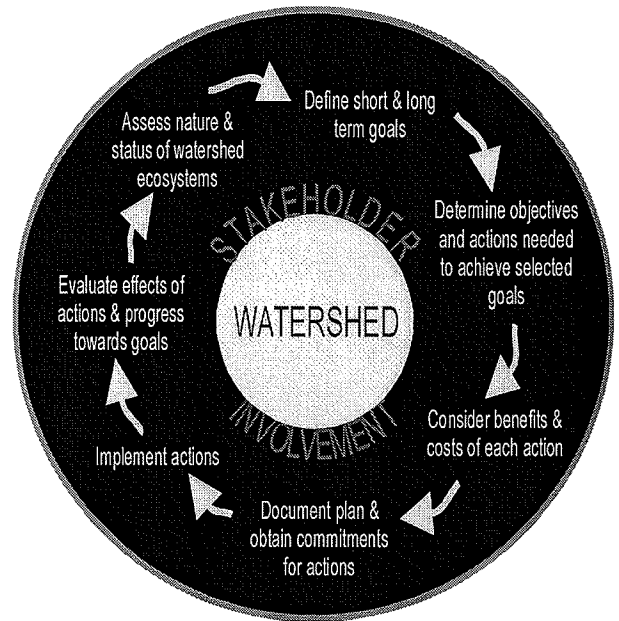


## CHAPTER 6 - METHODS OF MEASURING PROGRESS

As stated in the original Anchor Bay Watershed Management Plan (WMP), watershed planning is a dynamic process that can be represented by the cycle depicted in Figure 6-1. The evaluation process is an important part of watershed planning that allows for a review of watershed conditions and impairments each time the evaluation is completed. It also establishes a mechanism for determining the success and usefulness of programs initiated within the watershed in response to problems defined in the planning process. A well planned evaluation process measures the effectiveness of the WMP by showing changes in the public's awareness of water quality issues, changes in attitudes or behavior, changes in conditions of the watershed, and improvements in water quality.



**Figure 6-1: Evaluation Process as part of the Watershed Management Planning Cycle**

Local counties, municipalities, and organizations within the watershed will do much of the evaluation. Certain environmental measurements, however, are best conducted by the Michigan Department of Environmental Quality (MDEQ) and/or the Michigan Department of Natural Resources.

The Anchor Bay Steering Committee (Steering Committee) is responsible for the development and implementation of an overall evaluation strategy of the WMP, tracking the progress and effectiveness of pollution prevention efforts as well as revising and updating the WMP. This responsibility, however, can only begin once the Steering Committee has developed into a sustainable organization. Therefore, the evaluation process will be started after a one-year period, during which contracts between the communities will be developed and agreements have been signed to work together to form a sustainable Steering Committee. The challenge for the Steering Committee is to determine whether the cumulative effect of these recommended implementation efforts are successful in meeting water quality standards in the watershed and achieving the goals of the WMP.

Since National Pollutant Discharge Elimination System (NPDES) Phase II communities must report progress on their pollution prevention activities to the MDEQ on an annual basis, the Steering Committee will use these annual reports to measure progress toward implementation of the WMP. A review of the implementation process, effectiveness of pollution prevention activities, and tracking of these activities will also be discussed in bi-annual (every 6 months) Steering Committee meetings. These meetings will aid in the WMP update and evaluation process, allowing for any necessary midstream corrections. For

non-Phase II communities, the Steering Committee will expect similar annual report cards and/or input into the evaluation process.

An evaluation of the implementation of the WMP will provide the Steering Committee an opportunity to assess the effectiveness of the activities that have been implemented to achieve the goals set forth in the WMP. This chapter expands on the evaluation methods developed in the 2003 WMP to describe the set of criteria, based on the milestones developed, that will be used to determine if the pollutant reductions are being achieved over time and if substantial progress is being made toward attaining water quality standards.

Criteria was established to determine whether the WMP needs to be revised if the pollution reductions are not being achieved or progress is not being made toward attaining water quality standards (WQS). The WMP would need to be revised if the milestones are not being met or the Best Management Practices (BMPs) being implemented are not adequately meeting the defined goal. If additional watershed concerns are discovered, the milestones, actions, and commitments would also need to be updated. Monitoring components are also described to evaluate the effectiveness of the implementation efforts over time, based on the criteria. The evaluation process is outlined in Tables 6-1, 6-2, and 6-3.

In Table 6-1, the process is organized by matching a monitoring component to each BMP recommended in Chapter 4, and then describing the criteria and milestones for measuring progress toward meeting the goals and objectives. The Anchor Bay Evaluation Subcommittee developed 2-year and 7-year milestones to determine whether the BMPs are being implemented and if the progress in meeting the goals is moving in the right direction. The parties responsible for working with the Steering Committee in evaluating the achievement of the milestones are also included in Table 6-1. The task of measuring progress is a necessary component of creating a dynamic and effective management plan for Anchor Bay. The evaluation criteria provide an indication of how BMPs can be assessed to evaluate success.

Table 6-2 describes the monitoring plan in terms of the agency or organization responsible for conducting the monitoring, the parameters to be monitored, potential funding to conduct the monitoring, and the method to communicate the results of the monitoring. Table 6-3 provides a timeline for watershed monitoring that would measure water quality and habitat improvements after BMPs and management strategies have been implemented. The monitoring efforts are grouped by organization and the parameters to be measured are described. Figure 6-2 presents a proposed monitoring regime, illustrating where the monitoring would occur. Table 6-4 identifies each sampling point as to what is being measured. Some criteria are more appropriate for measuring progress on a watershed-basis, such as public awareness surveys and fishery surveys. Other criteria are more appropriate for specific sites or small tributaries, such as pollutant reduction calculations or student monitoring results. Through this evaluation process, communities and agencies will be better informed about public response and success of the

project, what improvements are necessary to the project, and which BMPs to continue as part of the project.

NPDES Phase II municipalities, involved as members of the Steering Committee, are required to update the WMP every two years. The evaluation methods presented in this chapter will assist the Steering Committee in determining what parts of the WMP are in need of revision. The update ensures that the WMP remains relevant and is a working document that can be used effectively to guide the implementation of environment-related activities within the Watershed.

## **6.1 SUMMARY OF MONITORING COMPONENTS**

Many parameters are currently being monitored in the Watershed. Some are conducted at a local level, while others are administrated at the county and state level. Establishing monitoring targets, against which observed measurements are compared, helps the Watershed group determine whether progress is being made toward targets and ultimately the Watershed goals. For some of the monitoring components, a firm target was set, such as “Inspect 90% of parks in critical *E. coli* areas twice a year,” to compare what actual target is achieved to how close the implementation of the WMP is for that goal and objective. The targets set are not enforceable, just a measure that the Steering Committee can use to gauge the implementation efforts. Table 6-1 identifies the specific monitoring component to measure the effectiveness and success of each BMP recommended for this Watershed. Those specific monitoring components are described below. The monitoring components that will be used to measure the overall improvement in the Watershed are described afterwards.

## **6.2 SPECIFIC MONITORING COMPONENTS FOR RECOMMENDED BMPS**

### **6.2.1 UNITED STATES DEPARTMENT OF AGRICULTURE - NATURAL RESOURCES CONSERVATION SERVICE (NRCS) YEARLY STATUS REVIEWS**

The NRCS District Offices are required to report annually on the agricultural practices installed in that county under all Farm Bill programs. The Steering Committee will work with NRCS and the conservation districts to gather this information and track the practices and the resource concerns that they address to assess water quality impacts from agricultural operations.

### **6.2.2 POLLUTANT REDUCTION CALCULATIONS**

The MDEQ provides instructions to calculate and document pollutant reduction from treatments to sources of sediment and nutrient pollutants using BMPs. The tons of sediment and associated pounds of nitrogen and phosphorus reduced from an identified site are calculated. The methods have standardized the progress reporting to systematically represent water quality impacts and statewide achievements of the amount of pollutants prevented from entering the waterways. The 3-year milestone is to identify the sites at which measurements need to be made to perform the pollutant reductions calculations.

