

# Chapter 5

## Best Management Practices for the Clinton Main Subwatershed

### 5.1 Selection of Best Management Practices

An understanding of the sources and causes of storm water pollution is necessary to select the best management practices, or BMPs, that will achieve efficient and effective solutions. BMPs cover a broad range of activities and vary greatly in cost, effectiveness, and feasibility. In many cases a series of BMPs should be applied to a site for the best effect; these BMPs will vary from site to site depending on specific conditions, such as whether the site is new construction in a rural community or a redevelopment project in an already urbanized area. In urbanized areas, including the Clinton Main Subwatershed, BMPs focus on both structural and nonstructural BMPs. Nonstructural BMPs include pollution prevention and good housekeeping practices while structural BMPs include many types of construction implementation projects.

#### Types of BMPs

As described above, BMPs generally fall into two categories: structural and non-structural. *Structural BMPs* are engineered and constructed systems that improve the quality and/or control the quantity of storm water runoff, such as detention and retention ponds, constructed wetlands, infiltration areas, and vegetated swales. *Non-structural BMPs* are institutional arrangements, educational programs, or pollution prevention practices designed to limit the generation of storm water runoff or reduce the amount of pollution contained in that runoff, such as public education workshops, land use planning tools, operation and maintenance practices, or any other technique that does not involve designing and physically building a storm water management system. Each BMP type must be considered based upon a number of site-specific factors, such as drainage area served, available land space, cost, pollutant removal efficiency, soil types, slopes, depth of the water table, etc.

#### Evaluation of BMPs

The evaluation of BMP effectiveness is a growing field of research that is critical to the watershed planning process. Without data on BMP effectiveness, selecting the right BMPs may seem like an overwhelming task. Choosing BMPs at random based on anecdotal recommendations can be disastrous if the site is not suited to the selected BMP. Structural BMPs can be designed to meet a variety of specific goals, including controlling the quantity of runoff and removing specific pollutants at specific rates. Because the effectiveness of these systems can be quantitatively measured by monitoring inflow and outflow parameters, recent studies have been undertaken to determine pollutant removal efficiencies of a variety of BMPs (Table 5.1) The data presented in Table 5.1 represents the results of nearly numerous monitoring studies from a variety of sources evaluating a diverse range of best management practices, including dry and wet ponds, wetlands, filters, and swales.

Quantitatively evaluating the success of non-structural BMPs can be much more difficult because there is no physical structure that can be measured. Research demonstrates that these BMPs have a large impact on changing policy, enforcing protection standards, improving operating procedures, increasing public awareness, and changing behaviors to improve water quality and quantity over the long term. Because many of these BMPs are applied over a large land area, it is even more difficult to quantify their collective impact. No controlled monitoring studies have yet been completed at the watershed scale, as this is a very difficult and time-consuming undertaking, and it is very difficult to control actual development and implementation of BMPs over a large area.

Table 5.1 Effectiveness of Storm Water Treatment Practices in Removing Pollutants (Loading Reduction by % Removal Rate).

PRACTICE	TSS	Total P	Total N	Cu	Zn	Pb	BOD <sub>5</sub>	O / G <sup>1</sup>	Organics	Bact	Criteria for Evaluation
a. Bioretention/Rain Gardens <sup>2</sup>	90	70-83	68-80	93-98	93-98	93-98	ND	ND	90	90	Area of BMP installed, total # of sites implementing BMP; drainage area and calculated pollutant loading reduction
b. Buffer/Vegetated Filter Strips <sup>3</sup>	50-90	50-80	ND	ND	ND	ND	ND	ND	ND	ND	Length of BMP installed, total # of sites implementing BMP; estimated pollutant reduction
c. Catch Basin Cleaning <sup>3</sup>	62-97	ND	ND	ND	ND	ND	54-88	ND	ND	ND	# of catch basins cleaned
d. Construction Phasing <sup>3</sup>	42 <sup>4</sup>	ND	ND	ND	ND	ND	ND	ND	ND	ND	Total # of sites implementing BMP
e. Detention Basin (Dry) <sup>5</sup>	50	20	25	26	26	ND	ND	3	ND	44	Area of BMP installed, total # of sites implementing BMP; drainage area and calculated pollutant loading reduction
f. Detention Basin (Extended Dry) <sup>6</sup>	80-90	20-30	10-20	50-60	30-50	70-80	20-30	ND	ND	ND	Area of BMP installed, total # of sites implementing BMP; drainage area and calculated pollutant loading reduction
g. Detention Basin (Wet)A, <sup>6</sup>	80-90	35-70	15-50	60-70	40-50	ND	20-40	78	ND	70	Area of BMP installed, total # of sites implementing BMP; drainage area and calculated pollutant loading reduction
h. Detention Basin (Constructed Wetland) <sup>3,5,7</sup>	75-85	30-65	10-30	40	44	ND	ND	85	ND	78	Area of BMP installed, total # of sites implementing BMP; drainage area and calculated pollutant loading reduction

PRACTICE	TSS	Total P	Total N	Cu	Zn	Pb	BOD <sub>5</sub>	O / G <sup>1</sup>	Organics	Bact	Criteria for Evaluation
<b>i. Filtering Practices</b> <sup>2,5</sup>	86	59	38	49	88	ND	ND	84	ND	37	Area/length of BMP installed, total # of sites implementing BMP
<b>j. Filtering Practices (Vertical Sand Filters)</b> <sup>2,5,8</sup>	60-95	45	40-65	ND	ND	ND	ND	15	ND	ND	Area/length of BMP installed, total # of sites implementing BMP
<b>k. Grassed Swales (Ditches/Biofilters/Highway Swales)</b> <sup>3,6,9</sup>	65-90	15-50	30-50	40-60	40-50	ND	20-40	60	ND	ND	Area/length of BMP installed, total # of sites implementing BMP; drainage area and calculated pollutant loading reduction
<b>l. Infiltration</b> <sup>5</sup>	95	80	51	ND	ND	ND	ND	ND	ND	ND	Area/length of BMP installed, total # of sites implementing BMP; drainage area and calculated pollutant loading reduction & %runoff using infiltration
<b>m. Infiltration Basin</b> <sup>3</sup>	50-80	100	ND	ND	ND	ND	ND	ND	ND	ND	Area of BMP installed, total # of sites implementing BMP; drainage area and calculated pollutant loading reduction & %runoff using infiltration
<b>n. Infiltration Trenches/Dry Wells</b> <sup>3,10, 11</sup>	50-90	60-70	60	90	90	90	70-80	ND	ND	90	Length of BMP installed, total # of sites implementing BMP
<b>o. Porous Pavement</b> <sup>8,12</sup>	82-95	65	80-85	ND	ND	ND	ND	ND	ND	ND	Area of BMP installed, total # of sites implementing BMP; estimated volume reduction
<b>p. Riparian Buffers</b> <sup>13</sup>	grass: 63-89	forested: 23-42; grass: 39-78	forested: 85; grass: 17-99	ND	ND	ND	ND	ND	ND	ND	Length of BMP installed, total # of sites implementing BMP.

PRACTICE	TSS	Total P	Total N	Cu	Zn	Pb	BOD <sub>5</sub>	O / G <sup>1</sup>	Organics	Bact	Criteria for Evaluation
q. Sand Filters <sup>3,6</sup>	70-90	20-60	40-70	30-60	50-80	ND	30-50	ND	ND	ND	Length of BMP installed, total # of sites implementing BMP
r. Silt Fences (a=If properly installed and maintained <sup>14</sup> ; b=If installed at toe of slope <sup>15</sup> ) <sup>3</sup>	a=75-86; b=36-65	ND	ND	ND	ND	ND	ND	ND	ND	ND	Length of BMP installed, total # of sites implementing BMP.
s. Stabilizing Soils on Construction Sites <sup>3, 16</sup>	80-90	ND	ND	ND	ND	ND	ND	ND	ND	ND	# of new construction sites in municipality, area of BMP installed.
t. Street Sweeping <sup>3,17</sup>	50-90	50-90	ND	ND	ND	ND	ND	ND	ND	ND	Miles of streets swept, volume of sediment collected.
u. Swirl Concentrator Unit	60-80	60-80	ND	ND	ND	ND	ND	ND	ND	ND	Total # of sites implementing BMP, # of BMP installed; drainage area and calculated pollutant loading reduction

ND = No Data

Total P = Total Phosphorus

Total N = Total NO<sub>2-3</sub>

Cu=Copper; Zn=Zinc; Pb=Lead

Zn = Zinc

O / G = Oil/Grease

<sup>1</sup> Represents Data for Oil/Grease and PAHs

<sup>2</sup> EPA Storm Water Technology Fact Sheet - Bioretention, September 1999.

<sup>3</sup> From Section 6.2 Description and Performance of Stormwater Best Management Practices Considered.

Lower One Rouge River Subwatershed Management Plan, April 2001.

<sup>4</sup> Claytor. Watershed Protection Techniques, Technical Note 80.

- <sup>5</sup> From Section 5.3.1 Definition and Performance of Best Management Practices, Stony Creek Subwatershed Plan, November, 2003.
- <sup>6</sup> From Rouge River National Wet Weather Demonstration Project Pilot Best Management Practices Projects (319 Grant), February 27, 1996.
- <sup>7</sup> Urbanization and Water Quality: A Guide to Protecting the Urban Environment. 1994. The Terrene Institute, Washington, D.C.
- <sup>8</sup> Erosion and Sediment Control Best Management Practices (BMPs) Research Project; Second Edition December 2002, PBSJ Water Resources Program, MD.
- <sup>9</sup> Reeves, E. 1994. Performance and Condition of Biofilters in the Pacific Northwest, Technical Note 30, Watershed Protection Techniques, Vol. 1, No. 3, P. 117-119.
- <sup>10</sup> EPA Storm Water Technology Fact Sheet - Infiltration Trench, September 1999.
- <sup>11</sup> Horner, Richard. 1994. Fundamentals of Urban Runoff Management, Terrene Institute, Washington, D.C., P. 116.
- <sup>12</sup> EPA Storm Water Technology Fact Sheet - Porous Pavement, September 1999.
- <sup>13</sup> Mill Creek Subwatershed Management Plan
- <sup>14</sup> Goldman, S.J., K. Jackson and T.A. Bursztynsky. 1986. Erosion and Sediment Control Handbook. McGraw-Hill Book Company. New York, NY.
- <sup>15</sup> Harding, M.V. 1990. Erosion Control Effectiveness: Comparative Studies of Alternative Mulching Techniques, Environmental Restoration; Science and Strategies for Restoring the Earth, Island Press, Covello, CA, P. 149-156.
- <sup>16</sup> Brown, W. and D. Caraco. 1996. Task 2 Technical Memorandum: Innovative and Effective Erosion and Sediment Control Practices for Small Sites. Center for Watershed Protection for the US EPA Office of Wastewater Management. Silver Spring, MD.
- <sup>17</sup> Watershed Protection Techniques. 1999. Technical Note: 103. Vol. 3, No. 1, P. 601.

