
Appendix B: Task Descriptions for the Generic TMDL Project Process

1 Watershed Survey Design

1.1 Examine Available Internal Information

Purpose: To compile internal information on past surveys (TSDs, PSDs, reference site data, other data, existing TMDL monitoring plans generated stressor/exposure data) to act as the baseline for a new survey to examine trends in impairment and causes/sources, identify gaps in previous surveys, etc. (See Ohio EPA 1999a) For waters that have had previous TMDLs developed and implemented, this process will ensure they are re-sampled for trend analyses and listing/de-listing.

Description: This activity is one of searching/reading through databases, documents, and files and compiling the data in ways (e.g., maps, tables) to make it useful for designing the new survey. This process includes QA/QC checks on the data. Information is typically summarized as part of a study plan document. EAU staff have traditionally taken the lead in developing the study plan, with the involvement of modelers, permitting staff, NPS, district staff and other agencies.

Inputs: Electronic or paper databases, files, reports.

Output: This is part of the process to produce a study plan document.

Time (Effort): 10-24 hours

Time (Span): 2-3 days; One to Two Weeks (mid April to late May)

Dependencies:
Project: None.

Recommendations: Improved data and information management for monitoring efforts; accurate geo-referencing standards for all data

Information Sources:

Ohio EPA. 1999a, Draft. Ohio EPA five-year surface water monitoring strategy, 2000-2004. Ohio EPA Technical Bulletin MAS/1999-7-2. Ohio EPA, Division of Surface Water, Front Street, Columbus, Ohio.

1.2 Examine Available External Information

Purpose: To compile external information on past surveys (e.g., other agencies, volunteer data) to add to a baseline of data for a new survey.

Description: This activity is one of searching/reading through databases, documents, and files and compiling the data in ways (e.g., maps, tables) to make it useful for designing the new survey. A time consuming part of this procedure could be finding the data,

documentation, and performing QA/QC checks on the data. Information is typically summarized as part of a study plan document. Guidelines for data acceptance (Ohio EPA 1999b) and development of Internet databases may improve this. For other government stakeholders (federal and state agencies) data sharing needs to be institutionalized at the staff level. Perhaps consideration of a mechanism like that which exists in Maryland (Maryland Water Monitoring Commission) should be considered as a permanent, independent entity to facilitate information sharing.

The new TMDL process will also incorporate feedback (including data) from stakeholders identified in the initial announcement of activity (e.g., monitoring, TMDL development) in the watershed. This will likely require one or more meetings and monitoring and assessment workshops. This will be discussed in more detail under a general plan for public participation. The proposed federal TMDL guidelines require consideration of "monitored" and "evaluated" (e.g., volunteer monitoring data) in constructing the TMDL list, however, this data would have to meet Ohio EPA QA/QC standards to be used in listing decisions [this supported in proposed regulations] . Evaluated data such as volunteer monitoring not rigorous for listing can help target the intensive monitoring that will be used to make attainment decisions, see Ohio EPA 1999b).

Inputs: Electronic or paper databases, files, reports.

Output: This is part of the process to produce a study plan document.

Time (Effort): 8-40 hours

Time (Span): 1 to 2 weeks (mid April to late May)

Dependencies:

Project: Public participation process in operation; availability of data in electronic and paper form (includes documentation of this data, and communication and participation of data "owners" to gain understanding of data "nuances").

Other: Development of public participation, completion of ambient monitoring guidance, development of training program and materials.

Recommendations: Future data and information management efforts should work to improve capture (e.g., via Internet) of external data and "metadata" (e.g., QA/QC information) to increase use/usefulness of information. At a minimum Ohio government agencies should not so parochial when dealing with these types of data.

Information Sources:

Ohio EPA. 1999a, Draft. Ohio EPA five-year surface water monitoring strategy, 2000-2004. Ohio EPA Technical Bulletin MAS/1999-7-2. Ohio EPA, Division of Surface Water, Front Street, Columbus, Ohio.