The 8-year milestone is to perform the calculations and report them to MDEQ and Environmental Protection Agency. As BMPs are installed, the Steering Committee can calculate pollutant reductions to estimate the amount of pollutants prevented from entering the stream and also compare the cost of BMPs to the amount of pollutants reduced.

### **6.2.3 NPDES PHASE II ANNUAL REPORTS**

Communities regulated under the NPDES Phase II storm water program are required to submit a report on the implementation status of the NPDES storm water permit and the progress and effectiveness of pollution prevention in their community on an annual basis. The reports must cover all of the decisions, actions, and results performed as part of the permit during the previous year.

- The progress report provides information of the actions taken to eliminate illicit discharges and evaluate the effectiveness of the program, as outlined in the approved Illicit Discharge Elimination Plan (IDEP).
- The community must provide documentation of the public education efforts and a summary of the evaluation of its effectiveness, as outlined in the approved Public Education Plan.
- The community must describe the compliance status of the permittee-specific actions and implementation schedules for the regulated areas, as outlined in the approved Storm Water Pollution Prevention Initiative (SWPPI). The reporting of SWPPI compliance status in the annual reports is expected to begin in 2006.

### **6.2.4 ST. CLAIR COUNTY DRAIN OFFICE (SCCDO)**

The SCCDO conducts physical inventories and inspections of the county drains, when necessary or requested. Problems associated with soil erosion and sedimentation, high flows, habitat degradation, and agricultural practices impairing water quality are investigated.

### **6.2.5 SOIL EROSION AND SEDIMENTATION CONTROL (SESC) PROGRAMS**

The St. Clair County Department of Public Works is the County Enforcing Agency (CEA) for the SESC Act 451, Part 91. The CEA is responsible for enforcing their SESC ordinance and administering SESC programs. The SCCDO and the St. Clair County Road Commission are Authorized Public Agencies (APA).

The Macomb County Public Works Office (MCPWO) is the CEA for Macomb County and responsible for administering the SESC ordinance. The Macomb County Road Commission is a registered APA.

### **6.2.6 NPDES IDEP**

The Macomb County Health Department (MCHD), MCPWO, St. Clair County Health Department (SCCHD), and SCCDO received funding to complete an IDEP investigation, looking for failing onsite disposal systems, illegal dumping, and pollutants from municipal storm sewers. The Anchor Bay IDEP investigations are complete and 90% of all the identified problems have been corrected. Further investigations on homeowner septic systems will occur on a complaint basis until IDEP investigations are made throughout the entire county.

### **6.2.7 WASTEWATER TREATMENT PLANT AND INDUSTRIAL COMPLIANCE TESTING**

Wastewater and industrial discharges are regulated under permits issued by the MDEQ. There are 16 permitted point source discharges that exist within the Watershed. These permittees are generally in compliance with discharge permits. The number of treated domestic wastewater discharges to the Watershed is increasing as more development occurs outside of the established sewer service area. The Steering Committee will review the reports submitted to the MDEQ and list the violations per year to assist in monitoring the improvements in the Watershed.

### **6.2.8 REVIEW OF COMMUNITY MASTER PLANS AND ORDINANCES**

Macomb County is currently developing a SESC ordinance. St. Clair County has an SESC ordinance that does not go beyond state requirements. The Steering Committee will conduct a follow-up with the counties and communities to track the enforcement and effectiveness of the ordinance.

## **6.3 OVERALL WATERSHED MONITORING EFFORTS**

The Steering Committee has developed a monitoring plan that will assess the cumulative effect of all the various implementation efforts. This plan is structured according to pollutants of concern and organizations responsible for conducting the monitoring, as described in Table 6-2.

### **6.3.1 PREVIOUS STUDIES**

The Lake St. Clair Assessment Regional Monitoring Project (LSCA) was previously conducted as part of a 2.5 million dollar grant awarded to the Macomb County Health Department and will be used as a benchmark condition of the Watershed. The LSCA Project acquired streamflow and water and sediment quality data over the 2004 and 2005 sampling seasons, with emphasis on the effects of major storm events. As part of the overall project, water quality monitoring was conducted at 4 locations in the Anchor Bay Watershed: Swan Creek, Salt River, Beaubien Creek, and a tributary to Lake St. Clair. Samples at these locations were analyzed for numerous physical, chemical, and biological parameters. The results of the LSCA project will complete a more comprehensive assessment of water quality,

determine contaminant loadings to Lake St. Clair and its tributaries, characterize the relationship between sediment concentrations and water quality, better describe the impacts of land uses and subsequent stormwater runoff, and may identify currently unknown point source discharges. Currently, these data are being analyzed for preparation of a major report. Application of mathematical modeling and statistical analyses will lead to scientifically sound findings and conclusions about conditions of the Lake and its major tributaries. The results will be used for evaluating trends, analyzing the effectiveness of control measures and for decision making by local, state and federal policy makers.

### **6.3.2 MONITORING PLAN FOR BACTERIA**

MDEQ had established a Total Maximum Daily Load for Salt River and Crapau Creek for *Escherichia Coli* (*E. coli*). Loading allocation has been determined for the point source discharges in the Watershed. Reductions in inputs of *E. coli* to the Watershed can be determined through monitoring exceedances of those loads and the number of violations occurring. The WMP identified Salt River and Crapau Creek as critical areas for bacteria, since results of the monitoring indicate that they are exceeding WQS.

The MCHD currently performs surface water sampling of *E. coli* at eleven locations in the Salt and Crapau Creek Watersheds and several other sites in minor tributaries as part of the Weekly Watershed *E. coli* Monitoring Project. In places where a source of *E. coli* contamination appears to be entering a watercourse, the MCPWO and MCHD have initiated a more extensive investigation that includes additional sampling and dye testing. They also work with local municipalities to locate and eliminate pollution sources. The testing results are used to identify WQS violations.

MCHD has performed analysis on water quality through the LSCA project since 1998. The LSCA 2004 report found a statistically significant correlation ( $r = 0.78$ ) between aqueous *E. coli* counts and turbidity at the Salt River (n28). This relationship was also found in last year's data. A statistically significant downward trend in *E. coli* was noted at Crapau Creek (n29) for the period of 1998 to 2004.

New Baltimore is the only public bathing beach in the Watershed and is monitored through the Macomb County Bathing Beach Monitoring Program. Macomb County is planning to continue funding all of the above sampling efforts.

Nine sites along the Anchor Bay shoreline are currently being monitored for *E. coli* weekly by the SCCHD. These sites are identified as: Tin Fish, Michigan Department of Natural Resources Boat Launch, Johnnie Lega's Pier, Brown's Landing, Frank's Dock, 1825 South Channel Drive, Algonac State Park, Marine City Dredge Cut, and Algonac Boardwalk. St. Clair County plans to continue this water quality monitoring program and is investigating adding Swan Creek and Beaubien Creek as additional sites for *E. coli* monitoring.

A typical sampling regime of the Health Departments would consist of weekly sampling from the end of May to the beginning of September.

### 6.3.2.1 Bacteria Criteria

The criteria for *E. coli* will be based on WQS and attaining designated uses. The targets set for *E. coli* are for water bodies to meet water quality standards for total and partial body contact recreation. Total body contact recreation standards are set by the State of 130 count *E. coli* per 100 milliliter (ml) as a 30-day geometric mean from May 1 to October 31. Partial body contact recreation standards are set as 1,000 count *E. coli* as a 30-day geometric mean all year.

The results of the monitoring can determine if the trend is moving toward meeting WQS and the designated uses. A measurable decrease in the number of MCHD WQS violations for bacteria will indicate that trend. The 3-year milestone was determined to be a 50% decrease in the number of violations for bacteria. The 8-year milestone was set as a 75% decrease in the number of violations.

