentation /Meeting	Name of Presenter	No. of Attendees	Region							Audience										Material Presented						
				Bay	Grand	Metro	North	Southwest	Superior	University	Executives	Design Staff	Construction Staff	O&M Staff	Planning Staff	Contractors - Construction	Contractors - Engineers	Local Government	General Public	Unknown MDOT Department	Overview of MDOT	Public Education	Public Involvement/ Participation	Illicit Discharge Elimination	Post Construction SWP	Construction Storm Water Runoff Control	Pollution Prevention
DCMI Watershed Plan Workshop	2/3/2000	Unknown	94						X								X	X	X	X		X					
Developing Watershed Management Plans for Water Quality Workshop	2/9/2000	Gary Rinkenberger	59				X									X	X	X	X	X		X					X
Developing a Watershed Plan Meeting	2/16/2000	Unknown	113		X			X		X		X			X		X	X	X								X
Developing Watershed Management Plans	2/29/2000	Unknown	94					X		X							X	X	X	X		X					
RC&D Council CMI Meeting	3/14/2000	Unknown	101		X	X	X	X		X							X	X	X	X		X					
RC&D Council CMI Meeting	3/7/2001	Unknown	62	X		X											X	X	X			X					
MDOT ROW Workshop - Okemos	3/14/2001	Gary Croskey	64	X	X	X		X		X		X			X		X					X					
MDOT ROW Workshop - Gaylord	4/12/2001	Gary Croskey	52	X		X	X		X			X					X					X					
MDOT ROW Workshop - Kalamazoo	5/17/2001	Gary Croskey	58					X				X			X		X					X					
Utlities/Permits 4th Quarterly Meeting	12/6/2001	Gary Croskey	25	X	X	X		X		X		X		X								X					
MDOT Design Staff Meeting	12/18/2001	Gary Croskey	256	X	X	X	X	X	X	X		X										X					
Soil Erosion Control Concepts 2002	2/2/2002	Several	312		X			X		X		X	X		X	X	X	X	X			X			X	X	X
MDOT ROW Workshop	2/6/2002	Gary Croskey	26							X		X					X					X					
MDOT ROW Workshop	2/14/2002	Gary Croskey	64							X							X			X		X					
MDOT ROW Workshop	2/20/2002	Gary Croskey	53	X	X	X	X	X	X	X		X										X					
How to Prepare ROW Plans	2/21/2002	Gary Croskey	46	X	X	X	X	X	X	X							X					X				X	X
Right of Way Workshop - Saginaw Valley State University	3/14/2002	Gary Croskey	40	X													X			X		X					
How to Prepare ROW Plans	3/19/2002	Gary Croskey	39		X					X							X			X		X				X	X
Soil Erosion and Sedimentation Control	3/19/2002	Unknown	12	X								X	X	X								X			X	X	X
MDOT ROW Workshop	3/21/2002	Gary Croskey	39					X												X		X					
MDOT ROW Workshop	4/11/2002	Gary Croskey	21			X											X			X		X					
MDOT ROW Workshop	4/18/2002	Gary Croskey	19				X										X			X		X					
MDOT ROW Workshop	4/23/2002	Gary Croskey	15						X											X		X					
Grand Region Spring Maintenance Meeting	5/8/2002	Byrne, Neiss, Phifer, Smith, Little, and Johnson	56		X									X				X									X
Michigan Association of County Drain Commissioners Southwest District Meeting	5/16/2002	Gary Croskey	26					X									X	X		X		X					
MDOT ROW Workshop	5/31/2002	Gary Croskey	31		X															X		X					
TOTAL			1777	9	11	9	7	12	6	12	0	10	2	3	4	2	18	9	7	13	0	24	0	0	2	4	7

Appendix B

Articles Written by MDOT for Public Education

TETRA TECH MPS

What is Storm Water Runoff?

One of the most significant, yet unrecognized groups of water contaminants is *storm water pollutants*. When it rains, storm water runs over yards, streets, roads, highways, parking lots, parks, and playgrounds, carrying with it everything in its path, including debris and pollutants. Eventually, the water will travel to a stream, either over land or via a storm drain. Storm drains are frequently located alongside streets and parking lots. Unlike sanitary sewers that divert water to a treatment plant directly from your home, storm drains lead directly to surrounding lakes and rivers without any type of treatment. All the debris and pollutants that were picked up by storm water runoff, end up in your lakes and streams!

Where Does the Pollution Come From?

Most contaminants are made up of common items used by residents, businesses and visitors, such as fertilizers, car oils and greases, yard clippings, soil, and pet wastes. Below are some tips you can follow to help keep pollution from entering lakes and streams via storm water runoff.

Tips to Keep Your Rivers, Lakes and Streams Clean

- Never dump anything down a storm drain!
- Use an oil pan when changing oil to keep fluids off the pavement. Check local body shops and quick lubes to find a place to appropriately dispose of used oil.
- Dispose of pet wastes in a trash can.
- Leave grass clippings on your lawn as an alternate nutrient to fertilizer. If a fertilizer is necessary, choose a slow-release product and test your soil to find out how much fertilizer your lawn actually needs.
- Wash your car on your lawn so excess water, chemicals, and dirt is filtered through the lawn.
- Keep household hazardous wastes, such as harsh cleaners, paint, car fluids, and batteries from entering lakes and streams by disposing at a household hazardous waste center. Try using environmentally-safe alternatives or recipes with non-hazardous ingredients.
- Use a broom rather than a hose to clean up grass clippings and dirt.
- Keep a trash bag in your car… and use it!

Look for more articles about storm water pollution prevention in future issues. For more information about MDOT's Storm Water Management Plan, check out www.mdot.state.mi.us/stormwater.

TETRA TECH MPS

Working Together…Better Roads, Cleaner Streams

Clean water is something that is easily taken for granted. According to the U.S. Environmental Protection Agency's (USEPA's) Report, ***Liquid Assets 2000: America's Water Resources at a Turning Point***, the number one threat to water quality is polluted runoff. Runoff is precipitation that falls on highways and roads, then carries pollutants and debris into streams, rivers, lakes, and ponds. Pollutants and debris can include sediment from construction sites, oil and leaking chemicals from cars and trucks, excess fertilizer from our yards, and a host of other pollutants. It will take our combined efforts to help reduce the amount of potential pollutants that enter Michigan's waterways.

One way to address this threat to water quality is to develop and implement a Storm Water Management Plan. This is exactly what the Michigan Department of Transportation is doing. This plan has a common mission: Working Together…Better Roads, Cleaner Streams. The three major components of the plan are the Illicit Discharge Elimination System, the Public Education Plan, and the Storm Water Pollution Prevention Plan. This management plan also fills the requirements of the USEPA's National Pollutant Discharge Elimination System Phase 1 Rules.

This article is a prelude to a series of articles that will be in future publications of *MDOT Today.* The topics of each article in the series are listed below. The intent of the articles is to explain what **YOU** can do to help protect Michigan's precious water resources.

