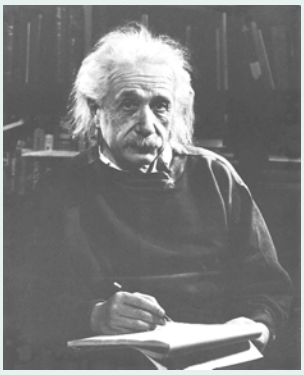
9. Evaluation Mechanisms

"Not everything that can be counted counts, and not everything that counts can be counted."

- Albert Einstein



Introduction

Watershed planning is meant to be an iterative process that provides for continuous input and revision of procedures, processes, and products. This Watershed Management Plan (WMP) is a living document and is meant to be used, revised, and altered to fit the changing needs of the watershed as new information becomes available. This section establishes an overall program framework which emphasizes the importance of an on-going iterative process that consists of three elements: Program Planning, Program Implementation, and Effectiveness Assessment. The relationship between the three elements is presented in Figure 9-1. Portions of this chapter are based on "A Framework for Assessing the Effectiveness of Jurisdictional Urban Runoff Management Programs" developed by the San Diego Municipal Storm Water Co-Permittees (2003).

The evaluation mechanisms for each action item are provided in Section 8. The purpose of this section is to explain the different evaluation mechanisms and how they fit into the permit requirements.

Figure 9-1. Program elements.

Permit Requirements

Watershed management is intended to be a tool in a comprehensive and systematic approach to balancing land uses and human activities to meet mutually agreed upon social, economic, and environmental goals and objectives in a watershed. As required by the NPDES Wastewater Discharge General Permit, the WMP must include the components listed in the dialog box on the next page, all of which are intended to be done in the context of significant public participation (Section 5).

Program Planning

The program planning phase requires a significant amount of public participation to characterize the watershed and develop and prioritize goals and objectives for the watershed. This phase can be broken down into the four steps below:

1. Goal and Objective Development
2. Action Plan Development
3. Evaluation Mechanisms
4. Assessment

While the elements of program planning interact in a cyclical manner, developing goals and objectives typically initiates the cycle. However, program planning also occurs following the effectiveness assessment phase if changes to the WMP are necessary.

Goal and Objective Development

The watershed committee has worked with the stakeholders and public to obtain input and comments during the initial watershed planning process. A facilitated workshop was held to develop and rank goals and objectives. Discussions at watershed committee meetings and stakeholder workshops helped to prioritize long-term watershed goals and objectives that would impact water quality within the watershed. Every effort was made to involve the public during the development process in order to gain support for implementation. The public participation efforts are documented in Section 5. The finalized goals and objectives are presented in Section 6.

Action Plan Development

To implement the goals and objectives, specific actions were developed for each objective. Action plan development was completed as part of this WMP and is presented in detail in Section 8. The actions were assigned a schedule, responsible party, cost, and means to measure success (refer to the following paragraph, 'Evaluation Mechanisms').

Evaluation Mechanisms

Evaluation mechanisms are essential to gauge implementation status and assess the effectiveness of the overall program. Identification of quantifiable measures provides both measurability and accountability within the program. Six success levels have been established, as shown in Figure 9-2, to provide an organizing framework for the evaluation mechanisms. These success levels are discussed further in the dialog box on the left-hand-side of the page. Note that measures may be classified in more than one level.

MDEQ-Required Components of the WMP

1. Assess the nature and status of the watershed ecosystem. (Sections 3 & 4)
2. Define long-term goals and short-term objectives for the system. (Section 6)
3. Determine actions needed to achieve long-term goals and short-term objectives. (Section 8)
4. Assess both benefits and costs of each action. (Sections 8 & 9)
5. Implement desired actions and permittee commitments by a specified schedule.
6. Evaluate the effects of the implemented actions and the progress toward goals and objectives.
7. Re-evaluate goals and objectives as part of an on-going, iterative process.

Source: MDEQ, 1997.

Evaluation Mechanisms

Level One – Activities conducted include those that are described or required in the permit. These activities are expected to be beneficial to water quality because they are part of a successful WMP. This plan addresses the permit requirements including specific requirements of the Storm Water Pollution Prevention Initiative (SWPPI).

Level Two – Changes in knowledge and awareness are targeted through the Public Participation Plan (PPP) and Public Education Plan (PEP), such as conducting stakeholder workshops and public briefings.