### 6.3.3 MONITORING PLAN FOR NUTRIENTS, DO, PH, WATER TEMPERATURE, AND METALS

The MCHD is completing the final report on the LSCA 2004 sampling results, which found the average annual nitrate concentration exceeded the critical value of 0.3 mg/L at the Salt River (n28), Crapau Creek (n2), and the South Channel (n13). However, statistically significant downward trends in nitrate, total phosphorous, chloride, total organic carbon, and *E. coli* were noted at Crapau Creek (n29) for the period of 1998 to 2004. Macomb County is planning to continue this project with funding from the Army Corps of Engineers and MDEQ.

The wastewater treatment plants in the Watershed regularly test raw water at their intakes for many water quality indicators, including ammonia nitrogen, total phosphorus, total residue chlorine, mercury, and copper. This sampling is conducted five times per week to comply with their NPDES discharge permits and will continue as long as they have their permits.

The operators and staff of the wastewater treatment plants (WWTPs) in New Baltimore and Algonac and the staff at Ira Water Treatment Plant (WTP) have offered to test for additional pollutants and accept samples from offsite to run through their analytical equipment. Staff from the New Baltimore WWTP will conduct monitoring at the Salt River, Crapau Creek, and Marsac Creek. They will measure DO and temperature in the field and drop samples off at Chesterfield Township for analyzation of bacteria, nutrients, and pH. Staff from the Algonac WWTP will collect similar monitoring on the Dana Drain, pending SCCPWO board approval. Algonac staff will conduct similar monitoring on the Marine City Dredge Cut and Ira Township WTP staff will collect similar monitoring on the Swan Creek and Beaubien Drain. The samples will be collected once a month for a year, every five years, as far upstream as possible where the water bodies have constant flow, but not the influence of Lake St. Clair.

### 6.3.3.1 Nutrient, DO, pH, Water Temperature, and Metals Criteria

Consistent with Great Lakes protection, the MDEQ states that limits for municipal wastewater discharges of phosphorus, "which is, or may readily become, available as a plant nutrient, shall be controlled from point source discharges to achieve 1 milligram (mg) per liter of total phosphorus as a maximum monthly average effluent concentration unless other limits, either higher or lower, are deemed necessary and appropriate. In addition, nutrients shall be limited to the extent necessary to prevent stimulation of growths of aquatic rooted, attached, suspended, and floating plants, fungi or bacteria which are or may become injurious to the designated uses of the surface waters of the state."

The criteria for nutrients are based on proposed WQS for phosphorus, a major nutrient for aquatic plant growth and often the limiting nutrient in freshwater systems. The results of the monitoring can determine if the trend is moving toward meeting WQS. MDEQ is expecting to present draft nutrient rules for surface water in the spring of 2006, with the rules going into effect in the fall of 2006. Proposed total phosphorus (TP) thresholds for lakes range from 0.01 mg/l to 0.027 mg/l. Proposed standards for streams have TP thresholds found at variable concentrations (0.01 to 0.80 mg/l), based on diatoms, macroinvertebrates, and fish productivities (<http://www.epa.gov/r5water/wqb/presentations/holden.pdf>). A measurable decrease in the number of WQS exceedances for phosphorus will indicate that trend. The 3-year milestone was determined to be a 50% decrease in the number of exceedances. The 8-year milestone was set as a 75% decrease in the number of exceedances.

The criteria for dissolved oxygen (DO), temperature, and pH are based on current water quality standards established by the State of Michigan. A minimum of 7 milligrams per liter (mg/l) of DO in all Great Lakes and connecting waterways shall be maintained at all times in all inland waters designated to be protected for coldwater fish. In all other waters, except for inland lakes as prescribed by R 323.1065, a minimum of 5 mg/l of DO shall be maintained. The results of the monitoring in the field can determine if the WQS is being met at those locations. A reduction in the number of DO measurements exceeding WQS will indicate if the DO is suitable for the desired fisheries.

Rivers, streams, and impoundments naturally capable of supporting coldwater fish shall not receive a heat load which would do either of the following: (a) Increase the temperature of the receiving waters at the edge of the mixing zone more than 2 degrees Fahrenheit above the existing natural water temperature, (b) Increase the temperature of the receiving waters at the edge of the mixing zone to temperatures greater than the following monthly maximum temperatures:

J F M A M J J A S O N D

38 38 43 54 65 68 68 68 63 56 48 40

Rivers, streams, and impoundments naturally capable of supporting warmwater fish shall not receive a heat load which would warm the receiving water at the edge of the mixing zone more than 5 degrees Fahrenheit above the existing natural water temperature. Rivers, streams, and impoundments naturally capable of supporting warmwater fish shall not receive a heat load which would warm the receiving water at the edge of the mixing zone to temperatures greater than the following monthly maximum temperatures:

For rivers, streams, and impoundments south of a line between Bay City, Midland, Alma, and North Muskegon, except the St. Joseph River:

J F M A M J J A S O N D

41 40 50 63 76 84 85 85 79 68 55 43

The results of the monitoring in the field can determine if the WQS is being met at those locations. A reduction in the number of temperature measurements exceeding WQS will indicate if temperatures are suitable for the desired fisheries.

The hydrogen ion concentration expressed as pH shall be maintained within the range of 6.5 to 9.0 in all surface waters of the state, except for those waters where the background pH lies outside the range of 6.5 to 9.0. Any requests to artificially induce a pH change greater than 0.5 in surface waters where the background pH lies outside the range of 6.5 to 9.0, shall be considered by the department on a case-by-case basis. The results of the monitoring in the field can determine if the WQS is being met at those locations. A reduction in the number of pH measurements outside the range of WQS will indicate if the pH is suitable for the desired habitat.

#### **6.3.4 MONITORING PLAN FOR SEDIMENT**

The Algonac Regional WWTP and the New Baltimore WWTP currently test raw water intakes for many parameters, including total suspended solids, but not turbidity. This monitoring is required under their NPDES discharge permit and will therefore continue for the duration of their permit.

Volunteers performed a pebble count analysis at 10 sites during the monitoring for the hydrologic study in 2004. The Steering Committee will use information gathered from that analysis to conduct studies at those sites every five years, which would measure the extent to which the objects are covered by sediment and the changes to that coverage over time.

The GLEAS No. 51 sampling protocol, conducted by MDEQ, to establish a water quality rating can also include an embeddedness study to determine the amount of sediment in a stream system. The Steering Committee will submit a monitoring request to the MDEQ Water Bureau, Surface Water Assessment

Section (SWAS), for an embeddedness study to be conducted. This request will be made in the fall of 2007 for the 2008 monitoring season, and will continue to make this request every 5 years. These submittals will include recommendations on where the assessment and what type of assessment should be conducted. MDEQ could continue to provide training to volunteers on this method or other methods to measure sediment, either through SWAS or the Nonpoint Source Unit.

#### **6.3.4.1 Sediment Criteria**

According to EPA, "suspended and bedded sediments are defined as particulate organic and inorganic matter that suspend in or are carried by the water, and/or accumulate in a loose, unconsolidated form on the bottom of natural water bodies. This includes the frequently used terms of clean sediment, suspended sediment, total suspended solids, bedload, turbidity, or in common terms, dirt, soils or eroded materials." The State of Michigan uses an effluent limitation system, with numeric criteria of 30 mg/l as a daily concentration during June 1 through August 31, and 36 mg/l as a daily concentration from September 1 through May 31.

The criteria for sediment evaluation would be a decrease in the number of exceedances of TSS and TDS measured by the WWTPs, more sites having sedimentation consistent with the soils types, as rated through the pebble count, and a measurable increase in the water quality rating, as rated through the GLEAS No. 51 survey.

### **6.3.5 MONITORING PLAN FOR HABITATS**

#### **MDEQ Macroinvertebrate Monitoring**

The MDEQ has developed a system to estimate the health of the predicted fish and macroinvertebrate communities through the GLEAS No. 51 sampling protocol. The State of Michigan conducts this protocol every 5 years in major watersheds and includes an assessment of the benthic macroinvertebrates. The MDEQ's next benthic survey is scheduled for 2008.