## 5.2 Clinton Main Best Management Practices

Storm water BMPs are most effective when they are implemented as a coordinated system; that is, achieving the best water resource protection requires the proper placement and phasing of BMPs from the initial site planning stage all the way to post-construction storm water runoff management. The following BMPs/Actions have been identified for implementation within the Clinton Main Subwatershed. Further detail on these actions, including subbasins for implementation, community commitments, costs, goals and objectives addressed, etc. are contained in subsequent tables.

### ***Action 1. Review and Update Ordinances as that Impact Water Resources as Applicable***

Increasing development in the subwatershed and the negative impacts of storm water due to land use change is of great concern. Increased impervious surfaces, increase of non-point source pollutants and loss of natural features to slow and filter pollutants, if not controlled, will lead to further degradation of the subwatershed's water resources. To mitigate these impacts, communities have developed and adopted various ordinances that help to control both the quantity and quality of storm water that is permitted to leave a developed site. Examples of such ordinances include storm water management ordinances; natural feature preservation ordinances (wetlands, woodlands, stream corridors); overlay district requirements; buffer requirements; impervious surface ordinances; and site plan review requirements. Many communities in the watershed have either adopted similar ordinances or are considering adopting these types of ordinances. Some communities that are experiencing high growth pressures are especially interested in this approach to protecting high-quality water resources.

Many of these ordinances outline specific requirements for constructing structural best management practices to minimize the flow and water quality impacts associated with new development. Oversight and implementation of storm water standards can be complicated by overlapping jurisdictions and conflicting goals and priorities. Where there are overlapping jurisdictions within individual communities, it is imperative that the municipality and county or state agency work cooperatively to understand the goals and unique issues specific to each.

### ***Action 2. Review and Update Master Plan as Applicable***

To provide a legal basis for local ordinances, municipalities need to include their thoughts and desires for the ultimate development of their community into a Comprehensive Land Use Plan or Master Plan. Because managing storm water is a relatively new practice, communities within the Clinton Main should consider amending their Master Plans to include a discussion about how they want storm water to be considered in future development and re-development projects. This discussion can be a few paragraphs, in the existing Master Plan, or it can be a plan on its own, often called a Storm Water Master Plan. This plan addresses development, implementation, and enforcement of controls to protect designated uses in all receiving waters.

### ***Action 3. Preserve Natural Areas***

Communities in the subwatershed will continue to encourage private landowners to preserve natural areas that will protect land in its natural state in perpetuity, thereby protecting the water quality in the Clinton Main Subwatershed. One way to achieve this is by developing a plan to identify sensitive lands that are under the greatest threat of development and hold the most value from a natural resource perspective. In addition, publicizing Oakland Land Conservancy efforts will raise awareness of private property owners about the opportunities of establishing conservation easements. This type of land protection with the Conservancy provides a number of benefits to private landowners.

#### ***Action 4. Review and Update Storm Water Management Design Standards***

As development increases and storm water technology and ideas change, it is beneficial to evaluate current standards. Continuing to improve on and be concurrent with technology will only benefit storm water quality and reduce storm water runoff volumes. Storm water design criteria generally outline standards for best management practices (BMPs). Appropriate BMPs may vary across local jurisdictions; however, the ultimate goal is to establish standards that not only improve storm water quality, but also minimize flow variability.

#### ***Action 5. Downspout/Sump Pump Disconnection Programs***

In an effort to reduce the amount of storm water that enters the community sewer systems when it rains, the municipalities will continue to evaluate opportunities for downspout/sump pump disconnection programs. Citizens should partner with their communities to continue to improve water quality, protect homes from flooding, and reduce operational cost to the cities and communities.

#### ***Action 6. Footing Drain Disconnection Program***

In some areas of the watershed, homes have experienced basement backup problems. Many of these have been the result of wastewater backing up from the sanitary sewers through basement floor drains, especially during periods of heavy rainfall. This wastewater presents a potential health risk and can cause damage to the structure and to belongings stored in the basement. In addition, this excess rainwater/groundwater places a strain on the sanitary sewer systems and must be treated at the wastewater treatment plants. Opportunities will be evaluated to establish programs for disconnecting residential and commercial footing drains from the municipal sewage collection and treatment systems.

#### ***Action 7. Log Jam Inventory and/or Management***

Local municipalities will identify problem log jams acting as restrictors to flow leading to flooding problems. As problems are identified, opportunities will be evaluated for appropriate log jam management. A map is one method identifies locations of log jams throughout the community. This work may be coordinated with streambank stabilization and improvement considerations so that woody and other debris acting as habitat or positively stabilizing slopes will be modified to benefit flow as well as habitat.

#### ***Action 8. Streambank Stabilization Program***

In areas where upstream flow can be controlled and/or reduced, areas for vegetative and/or structural streambank stabilization should be studied to assist in dissipating flow energy within the channel as well as increasing water quality by controlling erosion and deposition. Aesthetics and wildlife habitat are also improved. Affected communities (or potentially the subwatershed group) in the Clinton Main River watershed, will create a plan/program for identifying lengths of streambank that are in need of stabilization. The program will include methods for prioritization and implementation of vegetative and structural stabilization methods that will also improve riparian terrestrial and aquatic habitat. It is important to note that many of these creeks are located on private property and it may not always be feasible to conduct these types of evaluations if the property owner does not grant permission.

#### ***Action 9. Household Hazardous Waste Collection Program***

The proper disposal of household hazardous waste is an important component in any water quality protection program. A number of Clinton Main municipalities are members of the recently established North Oakland Household Hazardous Waste Consortium (NO HAZ), whose goal is to provide regular, reliable, and easily accessible waste collection services to their residents.

### ***Action 10. Habitat Improvement Program***

Habitat restoration techniques include instream structures that may be used to correct and/or improve fish and wildlife habitat deficiencies over a broad range of conditions. Examples of these techniques include channel blocks, boulder clusters, covered logs, tree cover, bank cribs, log and bank shelters, channel constrictors, cross logs, and revetment, wedge and "K" dams. The majority of these structures can be installed with hand labor and tools. After construction, a maintenance program must be implemented to ensure long-term success of the habitat structure. It should be noted that in areas that experience high storm water peak flows, instream habitat restoration should be installed after the desired flow target is reached to ensure the success of the habitat improvement project. Communities will develop a program that includes these appropriate components for habitat improvement.

### **Action 11. Promote and Encourage Riparian Best Management Practices**

In order to reduce nutrient pollution and restore habitat in the Clinton Main subwatershed, the communities will work to promote and encourage, to the extent feasible, the amount of forested or other riparian buffer, conserve existing forests/buffers along all streams and shorelines and increase the use of all riparian buffers and restore riparian forests, targeting efforts where they will be of greatest value to water quality. Construction of riparian buffers can positively affect water quality by decreasing sediment loads from runoff, increasing streambank shading that helps regulate water temperature and adding vegetation that stabilizes the streambanks. Replacing these physical features can help aquatic life by increasing sources of food, shade and shelter. Riparian buffer health is closely linked to healthy streams and watersheds.

### ***Action 12. Storm Water BMP Maintenance and/or Retrofit Programs***

Short-term maintenance of detention basins, swirl concentrators, and other storm water facilities during construction as well as long-term maintenance by the property owner or appropriate jurisdictional agency is as important as implementation of the storm water management ordinance. In developed areas where detention basins were originally designed only for flood control, opportunities exist for various enhancements or retrofits to incorporate sediment and nutrient removal capabilities. Outlet structures may be reconfigured to handle the smaller storm events provided adequate volume still exists in the basin for the design storm event. These improvements, combined with native plantings and buffer strips along the basin will reduce nutrient, sediment, and bacteria loadings, discourage geese from congregating, encourage populations of other types of wildlife such as birds, fish, and insects, and ultimately create a more aesthetic environment for the property owner. Such enhancements may also provide passive recreation opportunities. Local jurisdictions will develop a program to include appropriate components.

### ***Action 13. OSDS Maintenance Program***

An on-site sewage disposal system (OSDS) maintenance program can significantly reduce nutrient loading, especially near lakes and impoundments. Many areas around lakes and impoundments do not have access to sanitary sewer systems, so maintenance programs that include regular pumping of septic tanks and evaluation of the septic fields will not only improve the quality of the adjacent water resources, but will also educate home owners about the potential impacts on-site sewage disposal systems, if not functioning properly, have on their water resources. An OSDS time of sale ordinance is being considered in Oakland County. Most local jurisdictions rely on the County oversight for on-site sewage disposal systems.

### ***Action 14. Natural Areas Restoration/Enhancement Program***

Based on previous findings, there are opportunities in the subwatershed for restoration/enhancement of natural areas. Communities will develop a program that priorities restoration and enhancement of natural areas. The program may include one or both of the following two components: (1) Natural Areas

Restoration/Enhancement through new developments and (2) Natural Areas Restoration/Enhancement through stewardship. The first component includes identifying opportunities as site plans are reviewed through the site plan review process while the second component includes promoting and encouraging restoration/enhancement through stewardship and volunteer opportunities. The program will also address invasive species control and management.

#### **Action 15. Implement and/or Improve Inspection/Enforcement of SESC**

Within the Clinton Main subwatershed, statewide soil erosion and sedimentation control (SESC) regulations are managed primarily by county agencies. Communities may also consider adopting and overseeing a local SESC ordinance or standards, which must be approved by the Michigan Department of Environmental Quality Water Division. In addition, requiring SESC permits prior to allowing any construction work on a site will help to minimize soil erosion and sedimentation. Soil erosion and sedimentation control plans include stabilization measures for construction activities. These ordinances should generally limit the soil exposed during development or redevelopment, limit the rate at which water is transported across the exposed land, and allow for on-site capture of the sediment prior to discharging water from the site.

#### ***Action 16. Water Level Control Structure Committee***

Interested parties, including local government officials, lake property owners and riparian land owners, will be given an opportunity to participate in a committee to study the issues and evaluate alternatives that address both the impacts and benefits of lake level control structures. Governmental jurisdictions, including state, federal and local jurisdictions along with the Clinton River Watershed Council will form the basis of the committee. The committee will determine the process for evaluating impacts and benefits as well as determine the most appropriate mechanism for public participation. Once the impacts and benefits have been studied, a strategy will be evaluated for implementation.

#### ***Action 17. Natural Features Protection Plan/Inventory/Assessments***

Protecting existing natural features such as wetlands, woodlands and riparian corridors in the subwatershed is a key goal, especially in less developed areas of the subwatershed. These guidance documents can create opportunities to minimize impacts associated with new developments as well as identify opportunities for preservation and enhancement. A natural features protection plan generally starts out with an inventory and map of the community's existing environmental features, showing where the wetlands, woodlands, meadows, steep slopes, and tree rows are located. The map also shows how these features are interrelated, and how changes to one feature could impact another. The plan provides goals for natural feature preservation, often prioritizing specific natural areas and suggesting methods for their protection. Lastly, goals to create or preserve links between the natural areas for wildlife movement are often included in the plan.