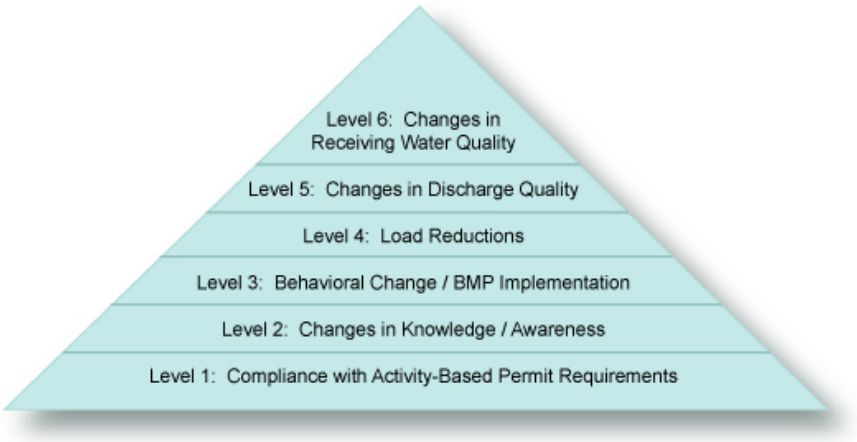
Level Three – The desired success of Level Three is behavioral change due to an increase in knowledge. This may be documented through the use of a survey or tracking the number of Best Management Practices (BMPs) installed or retrofitted. Section 7 discusses possible tools for watershed protection such as watershed planning, land conservation, and soil erosion and sediment control.

Level Four – BMPs are used to reduce the amount of pollutants entering local water bodies from storm water runoff. Load reductions may be calculated based on information provided once a BMP is installed. Load reductions may also be estimated for illicit discharges that are removed.

Level Five – Changes in the water quality of storm water discharge show the direct environmental benefit gained by the installation of BMPs and pollution prevention practices. Permittees will be working on this task through their Illicit Discharge Elimination Program (IDEP), which seeks to correct illicit discharges that are discovered through outfall screening and investigation. Should a sample show poor water quality, further sampling and testing will take place to pinpoint the source and work to remove it.

Level Six - The ultimate goal of the permit program is to improve the water quality of receiving water bodies. Monitoring may be conducted on a periodic basis to show change in water quality and environmental benefit. More details concerning monitoring efforts are included in the discussion on effectiveness assessments.

Figure 9-2. Success levels.



Each measure can also be classified based on the data required for an appropriate assessment. There are three data classifications, including:

- Measure of Activity Completion – requires only an indication of whether or not an activity has been completed (i.e. "Complete" or "Incomplete"). These measures are used to assess implementation.
- Measure of Usage – requires data concerning how much a facility has been used or how much of a material has been distributed or collected (i.e. "200 brochures distributed"). These measures are used to assess implementation.
- Measure of Change – requires data concerning baseline and post-action levels of knowledge or water quality (i.e. "a comparison of baseline and post-action results for macroinvertebrate monitoring in the river show signs of improvement"). These measures are used to assess effectiveness.

Table 9-1 gives examples of evaluation mechanisms from the action plan table based on the six different success levels. Note that actions must have at least one measurable in any data classification category and may have one in each category.

One other distinction that can be made to classify the evaluation mechanisms is whether they are direct or indirect. Direct evaluation mechanisms are associated with characterizing water quality and quantifying pollutant loads. Indirect evaluation mechanisms deal with degrees of activity or program implementation.

Table 9-1. Examples of evaluation mechanisms by type.

Level	Example Objective / Action	Measure of Activity Completion	Measure of Usage	Measure of Change
One	Objective 7d: Provide maintenance activities and inspection procedures for permanent structural storm water BMPs. Action 3: Adopt BMP Manual.	A manual has been adopted.	Number of local agencies and municipalities that adopt the manual.	Evaluate changes in water quality based on ongoing monitoring results.
Two	Objective 1b: Assist local school districts in developing a science curriculum on watershed studies. Action 3: Work with schools to see that this is implemented and that a standard survey or test is conducted following the presentation of the curriculum.	Communication / meetings between the community and the schools have occurred.	▪ Number of teachers presenting material. ▪ Number of students the curriculum reaches.	Evaluate changes in awareness through student survey or test.
Three	Objective 1h: Conduct 'Public Watershed Awareness Survey'. Action 3: Mail surveys and compile results.	Surveys have been mailed.	Number of surveys returned.	Results of survey to measure knowledge and behavior change.
Four	Objective 7f: Reduce discharge of pollutants from streets, roads, highways, parking lots, and maintenance garages. Action 4: Develop method to track quantity of sediment and debris removed	A method to track quantity of debris removed from system has been developed.	Quantity of debris removed from streets and catch basins annually.	Evaluate changes in water quality based on on-going monitoring results.
Five	Objective 8b: Conduct an illicit discharge removal program including: finding problems by checking for leaking sanitary systems, leaking septic systems, and illicit connections; removing the source of the problem and prohibiting their reoccurrence through municipal code and ordinances Action 3: Implement septic system tracking program in the Tri-County Area	Septic system tracking program has been implemented	Willingness of County Health Departments to use tracking system	Evaluate changes in water quality based on ongoing monitoring results.
Six	Evaluate changes in water quality based on ongoing monitoring results. See Table 9-2 for details concerning water quality monitoring within the watershed.			