- MDOT Storm Water Management Plan
- What is Storm Water Runoff?
- Storm Drain Stenciling- You Dumped *What* Down a Storm Drain?
- Car Care and Your Water: What's the Connection?
- Hazardous Waste in Your Home
- Is Your Home Improvement Project Water Friendly?
- Smart Care for your Lawn and Garden

Please check out our web site for more information and links to other related sites at ***www.mdot.state.mi.us/stormwater.***

TETRA TECH MPS

MDOT's Storm Water Management Plan

According to the U.S. Environmental Protection Agency (USEPA) and supporting research, pollutants that are washed off roads and highways by rain and snow melt, known as *runoff*, may impair the quality of our water resources. These are resources that we use for drinking, boating and fishing that also provide habitat to a variety of plants and animals. To address these concerns, in 1990 the USEPA developed rules establishing Phase I of the National Pollution Discharge Elimination System (NPDES). Under the Phase I program, MDOT is required to submit a Notice of Intent to develop a comprehensive and coordinated effort to preserve and improve the quality of water in a number of Michigan communities by reducing storm water runoff from MDOT's roadways and facilities. The Michigan Department of Environmental Quality (MDEQ) has issued an NPDES Permit to Ann Arbor, Flint, Grand Rapids, Sterling Heights, Warren, and Livonia. This permit requires MDOT to submit a **Storm Water Management Plan** that outlines MDOT's current and planned future activities to reduce the impact of storm water on our water resources.

MDOT's Storm Water Management Plan addresses concerns of highway runoff in concert with several other plans, such as the Illicit Discharge Elimination Plan (IDEP), the Public Education Plan (PEP), and the Pollution Prevention Plan (PPP). The IDEP aids in keeping illicit discharges out of the waterways by investigating MDOT highway drainage facilities to ensure that there are no illegal taps from sanitary or storm water sewers. The PEP educates the public through a variety of media, including the MDOT Storm Water Management web site and brochure. A theme slogan will be repeated on all educational materials, "Together…Better Roads, Cleaner Streams." Under the PPP, MDOT is maintaining the effectiveness of its storm drain catch basins and street cleaning program, and addressing controls to reduce the discharge of pollution associated with highway operation and maintenance and the application of herbicides and fertilizers applied to public right-of-ways. In addition, MDOT is currently developing a training program for its employees and contractors to ensure that they are informed about storm water pollution prevention activities associated with highway development, operations and maintenance.

The Storm Water Phase II Final Rule is the next step in EPA's effort to protect water resources. The Phase II program expands the Phase I program by requiring "small" municipal separate storm sewer systems (MS4s) and operators of small construction sites to apply for an NPDES permit, most likely under a general rather than individual permit, and to implement best management practices for controlling storm water discharge. The permitting authority for Michigan will designate small MS4s by December 8, 2002, which is projected to be a minimum of 252 communities and potentially up to 600. Permit applications will be due by March 10, 2003.

Look for more articles about storm water pollution prevention in future issues, including topics such as:

- Storm Water Runoff
- Storm Drain Stenciling
- Car Care and Your Water
- Household Hazardous Waste
- Water Friendly Home Improvement Projects
- Lawn and Garden Care

For more information about MDOT's Storm Water Management Plan, check out www.mdot.state.mi.us/stormwater.

TETRA TECH MPS

Car Care and Your Water: What's the Connection?

Your car and how well you maintain it have a significant impact on the lakes and streams near you. Cars carry many different hazardous fluids and require natural resources to run. How efficiently or inefficiently our cars use these resources and carry these fluids has a direct impact on our environment. When a vehicle is poorly maintained, and the maintenance activities are carelessly conducted, chemicals may spill or drip onto the pavement and, eventually, are carried by snow melt or rain into our streams and lakes. A well-maintained vehicle uses less gasoline and runs more efficiently without dripping chemicals onto the pavement or spewing excess exhaust into the air. Follow these simple guidelines to reduce the impact your car has on our streams, lakes and rivers – and save yourself money, too!

Car washing

While washing your car, the water collects soap, detergents, residues from exhaust fumes, gasoline and motor oils. Eventually, the water washes off the car and onto the pavement, collecting additional debris and pollutants before flowing down to the nearest storm drain. Unlike the treated water that comes out of a faucet in your home or at work, water that goes into storm drains flows directly to the lakes and streams near you with everything it has collected along the way!

TIP: Use water friendly soaps!
Many commercial grade soaps contain non-biodegradable detergents and acids. If you wash your car at home, try buying soaps that are labeled "non-toxic", "phosphate-free", or "biodegradable". The safest products for the environment are vegetable-based or citrus-based soaps.

Car Soap Recipe
1/4 cup vegetable oil-based liquid soap (such as Dr. Bronner's or Murphy's)

1 gallon warm water

TIP: Prevent the water from reaching the storm drain!
Minimize the amount of water running into a storm drain by washing your car on the lawn instead of the driveway. This will not only give your lawn a watering, but the grass and soil will naturally filter out some of the harmful chemicals or fluids. Remember, whenever possible, shut off the hose to prevent wasting water.

Car fluids

Vehicle fluids include any fluid normally used during operation, such as engine oil, transmission fluid, power steering fluid, brake fluid, and radiator fluid. When these fluids leak or drip out of the car onto the pavement or are improperly disposed, even in small amounts, they eventually run off into storm drains, lakes, and streams where they can contaminate water supplies and kill fish and other aquatic life. In some cases, if a drinking water supply is contaminated, it can be costly to correct and poses a health risk to humans. The cost to treat this contaminated water is passed onto consumers. If your drinking water is supplied by a well, the possibility of contamination may even be greater. Proper vehicle maintenance and good housekeeping when conducting vehicle maintenance activities can help protect your water resources and your wallet, too.

TIP: Check for leaks!
Have your vehicle checked for leaks at least once every three months. If you change your own oil, be sure to dispose of the used motor oil at an oil recycling center and not on the ground or down a storm drain. Many

facilitiesthat sell and change oil will accept your used oil, including quick lubes, Wal-Mart and Murray's Auto Center. Call your local businesses to find the most convenient place for you to dispose of your used fluids properly.

TIP: Clean up spills!

It is always a good idea to use an oil pan when working on your vehicle to prevent accidental spills. If you do spill, pour cat litter, sawdust, or cornmeal to absorb the spilled materials. Let this dry for a few hours and then sweep up the absorbents. If the spill is less than one gallon, place the absorption grains in a heavy-duty garbage bag and dispose with your trash. Otherwise, take the material to your local household hazardous waste drop-off site.

Household Hazardous Waste Contacts

Genesee County	Kent County	Washtenaw County	Wayne County
(810) 244.8524	(616) 336.3695 or 336.2501	(734) 971.7356	(734) 326.3936

Look for more articles about storm water pollution prevention in future issues. For more information about MDOT's Storm Water Management Plan, check out www.mdot.state.mi.us/stormwater.

TETRA TECH MPS

Is Your Home Improvement Project Water Friendly?

What a rewarding feeling it is to complete your own home improvement project! But did you know certain practices could contribute to water quality problems in Michigan's lakes and streams if special care isn't taken? Rainwater washes wastes from roads, driveways and yards into the nearest storm drain and/or body of water . Unlike the wastewater in your home which is cleaned at a wastewater treatment plant or in your septic system, anything that goes into a storm drain is routed directly into lakes and streams… untreated!