#### ***Action 18. Greenway Plan***

Greenway and Greenway Infrastructure Plans can serve multiple purposes, including natural features protection, alternative transportation routes, and recreation opportunities. To create such as plan, a map is prepared that identifies connections throughout the watershed utilizing existing trails, tree corridors, utility corridors and riparian corridors. Organizations such as the Oakland Land Conservancy have an established structure for reaching out to riparian landowners to promote corridor protection measures, such as conservation easements and stewardship projects. Community participation may include attending a visioning session and input to the county as Oakland County is currently working with individual communities to compile an overall Green Infrastructure Plan.

### ***Action 19. Recreation Plan***

A number of popular recreation areas are located in the Clinton Main subwatershed. Other recreation resources are not as well known, particularly the county and local parks. An inventory of existing recreation resources and an assessment of current needs will serve to establish a baseline for future improvements. Recreation access and amenities will be included in recreation master plans. The identification of potential recreation parcels should be included in the proposed Clinton Main corridor stewardship efforts. Acquisition efforts and conservation easements can include consideration of recreation potential in addition to natural features protection. Developing and implementing additional public education opportunities can enhance both existing and future recreation areas in the Clinton Main subwatershed. Recreation stakeholders including local, county, regional, and statewide entities along with community organizations already have many programs underway and can continue to coordinate these efforts. These entities may wish to collaborate on grant applications and program development in order to take advantage of limited resources.

### ***Action 20. Sanitary Sewer Master Plan***

The municipalities in the Clinton Main subwatershed that don't already have them should consider developing a comprehensive sewer plan that is consistent with their zoning and master plans. Local sewer plans identify areas where sanitary sewer service is or will be available, areas where on-site disposal systems will or can be used for wastewater treatment, and areas where sewers and on-site systems are not appropriate (i.e. environmentally sensitive areas, floodplains, etc.). These service areas should be developed based on the sewer system's capacity to collect, transport, and treat wastewater flows at the density levels allowed in the zoning and master plans and/or the ability of soils to accommodate on-site disposal systems.

### ***Action 21. Water Quality Monitoring***

Communities will evaluate existing monitoring programs and opportunities for support and collaboration with other watershed communities and agencies that may be conducting similar monitoring programs. Communities will help promote and participate in the current volunteer monitoring that is coordinated through the Clinton River Watershed Council which also forms the basis for the monitoring and evaluation component described in the Appendix.

### ***Action 22. Continue to Implement Actions from Approved PEP Plans***

Individual permittees each have approved Public Education Plans. Many communities in the Clinton Main Subwatershed have contracts with the Clinton River Watershed Council for implementation of many PEP components. At the same time, other communities located in both the Rouge Watershed and Clinton Main have PEPs that are not part of the CRWC program. Both types of plans include numerous public education opportunities of which individual actions address many of the goals and objectives contained in the subwatershed management plan. In addition, SEMCOG is also an active partner of numerous public education plans through the Southeast Michigan Partners for Clean Water. This action encompasses all required PEP activities.

### ***Action 23. Pet Waste/Waterfowl Management***

Effective pet waste and nuisance waterfowl management programs can reduce bacteria and nutrient sources within the subwatershed. Rural areas should consider working with the Michigan Department of Agriculture and MSU Extension to encourage proper manure and nutrient management on site. In urban and suburban areas, programs to reduce pet and waterfowl waste may include border collie roundup at golf courses and parks, as well as installation of native plantings to replace turf grass along ponds and lakes.

Furthermore, detention basin retrofits that incorporate taller native vegetation can help curtail nuisance waterfowl. Pet waste receptacles and educational signage can be placed in community parks or other pedestrian areas where residents walk their dogs.

***Action 24. Training/Inspection Program for Staff and Contractors***

Staff training for various storm water related activities would be conducted on an as-needed basis.

***Action 25. Catch Basin Inspection and Maintenance***

Research has shown that streets in urban areas are large contributors of phosphorus and sediment to water resources. Permittees will implement a catch basin cleaning/maintenance program.

***Action 26. Maintenance of Swales***

Vegetated swales can decrease the volume and rate of storm water discharged from roads to the Clinton River. To prolong the useful life of these storm water management BMPs, communities will maintain storm water swales by inspecting for and removing excessive build-up of sediment and other debris. The subwatershed group can coordinate with community organizations, schools, churches, and businesses to collect debris along swales along local, county, and state roads and in community parks and other areas.

***Action 27. Fleet Maintenance Activities***

Individually, vehicle service and repair shops do not generate a lot of hazardous waste, but collectively they represent a significant source of pollution. For these facilities there are opportunities to save money, conserve resources, reduce emissions, possibly reduce permitting fees, and help meet compliance with environmental rules by making simple changes in shop practices. This can be done by implementing various pollution prevention methods associated with material handling and storage, parts cleaning and degreasing, maintenance and repair activities and shop clean-up.

The goal of improving fleet maintenance activities and practices is to reduce environmental and health impacts of vehicle repair and maintenance operations by introducing cost effective pollution prevention practices, working with the vehicle service and repair industry to implement pollution prevention options and increasing compliance with environmental laws and regulations. These improved fleet maintenance activities may also include providing training and technical assistance to identify the economic and environmental benefits of pollution prevention methods, products and services to the private sector, local government agencies, and vehicle repair and fleet maintenance operations.

***Action 28. Street & Parking Lot/Pavement Sweeping***

Research has shown that streets in urban areas are large contributors of phosphorus and sediment to water resources. Permittees will evaluate opportunities to implement a street sweeping program and/or catch basin cleaning program to pick up finer sediments and debris that may reach surface waters. Communities in other watersheds are currently conducting studies of street sweeping and catch basin cleaning efforts to determine if more powerful equipment and/or more frequent cleaning schedules have a significant impact on sediment and debris removal. These results may be used by Clinton Main subwatershed communities to determine changes in current practices. Communities with roads under the jurisdiction of the county road commission will work with the commission to enhance maintenance for storm water, especially to control soil erosion and sedimentation from the many dirt roads in the area.

### ***Action 29. Salt Storage & Application***

Permittees that have deicing responsibilities will review and implement applicable practices to minimize impacts to water resources. These practices may include proper equipment calibration and evaluation of alternative materials. In addition, current salt storage practices will be evaluated and updated as necessary.

### ***Action 30. Golf Course Management***

Encouraging golf courses to develop and implement plans to minimize nutrient loading will help preserve the high quality of the Clinton Main subwatershed. These efforts may include educating golf course staff about the importance of protecting the water resources located on the golf course. Education may include training appropriate staff on proper fertilizer, watering and mowing techniques to protect water resources. In addition, identifying areas for suitable native plant establishment will also help slow and filter storm water runoff prior to it entering local tributaries. The MSU Extension Turf grass Stewardship Program is a good source of information for this purpose and offers a certification program for golf courses.

There are several golf courses within the subwatershed, some of which are public courses. With intensive turf management programs, these areas are suspected as large sources of phosphorus loading. Communities will evaluate current golf course operations from a storm water management perspective. Improvements will explore turf management, watercourse and wetland buffers, as well as detention basin maintenance and buffer vegetation.

### ***Action 31. Grounds and Facilities Maintenance***

Communities will promote and encourage proper grounds and facilities maintenance for municipally-owned properties. Activities include developing and implementing plans to minimize nutrient loading through educating staff and contractors on "good housekeeping" practices, including proper fertilizing and lawn care practices.

Chapter 4 described goals and objectives of the subwatershed reflecting the subwatershed data in Chapter 3 and also the prioritized pollutants, sources and causes within the subwatershed. The management alternatives and actions identified in this section have been cross-referenced with the information described in Chapter 4 and which is shown in Table 5.2.

Table 5.2 correlates the recommended management alternatives with goals and objectives in the subwatershed. Each goal and objective have at least one (1) recommended alternative associated with them, in most cases there are multiple actions to meet multiple goals. Pollutants addressed by the action, designated and desired uses along with sources and causes of the pollution are also identified.

Table 5.2 Goals, Objectives, Pollutants, Uses, Sources and Causes addressed by Action

Recommended Management Alternative/Action	Goals & Objectives Addressed	Pollutants Addressed	Uses Addressed (see Key below)	Sources Addressed	Causes Addressed
1. Review and Update Ordinances that Impact Water Resources as Applicable	1A, 2B, 5B, 6C, 7B	hydrology; sediment; nutrients; bacteria; temp; low DO levels; lack of aquatic and/or riparian habitat; loss of natural features; lack of public awareness	NV; FI; WL; PR; TR; HE; OS; RE; FC	storm water runoff; decreased groundwater resources; streambank erosion; construction site runoff; road-stream crossings; fertilizer use; lack of public education	lack of BMPs; increased impervious surfaces; improper or poor BMP maintenance; soil erosion; fertilizer application practices; removal of vegetation; types of outlet structures in impoundments/BMPs
2. Review and Update Master Plans as Applicable	1A, 2B, 5B, 6C, 7B	hydrology; sediment; nutrients; bacteria; temp; low DO levels; lack of aquatic and/or riparian habitat; loss of natural features; lack of public awareness	NV; FI; WL; PR; TR; HE; OS; RE; FC	storm water runoff; decreased groundwater resources; streambank erosion; construction site runoff; road-stream crossings; fertilizer use; lack of public education	lack of BMPs; increased impervious surfaces; improper or poor BMP maintenance; soil erosion; fertilizer application practices; removal of vegetation
3. Preserve Natural Areas	5D, 6A, 6B, 7A	hydrology; sediment; nutrients; bacteria; temp; organic, industrial & toxic compounds; low DO levels; lack of aquatic and/or riparian habitat; debris; loss of natural features; lack of public awareness	FI; WL; PR; TR; HE; OS; RE	storm water runoff; decreased groundwater recharge; stream bank erosion; reduced vegetation canopy in watershed; higher temps; log jams; loss of natural features in new development	removal of vegetation throughout watershed; increased impervious surfaces; soil erosion; river flashiness; lack of awareness; lack of long-term planning to obtain easements/property

Recommended Management Alternative/Action	Goals & Objectives Addressed	Pollutants Addressed	Uses Addressed (see Key below)	Sources Addressed	Causes Addressed
4. Review & Update Storm Water Management Design Standards	1A-1C, 2B, 5B, 5C, 7B	hydrology; sediment; nutrients; bacteria; temp; lack of public awareness	NV; FI; WL; PR; TR; HE; OS; RE; FC	storm water runoff; decreased groundwater recharge; stream bank erosion; construction site runoff; lack of public education	lack of BMPs; increased impervious surfaces; improper or poor BMP maintenance; soil erosion; river flashiness
5. Downspout/Sump Pump Disconnection Programs	5B, 5C	hydrology; temp; low DO levels	FI; WL; PR; TR; HE; FC	storm water runoff; decreased groundwater recharge	increased impervious surfaces; river flashiness
6. Footing Drain Disconnection Program	1A, 5B	hydrology; nutrients; bacteria; organic, industrial & toxic compounds; low DO levels	FI; WL; PR; TR; FC	storm water runoff; decreased groundwater recharge; illicit discharges; sediments/pesticides; household hazardous waste	river flashiness; illegal dumping; disposal practices
7. Log Jam Inventory and/or Management	2A, 2C, 3A, 3B, 4A, 6D	hydrology; debris	NV; FI; WL; HE; OS; RE; FC	storm water runoff; log jams	river flashiness; lack of awareness; lack of woody debris management practices