Assessment

Assessment is the process of evaluating the Evaluation Mechanisms. The following describes how each of the three types of evaluation mechanisms is assessed.

- Measure of Activity Completion - A 'yes' or 'no' is required to evaluate the measure.
- Measure of Usage - The actual usage amount is required to evaluate the measure.
- Measure of Change - The actual change in water quality or public behavior is required to evaluate the measure.

Program Implementation

Program implementation is the second phase of the cycle and consists of applying the WMP which was developed or updated during the program planning phase.

Lessons learned and comments on the WMP are compiled during the implementation phase and are subsequently addressed in the effectiveness assessment phase.

Effectiveness Assessment

The effectiveness assessment phase consists of a water quality assessment, a program assessment, and an integrated assessment. The integrated assessment facilitates examining the causal relationships between program implementation and changes in water quality.

Water Quality Assessment

Water quality assessment is the analysis of water quality data to draw conclusions on the condition of or changes to the condition of receiving waters or discharges to those waters. The water quality assessment provides a way to assess the direct evaluation mechanisms. Long-term assessment is also necessary to ensure that seasonal, annual, and other variables can be identified and are considered when interpreting the results.

Generally, determining the effectiveness of the actions is a qualitative process that relies on the water quality assessment showing at least minimal improvement in water quality over time.

Many watershed monitoring methods may be used throughout the watershed to help evaluate the effectiveness of WMP implementation. Examples of the methods include the following:

- Benthic Macroinvertebrate Monitoring
- Frog and Toad Survey
- Fish Studies
- Analytical Chemistry Testing
- Stream Corridor Assessments
- Stream Crossing Watershed Survey and Photographs
- Hot Spot Testing

The different monitoring activities will be conducted in close proximity to one another in order to develop relationships between them and a holistic view of a particular area. For example, the photographic monitoring will be done at the macroinvertebrate monitoring sites along with the basic water quality monitoring sites. The road/stream crossing surveys will be done immediately upstream and downstream of the macroinvertebrate monitoring sites and will include photographic log files.

A community-based research group made up of volunteers from the general public will be trained to assist with monitoring activities. The benefits of using volunteers to conduct monitoring include increasing public participation, increasing public education and decreasing the cost of the monitoring program. Including established volunteer programs in the monitoring effort may be beneficial. Established groups include the Mid-Michigan Environmental Action Council (MID-MEAC), public school projects such as GREEN (Global Rivers Environmental Education Network), or other organized activities such as 4H clubs, scouting groups, and senior citizen groups.

The following describes the various monitoring methods:

Benthic Macroinvertebrate Monitoring

The presence or absence of certain species of benthic macroinvertebrates is a good indicator of the health of a stream. A benthic macroinvertebrate is an organism having no backbone that dwells on the bottom of a water body. The presence of organisms tolerant to pollution and few or no organisms sensitive to pollution indicates pollution in the water.

MSUWATER, MDEQ/MDNR, and MID-MEAC have conducted macroinvertebrate monitoring in the past (see Section 4) and may do so again in the future at their discretion.

Benthic Monitoring, Clinton River Watershed Council, 2005

Frog and Toad Survey

Like benthic macroinvertebrates, frogs and toads are sensitive to changes in water quality. The absence or decline of a frog and toad population indicates a loss of the quality of their wetland habitat and ultimately their ecosystem. As a result of the concern for the rarity, decline, and population die-off of several species, the Michigan Department of Natural Resources (MDNR) developed the Michigan Frog and Toad Survey which uses volunteers to monitor wetland sites three times annually during early spring, late spring, and summer. At each site, the volunteer listens for frog and toad breeding season calls and makes a simple estimate on the population size. Detailed information is given to the volunteer including how to establish a survey route and a tape or CD of frog and toad calls.

Fish Studies

Fish studies may consist of assessing habitat, population diversity and abundance, and contaminants in tissue. All of these factors can be used as indicators of the health of the river.