Freshwater benthic macroinvertebrates are animals without backbones that are larger than 0.5 millimeter (the size of a pencil dot). These animals live on rocks, logs, sediment, debris, and aquatic plants during some period in their life and include crustaceans, such as crayfish, mollusks, such as clams and snails, aquatic worms, and immature forms of aquatic insects, such as stonefly and mayfly nymphs. Benthic macroinvertebrates are an important part of the food chain, especially as prey for fish. Many feed on algae and bacteria, which are on the lower end of the food chain. Some shred and eat leaves and other organic matter that enters the water. Because of their abundance and position as middleman in the aquatic food chain, these organisms play a critical role in the natural flow of energy and nutrients. As these macroinvertebrates die, they decay, leaving behind nutrients that are reused by aquatic plants and

other animals in the food chain. When these macroinvertebrates are found in large quantities, the waters are generally classified as clean or unpolluted by organic wastes. Without too much organic matter, the waters usually have lots of oxygen. For example, stoneflies are often considered to be clean water organisms. But when thinking about worms and midges, water quality professionals often view these as indicators of dirty water, especially in rivers and streams. Many studies regarding benthic macroinvertebrates have been conducted in Lake St. Clair; however, little data exists for Anchor Bay's tributaries. Studies that provide information on macroinvertebrates in the Watershed, in addition to MDEQ's surveys, need to be conducted to determine a comprehensive understanding of aquatic life habitat conditions in the watershed.

### **MDEQ Stream Crossing Surveys**

MDEQ also completes stream crossing surveys in each watershed on a five-year rotation and habitat is one component evaluated. The MDEQ stream crossing survey procedure was developed as a quick screening tool to assess general water quality and possible pollutant sources, causes, and problems within the Watershed. The survey procedure provides standardized visual assessments that can be conducted by MDEQ staff or trained volunteers. Because this assessment is based on visual observations designed to be conducted quickly, the survey results are only qualitative in nature. In addition, each site is photo-documented with a digital photograph taken in the downstream direction, upstream direction, and of the stream crossing. Examples of information collected at a site include: weather and any event conditions, culvert/bridge conditions, channel conditions, stream appearance, substrate composition, instream cover, stream corridor, and potential pollutant sources. The next MDEQ stream crossing surveys are scheduled in the Anchor Bay Watershed in 2007. The Steering Committee will continue to investigate the waterways in the Watershed and recommend to MDEQ what stations need to be surveyed in the future. One use for the surveys is to prioritize areas in the Watershed where water quality problems may exist. Certain areas would be identified for further investigation, to assess habitat conditions and streambank erosion. Other stretches could be assessed for improvements where BMPs were implemented.

### **GIS Monitoring Tools**

Macomb and St. Clair County Geographic Information System (GIS) Departments are planning to conduct a land use-land cover analysis that would identify changes in impervious cover and habitat. This analysis could track the implementation effects of certain management and policy BMPs, such as buffer ordinances, and open space preservation, to determine habitat improvements as a result of these BMPs.

### 6.3.5.1 Habitat Criteria

The criteria for macroinvertebrates are based on the amount and diversity of species sampled in a biosurvey at a specific location. Following sample analyses, a macroinvertebrate score is calculated for each station based on the sum of nine metrics. Each metric score for an individual station is contrasted to the ecoregional excellent sites. A final biosurvey category describing the degree of similarity to the excellent sites is given each station based on the total metric point score calculated. The three year goal is to have a 50 % of the locations rated as similar to the ecoregion excellent site, and an eight year goal of having 80% of the sites rated as similar to the ecoregion excellent site.

The information is still incomplete for the road surveys, although the 2002-2003 reported that 8% of the habitats were rated good, 59% of the habitats were rated as fair, and 33% of the habitats were rated as poor. The MDEQ and the Steering Committee could complete the inventory according to MDEQ protocol, and then reassess the results to prioritize the contribution of pollutants to the watershed. The criteria for habitat will be based on these road stream crossings, with a three-year goal of increasing the crossings rated as good to 15%, and an eight-year goal of increasing the crossings rated as good to 25%. The criteria for evaluating improvements of habitat based on the land use-land cover analysis will be determined during the development of the work plan for the project.

The criteria for the GIS tools of analyzing land use and land cover will be developed once the County has the program in place.

### 6.3.6 MONITORING PLAN FOR HYDROLOGY

A computer model was developed by Fishbeck, Thompson, Carr & Huber, Inc., in 2005, to assess the hydrologic conditions of a typical subwatershed under three build out scenarios to determine the most effective detention policies to protect the Anchor Bay Watershed streams from development-induced streambank erosion. The Steering Committee, if financial resources are available, will perform subsequent runs of the model previously developed when BMPs or strategies, recommended in the storm water ordinance, have been implemented.

Rainfall and stream monitoring was performed at reference reaches to support the regional curve analysis and the hydrologic modeling analysis. If one or more rainfall events occur that produce near bankfull flows, then the rainfall monitoring data can be used to determine the frequency of the bankfull event. The Steering Committee could take measurements at the reference reaches in 5 years to assess the condition of the reaches to see if the storm water management practices have protected these areas from the effects of increased flow. Volunteers could measure the cross-sections of the streams, velocities, flows with a pygmy meter, and rainfall from rain gauges to look for changes that might have occurred due to build out. The rain gauges and flow measurements make it possible to measure the frequency of bankfull

flows, to see if the flows have increased in response to similar rainfalls in the past. Actual measurements of stream sections and discharges associated with a measured rainfall event can be used to calibrate the hydrologic model to actual conditions. The model could then illustrate if the practices and management strategies adopted have reduced peak flows and addressed the high-flow issues associated with water quality impairments, as predicted in the initial model.

#### **6.3.6.1 Hydrology Criteria**

The criteria for assessing flow will be to use the hydrologic model and the flow measurements to determine the effects of build out and what might have happened if the storm water management practices had not been put in place.

#### **6.4 Conclusion**

Ultimately, the Steering Committee will use all of these monitoring efforts to gain an understanding of the overall progress toward meeting water quality standards and achieving pollutant loading reductions. The Steering Committee will determine the costs of the methods to determine the most effective strategy to perform this evaluation and has agreed to allocate costs of future evaluation efforts among group members.

**TABLE 6-1: GOAL 1 - RESTORE AND ENHANCE RECREATIONAL USES**

Actions and Best Management Practices (No.)	Monitoring Components	Units of Measurement	Criteria	3-Year Milestone (2008)	8-Year Milestone (2013)	Evaluation Schedule	Responsible Partners
<i>OBJECTIVE: Reduce bacterial loading</i>							
Develop manure management plans and CNMPs (part of GAAMPs (No.1)	USDA yearly status reviews	Number and location of agricultural BMPs installed	Increased participation in Farm Bill programs	Identify agricultural operations in need of manure management plans and CNMPs	Develop 75% of manure management plans and CNMPs needed	Annually	<b>Conduct Monitoring:</b> NRCS <b>Implement Evaluation:</b> Steering Committee, Conservation Districts
Control SSOs and maintain sanitary sewer infrastructure (No.2)	NPDES Phase II Annual Reports	Number of SSOs reported	Elimination or control of SSOs	Identify areas with potential SSOs	Watershed in full compliance with Part 41, Sewerage System permits and agreements	Annually	<b>Conduct Monitoring:</b> MDEQ, New Baltimore Wastewater Treatment Plant <b>Implement Evaluation:</b> Steering Committee, NPDES Phase II Entities
Eliminate failing OSDSSs (No.3)	NPDES Phase II Annual Reports	Number of failing OSDSS reported in St. Clair County	Elimination or control of OSDSS failures	Increase or maintain ability to enforce the correction of OSDSS failures	Eliminate 90% of failing OSDSSs	Annually	<b>Conduct Monitoring:</b> St. Clair County Health Department <b>Implement Evaluation:</b> Steering Committee, NPDES Phase II Entities in St. Clair County
		Number of systems identified through MC Ordinance	Enforcement of MC Ordinance	Increased identification of failing septic systems through MC Ordinance	Replace 100% of failing septic systems identified through MC Ordinance	Annually	<b>Conduct Monitoring:</b> MCHD <b>Implement Evaluation:</b> Steering Committee, NPDES Phase II Entities in Macomb County
Manage lagoon systems and package WWTP (No.4)	NPDES WWTP permit compliance	Number of permit violations	Decrease in number of permit violations	Identify permittees with discharges in Watershed	100% compliance with permit	Monthly	<b>Conduct Monitoring:</b> WWTPs <b>Implement Evaluation:</b> Steering Committee