Recommended Management Alternative/Action	Goals & Objectives Addressed	Pollutants Addressed	Uses Addressed (see Key below)	Sources Addressed	Causes Addressed
8. Streambank Stabilization Program	1C, 2C, 3A, 3B	sediment	NV; FI; WL; PR; TR; HE; RE; FC	storm water runoff; stream bank erosion; construction site runoff	removal of vegetation throughout watershed; increased impervious surfaces; soil erosion; river flashiness; lack of awareness
9. Household Hazardous Waste collection Program	AB, 2A, 2B, 2C, 6D	nutrients; bacteria; organic, industrial & toxic compounds	FI; WL; HE; OS	storm water runoff; fertilizer use; illicit discharges; sediments/pesticides; household hazardous waste	disposal practices; lack of awareness; illegal dumping
10. Habitat Improvement Program	3A, 3B, 6A, 6B, 6D, 7A	hydrology; sediment; temp; low DO levels; lack of aquatic and/or riparian habitat	FI; WL; HE; OS; RE; FC	storm water runoff; decreased groundwater recharge; reduced vegetation canopy in watershed; higher temps	legally established lake levels; lake level management practices; increased impervious surfaces; removal of vegetation throughout watershed; soil erosion
11. Promote and Encourage Riparian Best Management Practices	3A, 3B, 5D, 6A, 6B, 7A	hydrology; sediment; nutrients; bacteria; temp; organic, industrial & toxic compounds; low DO levels; lack of aquatic and/or riparian habitat; debris; loss of natural features; lack of public awareness	NV; FI; WL; PR; TR; HE; OS; RE; FC	storm water runoff; decreased groundwater recharge; stream bank erosion; reduced vegetation canopy in watershed; sediments/pesticides; higher temps; log jams; loss of natural features in new development	Lack of BMPs, removal of vegetation throughout watershed; increased impervious surfaces; improper or poor BMP maintenance; soil erosion; road & impervious surface maintenance practices; river flashiness

Recommended Management Alternative/Action	Goals & Objectives Addressed	Pollutants Addressed	Uses Addressed (see Key below)	Sources Addressed	Causes Addressed
12. Storm Water BMP Maintenance and/or Retrofit Programs	1A, 1B, 1C, 2A, 5B	hydrology; sediment; nutrients; bacteria; temp; low DO levels; debris	NV; FI; WL; PR; TR; HE; OS; RE; FC	storm water runoff; decreased groundwater recharge; stream bank erosion; higher temps; trash; impoundment structures	lack of BMPs; removal of vegetation throughout watershed; increased impervious surfaces; improper or poor BMP maintenance; soil erosion; river flashiness; types of outlet structures in impoundments/BMPs
13. OSDS Maintenance Program	1A, 1B, 6D	nutrients; bacteria; low DO levels	FI; PR; TR	illicit discharges; failing septic systems; aquatic plan overpopulation	lack of inspections; lack of maintenance; improper siting for new OSDS
14. Natural Areas Restoration/ Enhancement Program	5D, 6A, 6B, 7A, 7B, 7C	hydrology; sediment; nutrients; temp; low DO levels; lack of aquatic and/or riparian habitat; loss of natural features	FI; WL; HE; OS; RE	storm water runoff; decreased groundwater recharge; streambank erosion; reduced vegetation canopy in watershed;	increased impervious surfaces; inadequate local ordinance or enforcement; removal of vegetation throughout watershed; lack of BMPs
15. Implement and/or Improve Inspection/ Enforcement of SESC	1A, 1B, 1C	sediment; nutrients	NV; FI; WL; PR; TR; HE; OS; RE; FC	storm water runoff; stream bank erosion; construction site runoff	soil erosion; road & impervious surface maintenance practices; lack of BMPs; improper or poor BMP maintenance; inadequate local ordinance enforcement

Recommended Management Alternative/Action	Goals & Objectives Addressed	Pollutants Addressed	Uses Addressed (see Key below)	Sources Addressed	Causes Addressed
16. Water Level Structure Control Committee	5A	hydrology; temp; low DO levels; lack of aquatic and/or riparian habitat	NV; FI; RE; FC	storm water runoff; lake level management; higher temps; low flow conditions; impoundment structures	legally established lake levels; lake level management practices; lack of subwatershed representation by residents outside lake owner associations; lack of awareness by lake owners in understanding downstream impacts
17. Natural Features Protection Plan/Inventory/ Assessments	5D, 6A, 6B, 7A, 7B, 7C	hydrology; sediment; nutrients; temp; low DO levels; lack of aquatic and/or riparian habitat; loss of natural features	FI; WL; HE; OS; RE	storm water runoff; decreased groundwater recharge; streambank erosion; road-stream crossings; reduced vegetation canopy in watershed; loss of natural features in new development; lack of conservation easements; lack of natural features ordinance	increased impervious surfaces; inadequate local ordinance or enforcement; removal of vegetation throughout watershed; lack of BMPs; lack of long-term planning to obtain easements/property
18. Greenway Plan	7C	hydrology; sediment; nutrients; temp; low DO levels; lack of aquatic and/or riparian habitat; loss of natural features	HE; OS; RE	storm water runoff; decreased groundwater recharge; streambank erosion; road-stream crossings; reduced vegetation canopy in watershed; loss of natural features in new development; lack of conservation easements	lack of awareness

Recommended Management Alternative/Action	Goals & Objectives Addressed	Pollutants Addressed	Uses Addressed (see Key below)	Sources Addressed	Causes Addressed
19. Recreation Plan	4A	lack of aquatic and/or riparian habitat, lack of public awareness; limited public access	NV; HE; OS; RE	lack of public education; lack of publicly-owned riparian land	lack of awareness; economical constraints
20. Sanitary Sewer Master Plan	1A	nutrients; bacteria; low DO levels	FI; PR; TR	illicit discharges; aquatic plant overpopulation; failing septic systems (OSDS)	lack of inspections; lack of maintenance; sanitary sewer overflows (SSOs)
21. Water Quality Monitoring	1A, 1B, 1C, 2C, 3B	sediment; nutrients; bacteria; temperature; low DO levels; lack of aquatic and/or riparian habitat; debris; lack of public awareness	FI; WL; PR; TR	illicit discharges; failing septic systems; aquatic plant overpopulation; lack of public education	improper or poor BMP maintenance; soil erosion; lack of BMPs; past contamination; disposal practices; waste water treatment plant
22. Continue to Implement Actions from Approved PEP Plans	2A, 2B, 2C	sediment; nutrients; bacteria; organic, industrial & toxic compounds; low DO levels; debris; lack of public awareness	FI; WL; PR; TR; HE; OS; RE; FC	lack of public education	lack of awareness
23. Pet Waste/Waterfowl Management	1B, 1C, 2A, 6D	nutrients; bacteria; low DO levels	FI; WL; PR; TR; HE	waterfowl & pet waste	lack of awareness; residential feeding of waterfowl; pet waste management practices
24. Training/Inspection Program for Staff and Contractors	1A, 2A, 2B	sediment; nutrients; bacteria; temperature; salt; organic, industrial & toxic compounds; low DO levels; debris; lack of public awareness	FI; WL; PR; TR; OS; RE; FC	construction site runoff; illicit discharges; sediments/pesticides; lack of BMPs; improper or poor BMP maintenance	lack of awareness

Recommended Management Alternative/Action	Goals & Objectives Addressed	Pollutants Addressed	Uses Addressed (see Key below)	Sources Addressed	Causes Addressed
25. Catch Basin Inspection and Maintenance	1A, 6D	sediment; nutrients; lack of aquatic and/or riparian habitat	FI; WL; PR; TR; OS; RE; FC	storm water runoff; construction site runoff; illicit discharges	soil erosion; road & impervious surface maintenance practices; lack of BMPs; improper or poor BMP maintenance; disposal practices
26. Maintenance of Swales	1A, 5B	hydrology; sediment; nutrients; temperature; low DO levels; debris	FI; WL; PR; TR; OS; RE; FC	storm water runoff; decreased groundwater recharge; sediments pesticides	soil erosion; lack of BMPs; improper or poor BMP maintenance
27. Fleet Maintenance Activities	1A, 1B, 6D	sediment; salt; organic, industrial & toxic compounds; low DO levels	FI; WL; PR; TR; OS; RE; FC	illicit discharges	lack of BMPs; improper or poor BMP maintenance; lack of awareness; equipment maintenance practices
28. Street & Parking Lot/Pavement Sweeping	1A, 6D	sediment; nutrients; lack of aquatic and/or riparian habitat	FI; WL; PR; TR; OS; RE; FC	storm water runoff; illicit discharges; sediments/pesticides	soil erosion; road & impervious surface maintenance practices; lack of BMPs; improper or poor BMP maintenance
29. Salt Storage & Application	1A, 1B	salt	FI; WL; PR; TR; OS; RE; FC	all impervious surface runoff	salt storage practices; equipment maintenance practices; salt application practices; increased impervious surfaces

Recommended Management Alternative/Action	Goals & Objectives Addressed	Pollutants Addressed	Uses Addressed (see Key below)	Sources Addressed	Causes Addressed
30. Golf Course Management	1A, 1B, 1C, 2A	nutrients; low DO levels	FI; WL; PR; TR; OS; RE; FC	storm water runoff; fertilizer use; illicit discharges; sediments/pesticides	fertilizer application practices; lack of BMPs, improper or poor BMP maintenance; grounds maintenance practices
31. Grounds and Facilities Maintenance	1A, 1B, 1C	sediment, nutrients; salt; organic, industrial & toxic compounds; low DO levels; debris	FI; WL; PR; TR; OS; RE; FC	storm water runoff; illicit discharges; sediments/pesticides	grounds maintenance practices; improper or poor BMP maintenance

N/A = Currently Not Applicable

A = Agriculture

IW = Industrial water supply

PW = Public water supply at the point of intake

NV = Navigation

FI = Warmwater / Coldwater fishery

WL = Other indigenous aquatic life and wildlife

PR = Partial body contact recreation

TR = Total body contact recreation (between May 1<sup>st</sup> & October 31<sup>st</sup>)

HE = Wildlife habitat enhancement

OS = Preservation/protection of remaining open spaces

RE = Enhance recreational opportunities (boating, trails, canoeing)

FC = Flood Control (BMP implementation)

### 5.3 Subbasin Sequencing of Best Management Practices

Determining which BMPs are appropriate for a site, which actions should be implemented at what location in a subwatershed, and which actions should be taken in what order is critical to the effectiveness of the overall storm water management strategy. For example, it is inappropriate and potentially ineffective to address an erosion problem with streambank stabilization if the root of the problem – increasing flows – is left unaddressed further upstream.