The following suggestions will help you decrease the amount of pollution coming from your home.

Painting dos & don'ts

When painting your house, trim, fencing or anything outside, consider alternatives to your usual routine. A little bit of planning can go a long way in reducing the impact your activities have on our water resources.

TIP: Use latex paint.
Choose water-based paints over oil-based paints. They're less toxic.

TIP: Keep track of paint age.
Don't use paints over 15 years old because they may contain toxic levels of lead.

TIP: Dispose of paints properly.
Excess paint, thinners, solvents, saturated rags, empty aerosol cans, lead paint chips and chemical paint stripping residue are considered hazardous waste and should be taken to a household hazardous waste site.

TIP: Recycle!
Reuse paint thinner or cleaning solvents. Set aside in a closed jar to settle out paint particles, then pour off clear liquid for future use. Be sure you label the jar so you don't forget what is inside!

TIP: Buy only what you need.
Try to determine the amount of paint you will need. If you have too much, save it and donate it to an organization.

Concrete, masonry, and tile work

Construction of new driveways, patios, walkways and other brick and concrete structures can greatly impact water quality during the construction process, as well as after the structure is built. Surfaces such as concrete and roofed areas increase the volume and velocity with which rainwater travels to streams. These types of surfaces do not provide an opportunity for the water to infiltrate into the ground – a process that naturally filters out pollutants collected by rainwater. Try using alternatives, like gravel, brick or flagstone, which allow some water to infiltrate down into the earth. If you must use concrete and impervious materials, try to minimize their effect by sloping such surfaces toward vegetated areas.

TIP: Don't use your hose as a broom!
Never wash excess material from bricklaying or patio/driveway construction into a storm drain. Also, don't hose down driveways, sidewalks, or streets into storm drains. Use a broom instead to sweep up and dispose of waste in the trash. **TIP: Reuse!**
Collect and reuse excess sand and gravel.

TIP: Make clean-up simple.

Set up and operate small cement mixers on heavy tarps or drop cloths. Once construction is complete, recycle residual or dispose of it properly.

TIP: Watch the weather.
Apply driveway sealant when rain is not forecasted. If you apply sealant prior to a heavy rain, some of the sealant will wash off, reducing effectiveness of the remaining sealant while also running off to pollute streams, lakes and rivers. Cover bags of cement and mortar after opening to keep wind-blown dust away from gutters and storm drains.

Landscaping

Many landscaping projects have the potential for exposing soils and adding chemicals to your lawn and garden. When fertilizers, pesticides and herbicides are not applied correctly, storm water will wash the excess into nearby lakes, streams, and storm drains.

Here's how you can prevent erosion and reduce the impact of your lawn and garden on water resources:

TIP: Watch the weather.
Schedule grading projects for dry weather and replant as soon as possible. If there is lag time between the grading and the final planting, temporary vegetation may be necessary, like an annual grass seed.

TIP: Landscape with hardy plants.
Choose disease- and pest-resistant plant varieties appropriate for your soil and climate.

TIP: Mulch it!
Cover exposed soil in the garden with 2-3 inches of mulch to prevent weeds from surfacing. Don't forget, pulling weeds is a great alternative to spraying with chemicals!

TIP: Let your clippings lay.
Cut grass is natural mulch (and free fertilizer) for your lawn. A mulching mower will cut clippings into tiny pieces, and will allow for quicker and easier decomposition.

TIP: Compost… the miracle drug for your yard.
Compost is a natural, slow-release fertilizer that retains water when added to sandy soils and improves drainage when added to clay soils.

TIP: De-bug.
Remove pest-infested plants in the fall. Remove insect eggs, larvae, cocoons, and adults from plants by hand.

TIP: Test your soil.
If you think a fertilizer is necessary, test your soil first. A soil test will tell you how much nutrients your lawn or garden have so that you will not over-apply.

For more details on landscaping projects, contact your local MSU Extension Office

Genesee County	Kent County	Macomb County	Washtenaw County	Wayne County
(810) 244.8524	(616) 336.3265	(810) 469.5180	(734) 997.1678	(313) 833.3412

Look for more articles about storm water pollution prevention in future issues. For more information about MDOT's Storm Water Management Plan, check out www.mdot.state.mi.us/stormwater.

TETRA TECH MPS

A to Z…
Household Hazardous Waste Products

aerosols
ammunition
antifreeze
asbestos
asphalt and roofing tar
auto fluids
batteries
bleach
brake fluid
caulk
DDT and chloride
drain cleaner
explosives
flammables
furniture/floor polish
gasoline
glues
herbicide (weed killer)
kerosene
lye
moth balls
motor oil
mouse/rat poison
nail polish/remover
old medicine
oven cleaner
paint thinner and stripper
pesticide (bug killer)
photographic chemicals
propane
shoe polish
smoke detectors (radioactive)
swimming pool chemicals
toilet bowl cleaner
toner cartridges
transmission fluid
varnish
wood preservatives

Hazardous Waste in Your Home?

Surprisingly, many of the products we use in our home everyday are hazardous if they are used, stored, or disposed of improperly. These products can make their way into our water supplies - such as our lakes and streams - where they can be harmful to the plants and animals, or even contaminate drinking water supplies or make recreational activities, such as swimming or fishing, unsafe.

Hazardous Chemical Properties

A product is considered hazardous if it is has one or more of the following properties:

- Toxic — poisonous or capable of causing acute illness;
- Flammable — ignitable and burns easily;
- Corrosive — eats through other materials; or
- Reactive — can possibly explode or react with other chemicals.

Always check the label to see if a product is hazardous. A product may be hazardous if the label has a picture of a skull and cross bones or, if it contains the words WARNING, CAUTION, DANGER or POISON.

How to Reduce the Impact of Household Hazardous Waste

There are many actions you can take to reduce the impact of household hazardous waste. The list below highlights a few simple steps you can follow to protect your streams and lakes.

TIP: Only buy what you need
Reduce your waste and save money by purchasing only what you will use.

TIP: Label it!
Keep unused portions in their original containers with labels intact and readable so that the product can be identified.

TIP: Store products properly
Store hazardous materials in a cool, dry place inaccessible to children and pets. Some chemicals may become volatile in warm or hot climates, or dry out to the point where they are unusable. You'll save money, reduce waste and prevent potential accidental spills or exposure.

TIP: Follow directions
Use products in accordance with the manufacturer's directions and follow all safe-handling requirements.

TIP: Give away extras
Offer surplus portions of products that are useable and safely packaged to others. For instance, offer pesticides to nurseries and paint to theater groups.

For more information on household hazardous waste and disposal centers in your area, contact:

Genesee County
(810) 244-8524

Kent County
(616) 336-3695 or 336-2501

Macomb County
(810) 469-5467

Washtenaw County
(734) 971-7356

Wayne County
(734) 326 – 3936

Look for more articles about storm water pollution prevention in future issues. For more information about MDOT's Storm Water Management Plan, check out: www.mdot.state.mi.us/stormwater.