**TABLE 6-1: GOAL 1 - RESTORE AND ENHANCE RECREATIONAL USES**

Actions and Best Management Practices (No.)	Monitoring Components	Units of Measurement	Criteria	3-Year Milestone (2008)	8-Year Milestone (2013)	Evaluation Schedule	Responsible Partners
Manage pet waste and wildlife populations (No.5)	NPDES Phase II Annual Reports	Number of pet waste information stations with bags to collect waste	Number of bag refills	Identify popular riparian areas for dog walkers	Install 5 pet waste stations	Annually	<b>Conduct Monitoring:</b> County and local parks <b>Implement Evaluation:</b> Steering Committee, NPDES Phase II Entities
	Municipal inspections	Amount of pet waste	Opinion on whether the amount of dog waste has dropped at local parks	Develop inspection report and assess existing conditions	Inspect parks in critical <i>E. coli</i> areas	During regular maintenance duties; summary 1x/ year	<b>Conduct Monitoring:</b> Local Parks Departments <b>Implement Evaluation:</b> Steering Committee
	Wildlife population surveys	Population numbers of wildlife	Number of controls for wildlife populations	Identify critical riparian areas with wildlife concentrations of wildlife	Implement wildlife populations controls in critical riparian areas	Annually	<b>Conduct Monitoring:</b> Michigan Department of Natural Resources <b>Implement Evaluation:</b> NPDES Phase II Entities
<b>OBJECTIVE: Reduce nutrient loading</b>							
Support environmentally friendly lawn and garden maintenance (No.6)	NPDES Phase II Annual Reports	Environmentally friendly lawn and garden management practices	Increase in number of practices implemented and participants attending workshops	Development of environmentally friendly lawn and garden management practice training for local municipalities and counties at their facilities and parks and the general public	One practice installed at every park. Increase in number of participants and one additional program implemented every year	Annually	<b>Conduct Monitoring:</b> NPDES Phase II Entities <b>Implement Evaluation:</b> Steering Committee

**TABLE 6-1: GOAL 2 - RESTORE AND PROTECT AQUATIC LIFE, WILDLIFE, AND HABITAT**

Actions and Best Management Practices	Monitoring Components	Units of Measurement	Criteria	3-Year Milestone (2008)	8-Year Milestone (2013)	Evaluation Schedule	Responsible Parties
<i>OBJECTIVE: Provide additional public access to water resources</i>							
Identify riparian land areas for recreation enhancement and conserve for future parks and public access (No.7)	Planning Department Annual Reports	Acres enhanced or conserved for public access sites	Increased number of acres enhanced or conserved for recreation	Identify riparian areas where recreational opportunities could be enhanced and establish and prioritize efforts to acquire and protect riparian land	Enhancement or acquisition of top 3 priority riparian lands	Annually	<b>Conduct Monitoring:</b> County parks and recreation, county planning departments, local municipalities and counties <b>Implement Evaluation:</b> Steering Committee
<i>OBJECTIVE: Protect and re-establish riparian and instream habitat</i>							
Install buffers and protect riparian corridors (No.8)	Planning Departments Phase II Annual Reports	Acres of protected riparian areas and riparian areas with adequate buffers	Acres of adequately protected riparian areas	Map priority riparian areas for protection	25% increase in number of riparian areas with adequate protection/buffer	Annually	<b>Conduct Monitoring:</b> State, county, and local planning departments <b>Implement Evaluation:</b> Steering Committee
Install storm drain markers (No.9)	NPDES Phase II Annual Reports	Number of storm drain markers installed	Percent of catch basins with storm drain markers	Identify and prioritize catch basins to have storm drain markers installed	Install 75% of total number of storm drain markers on catch basins	Annually	<b>Conduct Monitoring:</b> NPDES <b>Implement Evaluation:</b> Phase II Entities PEP Steering Committee
Utilize habitat restoration techniques (No.10)	MDEQ Stream Crossing surveys	Habitat site rating	Improved habitat site rating	Identify sites for habitat restoration efforts	Implement techniques at 3 sites for habitat restoration	Every 10 years	<b>Conduct Monitoring:</b> Road Commissions, Local municipalities <b>Implement Evaluation:</b> Steering Committee
Install/maintain oil and grease trap devices (No.11)	NPDES Phase II Annual Reports	Number of devices	Removal of oil and grease from storm water runoff	Identification of areas where installation would be beneficial	75% of devices installed in areas previously identified	Annually	<b>Conduct Monitoring:</b> Counties and local department of public works <b>Implement Evaluation:</b> Steering Committee, NPDES Phase II Entities
Minimize the effects of salt and deicing chemical storage areas (No.12)	NPDES Phase II Annual Reports	Number of properly stored salt and deicer chemicals	Properly stored salt and deicer chemicals	Locate storage areas	Inspect 100% of storage areas for compliance	Annually	<b>Conduct Monitoring:</b> County and Local departments of public works <b>Implement Evaluation:</b> Steering Committee, NPDES Phase II Entities
<i>OBJECTIVE: Reduce soil erosion and sedimentation</i>							

**TABLE 6-1: GOAL 2 - RESTORE AND PROTECT AQUATIC LIFE, WILDLIFE, AND HABITAT**

Actions and Best Management Practices	Monitoring Components	Units of Measurement	Criteria	3-Year Milestone (2008)	8-Year Milestone (2013)	Evaluation Schedule	Responsible Parties
Improve SESC programs (No. 13)	NPDES Phase II Annual Reports	SESC programs	Reduction of erosion and sedimentation from construction sites	Develop plan to improve SESC program	Demonstrate progress on 2008 SESC improvement plan	Annually	<b>Conduct Monitoring:</b> Macomb and St. Clair SESC CEAs, SESC Municipal Enforcing Agents (MEAs) <b>Implement Evaluation:</b> Steering Committee, NPDES Phase II Entities
	NPDES Phase II Annual Reports	Number of code enforcement actions per number of permits issued	Reduction in number of projects in violation	25% decrease in number of code enforcement actions per number of permits issued	Less than 10% of projects in violation	Annually	<b>Conduct Monitoring:</b> Macomb and St. Clair SESC CEAs, SESC MEAs <b>Implement Evaluation:</b> Steering Committee, NPDES Phase II Entities
Implement streambank stabilization measures (No. 14)	Embeddedness study	Amount of sediment	Reduction of sediment	Identify most critical erosion sites and possible sources	Implement actions at 50% of critical sites to stabilize stream flows and/or areas of erosion	After installation of system of BMPs	<b>Conduct Monitoring:</b> MDEQ, volunteers <b>Implement Evaluation:</b> Steering Committee
Perform street sweeping (No. 15)	NPDES Phase II Annual Reports	Effectiveness of street sweeping program	Street sweeping strategy for maximum effectiveness	Identify entities that use street sweepers and evaluate components of program	2 additional entities using street sweepers and improved effectiveness	Every 2 years	<b>Conduct Monitoring:</b> County and local department of public works <b>Implement Evaluation:</b> Steering Committee, NPDES Phase II Entities
<b>OBJECTIVE: Reduce excess runoff</b>							
Support environmentally-friendly lawn and garden maintenance (See No. 6 above)							
<b>OBJECTIVE: Protect open space and natural areas within the Watershed</b>							
Conduct natural feature inventory and assessments (No. 16)	NPDES Phase II Annual Reports	Natural features maps	Implementation of ordinances and overlay districts to protect water features and riparian land	Map and prioritize natural features without protection	Develop ordinances or overlay districts to protect identified areas	Annually	<b>Conduct Monitoring:</b> County and local planning departments <b>Implement Evaluation:</b> Steering Committee, NPDES Phase II Entities
Increase wetland conservation (No. 17)	NPDES Phase II Annual Reports	Wetlands inventory - Inventory of unique wetlands unprotected by MDEQ	Implementation of programs that increase protection of wetlands	Presentations regarding wetland credits and wetland banking	Implement program to provide additional protection to wetlands	Annually	<b>Conduct Monitoring:</b> MDEQ, and local planning departments <b>Implement Evaluation:</b> Steering Committee, NPDES Phase II Entities