A phasing approach has been developed for BMPs that assists in clarifying the BMPs that should be considered at various stages in the watershed management process (Middle One Rouge River Subwatershed Advisory Group, 2001). This approach is a recommendation only, as specific site conditions may warrant alternative sequencing.

- Phase I:** BMPs that can be initiated right away, require minimal cost or planning, address the upstream sources / causes of a downstream problem. Usually non-structural BMPs such as source controls, education, good housekeeping activities, ordinance updates, etc.
- Phase II:** BMPs that require significant planning and development or design specifications, require major costs, address sources / causes of a problem. Can be structural or non-structural BMPs, including new projects / programs, studies, construction of detention ponds or wetlands, etc.
- Phase III:** BMPS for which success may depend on the success of a previously implemented BMP. Usually structural, such as in-stream habitat improvements after flow improvements have been made; pond or lake dredging after watershed-wide nutrient or sedimentation reduction efforts are in place, etc.

Table 5.3 identifies the most suitable phase associated with each proposed Clinton Main BMP.

**Table 5.3: Best Management Practice Phasing**

Best Management Practices/ Actions	PHASE I	PHASE II	PHASE III
1. Review and Update Ordinances that Impact Water Resources as Applicable	X		
2. Review and Update Master Plan as Applicable	X		
3. Preserve Natural Areas	X		
4. Review and Update Storm Water Management Design Standards	X		
5. Downspout/Sump Pump Disconnection Programs		X	
6. Footing Drain Disconnection Program		X	
7. Log Jam Inventory and/or Management	X		
8. Streambank Stabilization Program		X	
9. Household Hazardous Waste Collection Program	X		
10. Habitat Improvement Program		X	
11. Promote and Encourage Riparian Best Management Practices	X		
12. Storm Water BMP Maintenance and/or Retrofit Programs		X	X
13. OSDS Maintenance Program	X		
14. Natural Areas Restoration/Enhancement Program			X
15. Implement and/or Improve Inspection/Enforcement of SESC	X		

Best Management Practices/ Actions	PHASE I	PHASE II	PHASE III
16. Water Level Structure Control Committee		X	
17. Natural Features Protection Plan/Inventory/Assessments	X		
18. Greenway Plan	X		
19. Recreation Plan	X		
20. Sanitary Sewer Master Plan	X		
21. Water Quality Monitoring	X		
22. Continue to implement actions from approved PEP Plans	X		
23. Pet Waste Management	X		
24. Training/Inspection Program for Staff and Contractors	X		
25. Catch Basin Inspection and Maintenance	X		
26. Maintenance of Swales	X		
27. Fleet Maintenance Activities	X		
28. Street and Parking Lot/Pavement Sweeping	X		
29. Salt Storage and Application	X		
30. Golf Course Management	X		
31. Grounds and Facilities Maintenance	X		

These BMPs/Management Alternatives/Actions have been further evaluated for applicability to the various subbasins as well as applicability for implementation by each of the subwatershed representatives. In addition, Table 5.1 represents subset BMPs of a majority of the above actions. In fact, Actions 1, 4, 7, 8, 10, 11, 12, 14, 15, 17 and 18 include, as appropriate, BMPs listed in Table 5.1. Each subwatershed representative will incorporate features from Table 5.1 through implementation of the above management alternatives based on their respective suitability and application. Table 5.4 below identifies Recommended Management Alternatives (BMPs) by Critical Subbasin within the Clinton Main Subwatershed.

Table 5.4 Recommended Management Alternatives/Actions by Subbasin

Clinton Main Subbasin ID (Field Survey Site IDs in Subbasin)	Subwatershed Representatives	Preservation/Restoration Category	Recommended Alternatives/Actions (BMP Phase 1)	Recommended Alternatives/Actions (BMP Phase II)	Recommended Alternatives/Actions (BMP Phase III)
1	Orchard Lake Village; Waterford Township; West Bloomfield Township; Oakland County	Preservation Category 1	1, 2, 3, 4, 9, 11, 13, 15, 17, 18, 19, 20, 22, 24, 25, 26, 28, 31	6, 10, 12, 16	12, 14
2	Keego Harbor; Orchard Lake Village; Sylvan Lake; Waterford Township; West Bloomfield Township; Oakland County	Preservation Category 1	1, 2, 4, 9, 11, 13, 15, 19, 20, 21, 22, 23, 24, 25, 26, 28, 31	12, 16,	12, 14
3	Pontiac; Waterford Township; Oakland County	Restoration Category 3	1, 2, 4, 11, 13, 15, 17, 18, 19, 21, 22, 23, 24, 25, 26, 28, 31	8, 10, 16	14
4	Auburn Hills; Bloomfield Township; Pontiac; Rochester Hills; Oakland County	Restoration Category 3	1, 4, 7, 11, 15, 17, 18, 19, 21, 22, 23, 24, 25, 27, 28, 31	5, 6, 8, 10	14
5	Rochester; Rochester Hills; Oakland County	Preservation/Restoration Category 2	1, 4, 7, 11, 17, 18, 19, 22, 23, 24, 25, 26, 28, 31	8, 10, 12	12, 14
6	Rochester Hills; Oakland County	Preservation Category 1	2, 7, 9, 11, 17, 18, 19, 22, 23, 24, 25, 26, 28, 31	8, 10, 12	12, 14
7	Rochester; Rochester Hills; Oakland County	Preservation Category 1	2, 7, 9, 11, 17, 18, 19, 22, 23, 24, 25, 26, 28, 31	8, 10, 12	12, 14

Table 5.4 (cont) Recommended Management Alternatives/Actions by Subbasin

Clinton Main Subbasin ID (Field Survey Site IDs in Subbasin)	Subwatershed Representatives	Preservation/Restoration Category	Recommended Alternatives/Actions (BMP Phase 1)	Recommended Alternatives/Actions (BMP Phase II)	Recommended Alternatives/Actions (BMP Phase III)
8	Rochester; Rochester Hills; Oakland County	Preservation Category 1	2, 7, 9, 11, 17, 18, 19, 22, 23, 24, 25, 26, 28, 31	8, 10, 12	12, 14
10	Rochester; Rochester Hills; Oakland County	Preservation/Restoration Category 2	2, 7, 9, 11, 17, 18, 19, 22, 23, 24, 25, 26, 28, 31	8, 10, 12	12, 14
11	Auburn Hills; Oakland University; Rochester Hills; Pontiac; Oakland County	Preservation/Restoration Category 2	1, 2, 3, 4, 7, 17, 18, 19, 21, 22, 24, 25, 26, 27, 28, 30, 31	8, 10, 12	12, 14
12	Auburn Hills; Orion Township; Rochester Hills; Pontiac; Oakland County	Preservation Category 1	1, 2, 3, 4, 7, 9, 11, 13, 15, 17, 20, 22, 23, 24, 25, 26, 28, 31	8, 10, 12	12, 14
13	Auburn Hills; Pontiac; Orion Township; Oakland County	Preservation/Restoration Category 2	1, 2, 3, 4, 7, 9, 11, 13, 15, 17, 20, 22, 23, 24, 25, 26, 28, 31	8, 10, 12	12, 14
14	Pontiac; Waterford Township; Oakland County	Restoration Category 3	4, 9, 11, 17, 18, 21, 22, 23, 24, 25, 28, 31	5, 6, 8, 10, 12	12, 14
15	Waterford Township; Oakland County	Restoration Category 3	1, 4, 11, 21, 22, 25, 26, 28	5, 10	14
16	Waterford Township; Sylvan Lake; Oakland County	Preservation Category 1	1, 2, 4, 11, 15, 17, 18, 19, 21, 22, 23, 24, 25, 26, 28, 31	8, 10, 16	14

Based on Tables 5.3 and 5.4, subwatershed, individual representatives evaluated all of the management alternatives and actions and subsequently identified applicable commitments for implementation. Table 5.5 Subwatershed Community Action Matrix outlines these commitments. General timeframes for these commitments are defined as follows:

- ❖ E = Ongoing/Current: This commitment describes an action / management alternative already in process. Specific completion dates are anticipated to be included within the representatives' respective SWPPIs.
- ❖ P = Planned within 5 Years: This commitment describes an action / management alternative that will be completed within 5 years or generally the term of the General Storm Water Permit. Since each representative must determine their own specific resources and timeframes for implementation, it is anticipated, similar to "E" above, that specific completion dates will be identified within the representatives' respective SWPPIs.
- ❖ L = Planned after 5 Years: Although this commitment timeframe does not have a specific end date, it is anticipated that during the course of any WMP update these commitments will be updated and most long-term actions will become planned or ongoing/current actions.
- ❖ CS = County Standards Applied: Due to the fact that there are multiple legal jurisdictions within a specific community's boundaries, this designation applies to those actions in which communities do not have authority.
- ❖ NA = Not Applicable: This defines an action to be not applicable for a specific representative. Reasons for this designation vary; however, those justifications are defined separately during the WMP review process.
- ❖ WL = Wish List: This designation determines items that are important from a watershed planning perspective; however, they will be implemented only if grant funding is available.

The long-term planning of these watershed actions recognizes that as these actions are implemented in both the short and long-term, improvements will be observed throughout the Clinton Main subwatershed. Interim goals for these subwatershed-wide improvements are based on implementation and level of effort of these management alternatives and actions by the various responsible entities. Table 5.6 Action Matrix Details identifies the subwatershed cost estimates, resources, level of effort and associated milestones that will be observed throughout the long-term implementation of this subwatershed management plan. This table also outlines the suggested methods of evaluation for the management alternatives.

The Plan, and its long and short-term goals and selected BMPs, is a long-term, iterative process whereby communities and agencies involved with the plan will modify aspects of the documents as they learn more about what works best and what BMPs are most needed to protect and restore the subwatershed. The Clinton Main Subwatershed communities will do bi-annual reviewing of the plan. During review, new data and information will be explored and a decision to revise (or not to revise) the plan will be made.

In addition to these categories of projects, more specifically-defined projects have been identified that are above and beyond NPDES Phase II permit requirements, but are necessary for demonstrated improvements to the Clinton Main river. These specific projects, their respective categories, pollutant and volume reductions, cost-estimates and milestones are outlined following Table 5.6.