TIP: Dispose products properly.
Properly dispose of household hazardous waste, because if it is simply landfilled, it can end up vaporizing or leaking into our ground water. These wastes should be recycled or taken to a household hazardous waste drop-off site or event for proper disposal. Contact your local disposal center for additional information on proper disposal and hazardous waste drop-off locations and dates.

TIP: Use non-toxic alternatives.
Reduce the amount of hazardous wastes you purchase by using non-toxic alternatives listed below.

Toxic Products	*Non-Toxic Alternatives*
Oil based paint	Latex paint
All purpose cleaner	One cup vinegar mixed in a gallon of warm water
Disinfectant / Bleach	Borax brand detergent (mix half a cup in a gallon of warm water)
Window Cleaner	One part vinegar to four parts warm water
Carpet Deodorizer	Sprinkle with baking soda then vacuum after 30 minutes
Furniture / Floor Polish	Murphy's Oil Soap or equal parts of mineral oil and lemon oil
Floor Cleaner	Mix ¼ cup white vinegar and ¼ cup baking soda with one gallon warm water; polish with club soda or add skim milk to rinse water for shine
Abrasive Cleaners	Bon Ami brand cleanser, Clorox Soft Scrub or baking soda
Drain Cleaner	Plunger or plumber snake; rinse with ¼ cup baking soda and 2 ounces vinegar
Fabric Softener	½ cup white vinegar and ¼ cup baking soda
Mildew Remover	Lemon juice and salt; or white vinegar and salt
Oven Cleaner	Baking soda and water
Flea Collars	Use a collar with pyrethrum
Herbicides	Pull weeds or mulch
Pesticides	Soap sprays
Mouse / Rat Poison	Use live traps
Wood Preservatives	Urethane

Smart Care for Your Lawn and Garden

Lawns and gardens often require watering during the summer and early fall. Overwatering is not only bad for your lawn, it's a strain on water supplies and often ends up as wasted, excess runoff to lakes and streams.

Watering Your Lawn

According to Michigan State University Extension Office research, lawns generally require 1/2 to 1-1/2 inches of water per week, applied in small amounts throughout the week. Light, frequent watering supports healthy grass and resists disease and pests. The best schedule for watering is 15 - 20 minutes per day between noon and 4:00 p.m. when the grass is under the most stress. If daily watering is not practical for you, local horticulture specialists suggest an every-other-day schedule of 30 - 40 minutes. For best results, combine light, frequent watering with grass mulching and slow-release fertilizer applications.

Reduce Your Watering: Feed Your Lawn with Grass Clippings!

Clippings are 85 percent water. Short clippings quickly decompose, adding valuable nutrients to the soil. By mulching grass, fertilizers can be reduced by 30 percent or more! A common myth is that grass clippings cause thatch, a layer of living and dead roots and stems growing between the green layer and the soil. Troublesome thatch is actually caused by improper use of lawn chemicals, compacted soils, and excessive watering.

TIP: Mow High!

Set mower blade at the highest setting, leaving grass blades 3" tall. Tall grass encourages deep roots, which require less water, and also shades out crabgrass and low-growing weeds. It also makes your lawn less vulnerable to drought.

TIP: Mow Frequently!

Remove no more than the top 1/3 of the grass blade.

TIP: Let your clippings lay

Let the short grass blades fall back onto the lawn. A mulching mower will cut grass blades into small pieces that can decompose quicker.

TIP: Properly maintain your lawn mowing equipment

Use a sharp mower blade. A dull mower blade will tear grass and provide an entry way for diseases. Keep the mower deck clean.

TIP: Watch the weather

Mow when the grass is dry.

Fertilizing Your Lawn

In the case of fertilizer, more is NOT better! Over-applied fertilizer will wash off your lawn when it rains and pollute lakes and streams. Excess fertilizer may also move past the root zone and contaminate your drinking water supplies.

TIP: Know what your lawn needs!

A soil test will tell you what nutrients are already contained in your lawn so that you are not over-applying fertilizers. Soil-test assistance with interpreting test results are available from your local Michigan State University Extension Office.

For more guidelines on composting yard waste in your community:

Ann Arbor
Solid Waste Department
(734) 994-2807
Yard waste curbside collection for labeled paper yard waste bags and bundles tied with twine, or use the drop-off station at 2950 E. Ellsworth, (734) 971-7400.

Flint Sanitation Department
(810) 766-7076
Yard waste curbside collection from mid-April to December. Pick-up is the day after regular trash pick-up. Brown paper yard waste bags or 25-32 gallon trash cans ONLY!

Grand Rapids
Sanitation Department
(616) 456-3232
Yard waste curbside collection with regular trash pick-up. Must purchase City's clear yard waste bags or purple tags for bundles, available at local fire stations, supermarkets, neighborhood stores, or the city treasury office.

Livonia
Department of Public Works
(734) 466-4655
Yard waste curbside collection with regular trash pick-up. Label 30-gallon containers or use paper yard waste bags. Small, tied bundles are accepted.

Sterling Heights
Department of Public Works
(734) 446-2489
Yard waste curbside collection with regular trash pick-up. Label 30-gallon containers or use plastic or paper yard waste bags. 40-pound or less bundles tied with twine or duct tape are accepted.

Warren Sanitation Department
(810) 775-1400
Yard waste curbside collection with regular trash pickup starting the first day of spring until end of December. Use brown paper lawn bags or a 32-gallon container labeled with a City-issued, yard waste label. Small, tied bundles are accepted.

TIP: Pick the right fertilizers
Select a slow-release fertilizer to promote steady, uniform growth and to protect water quality. Slow-release options include organic fertilizers, products with water-insoluble nitrogen (marked "W.I.N." on the label), and products with synthetic coatings.

TIP: Fertilize only when necessary
Fertilize in September or October to promote root growth rather than top growth. Deep roots withstand drought and resist disease. Strong roots store food produced in the grass blades for use in early spring.

TIP: Stay away from combined fertilizers
Separate fertilizers from pesticides. Combination "weed and feed" products often contain unnecessary herbicides.

TIP: Know your compost
Use screened compost as a top dressing on the lawn. Compost contributes organic matter and gradually releases nutrients to the soil.

What should you do with extra grass clippings?

There are a variety of ways you can manage excess grass clippings. Below are several suggestions.

TIP: Compost it!
Mix grass clippings with leaves and soil to make a compost pile.

TIP: Mulch it!
Use clippings as garden mulch.

TIP: Buy a new mulching blade
Retrofit your present mower with a mulching blade. For optimal safety and performance, select a mulching blade or kit (blade and chute cover) that is specifically designed to fit the model of your mower. For a rear discharge mower, the discharge chute should be covered for safety.

Some older mowers can be used to mulch by raising the mower blade and cutting more frequently. Before attempting to use your mower to recycle grass, consult your owner's manual or local equipment dealer. You may want to consider purchasing a new mower. Mulching mowers powered by battery, electricity, and gasoline are popular choices. Manual push mowers do not emit exhaust fumes and are also available with easy-roll wheels.