**TABLE 6-1: GOAL 2 - RESTORE AND PROTECT AQUATIC LIFE, WILDLIFE, AND HABITAT**

Actions and Best Management Practices	Monitoring Components	Units of Measurement	Criteria	3-Year Milestone (2008)	8-Year Milestone (2013)	Evaluation Schedule	Responsible Parties
Implement natural features and floodplain protection ordinances (No.18)	NPDES Phase II Annual Reports	Natural features and floodplain protection ordinances	Implementation of ordinances	Develop model natural features and floodplain protection ordinances and present to county and municipal governments	Adopt ordinances or overlay districts to protect identified areas	Annually	<b>Conduct Monitoring:</b> County and local planning departments <b>Implement Evaluation:</b> Steering Committee, NPDES Phase II Entities
Continue and expand litter and debris cleanup programs (No.19)	NPDES Phase II Annual Reports	Number of cleanup programs	Increase number of programs	Identify areas in need of cleanup efforts	Conduct clean-up efforts in 5 areas	Annually	<b>Conduct Monitoring:</b> Local volunteer groups and organizations, Road Commission and MDOT <b>Implement Evaluation:</b> Adopt-A-Road program PEP Steering Committee, NPDES Phase II Entities
Continue and expand hazardous waste recycling programs (No.20)	NPDES Phase II Annual Reports	Level of participation in hazardous waste collection programs	Increase knowledge and use of hazardous waste collection	Increase hazardous waste education efforts	Increased hazardous waste collection knowledge and use by 25%	5 years (post Southeast Michigan Council of Governments education survey)	<b>Conduct Monitoring:</b> Local municipalities and counties <b>Implement Evaluation:</b> NPDES Phase II Entities

**TABLE 6-1: GOAL 3 - PROTECT PUBLIC HEALTH**

Actions and Best Management Practices (No.)	Monitoring Component	Units of Measurement	Criteria	3-Year Milestone (2008)	8-Year Milestone (2013)	Evaluation Schedule	Responsible Parties
<i>OBJECTIVE: Protect drinking water supply</i>							
Include drinking water protection measures in master plans, zoning ordinances, and protection plans for the Cities of Algonac and New Baltimore and Ira Township (No.21)	Review of master plans and ordinances	Master plans and ordinances	Adoption of ordinances to support master plans	Complete (source water protection plans) and implement recommendations that have been approved by MIDEQ	Complete evaluation of implementation efforts and review source water protection requirements	Every 5 years	<b>Conduct Monitoring:</b> City of Algonac, City of New Baltimore, Ira Township <b>Implement Evaluation:</b> Steering Committee
<i>OBJECTIVE: Reduce pollutants resulting in fish advisories</i>							
Hazardous waste recycling programs (See No.20 above)							
Identify and eliminate illicit discharges (No.22)	NPDES Phase II Annual Reports	Number of correction of illicit discharges/connections	Correction of illicit connections	Correct illicit connections discovered through IDEP	Maintain an effective program for finding and eliminating illicit discharges	According to approved NPDES Phase II IDEP	<b>Conduct Monitoring:</b> County departments of public works and health departments <b>Implement Evaluation:</b> Steering Committee, NPDES Phase II Entities
<i>OBJECTIVE: Reduce bacterial loading</i>							
Develop manure management plans (part of GAAMPs) (See No. 1 above)							
Control Sanitary Sewer Overflows (SSOs) and maintain sanitary sewer infrastructure (See No. 2 above)							
Eliminate failing onsite septic disposal systems OSDSS (See No. 3 above)							
Manage lagoon systems and package WWTP (See No. 4 above)							
Manage pet waste and wildlife populations (See No. 5 above)							

**TABLE 6-1: GOAL 4 - REDUCE IMPACTS FROM PEAK FLOWS**

Actions and Best Management Practices	Monitoring Component	Units of Measurement	Criteria	3-Year Milestone (2008)	8-Year Milestone (2013)	Evaluation Schedule	Responsible Parties
<i>OBJECTIVE: Establish target peak flows for tributaries</i>							
Conduct hydrologic analysis (No.23)	Hydrologic analysis	Hydrographs	Storm water controls that protect target peak flows	Determine areas where target peak flows are needed within watershed	Implement storm water controls in identified areas to meet target peak flows	To be determined after entities have implemented storm water controls	<b>Conduct Monitoring:</b> Consultant <b>Implement Evaluation:</b> Steering Committee
<i>OBJECTIVE: Develop water resource protection and management ordinances to reduce runoff</i>							
Implement storm water ordinances that include low impact development techniques (No.24)	NPDES Phase II Annual Reports	Progress of NPDES Phase II Program	Adoption of ordinances and/or engineering standards	Progress towards adoption of model storm water ordinance and/or engineering standards	100% of Phase II storm water ordinances	Annually	<b>Conduct Monitoring:</b> County and local planning departments <b>Implement Evaluation:</b> Steering Committee, NPDES Phase II Entities
<i>OBJECTIVE: Reduce storm water runoff quantity and minimize post-storm instream velocities</i>							
Construct/maintain storm water storage facilities (No.25)	NPDES Phase II Annual Reports	Progress of NPDES Phase II Program	Installation of storm water control measures in developing areas	Identify areas from hydrologic model and build-out analysis where storm water control measures need retrofiting	50% of retrofit control measures implemented in identified areas	Annually	<b>Conduct Monitoring:</b> County and local departments of public works <b>Implement Evaluation:</b> Steering Committee, NPDES Phase II Entities
Install/maintain storm water infiltration devices (No.26)							
Enhance storm water treatment (No.27)							
Prevent and remove flow obstructions following woody debris management techniques (No.28)	Drain Commissioners' inspection reports	Amount of obstructions removed	Obstructions removed in critical areas	Identify critical areas for obstructions and develop maintenance plan	Implement maintenance plan	Annually	<b>Conduct Monitoring:</b> County and local departments of public works, drain commissioners <b>Implement Evaluation:</b> Steering

**TABLE 6-1: GOAL 4 - REDUCE IMPACTS FROM PEAK FLOWS**

Actions and Best Management Practices	Monitoring Component	Units of Measurement	Criteria	3-Year Milestone (2008)	8-Year Milestone (2013)	Evaluation Schedule	Responsible Parties
<p>Notes:</p> <ul style="list-style-type: none"> <li>CNMPs - Comprehensive nutrient management plans</li> <li>GAAMPS - Generally Accepted Agricultural Management Practices</li> <li>SSOs - Sanitary Sewer Overflow</li> <li>OSDSs - Onsite Septic Disposal Systems</li> <li>USDA - U.S. Department of Agriculture</li> <li>BMPs - Best Management Practices</li> <li>MC - Macomb County Time-of-Sale Ordinance</li> </ul>							Committee, NPDES Phase II Entities

NRCS - Natural Resource Conservation Service  
 MDEQ - Michigan Department of Environmental Quality  
 NPDES - National Pollutant Discharge Elimination System  
 MCHD - Macomb County Health Department  
 WWTP - Water Treatment Plant  
 SESC - Soil Erosion Sedimentation Control  
 CEAs - County Enforcing Agents  
 MEAs - Municipal Enforcing Agents