MSUWATER or the MDEQ / MDNR have conducted fish studies in the past (see Section 4) and may do so again in the future at their discretion.

Analytical Chemistry Testing

Many different analytical chemistry tests may be performed to determine the quality of surface water. The tests may be considered individually or combined together in an index. An example of one such index was created and designed by the National Sanitation Foundation (NSF) in 1970 called the Water Quality Index (WQI). The purpose of the index is to measure water quality changes in a particular river reach over time and provide a means to compare results with different reaches of the same river or other rivers. The WQI includes testing the water for dissolved oxygen, fecal coliform, pH, biochemical oxygen demand (BOD), temperature, total phosphate, nitrates, turbidity, and total solids. The nine resulting values are then added, with weighting factors, to arrive at an overall water quality index (Mitchell, 2000). Sampling and testing may be done by either volunteer or professionals depending on the desired results and budgetary constraints.

The MDEQ/MDNR have conducted analytical chemistry testing in the past and may do so again in the future at their discretion.

Photo Courtesy of CWP, June 2005.

Stream Corridor Assessments

During this effort the participants walk reaches of a stream looking for and recording issues potentially impacting the waterbody such as outfalls, bank erosion, buffer, channel modifications, trash and debris, and impacts from utilities. Issues such as substrate, water clarity, plant and wildlife, shade cover can also be noted. Some data collected during the assessments overlaps with data collected using other methods.

Stream corridor assessments may be conducted as part of a canoe trip on waterways large enough to support canoeing.

Stream Crossing Watershed Survey with Photograph

The stream crossing watershed survey is an approach used to collect information about the quality of a stream. A standard data collection form is used to ensure uniformity throughout the watersheds. The physical habitat of the site including water characteristics, stream characteristics, plant life, foam and trash presence, substrate type, stream morphology, land use, and corridor description are recorded. Also potential sources of pollution upstream and downstream of the site are identified if apparent. This method is similar to the stream corridor assessment but is conducted at discrete sites where streams and roads cross as opposed to entire stretches of stream.

The MDEQ maintains a statewide database and standard protocol set that can easily be implemented. The MDEQ may provide training upon request.

River Sampling, Courtesy of Tetra Tech, June 2005.

Hot Spot Testing

Parts of the watershed encompass land once and currently used for industrial and commercial purposes. Prior to government regulation, a number of pollutants were released without realizing their potential impacts on public health and safety and water quality in aquatic environments. In addition to this historical pollution, various hot spots of pollution may exist due to accidental release or intentional, illegal

releases. Any known or discovered hot spots may be monitored for the applicable pollutants.

Program Assessment

Program assessment involves reviewing the attainment of the evaluation mechanisms. Evaluation mechanisms will be reviewed for implementation and effectiveness and if not implemented or effective, an investigation will be conducted to determine possible factors causing the delay or failure.

The program assessment involves a number of techniques such as: water quality monitoring, a public watershed awareness survey, a student awareness survey, meeting evaluations, inspection results, and staff training surveys. Table 9-2 is an action plan specifically for conducting evaluation mechanisms. The table is similar to the action plan table in Section 8 and addresses the actions, schedule, responsible party, and cost to implement the evaluation mechanisms.

Generally, determining the effectiveness of the actions is a qualitative process that relies on the program assessment showing at least minimal improvement in awareness and knowledge over time.

Assessing the evaluation mechanisms is an annual task that will be reported in the annual progress reports. The annual progress report is required to cover decisions made, actions performed, and results of the IDEP, PEP, SWPPI, and other storm water actions conducted during the previous permit year. The IDEP and PEP are separate documents containing additional actions and evaluation mechanisms not covered in this WMP. The annual report must also cover updates of nested drainage system agreements and point source discharges to the storm water system.

Integrated Assessment

The integrated assessment incorporates the water quality assessment and program assessment and evaluates the entire watershed management plan as a whole. The integrated assessment identifies and addresses data gaps in the water quality monitoring program and finds causal relationships between actions taken through the WMP and changes in load reductions, discharge quality, and receiving water quality.

As a result of the integrated assessment, targeted updates and revisions will be made to the WMP for submittal to the MDEQ by the March 1, 2007 deadline indicated on the certificate of coverage.

Evaluation Action Plan

Insert Table 9-2

Summary

The framework presented here is not meant to be inclusive, but rather a guide illustrating the embodiment of the watershed management plan. The emphasis of the plan is to focus on high priority constituents, sources, benefits etc. rather than all potential problems. Attention is given to the importance of long-term assessments that boast strategy rather than ambition.

References

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