TIP: Recycle it!
Remember, state law prohibits yard waste in landfills. Contact your city's sanitation or environmental department to see if they have a curbside collection program specifically for grass clippings and other yard waste.
For more information about MDOT's Storm Water Management Plan, check out www.mdot.state.mi.us/stormwater.

TETRA TECH MPS

You Dumped WHAT Down that Storm Drain?

Many people do not realize that when they dump a bucket of oil or toxic material into a storm drain, they are dumping it directly into their streams, lakes and rivers! Storm Drain Stenciling is a hands-on program that raises awareness of the harmful effects of dumping hazardous materials into storm sewers. Traditionally, the message "Dump No Waste – Drains to Stream" is spray-painted onto the concrete next to storm drains, using a plastic or Mylar stencil. Volunteers gain a sense of making a difference in their community, while local residents learn more about their surroundings. Recent studies in Wisconsin and Washington show that storm drain stenciling worked to raise citizen awareness of storm drain connections to local lakes and rivers. Over 75 percent of people who had seen the stenciled drains knew where their water went, compared to about a third of those who had not seen a stenciled drain.

More permanent alternatives are available than spray painting, such as plastic curb markers. Many communities have custom door hangers given to residents in the targeted areas that are stenciled or labeled. The door hangers describe the program, effects of dumping hazardous materials into storm drains and proper disposal methods. Stenciling can usually be done with a group of three to five people.

For additional information about storm drain stenciling, contact:

Huron River Watershed Council
(734) 769-5123

Clinton River Watershed Council
(248) 853-9580

Friends of the Rouge
(313) 792-9628

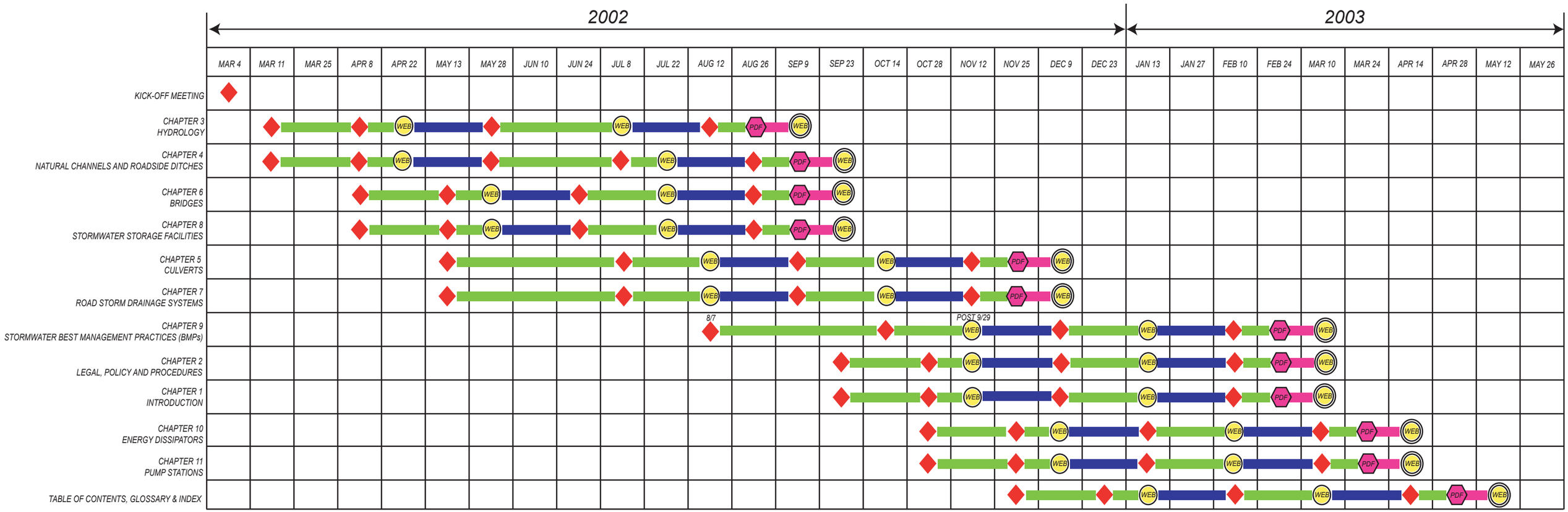
Genesee County MSU Extension
(810) 244-8500

Look for more articles about storm water pollution prevention in future issues. For more information about MDOT's Storm Water Management Plan, check out www.mdot.state.mi.us/stormwater.

Appendix C

Gantt Chart for Schedule of Completion of the Drainage Design and Storm Water Management Manual

MICHIGAN DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN AND STORMWATER MANAGEMENT MANUAL
PROJECT SCHEDULE



LEGEND

- Progress Meeting
- TTMPS Editing
- Post on Project Team Web Site
- Review Period
- Create PDF
- Post on Public Web Site

LA/P/0326034.08/PM/Manual- Project Schedule2.ai

TETRA TECH MPS

Updated September 9, 2002

Appendix D

Public Education Brochures, Web Site Promotion Cards, and Litterbags

Appendix E

Watershed and Local Stream Organizations

River/Watershed Groups with Interest in Phase I Communities
Ann Arbor, Flint, Grand Rapids, Sterling Heights, Warren

Clinton River
Clinton River Watershed Council
Jessica Pitelka Opfer, Executive Director
Brett E. Levin, Education Director
1970 E. Auburn Road
Rochester Hills, MI 48307-4803
(248) 853-9580
(248) 853-0486 fax
jesica@crwc.org
educator@crwc.org

Clinton River RAP
William Smith
49 Breitmeyer
Mt. Clemens, MI 48043
(810) 468-4028

Flint River
Flint River Watershed Coalition
Glenn Lefeber, Executive Director
Dorothy Gonzales, Public Relations Chair
Center for Applied Environmental Research
432 N. Saginaw Street
Suite 805
Flint, MI 48502
(810) 257-3190 or 810-767-6490
(810) 257-3810 fax
dgonzale@co.genesee.mi.us
flint.river.org

Partnership for the Saginaw Bay Watershed
William Wright
C/o Saginaw County Planning
400 Court Street
Saginaw, MI 48602
(517) 797-6800
(517) 797-6947 fax

Saginaw River/Bay RAP
Dennis Zimmerman
716 E. Forest Blvd.
P.O. Box 325
Lake George, MI (517) 588-9343
(517) 588-2574 fax

The WETNET Project
Goodrich Middle/High Schools
8029 S. Gale Road
Goodrich, MI 48438
(810) 636-2550
(810) 636-2253 fax
twheatle@genesee.freenet.org

Grand River
Robert B. Annis Water Resources Institute
Grand Valley State University
One Campus Drive
Allendale, MI 49401
(616) 895-3749

Bear Creek Watershed Project
Barbara Scott
Robert B. Annis Water Resources Institute
Grand Valley State University
One Campus Drive
Allendale, MI 49401
(616) 895-3789

West Michigan Environmental Action Council
1514 Wealthy SE
Grand Rapids, MI 49506
(616) 451-3051
info@wmeac.org
http://www.wmeac.org

York Creek
Frank Walsh
Robert B. Annis Water Resources Institute
Grand Valley State University
One Campus Drive
Allendale, MI 4940
(616) 895-3722