**Table 5.5 Subwatershed Community Action Matrix**

E = Ongoing /Current	L = Planned After 5 Years	CS = County Standards Applied
P = Planned Within 5 Years	WL = Wish List	NA = Not Applicable

Action/Management Alternative	Auburn Hills	Avondale Schools	Bloomfield Township	Keego Harbor	City of Lake Angelus	Oakland County	Oakland University	Orchard Lake Village	Orion Township	Pontiac	Rochester	Rochester Hills	Rochester Schools	Sylvan Lake	Waterford Township	West Bloomfield Township
1. Review and Update Ordinances that Impact Water Resources as Applicable	E	NA	E	E	E	E	E	E	P	P	E	E	NA	E	E	E
2. Review and Update Master Plans as Applicable	E	NA	E	E	WL	E	L	NA	L	L	E	E	NA	E	E	E
3. Preserve Natural Areas	E	NA	E	E	E	E	P	P	NA	WL	E	P	NA	E	E	E
4. Review & Update Storm Water Management Design Standards	E	P	E,P	E	NA	E	P	P	P	E	E	E	L	E	E	E
5. Downspout/Sump Pump Disconnection Programs	E	WL	E	E	NA	NA	WL	NA	NA	WL	NA	WL	WL	E	E	E

Action/Management Alternative	Auburn Hills	Avondale Schools	Bloomfield Township	Keego Harbor	City of Lake Angelus	Oakland County	Oakland University	Orchard Lake Village	Orion Township	Pontiac	Rochester	Rochester Hills	Rochester Schools	Sylvan Lake	Waterford Township	West Bloomfield Township
6. Footing Drain Disconnection Program	E	WL	E	E	NA	NA	WL	NA	NA	WL	NA	WL	WL	E	E	E
7. Log Jam Inventory and/or Management	E	NA	NA	NA	NA	WL	WL	NA	NA	WL	WL	E	P	NA	WL	NA
8. Streambank Stabilization Program	NA	NA	NA	NA	NA	WL	E	NA	NA	WL	L	WL	P	NA	WL	NA
9. Household Hazardous Waste Collection Program	E	E	E	NA	E	E	E	E	E	E	E	E	E	E	E	E
10. Habitat Improvement Program	NA	P	NA	NA	NA	WL	E	NA	NA	WL	WL	NA	P	NA	WL	E
11. Promote and Encourage Riparian Best Management Practices	E	L	NA	P	E	E	E	E	NA	E	L	E	L	P	E	E
12. Storm Water BMP Maintenance and/or Retrofit Programs	E	P	NA	CS	NA	WL	P	E	E	E	E	WL	P	E	E	NA
13. OSDS Maintenance Program	CS	CS	CS	CS	E	E	P	CS	CS	CS	CS	CS	CS	CS	CS	E

Action/Management Alternative	Auburn Hills	Avondale Schools	Bloomfield Township	Keego Harbor	City of Lake Angelus	Oakland County	Oakland University	Orchard Lake Village	Orion Township	Pontiac	Rochester	Rochester Hills	Rochester Schools	Sylvan Lake	Waterford Township	West Bloomfield Township
14. Natural Areas Restoration/ Enhancement Program	NA	P	E	NA	E	E	P	WL	NA	WL	WL	WL	P	NA	WL	E
15. Implement and/or Improve Inspection/ Enforcement of SESC	CS	CS	CS	CS	E	E	CS	CS	E	E	CS	CS	CS	NA	CS	E
16. Water Level Structure Control Committee	E	NA	NA	P	E	P	WL	P	NA	P	E	WL	WL	E	CS	NA
17. Natural Features Protection Plan/Inventory/ Assessments	NA	WL	E	E	E	E	E	E	WL	WL	WL	E	P	E	WL	E
18. Greenway Plan	NA	NA	NA	E	NA	P	NA	P	P	L	E	E	NA	E	E	NA
19. Recreation Plan	E	NA	NA	E	NA	P	NA	E	L	E	E	E	NA	E	L	NA
20. Sanitary Sewer Master Plan	E	NA	E	CS	NA	CS	P	CS	WL	E	E	E	NA	E	E	E
21. Water Quality Monitoring	E	E	NA	P	E	E	E	P	NA	E	P	E	E	E	E	P

Action/Management Alternative	Auburn Hills	Avondale Schools	Bloomfield Township	Keego Harbor	City of Lake Angelus	Oakland County	Oakland University	Orchard Lake Village	Orion Township	Pontiac	Rochester	Rochester Hills	Rochester Schools	Sylvan Lake	Waterford Township	West Bloomfield Township
22. Continue to Implement Actions from Approved PEP Plans	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
23. Pet Waste/Waterfowl Management	E	E	E	E	E	P	E	E	E	E	E	E	NA	E	E	E
24. Training/Inspection Program for Staff and Contractors	E	E	E	E	E	E	E	E	P	E	E	E	E	E	P	E
25. Catch Basin Inspection and Maintenance	E	E	NA	CS	NA	E	E	E	NA	E	E	E	E	E	E	P
26. Maintenance of Swales	E	E	NA	P	NA	E	E	E	NA	NA	NA	E	E	E	E	NA
27. Fleet Maintenance Activities	E	E	E	P	E	E	E	E	NA	E	P	E	P	E	P	E
28. Street & Parking Lot/Pavement Sweeping	E	E	NA	E	NA	E	E	E	NA	E	E	E	E	E	E	P
29. Salt Storage & Application	E	E	E	P	NA	E	E	E	NA	E	E	E	E	NA	NA	NA

Action/Management Alternative	Auburn Hills	Avondale Schools	Bloomfield Township	Keego Harbor	City of Lake Angelus	Oakland County	Oakland University	Orchard Lake Village	Orion Township	Pontiac	Rochester	Rochester Hills	Rochester Schools	Sylvan Lake	Waterford Township	West Bloomfield Township
30. Golf Course Management	E	NA	NA	NA	NA	E	E	NA	NA	E	NA	N/A	NA	NA	WL	NA
31. Grounds and Facilities Maintenance	E	E	E	E	E	E	E	E	NA	E	E	E	E	E	P	E

**Table 5.6 Action Matrix Details (Cost, Evaluation, Level of Effort and Interim Milestones)**

Watershed Management Alternatives/Actions/Best Management Practices	Estimated Cost and Technical/Financial Assistance*	Methods of Evaluation	Level of Effort (Number below Indicates Percent (%) of Total Representatives)					Overall Subwatershed Interim Milestones
			Ongoing Activity	Completed in < 5 years	Completed in > 5 years	Not Applicable or County Standard	Wish List (Eligible for Grant Funding; Non-Phase II)	
<b>1. Review and Update Ordinances that Impact Water Resources as Applicable</b>	Using existing templates tailor to individual community needs. \$2,000 - \$12,000 per ordinance depending on level of detail. (Subwatershed Representative and Consultant Assistance)	Municipalities are in various stages of adopting/updating these types of ordinances.	69	13		13		82% completion & participation within 5 years
<b>2. Review and Update Master Plans as Applicable</b>	\$5,000-\$20,000 Master Plan (Subwatershed Representative and Consultant Assistance)	Completed Master Plan	56		19	19		56% currently reviewing Master Plans with anticipated completion in next 3 years.

Watershed Management Alternatives/Actions/Best Management Practices	Estimated Cost and Technical/Financial Assistance*	Methods of Evaluation	Level of Effort (Number below Indicates Percent (%) of Total Representatives)					Overall Subwatershed Interim Milestones
			Ongoing Activity	Completed in < 5 years	Completed in > 5 years	Not Applicable or County Standard	Wish List (Eligible for Grant Funding; Non-Phase II)	
<b>3. Preserve Natural Areas</b>	Community staff at \$60/hour or consultant assistance at \$150/hr; Some projects may also be completed by volunteers. (Subwatershed Representative and Consultant Assistance)	Areas are preserved through private efforts, coordination with municipalities and/or Oakland Land Conservancy.	50	19		25		50% currently in process and 69% anticipate completion within 5 years.
<b>4. Review &amp; Update Storm Water Management Design Standards</b>	Using existing templates tailor to individual community needs. \$2,000 - \$12,000 depending on level of detail.	Completed design standards.	63	25	6			63% are currently updating with a total of 88% complete in 5 years.

Watershed Management Alternatives/Actions/Best Management Practices	Estimated Cost and Technical/Financial Assistance*	Methods of Evaluation	Level of Effort (Number below Indicates Percent (%) of Total Representatives)					Overall Subwatershed Interim Milestones
			Ongoing Activity	Completed in < 5 years	Completed in > 5 years	Not Applicable or County Standard	Wish List (Eligible for Grant Funding; Non-Phase II)	
<b>5. Downspout/Sump Pump Disconnection Programs</b>	Using existing templates tailor to individual community needs. \$2,000 - \$12,000 depending on level of program detail. Implementation costs vary widely from \$50 for simple downspout disconnects to \$5,000 for elaborate sump pump disconnect.	Completed program development.	38			25	31	38% have ongoing programs.

Watershed Management Alternatives/Actions/Best Management Practices	Estimated Cost and Technical/Financial Assistance*	Methods of Evaluation	Level of Effort (Number below Indicates Percent (%) of Total Representatives)					Overall Subwatershed Interim Milestones
			Ongoing Activity	Completed in < 5 years	Completed in > 5 years	Not Applicable or County Standard	Wish List (Eligible for Grant Funding; Non-Phase II)	
<b>6. Footing Drain Disconnection Program</b>	Using existing templates tailor program to individual community needs. \$2,000 - \$12,000 depending on level of detail. Implementation costs vary widely.	Completed program development.	38			25	31	38% have ongoing programs.
<b>7. Log Jam Inventory and/or Management</b>	Community staff at \$60/hour; equipment costs range from \$80 - \$150/hour. Some projects may also be completed by volunteers with community oversight. (Subwatershed Representative and Consultant Assistance)	Project sites are prioritized and projects completed. Measure: number of sites restored, monitoring results.	13	6		50	25	19% of representatives will have programs / participation within 5 years.

Watershed Management Alternatives/Actions/Best Management Practices	Estimated Cost and Technical/Financial Assistance*	Methods of Evaluation	Level of Effort (Number below Indicates Percent (%) of Total Representatives)					Overall Subwatershed Interim Milestones
			Ongoing Activity	Completed in < 5 years	Completed in > 5 years	Not Applicable or County Standard	Wish List (Eligible for Grant Funding; Non-Phase II)	
<b>8. Streambank Stabilization Program</b>	Bioengineering costs range from \$20 - \$120 per lineal foot; road crossings may require structural improvements at higher costs; additional stream surveys at \$3,000 per stream mile. (Subwatershed Representative; Consultant; CRWC and Volunteers)	Road crossings ranked thru existing surveys; other areas to survey; document lineal footage of streambank stabilized and address flow reduction upstream; lbs of sediment reduced from stabilization.	6	6	6	50	25	19% will have programs within 5 years.
<b>9. Household Hazardous Waste Collection Program</b>	Costs vary depending on whether municipalities are participating in a partnership or establishing their own program. \$5k - \$50k per year. (Subwatershed Representative)	Community develops, implements and/or participates in an existing program.	81			6		88% have ongoing programs.