Table 6-2: Recommended Monitoring Plan for Anchor Bay Watershed

Organization	Name of monitoring program	Funding source	Dates of monitoring program	Locations of monitoring (within Anchor Bay Watershed)	Frequency of sampling	Parameters analyzed	Methods of evaluation	Summary of results (please attach report summary if possible)	Method to communicate results	Continuing efforts of program	Partners involved in program
<b>County Activities</b>											
Macomb County Health Department	Weekly Watershed <i>E. coli</i> Monitoring	Macomb County	May - September 1995 - present	11 sites in Crapau Creek, Salt River, and other minor tributaries	1 sample per site per week	<i>E. coli</i>	Total body contact standards	Salt River and Crapau Creek exceeding total body contact standards	<a href="http://www.macombcountymi.gov/publichealth">www.macombcountymi.gov/publichealth</a>	Will continue in future with County funding	
Macomb County Health Department	Bathing Beach Monitoring	Macomb County and State	May - September 1995 - present	New Baltimore Beach	3 samples per site per visit. Mondays and Wednesdays, mid-April to end of September	<i>E. coli</i>	Macomb County lab. Geometric mean in estimating a 30-day average from individual samples taken during five or more sampling events	Beach is closed in total body contact standards are exceeded -300 e. coli colonies per 100 milliliters, as a geometric mean of all samples collected at a beach during one sample event; -130 e. coli colonies per 100 milliliters, as a geometric mean of all samples collected over a 30-day period.	<a href="http://www.macombcountymi.gov/publichealth">www.macombcountymi.gov/publichealth</a> <a href="http://www.lakestclairdata.net">www.lakestclairdata.net</a> Data from 2001-2005 on website, daily and 30-day geometric means posted	Will continue through County and State funding	
Macomb County Health Department	Lake St. Clair Assessment (LSCA)	Army Corps of Engineers, MDEQ, County	May - September 1998 - present	40+ locations near shore, off shore and within watershed of Lake St. Clair	Various	Water and sediment sampling for many parameters	Various		Comprehensive written reports, summaries, and additional information on the website <a href="http://www.lakestclairdata.net">www.lakestclairdata.net</a>	Will continue in future	
St. Clair County Health Department	SCCHD Weekly Monitoring Program	SCCHD	Late May - August 1995 - 2005	10 sites Marine City Dredge Cut <u>St. Clair River</u> Algonac State park Algonac Boardwalk  Harsen's Island 1825 S. Channel Drive Frank's Dock  <u>North Channel</u> - Browns Landing  <u>Beuabien Creek</u>  <u>Swan Creek</u>  <u>Anchor Bay</u> - DNR Boat Launch - Tin Fish	Weekly	Bacteria	Full body contact standards	Overall meeting WQS for full body contact recreation	Written annual reports	Expected to continue	none

**Table 6-2: Recommended Monitoring Plan for Anchor Bay Watershed**

Organization	Name of monitoring program	Funding source	Dates of monitoring program	Locations of monitoring (within Anchor Bay Watershed)	Frequency of sampling	Parameters analyzed	Methods of evaluation	Summary of results (please attach report summary if possible)	Method to communicate results	Continuing efforts of program	Partners involved in program
Macomb County, St. Clair County GIS	Land use/Land Cover Analysis	Counties	2010 -	Entire Watershed	Every 5 years	Land use/Land Cover, habitat	Compare amounts of agricultural land and other changes in land cover	Look for new development to see effects of imperviousness and implementation of BMPS	Maps and report to communities, posted on website		1) SEMCOG
<b>Water Treatment Plant Activities</b>											
St. Clair County Waste Treatment Plants	NPDES Permit Compliance	St. Clair County Public Works Office, City of Algonac, Ira Twp, and Clay Twp.	Year round	Dana Drain (Swartout Creek)	Various	TSS, DSS, everything except turbidity and fecal - same as New Baltimore	The Steering Committee will evaluate data against criteria established by the state or otherwise by this WMP.	Look for concentrations close to criteria	Annual report to the Steering Committee.	Will continue for NPDES permitting	1) St. Clair County Public Works Office, 2) City of Algonac, 3) Ira Twp, 4) Clay Twp.
City of New Baltimore WWTP	NPDES Discharge Permit Compliance (MI0023680)	City of New Baltimore	Continuous	Outfall 001 - discharge to Crapau Creek  3 storm water stations on tributaries to Crapau Creek  67 sampling points for bacteria in Crapeau Creek from previous study	5 times per week (mercury and copper quarterly)	CBOD <sub>5</sub> , ammonia nitrogen (as N), TSS, total phosphorus, (as P), total residue chlorine, mercury, copper, pH, flow	Maximum limits Multi-parameter probes installed on site	Criteria are determined by NPDES permit.	Summary of data included on City Council reports every month	Will continue for NPDES permitting	1) City of New Baltimore WWTP
Water Treatment Plants	Lake St. Clair and St. Clair River Drinking Water Monitoring System	Stakeholders of system		3 of 9 WTP sites in total project are located in the Anchor Bay Watershed: 1) City of New Baltimore 2) Ira Township 3) City of Algonac	Sampling to begin in 2007  The WTP hopes to provide the Steering Committee with sample processing or mobile probes once the project is set up.	Multi-parameter probes with mass spectrometers, fluorimeters, testing for pH, alkalinity, VOCs, hydrocarbons, conductivity, DO	The Steering Committee will evaluate data against criteria established by the state or otherwise by this WMP.	Look for concentrations close to criteria	To be determined, possibly through a regional website	Funding was approved on 4/1/2006	Water Treatment Plants 1) City of New Baltimore 2) Ira Township 3) City of Algonac

**Table 6-2: Recommended Monitoring Plan for Anchor Bay Watershed**

Organization	Name of monitoring program	Funding source	Dates of monitoring program	Locations of monitoring (within Anchor Bay Watershed)	Frequency of sampling	Parameters analyzed	Methods of evaluation	Summary of results (please attach report summary if possible)	Method to communicate results	Continuing efforts of program	Partners involved in program
<b>Anchor Bay Steering Committee Activities</b>											
Anchor Bay Steering Committee (Staff from Ira Township DPW, Algonac WWTP, New Baltimore WTP and Chesterfield Twp.)	Anchor Bay Monitoring Program	Phase II MS4s and WQ Monitoring grants.  Estimated consultant costs - 10,500 for sampling time, equipment, and analysis every 5 years	2007; Every five years thereafter.	1) Marine City Drain, 2) Swan Creek, 3) Beaubien Drain 4) Dana Drain (Swartout Creek) 5) Salt River 6) Crapau Creek 7) Marsac Creek  - as far upstream as possible where year round water levels are present	Once every 5 years, 12-15 samples per site	Bacteria, nutrients (phosphorus), temperature, DO, and pH	Grab samples analyzed by local WWTPs  Criteria established by the WMP.	Look for concentrations close to criteria	Written and electronic report for posting on the Anchor Bay website and other related project websites.  Correlate with Lake sampling	SCCPWO sampling is dependent upon approval by their board.  Costs of hiring a consultant to be allocated among Steering Committee	SCCPWO, Ira Twp, City of Algonac, City of New Baltimore, Chesterfield Twp., Consultant
											Ira Township Staff, Algonac WWTP, New Baltimore CWTP
Anchor Bay Steering Committee (volunteer field staff from MS4s and/or volunteer organizations)	Anchor Bay Monitoring Program	MS4s, WQ Monitoring grants  Estimated consultant costs - \$3,000 for each sampling period	2007 ; Every year thereafter.	Same sites as monitored in the 2004 hydrologic study Project and/or determined based on land use changes/ projects.	Once a year, and additional sampling during wet weather.	Sedimentation,	Embeddedness and/or pebble counts (whichever is more appropriate)	Criteria established in the WMP	Written and electronic report for posting on the Anchor Bay website and other related project websites.	Consultant costs to be allocated among the Steering Committee	MS4s – field staff, MSUE Adopt-a-Stream, Home School Association, Local Schools, SCC River Day, MDEQ provide training
Anchor Bay Steering Committee	Anchor Bay Monitoring Program	MS4s and/or grants  Estimated Costs - \$9,800 for time and analysis every 5 years	2010	Same as previous sites used for 2004 hydrologic study	Once every 5 years	Hydrology	Measurements at reference reaches	Compare to desired levels established in 2004 Report	Written and electronic report for posting on the Anchor Bay website and other related project websites.	Consultant costs to be allocated among the Steering Committee	Consultant, MDEQ, MS4s – field staff