Huron River
Huron River Watershed Council
Laura Rubin, Executive Director
1100 N. Main Street
Suite 210
Ann Arbor, MI 48104
(734) 769-5123
(734) 998-0163 fax
lrubin@hrwc.org
comnet.org/hrwc/

Allens Creek Watershed Group
Rita or Vince Caruso
(734) 668-0497

Fleming Creek Advisory Council
Meroe Kericher
(734) 459-5386

Malletts Creek Association
Jesse Gordon (734) 971-9018

Michigan Natural Areas Council
Teresa Chase, Sylvia M. Taylor, Ph.D.
C/o Matthaei Botanical Gardens
1800 N. Dixboro Road
Ann Arbor, MI 48109-9741
(734) 461-9390
mnac@cyberspace.org

Appendix F

BMP Matrix

Table G-1 MDOT Approved BMP Matrix

Nationwide Examples of Treatment Control (Structural) Best Management Practices (BMPs)					
Treatment Control (Source)	Limitations	Benefits	Removal Efficiency	Capital Cost (approximate)	O & M Cost (approximate)
Infiltration - a family of treatment systems in which the majority of the runoff from small storms is infiltrated in the ground rather than discharged into a surface water body. (1)					
Infiltration Trench - is an excavated trench (3 to 12 feet deep), backfilled with stone aggregate, and lined with filter fabric. (23) It is used to treat a small portion of the runoff by detaining storm water for short periods until it percolates down to the groundwater table. (21) Useful life is usually around 10 years. (20)	*potential loss of infiltrative capacity. (1) *applicability depends on specific site characteristics/opportunities (slope, soil types, proximity to water table). (23) *potential groundwater contamination. (1) *not suitable for sites that contain chemical or hazardous material. (23) *may need to be preceded by appropriate pretreatment. (23) *relatively short life span. (23)	*efficient removal of pollutants. (1) *can recharge groundwater supplies. (2) *provides localized streambank erosion control. (2) *easy to fit into unutilized areas of development sites. (2) *an effective runoff control. (1) *increases baseflow in nearby streams. (23) *Low land use requirement. (20)	* nitrogen compounds 40% to 80%. (2) * phosphorus compounds 40% to 80%. (2) * combined nitrogen and phosphorus compounds 45% to 75% (depending on design). (8) * total suspended solids 75%. (20) *total phosphorous 60%. (20) * total nitrogen 55%. (20) *COD 65%. (20) * Lead 65%. (20) * Zinc 65%. (20)	* $4,900/acre (prorated using ENR index from 1992 cost). (5) * $3.6 to $10.70/cubic feet storage (prorated using ENR index from 1986 cost). (20)	* $1,800/acre/year (prorated using ENR index from 1992 cost). (5) * 9% of Capital Cost (20)

Nationwide Examples of Treatment Control (Structural) Best Management Practices (BMPs)					
Treatment Control (Source)	Limitations	Benefits	Removal Efficiency	Capital Cost (approximate)	O & M Cost (approximate)
Pond (Basin) - consist of shallow, flat basins excavated in pervious ground, with inlet and outlet structures to regulate flow. (19) Useful Life is usually around 25-years. (20)	*potential loss of infiltrative capacity. (1) *low removal of dissolved pollutants in very coarse soils. (1) *possible nuisance (odor, mosquito). (2) *frequent maintenance requirement. (2) *risk of groundwater contamination. (1) * High land use requirement. (20)	*achieves high levels of particulate pollutant removal. (1) * can recharge groundwater supplies. (2) *an effective runoff control. (1) *can serve tributary areas up to 50 acres. (1) *provides localized streambank erosion control. (2) *cost effective. (2)	* nitrogen compounds 40% to 80%. (2) * phosphorus compounds 40% to 80%. (2) * combined nitrogen and phosphorus compounds 45% to 75% (depending on design). (8) * total suspended solids 75%. (20) *total phosphorous 65%. (20) * total nitrogen 60%. (20) *COD 65%. (20) * Lead 65%. (20) * Zinc 65%. (20)	* $36,900/million gallons (prorated using ENR index from 1992 cost). (5) * $0.60 to $1/cubic feet storage (prorated using ENR index from 1986 cost). (20)	* $1,200/million gallons/year (prorated using ENR index from 1992 cost). (5) * 7% of Capital Cost (20)
Concrete Grid Pavement – are lattice grid structures with grassed or pervious material placed in the grid openings. (1) Useful life is usually around 20 years. (20)	*require regular maintenance. (20) *not suitable for high traffic areas. (20) *potential groundwater contamination. (20) *only feasible where soil is permeable. (20)	*groundwater recharge. (20) *can provide peak flow control. (20)	*total nitrogen 90%. (20) * total phosphorus compounds 90%. (20) * total suspended solids 90%. (20) *COD 90%. (20) * Lead 90%. (20) * Zinc 90%. (20)	* $1.7 - $3.5/ft^2 (prorated using ENR index from 1981 cost) (incremental cost beyond the conventional asphalt pavement) (20)	* -$0.07/ft^2 feet (prorated using ENR index from 1981 cost) (incremental cost beyond the conventional asphalt pavement) (20)
Infiltration Drainfields – a system composed of a pretreatment structure, a manifold system, and a drainfield. (28)	*high maintenance when sediment loads are heavy. (28) *short life span if not well maintained. (28) *not suitable in regions with clay or silty soils. (28) *anaerobic conditions could clog the soil. (28) *potential groundwater contamination. (28)	*groundwater recharge. (28) *used to control runoff. (28)	* depends on design – little monitoring data currently available. Potentially 100% of pollutant could be prevented from entering surface water. (28)	Approx. $72,000 for a drainfield with dimensions: 100 ft long, 50 feet wide, 8 feet deep with 4 ft cover. (28)	

Nationwide Examples of Treatment Control (Structural) Best Management Practices (BMPs)					
Treatment Control (Source)	Limitations	Benefits	Removal Efficiency	Capital Cost (approximate)	O & M Cost (approximate)
Wetlands - constructed wetlands are a single stage treatment system consisting of a forebay and micro pool with aquatic plants. They remove high levels of particulate, as well as some dissolved contaminants. (19) Useful life is around 50 years. (20)	*need of supplemental water to maintain water level. (1) *potential nutrient release in the winter. (19) *reduction in hydraulic capacity with plant growth. (19) *wetland area less than 2% of watershed area. (10) *potential groundwater contamination. (26) * high land requirements. (20)	*passive recreation and wildlife support. (1) *improve downstream water and habitat quality. (26) *flood attenuation. (26) *achieves high levels pollutant removal. (1)	* total suspended solids 67% (26) & 65% (20). * total phosphorus 49% (26) & 25% (20). * total nitrogen 28% (26) & 20% (20). * organic carbon 34%. (26) * COD 50%. (20) * petroleum hydrocarbons 87%. (26) * cadmium 36%. (26) * copper 41%. (26) * lead 62% (26) & 65% (20). * zinc 45% (26) & 35% (20). * bacteria 77%. (26)	$26,000 to $55,000 per acre of wetland. (26)	2 percent of construction cost per year. (26)
Biofilters - Systems designed to pass storm water runoff slowly over a vegetated surface in the form of a swale or strip to filter pollutants and to infiltrate the runoff. (19)					