Watershed Management Alternatives/Actions/Best Management Practices	Estimated Cost and Technical/Financial Assistance*	Methods of Evaluation	Level of Effort (Number below Indicates Percent (%) of Total Representatives)					Overall Subwatershed Interim Milestones
			Ongoing Activity	Completed in < 5 years	Completed in > 5 years	Not Applicable or County Standard	Wish List (Eligible for Grant Funding; Non-Phase II)	
<b>10. Habitat Improvement Program</b>	Costs may be incorporated into the streambank stabilization activities; vary depending on type and size of project. \$40-\$60/hour/representative; \$100-\$150/hour consultant. (Subwatershed Representative; CRWC; Consultant and Volunteers)	Sites are identified and prioritized; number of sites/amount of stream habitat restored; monitoring results	13	13		50	19	26% will have ongoing programs within 5 years.
<b>11. Promote and Encourage Riparian Best Management Practices</b>	Community staff at \$60/hour or consultant assistance at \$150/hr; Some projects may also be completed by volunteers. (Subwatershed Representative and Consultant Assistance)	Riparian BMPs are implemented on private properties.	50	13	13	13		63% will have ongoing practices within 5 years; 50% have ongoing activities.

Watershed Management Alternatives/Actions/Best Management Practices	Estimated Cost and Technical/Financial Assistance*	Methods of Evaluation	Level of Effort (Number below Indicates Percent (%) of Total Representatives)					Overall Subwatershed Interim Milestones
			Ongoing Activity	Completed in < 5 years	Completed in > 5 years	Not Applicable or County Standard	Wish List (Eligible for Grant Funding; Non-Phase II)	
12. Storm Water BMP Maintenance and/or Retrofit Programs	Incorporate maintenance requirements into ordinance and/or standards; actual maintenance varies; \$1,000 - \$50,000 depending on maintenance needs(erosion repair, riprap repair, dredging, buffer construction, native plant enhancement, outlet repair, embankment repair, unclogging of structures) (Subwatershed Representative and Consultant Assistance)	Community includes a section within the Storm Water Management Ordinance that requires detention basin maintenance both during construction and after appropriate long-term owners take over responsibility for the basin; creates a final draft through a series of input meetings, and adopts it.	44	19		19	13	63% will have ongoing programs within 5 years.

Watershed Management Alternatives/Actions/Best Management Practices	Estimated Cost and Technical/Financial Assistance*	Methods of Evaluation	Level of Effort (Number below Indicates Percent (%) of Total Representatives)					Overall Subwatershed Interim Milestones
			Ongoing Activity	Completed in < 5 years	Completed in > 5 years	Not Applicable or County Standard	Wish List (Eligible for Grant Funding; Non-Phase II)	
<b>13. OSDS Maintenance Program</b>	Research and develop rules and technical guidelines for property owners. 80-120 hours @ \$100-\$150/hour (consultant). \$3,000 legal review and \$10,000 per year for coordination of program. (Subwatershed Representative and Consultant Assistance)	County jurisdiction and potentially initiates development of the ordinance and adopts.	13	6		75		County primary jurisdiction with 2 additional representatives implementing programs within 5 years.
<b>14. Natural Areas Restoration/ Enhancement Program</b>	~\$15,000-\$50,000 per community depending on size and whether field surveys are utilized. (Subwatershed Representative and Consultant Assistance)	Plan is prepared and utilized during site planning review processes.	19	19		31	25	38% programs development within 5 years.

Watershed Management Alternatives/Actions/Best Management Practices	Estimated Cost and Technical/Financial Assistance*	Methods of Evaluation	Level of Effort (Number below Indicates Percent (%) of Total Representatives)					Overall Subwatershed Interim Milestones
			Ongoing Activity	Completed in < 5 years	Completed in > 5 years	Not Applicable or County Standard	Wish List (Eligible for Grant Funding; Non-Phase II)	
<b>15. Implement and/or Improve Inspection/ Enforcement of SESC</b>	Increased staffing and enforcement - approximately \$50,000 per year. (Subwatershed Representative)	Community/county expands inspection/enforcement program. Track number of complaints/violations and enforcement actions.	25			69		25% have ongoing programs while most rely on County.
<b>16. Water Level Structure Control Committee</b>	Community staff at \$60/hour and/or consultants at \$150/hour (Subwatershed Representatives and Consultant Assistance)	Document participation, input and goals developed from committee.	19	25		50	19	39% participation in committee within 5 years.

Watershed Management Alternatives/Actions/Best Management Practices	Estimated Cost and Technical/Financial Assistance*	Methods of Evaluation	Level of Effort (Number below Indicates Percent (%) of Total Representatives)					Overall Subwatershed Interim Milestones
			Ongoing Activity	Completed in < 5 years	Completed in > 5 years	Not Applicable or County Standard	Wish List (Eligible for Grant Funding; Non-Phase II)	
<b>17. Natural Features Protection Plan/Inventory/ Assessments</b>	~\$15,000-\$50,000 per community depending on size and whether field surveys are utilized. (Subwatershed Representative and Consultant Assistance)	Plan is prepared and utilized during site planning review processes.	44	6		13	31	50% implementation within 5 years.
<b>18. Greenway Plan</b>	Staff time from Oakland County and community participation. \$100/hour with approximately 80 hours/community. (Subwatershed Representatives and Assistance from Counties)	Overall map is created as a guiding document for long-term planning efforts.	25	19		50		44% implementation within 5 years; however, County taking lead so majority of Clinton Main area will have plan within 5 years.

Watershed Management Alternatives/Actions/Best Management Practices	Estimated Cost and Technical/Financial Assistance*	Methods of Evaluation	Level of Effort (Number below Indicates Percent (%) of Total Representatives)					Overall Subwatershed Interim Milestones
			Ongoing Activity	Completed in < 5 years	Completed in > 5 years	Not Applicable or County Standard	Wish List (Eligible for Grant Funding; Non-Phase II)	
19. Recreation Plan	\$5,000-\$20,000 Recreation Plan (Subwatershed Representative and Consultant Assistance)	Completed recreation plan	44	6	13	50		50% plan development within 5 years.
20. Sanitary Sewer Master Plan	\$5,000-\$20,000 Master Plan (Subwatershed Representative and Consultant Assistance)	Completed Master Plan	50	6		31	6	56% plan development within 5 years, most others rely on County.
21. Water Quality Monitoring	Volunteer monitoring \$15,000 annually; long-term water quality sampling program \$200,000; long-term modeling efforts \$150,000. (CRWC Assistance)	Volunteer monitoring ongoing-track progress; long-term dependent on funding availability.	56	25		13		Participation in program increase to 81% within 5 years.

Watershed Management Alternatives/Actions/Best Management Practices	Estimated Cost and Technical/Financial Assistance*	Methods of Evaluation	Level of Effort (Number below Indicates Percent (%) of Total Representatives)					Overall Subwatershed Interim Milestones
			Ongoing Activity	Completed in < 5 years	Completed in > 5 years	Not Applicable or County Standard	Wish List (Eligible for Grant Funding; Non-Phase II)	
22. Continue to Implement Actions from Approved PEP Plans	\$10,000-\$11,000 per year for entire subwatershed; cost for each community is based on land area and population size. Additional in-kind services to be provided by communities, such as newsletters, cable TV coverage, etc. (Subwatershed Representative; CRWC and Consultant Assistance)	Number of events; number of participants; pre-/post-surveys; monitoring results.	94					94% ongoing activity as required activity.

Watershed Management Alternatives/Actions/Best Management Practices	Estimated Cost and Technical/Financial Assistance*	Methods of Evaluation	Level of Effort (Number below Indicates Percent (%) of Total Representatives)					Overall Subwatershed Interim Milestones
			Ongoing Activity	Completed in < 5 years	Completed in > 5 years	Not Applicable or County Standard	Wish List (Eligible for Grant Funding; Non-Phase II)	
<b>23. Pet Waste/Waterfowl Management</b>	Brochure printing: \$0.25 - \$1 each. Border Collie program - 80-120 hours @ \$100-\$150/hr to develop. Once in place requires 20-40 hrs/month. Park / common area signage additional. (Subwatershed Representative; CRWC and Consultant Assistance)	Number of individuals reached / personal observation; quantity of materials distributed; pre-/ post-survey results; monitoring results.	81	6		6		81% participation as a required activity; another 6% within 5 years.

Watershed Management Alternatives/Actions/Best Management Practices	Estimated Cost and Technical/Financial Assistance*	Methods of Evaluation	Level of Effort (Number below Indicates Percent (%) of Total Representatives)					Overall Subwatershed Interim Milestones
			Ongoing Activity	Completed in < 5 years	Completed in > 5 years	Not Applicable or County Standard	Wish List (Eligible for Grant Funding; Non-Phase II)	
<b>24. Training/Inspection Program for Staff and Contractors</b>	Varies by activity; may include workshops, brochures, etc. \$40-\$60/hour/representative; \$100-\$150/hour consultant. \$10/hour volunteer. (Subwatershed Representative; CRWC and Consultant Assistance)	Number / type of programs / materials distributed; documentation of changes in practices.	81	13				81% participation currently as required activity; another 13% within 5 years.
<b>25. Catch Basin Inspection and Maintenance</b>	Dependent on number of catch basins; \$30\$40/hour operator at approximately 1 hour per catch basin; Additional disposal costs if necessary. (Subwatershed Representative)	Miles of streets swept or parking lot areas; # of catch basins cleaned; lbs/tons material captured; or number of truckloads.	63	6		25		63% as ongoing activity as a requirement; another 6% within 5 years.

Watershed Management Alternatives/Actions/Best Management Practices	Estimated Cost and Technical/Financial Assistance*	Methods of Evaluation	Level of Effort (Number below Indicates Percent (%) of Total Representatives)					Overall Subwatershed Interim Milestones
			Ongoing Activity	Completed in < 5 years	Completed in > 5 years	Not Applicable or County Standard	Wish List (Eligible for Grant Funding; Non-Phase II)	
26. Maintenance of Swales	Dependent on area of swales; \$30-\$40/hour operator with 2 operators. (Subwatershed Representative)	Miles of swales cleaned; lbs of material removed.	50	6		38		50% participation ongoing with another 6% in 5 years.
27. Fleet Maintenance Activities	Varies by activity; may include workshops, brochures, etc. \$40-\$60/hour/representative; \$100-\$150/hour consultant. (Subwatershed Representative; CRWC and Consultant Assistance)	Number / type of programs / materials distributed; documentation of changes in practices.	63	25		6		63% ongoing participation as a required activity with another 25% within 5 years.