**Table 6-2: Recommended Monitoring Plan for Anchor Bay Watershed**

Organization	Name of monitoring program	Funding source	Dates of monitoring program	Locations of monitoring (within Anchor Bay Watershed)	Frequency of sampling	Parameters analyzed	Methods of evaluation	Summary of results (please attach report summary if possible)	Method to communicate results	Continuing efforts of program	Partners involved in program
<b>MDEQ Activities</b>											
MDEQ - WB	MDEQ Road Stream Crossing Surveys	MDEQ - WB	2002; 2007; Every five years	24 Mile Road (Salt River), 27 Mile Road (Salt River), Shook Drain (Salt River) These are the 2002 Road Stream Crossing sites, different sites will be requested if necessary.	Every 5 years, 1 sample per site	Habitat metrics (substrate and instream cover, channel morphology, riparian and bank structure), temperature, flow, macroinvertebrates	Ratings	In 2002-2003, 8% rated good, 59% fair, 33% poor	MDEQ publishes report	Scheduled for 2007	MDEQ
MDEQ - WB	SWAS Watershed Monitoring Program	MDEQ - WB	Every five years		2002; 2007; Every 5 years	Road crossing conditions, stream and riparian habitat	Ratings	Habitat rating: Salt River - Marginal (moderately impaired) Shook Drain - Good (slightly impaired) Macroinvertebrate community rating: All Acceptable	MDEQ publishes report, available on website	Scheduled for 2007	Volunteers trained by MDEQ
MDEQ - WB	GLEAS Procedure 51 Water Quality Monitoring Program	MDEQ - WB	Request monitoring of MDEQ in October of year when monitoring is needed; 10/2008	Where requested	As requested	What's requested	How requested		MDEQ SWAS reports	Sampling is dependent on available MDEQ staff and MDEQ monitoring priorities.	Steering Committee

**Table 6-3: Timeline Monitoring**

Description	2007				2008				2009				2010				2011				2012				
	JFM	AMJ	JAS	OND	JFM	AMJ	JAS	OND	JFM	AMJ	JAS	OND	JFM	AMJ	JAS	OND	JFM	AMJ	JAS	OND	JFM	AMJ	JAS	OND	
Revise WMP				X								X							X						
Revise SWPPI						X								X								X			
<b>COUNTY ACTIVITIES</b>																									
Macomb County Health Department 11 sites	Weekly <i>E. coli</i> monitoring at 11 sites																								
Macomb County Health Department New Baltimore Beach		Bathing Beach <i>E. coli</i> Monitoring				Bathing Beach <i>E. coli</i> Monitoring				Bathing Beach <i>E. coli</i> Monitoring				Bathing Beach <i>E. coli</i> Monitoring				Bathing Beach <i>E. coli</i> Monitoring				Bathing Beach <i>E. coli</i> Monitoring			
Macomb County Health Department Lake St. Clair Assessment	Water and sediment sampling, near shore, off shore, and in lake																								
St. Clair County Health Department 11 sites		Bathing Beach <i>E. coli</i> Monitoring				Bathing Beach <i>E. coli</i> Monitoring				Bathing Beach <i>E. coli</i> Monitoring				Bathing Beach <i>E. coli</i> Monitoring				Bathing Beach <i>E. coli</i> Monitoring				Bathing Beach <i>E. coli</i> Monitoring			
Macomb and St. Clair County GIS Entire watershed													Land Use/Land Cover Analysis												
<b>WATER TREATMENT PLANT ACTIVITIES</b>																									
St. Clair County Public Works Office																									
City of New Baltimore WWTP	NPDES Permit compliance testing for various parameters (ammonia, phosphorus, TSS, pH, flow)																								
Regional Water Treatment Plants	NPDES Permit compliance testing for various parameters (ammonia, phosphorus, TSS, pH, flow)																								
<b>ANCHOR BAY STEERING COMMITTEE ACTIVITIES</b>																									
Staff from Ira Township DPW and Algonac WWTP - Marine City Drain, Swan Creek, Beaubien Drain, Dana Drain		Grab samples for bacteria, nutrients, phosphorus, temp, DO, pH																				Grab samples for bacteria, nutrients, phosphorus, temp, DO, pH			
Staff from New Baltimore WWTP Salt River, Crapau Creek, Marsac Creek		Grab samples for bacteria, nutrients, phosphorus, temp, DO, pH																				Grab samples for bacteria, nutrients, phosphorus, temp, DO, pH			
Steering Committee Volunteers 10 sites, conducting pebble counts and embeddedness study		TSS				TSS					TSS											TSS			
Steering Committee and Consultant Hydrologic model and reference reach analysis												Hydrologic and reference reach analysis													
<b>MDEQ ACTIVITIES</b>																									
SWAS Watershed Monitoring 3 sites in Salt River																									
MDEQ Stream Crossing Surveys Complete survey in entire watershed based on 2002-2003 results		HM																							
GLEAS Procedure 51, as requested																									

Notes:

WMP = Watershed Management Plan	<i>E. coli</i> = <i>Escherichia Coli</i>
SWPPI = Storm Water Pollution Prevention Initiative	TSS = Total Suspended Solids
WWTP = Wastewater Treatment Plant	DO = Dissolved Oxygen
DPW = Department of Public Works	pH = potential of hydrogenBa measure of acidity and alkalinity
MDEQ = Michigan Department of Environmental Quality	HM = Habitat Metrics
SWAS = Surface Water Assessment Section	WC = Water Chemistry

Table 6-4: Sampling Points

Subwatershed	sample point	<i>E. coli</i>	TSS	TDS	CBOD <sub>5</sub>	ammonia	total phosphorus	chlorine	mercury	copper	pH	flow stream morphology	rain gauge	flow monitor	Habitat metrics	temp	macroinvertebrates	sedimentation (pebble counts, embeddedness)	VOCs	alkalinity	hydrocarbons	conductivity	DO
Anchor Bay Shores Drainage	ABS1	X																					
Pitts Drain	PD1	X																					
Salt River	SR1	X																					
	SR2	X					X				X					X							X
	SR3											X			X	X	X						
	SR4	X																					
	SR5																						
	SR6											X			X	X	X						
	SR7											X			X	X	X						
	SR8	X																X					
	SR9													X				X					
	SR10												X										
Crapau Creek	CC1	X																					
	CC2	X	X	X	X	X	X	X	X	X	X	X				X			X	X	X	X	X
	CC3	X																					
	CC4	X																					
Marsac Creek	MC1	X																					
	MC2	X																					
	MC3	X					X				X			X		X		X					X
	MC4											X											
	MC5											X						X					
	MC6											X						X					
	MC7												X										
Swan Creek	SC1	X																					
	SC2	X					X				X					X							X
	SC3											X						X					
	SC4													X				X					
	SC5												X										
	SC6											X						X					
	SC7											X						X					
Beaubien Creek	BC1	X																					
	BC2	X					X				X					X							X
	BC3											X											
	BC4											X											
Swartout Drain	SD1	X																					
	SD2	X																					
	SD3		X	X	X	X	X	X	X	X	X	X						X	X	X	X	X	X
	SD4											X						X					
	SD5											X						X					
	SD6	X																					

Table 6-4: Sampling Points

	sample point	<i>E. coli</i>	TSS	TDS	CBOD <sub>5</sub>	ammonia	total phosphorus	chlorine	mercury	copper	pH	flow	stream morphology	rain gauge	flow monitor	Habitat metrics	temp	macroinvertebrates	sedimentation (pebble counts, embeddedness)	VOCs	alkalinity	hydrocarbons	conductivity	DO
<b>Subwatershed</b>																								
St. Clair River Drainage	SCR1	X																						
Marine City Drain	MCD1	X				X					X						X							X
South Channel Drive	SCD1	X																						
Frank's Dock	FD1	X																						
Brown's Landing	BL1	X																						
Other Water Treatment Plants																			X	X	X	X	X	X

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