Nationwide Examples of Treatment Control (Structural) Best Management Practices (BMPs)					
Treatment Control (Source)	Limitations	Benefits	Removal Efficiency	Capital Cost (approximate)	O & M Cost (approximate)
Vegetated Swale – is a broad, shallow channel (typically trapezoidal shaped) with a dense stand of vegetation covering the side slopes and bottom. (29) Useful life is around 50 years. (20)	*generally incapable of removing nutrients. (2) *can become drowning hazards, mosquito breeding areas. (29) *not appropriate for steep topography, very flat grades. (29) *tributary area limited to a maximum of 5 acres. (19) *difficult to avoid channelization. (19) *ineffective in large storms due to high velocity flows. (29)	*design to convey runoff of 2 year storm, with freeboard of 10 year storm. (19) * low land requirement. (20) *suitable for small residential areas. (1) *can removes particulate pollutants at rates similar to wet ponds. (1) *reduction of peak flows. (29) *lower capital cost. (29) *promotion of runoff infiltration. (29) * low land requirements. (20)	* nitrogen 0 to 60% (2) * total nitrogen 10%. (20) * phosphorus 0 to 60% (2) * total phosphorus 9% (29) & 20% (20). * COD 25%. (20) * oxygen demanding substances 67%. (29) * total suspended solids 81% (29) & 60% (20). * nitrate 38%. (29) * hydrocarbons 62%. (29) * cadmium 42%. (29) * lead 67% (29) & 70% (20). * zinc 71% (29) & 60% (20). * copper 51%. (29)	* $6.80 to $12.50 per linear foot (prorated using ENR index from 1987 cost). (29) * $10.80 to $63.40 per linear foot (prorated using ENR index from 1991 cost). (29) * typical total for a 1.5 ft. deep, 10 ft wide, 1,000 ft long Low - $8,100 Moderate - $14,870 High - $21,640 Prorated using ENR index from 1991 cost). (29)	* $0.73 - $0.95 per linear foot (prorated using ENR index from 1991 cost). (29) * $1/linear foot 9prorated using ENR index from 1987 cost). (20)
Infiltration (Vegetative Filter) Strip - are broad surfaces with a full grass cover that allows storm water to flow in a relatively thin sheets (21) Useful life is around 50 years (20).	*sheet flow may be difficult to attain. (1) *not appropriate for steep slopes. (19) *tributary area limited to 5 acres. (19)	*suitable for parking lots. (1) *slows runoff flow. (1) *removes particulate pollutants. (1)	* nitrogen 0 to 40%. (2) * phosphorus 0 to 40%. (2) * total suspended solids 65%. (20) * total phosphorous 40%. (20) * total nitrogen 40%. (20) * COD 40%. (20) * lead 45%. (20) * zinc 60%. (20)	* $3,100/acre (prorated using ENR index from 1992 cost). (5)	* $310/acre/yr (prorated using ENR index from 1992 cost). (5) * $139 to $1,100/acre/year (prorated using ENR index from 1987 cost). (20)

Nationwide Examples of Treatment Control (Structural) Best Management Practices (BMPs)					
Treatment Control (Source)	Limitations	Benefits	Removal Efficiency	Capital Cost (approximate)	O & M Cost (approximate)
Dry Detention Basins - consist of a settling basin with an outlet sized to remove particulate matter by slowly releasing accumulated runoff over a 24 to 40 hour period. "Dry" detention basins may be designed to empty between usages. (19) Useful life is usually 50 years. (20)	*occasional nuisance in inundated portion. (19) *inability to vegetation may result in erosion and re-suspension. (1) *limited orifice diameter preclude use in small watersheds. (1) *requires differential in elevation at inlet and outlet. (1) *frequent sediment maintenance. (19) * High land requirement. (20)	*creation of local wildlife habitat. (2) *recreational use in inundated portion. (2) *can remove soluble nutrients by shallow marsh or permanent pool. (2) *suitable for sites over 10 acres. (10) *temporary storage of runoff. (1) *no need of supplemental water. (1) *protection for downstream channel erosion. (2)	* nitrogen 20% to 60%. (2) * phosphorus 20% to 80% (2) & 10% to 30%. (10) * nitrogen and phosphorus 30% to 70% (depending on volume ratio). (8) * soluble nutrients – low or negative. (10) * total suspended solids 45% (20) & 88% (44). * nitrate 15% (44). * nitrite 61% (44). * oil and grease 56%. (44) * fecal coliform 45%. (44) total petroleum hydrocarbons 17% to 20%. (44) * TKN 40%. (44) * ammonia 5%. (440 *total phosphorous 25% (20) & 57% (44). * total nitrogen 30%. (20) *COD 20% (20) & (44). * lead 20% (20) & 55% (44). * zinc 20% (20) & 47% (44). * chromium 68%. (44) * copper 37%. (44) * nickel 62%. (44)	$123,000/million gallons (prorated using ENR index from 1992 cost). (5)	* $1,230/million gallons/year (prorated using ENR index from 1992 cost). (5) * 4% of capital cost. (20)

Nationwide Examples of Treatment Control (Structural) Best Management Practices (BMPs)					
Treatment Control (Source)	Limitations	Benefits	Removal Efficiency	Capital Cost (approximate)	O & M Cost (approximate)
Catch Basin Inlet Devices - devices that are inserted into storm drain inlets to filter or absorb sediment, pollutants, and oil and grease (21)	* not feasible for larger than 5 acres. (20)	* high removal efficiency for large particles and debris for pretreatment. (20) * low land requirement. (20) * flexibility for retrofit of existing systems. (20)			
Curb Inlet Drain Diaper Insert – sorbent type diaper placed at the catch basin insert. (40)				$125 per unit. (40)	
Some Examples of Temporary Erosion and Sediment Control BMPs – (typically used during construction activity)					

Nationwide Examples of Treatment Control (Structural) Best Management Practices (BMPs)					
Treatment Control (Source)	Limitations	Benefits	Removal Efficiency	Capital Cost (approximate)	O & M Cost (approximate)
Temporary Seeding of Stripped Areas - The establishment of a temporary vegetative cover on disturbed areas by seeding with rapidly growing plants. This provides temporary soil stabilization to areas which would remain bare for more than seven days where permanent cover is not necessary or appropriate. (42)	*Temporary seeding is only viable when there is a sufficient window in time for plants to grow and establish cover. During the establishment period the bare soil should be protected with mulch and/or plastic covering. (42) *If sown on subsoil, growth may be poor unless heavily fertilized and limed Because over-fertilization can cause pollution of stormwater runoff, other practices such as mulching alone may be more appropriate. The potential for over-fertilization is an even worse problem in or near aquatic systems. (42) *Once seeded, areas cannot be used for heavy traffic. (42) *May require regular irrigation to flourish. Regular irrigation is not encouraged because of the expense and the potential for erosion in areas that are not regularly inspected. The use of low maintenance native species should be encouraged, and planting should be timed to minimize the need for irrigation. (42)	*This is a relatively inexpensive form of erosion control but should only be used on sites awaiting permanent planting or grading. Those sites should have permanent measures used. (42) *Vegetation will not only prevent erosion from occurring, but will also trap sediment in runoff from other parts of the site. (42) *Temporary seeding offers fairly rapid protection to exposed areas. (42)			