Watershed Management Alternatives/Actions/Best Management Practices	Estimated Cost and Technical/Financial Assistance*	Methods of Evaluation	Level of Effort (Number below Indicates Percent (%) of Total Representatives)					Overall Subwatershed Interim Milestones
			Ongoing Activity	Completed in < 5 years	Completed in > 5 years	Not Applicable or County Standard	Wish List (Eligible for Grant Funding; Non-Phase II)	
28. Street & Parking Lot/Pavement Sweeping	\$50,000 Per year lease; \$30\$40/hour operator for 150 days/year; Mechanical broom sweeper \$100k; Vacuum Sweeper \$150k - \$250k; \$250 - \$1000 per catch basin insert. (Subwatershed Representative)	Miles of streets swept or parking lot areas; # of catch basins cleaned; lbs/tons material captured; or number of truckloads.	63	6		19		69% ongoing as a required activity with another 6% within 5 years.

Watershed Management Alternatives/Actions/Best Management Practices	Estimated Cost and Technical/Financial Assistance*	Methods of Evaluation	Level of Effort (Number below Indicates Percent (%) of Total Representatives)					Overall Subwatershed Interim Milestones
			Ongoing Activity	Completed in < 5 years	Completed in > 5 years	Not Applicable or County Standard	Wish List (Eligible for Grant Funding; Non-Phase II)	
<b>29. Salt Storage &amp; Application</b>	Requires adjustment of application rates and recalibration of equipment. Calcium chloride \$20/land mile extra, CMA \$65 / lane mile extra compared with salt. \$40-\$60/hour/representative; \$100-\$150/hour consultant. (Subwatershed Representative and Consultant Assistance)	Community / county reviews and modifies practices.	63	6		25		63% as ongoing required activity with another 6% in 5 years.

Watershed Management Alternatives/Actions/Best Management Practices	Estimated Cost and Technical/Financial Assistance*	Methods of Evaluation	Level of Effort (Number below Indicates Percent (%) of Total Representatives)					Overall Subwatershed Interim Milestones
			Ongoing Activity	Completed in < 5 years	Completed in > 5 years	Not Applicable or County Standard	Wish List (Eligible for Grant Funding; Non-Phase II)	
<b>30. Golf Course Management</b>	Varies depending on activity (may include workshops, mailings, site visits). \$40-\$60/hour/representative; \$100-\$150/hour consultant. (Subwatershed Representative and Consultant Assistance)	Golf courses develop and implement management programs.	25			63	6	25% as ongoing activity; most others do not own golf courses.
<b>31. Grounds and Facilities Maintenance</b>	Varies by activity; may include workshops, brochures, etc. \$40-\$60/hour/representative; \$100-\$150/hour consultant. (Subwatershed Representative; CRWC and Consultant Assistance)	Number / type of programs / materials distributed; documentation of changes in practices.	82	6		6		25% as ongoing activity.

### 5.3 Non-NPDES Phase II Permit Priority Preservation/Restoration Projects

As previously mentioned, there are numerous actions that work towards improving water resources in the Clinton Main subwatershed and the overall Clinton River Watershed. These projects are identified separately in order to qualify for eligibility under the EPA Section 319 grant funding program. While similar categories of information are required for both for Phase II and Non-Phase II activities, these projects are called-out in this section separately so as to clearly identify them as 319 projects. Priorities were established by the Clinton Main Subwatershed Group in December 2009. The prioritized best management practice categories and associated projects for implementation over the short-term (5 – 10 years) are identified as follows:

#### 1. Storm Water Enhancements/Retrofits

- Land Cover Classifications Analysis
- Downspout Disconnect
- Detention Pond Retrofits
- Athletic Field Retrofits
- Porous Pavement
- Regional Detention/Wetland Basins
- Rain Gardens
- Bioswales

#### 2. Stabilization Projects

- Streambank
- Lakeshore
- Outfall
- Easement Acquisition

#### 3. Recreational Enhancements

- Easement Acquisition
- River/Lake Access

#### 4. Habitat Restoration

- Easement Acquisition
- Wetland Restoration/Enhancement
- Invasive Species Management

#### 5. Preservation

- Easement Acquisition

Table 5.7a Clinton Main Proposed Projects Prioritized by Community below identifies the specific BMP projects that have been targeted for implementation over the short-term. The "Priority BMP Category" reflects the priorities listed above, followed by individual prioritization by subwatershed representative.

In order to further evaluate benefits of the proposed projects, a number of approaches were utilized, including the following:

- An estimate of existing storm water runoff volume across the subwatershed was developed that includes both runoff volume during a 2-year, 24-hour event and annual runoff. These estimates are strictly based on the curve number method and an annual rainfall of thirty-two (32)-inches per year and an average runoff coefficient of 0.7. See Table 5.7b. Clinton Main Storm Water Runoff Volume – Existing Conditions.
- Table 5.7c. Clinton Main Annual Storm Water Runoff Volume, Total Phosphorus Loading & Total Phosphorus Loading Reduction Targets shows the annual total phosphorus load estimate along with the estimated phosphorus reduction from the above mentioned projects. These loading estimates were based on the PLOAD analysis described earlier in the watershed plan. The loading reduction estimates were determined from the Center for Watershed Protection spreadsheet tool or the Oakland County Site Evaluation Tool developed as part of the Clinton River project.
- Table 5.7d. Clinton Main Annual Storm Water Runoff Volume, Total Nitrates/Nitrites Loading & Total Nitrates/Nitrites Loading Reduction Targets shows the annual total nitrogen load estimate along with the estimated total nitrogen reduction from the above mentioned projects. The loading reduction estimates were determined from the Center for Watershed Protection spreadsheet tool or the Oakland County Site Evaluation Tool developed as part of the Clinton River project.
- Table 5.7e. Clinton Main Annual Storm Water Runoff Volume, Total Suspended Solids Loading & Total Suspended Solids Loading Reduction Targets shows the annual total suspended solids loading along with the estimated total suspended solids loading reduction from the above mentioned projects. The loading estimates and loading reduction estimates were calculated similarly to the previous pollutants.

Table 5.7f outlines the Pollutants/Threats, Sources and Causes that are addressed by each of these priority projects. Table 5.7g shows the volume and pollutant loading reductions for each project, if applicable. It should be noted that not all projects can specifically estimate direct pollutant loading reduction benefits; however, these projects are still highly valuable in working towards improving water resources. Table 5.7h outlines the individual project costs, schedule, milestones and methods of evaluation. A total estimate of these projects for watershed restoration and preservation is on the order of \$13 million. All of these tables referenced are located at the end of this chapter.

#### 5.4 Available Technical Resources from Partner Organizations

There are many local resources to help further understand and implement the more than 130 different BMPs that can potentially be used to restore urban subwatersheds. Below are a few of the organizations currently working within the Clinton River Watershed:

- Clinton River Watershed Council ([www.crowc.org](http://www.crowc.org))
- Clinton River Remedial Action Committee (<http://www.epa.gov/glnpo/aoc/clinriv.html>)
- Southeast Michigan Council of Governments ([www.semcog.org](http://www.semcog.org))
- Michigan Department of Environment ([www.michigan.gov/deq](http://www.michigan.gov/deq))
- Michigan Department of Natural Resources ([www.michigan.gov/dnr](http://www.michigan.gov/dnr))
- Oakland County Water Resources Commissioner's Office ([www.oakgov.com/drain/](http://www.oakgov.com/drain/))
- Oakland County Planning & Environment ([www.oakgov.com/peds/info\\_pub/planning\\_and\\_enviromental\\_infoandpubs.html](http://www.oakgov.com/peds/info_pub/planning_and_enviromental_infoandpubs.html))
- United States Environmental Protection Agency – Region 5 ([www.epa.gov/region5/](http://www.epa.gov/region5/))

- ◆ United State Army Corp of Engineers Great Lakes & Ohio River Division ([www.lrd.usace.army.mil/](http://www.lrd.usace.army.mil/))

## 5.5 Potential Funding Sources

The following are some of the possible funding sources such as grants, loans, and cost share programs, available to stakeholder agencies and non-governmental organizations for watershed management. This list is not exhaustive. Information on these funding sources can be found on the Internet or by contacting the agency.

### Agricultural

- ◆ Agriculture in Concert with the Environmental Program (USDA)
- ◆ Watershed Protection and Flood Prevention Program (USDA)
- ◆ Conservation Reserve Program (NRCS)
- ◆ Wetlands Reserve Program (NRCS)
- ◆ Wildlife Habitat Incentive Program (NRCS)
- ◆ Forestry Incentives Program (NRCS)
- ◆ Environmental Quality Incentives Program (NRCS)
- ◆ Farmland Protection Program (USDA)
- ◆ Debt for Nature (Farm Service Agency)
- ◆ SARE Producer Grant Program (USDA)

### Storm, waste and drinking water improvements and management

- ◆ MDEQ Clean Water State Revolving Fund Loans
- ◆ MDEQ Drinking Water Revolving Fund Loans
- ◆ Rural Business Enterprise Grants (water, wastewater, storm water) (USDA)
- ◆ Rural Development Water & Wastewater Disposal Program Grants & Loans (USDA)

### Habitat restoration and creation

- ◆ Partners for Fish & Wildlife (US Dept Fish & Wildlife)
- ◆ North American Wetland Conservation Act Grant Program (US Dept of Interior)
- ◆ National Fish & Wildlife Foundation (US Dept of Interior)
- ◆ US EPA Five Star Restoration Grant Program
- ◆ Great Lakes Aquatic Habitat Network and Fund
- ◆ Natural Heritage Grant Program (MDNR)
- ◆ Inland Fisheries Grant Program (MDNR)
- ◆ Private Stewardship Grant Program (US Dept of Interior, US Fish & Wildlife, Endangered Species)
- ◆ Aquatic Ecosystems Restoration Grants (US Army Corps of Engineers)
- ◆ Great Lakes Fishery Trust
- ◆ DTE Energy Tree Planting Grants
- ◆ NOAA: Open Rivers Initiative
- ◆ NOAA Community-based Restoration Program - Project Grants

### Education

- ◆ US EPA Environmental Education Program
- ◆ US EPA Five Star Restoration Grant Program

### Watershed planning and implementation

- ◆ Clean Water Act Section 319 Nonpoint Source Pollution Management Grants (MDEQ)

- ◆ Clean Michigan Initiative Grants

General

- ◆ Non-point Source Pollution Management Grant (MDEQ)
- ◆ US National Research Initiative Competitive Grants Program (USEPA)
- ◆ Community Forestry Grant Program (MDNR)
- ◆ Great Lakes Basin Program for Soil Erosion and Sediment Control (Great Lakes Commission)
- ◆ The Joyce Foundation
- ◆ Wal-Mart Environmental Grants
- ◆ Michigan Gateway Community Foundation
- ◆ Great Lakes Commission Grants
- ◆ Great Lakes Protection Fund
- ◆ Small Watershed Program (NRCS)
- ◆ Community Foundation for Southeast Michigan
- ◆ Plant Conservation Alliance: NFWF Native Plant Conservation Initiative
- ◆ Paul H. Young Trout Unlimited

Water quality monitoring

- ◆ Clean Water Corps grant program (MDEQ)
- ◆ Great Lakes Aquatic Habitat Network and Fund