Nationwide Examples of Treatment Control (Structural) Best Management Practices (BMPs)					
Treatment Control (Source)	Limitations	Benefits	Removal Efficiency	Capital Cost (approximate)	O & M Cost (approximate)
Mulching and Matting - Application of plant residues or other suitable materials to the soil surface. This provides immediate protection to exposed soils during the period of short construction delays, or over winter months through the application of plant residues, or other suitable materials, to exposed soil areas. Mulches also enhance plant establishment by conserving moisture and moderating soil temperatures. Mulch helps hold fertilizer, seed, and topsoil in place in the presence of wind, rain, and runoff and maintains moisture near the soil surface. (42)	*Care must be taken to apply mulch at the specified thickness, and on steep slopes mulch must be supplemented with netting. (42) *Thick mulches can reduce the soil temperature, delaying seed germination. (42)	*Mulching offers instant protection to exposed areas. (42) *Mulches conserve moisture and reduce the need for irrigation. (42) *Neither mulching nor matting require removal; seeds can grow through them unlike plastic coverings. (42)			
Spill Response and Prevention Plan (46)	*Requires a well-planned and clearly defined plan. *May require training *Equipment must be readily available. (46)	*can be highly effective at reducing the risk of surface and ground water contamination. (46)	N/A	No Information	No Information
Used Oil Recycling Program (46)	*Oil may easily become contaminated during collection making it a hazardous waste. (46)	*reduces the risk of groundwater and surface water contamination, but can become hazardous waste if mixed with other materials. (46)	N/A	N/A	Recovery service charge $79-$179 (46)
Materials Management Plan (46)	No Information	*Identifies hazardous and non-hazardous materials in the facility. (46) *Assures that all containers have labels. (46) *Identifies hazardous chemicals that require special handling, storage, and disposal (46)	N/A	No Information	No Information

Nationwide Examples of Treatment Control (Structural) Best Management Practices (BMPs)					
Treatment Control (Source)	Limitations	Benefits	Removal Efficiency	Capital Cost (approximate)	O & M Cost (approximate)
BMP Inspection and Maintenance Plan (46)	Materials needed for emergency structural repairs may not be easily obtainable and may require stockpiling. (46)	*A regular inspection and maintenance program will maintain the effectiveness and structural integrity of the BMPs. (46)		N/A	$150-$9,000 depending on the BMP. (46)
Storm Drain Stenciling (46)	*Paint will weather away a short period of time and decals may need replaced if vandalized or improperly installed. (46)	*Educates the general public that the storm drain discharges into a natural waterbody. (46)	N/A	Mylar Stencils- $0.45 per lineal inch (46) Ceramic tiles $5-$6 each (46) Metal stencils- $100 or more (46)	No Information
Green Parking (46) This BMP will be experimental for MDOT until it is proven valuable and cost effective.	*Applicability(46) *Cost *Maintenance	*Promotes infiltration and filtering of Stormwater. (46)	N/A	No Information	No Information
Alum Injection (46) This BMP will be experimental for MDOT until it is proven valuable and cost effective.	*Experimental practice(46) *Involves on-going operation in addition to maintenance(46) *Does not control flows(46) *Chemicals may have negative impacts downstream(46) *Precipitates must be disposed of. (46)	*Alum injected into stormwater forms precipitates that combine with heavy metals and phosphorus creating a floc. The floc is inert and stable. (46)	Removal efficiency varies greatly by study and pollutant. The removal efficiency is uncertain at this time. (46)	Cost ranges from $135,000 to $400,000 depending on the size of the watershed. (46)	$6,500 to $25,000 (46)

Nationwide Examples of Treatment Control (Structural) Best Management Practices (BMPs)					
Treatment Control (Source)	Limitations	Benefits	Removal Efficiency	Capital Cost (approximate)	O & M Cost (approximate)
Plastic Covering - The covering with plastic sheeting of bare areas, which need immediate protection from erosion. This provides immediate temporary erosion protection to slopes and disturbed areas that cannot be covered by mulching, in particular during the specified seeding periods. Plastic is also used to protect disturbed areas, which must be covered during short periods of inactivity to meet November 1 to March 31 cover requirements. Because of many disadvantages, plastic covering is the least preferred covering BMP. (42)	*There can be problems with vandals and maintenance. (42) *The sheeting will result in rapid, 100 percent runoff, which may cause serious erosion problems and/or flooding at the base of slopes unless the runoff is properly intercepted and safely conveyed by a collecting drain. This is strictly a temporary measure, so permanent stabilization is still required. *The plastic may blow away if it is not adequately overlapped and anchored. (42) *Ultraviolet light can cause some types of plastic to become brittle and easily torn. (42) *Plastic must be disposed of at a landfill; it is not easily degradable in the environment. (42)	*Plastic covering is a good method of protecting bare areas, which need immediate cover and for winter plantings. (42) *May be relatively quickly and easily placed. (42)			

Nationwide Examples of Source Control (Non-Structural) Best Management Practices (BMPs)

Source Control (5)	Benefit (5)	Capital Cost (5)	O & M Cost (5)
Minimizing Effects from Highway Deicing			
Employee Training – teaches employees about storm water management, potential sources of contaminants, and BMPs. (43)	*low cost and easy to implement storm water management BMPs. (43)		
Litter Control	*Reduce potential clogging. *proper disposal of paper, plastic and glass.	$20 per trash cans (1992)	$16/acre/yr (1992)
Identify and Prohibit Illegal or Illicit discharge to Storm Drain	*halt hazardous and harmful discharge.	$2/acre (assumes 1 system monitored every 5 sq. miles)	$50/acre/yr (assumes TV inspection)
Street Sweeping - Two types of street sweepers are available for removal of solids from highway surfaces. The commonly used design is a mechanical street cleaner that combines a rotating gutter broom with a large cylindrical broom to carry the material onto a conveyor belt and into a hopper. The vacuum assisted sweepers, found to potentially remove more fine particles from the impervious surface, are impracticable due to their slow speed in highway maintenance operations. (42)	*reduction in potential clogging storm drain material. *some oil and grease control.	N/A	$0.83/acre/yr
Clean and Maintain Storm Drain Channels	*prevent erosion in channel. *improve capacity by removing sedimentation. *remove debris toxic to wildlife.	N/A	$21/acre/yr
Clean and Maintain Storm Inlet and Catch Basins - Inlets, catch basins, and manholes are to be periodically inspected and cleaned out using a vacuum truck. (42)	*removes sedimentation. *may prevent local flooding.	N/A	$21/acre/yr

Snow and Ice Control Operations - Snow control operations consist of removing accumulated snow from the traveled way, shoulders, widened areas and public highway approaches within the right-of-way. (42)	*removes snow/ice before it requires ice control operations. (42)		