Ohio EPA. 1999b, Draft. Guide to the uses of ambient monitoring data for surface waters in the TMDL process. Ohio EPA Fact Sheet MAS/1999-?????. Ohio EPA, Division of Surface Water, Front Street, Columbus, Ohio.

1.3. Complete Study Plan Design

Purpose: To write and produce a plan of study for a watershed.

Description: This activity meshes Agency study objectives (TMDL needs, other water quality management needs, such as unsampled area, permit support, WQS support, etc., see Ohio EPA 1999a, b) with knowledge of previous assessment and data to create a monitoring plan of study for a watershed. Important issues will include sample design and coverage based on environmental complexity. Meetings with stakeholders and those with interest/expertise outside of Ohio EPA will be an important form of public input.

Inputs: Electronic or paper databases, files, reports, complaints, BPJ, meeting notes.

Output: A study plan document in printed and electronic form (web).

Time (Effort): 16-40 hours

Time (Span): 5-10 days with review; 1 to 2 weeks (mid April to late May)

Dependencies:

Project: 1.1, 1.2

Information Sources:

Previous Study Plans, TSDs, TMDL Reports, etc.,

Ohio EPA. 1999a, Draft. Ohio EPA five-year surface water monitoring strategy, 2000-2004. Ohio EPA Technical Bulletin MAS/1999-7-2. Ohio EPA, Division of Surface Water, Front Street, Columbus, Ohio.

Ohio EPA. 1999b, Draft. Guide to the uses of ambient monitoring data for surface waters in the TMDL process. Ohio EPA Fact Sheet MAS/1999-?????. Ohio EPA, Division of Surface Water, Front Street, Columbus, Ohio.

2 Collect Water Quality Data

2.1 Collect and Compile Ambient Assessment Data (Internal Efforts)

Purpose: To collect and compile data that will be used to assess attainment of designated uses and to identify sources and causes that are limiting achievement of these uses.

Description: This activity is the “nitty-gritty” of going out into the environment to collect data and turn it into information on whether various designated uses (aquatic life, recreation) are meeting these uses (i.e., goals). It is the collection of various categories of appropriate indicators including aquatic life, bacteria, ambient water column and sediment chemistry, habitat data, toxicity data, etc. based on the plans of study devised in step 1. For aquatic life, for example, the process includes data collection, processing of samples, entering and proofing data (e.g., taxonomic, geographic) and calculating indices or other measures. The Ohio EPA monitoring strategy covers many of the important considerations related to monitoring not mentioned here (Ohio EPA 1999a).

Inputs: Plan of study (1.3)

Output: Data that meets all data quality objectives (QA/QC) for its intended use in an electronic form useful for part 3.1 and 3.2.

Time (Effort): 4-8 work years per watershed

Time (Span): 9- 15 months

Dependencies:

Project: Step 1.3. Complete study plans, equipment and resources (e.g., interns, supplies) for field work, data management resources for data entry or access, QA/QC, etc.

Information Needs:

Study plans

Ohio EPA. 1999a, Draft. Ohio EPA five-year surface water monitoring strategy, 2000-2004. Ohio EPA Technical Bulletin MAS/1999-7-2. Ohio EPA, Division of Surface Water, Front Street, Columbus, Ohio.

Ohio Environmental Protection Agency. 1987a. Biological criteria for the protection of aquatic life: Volume I. The role of biological data in water quality assessment. Div. Water Qual. Monit. & Assess., Surface Water Section, Columbus, Ohio.

Ohio Environmental Protection Agency. 1987b. Biological criteria for the protection of aquatic life: Volume II. Users manual for biological field assessment of Ohio surface waters. Div. Water Qual. Monit. & Assess., Surface Water Section, Columbus, Ohio.

Ohio Environmental Protection Agency. 1989c. Biological criteria for the protection of aquatic life: Volume III. Standardized biological field sampling and laboratory methods for assessing fish and macroinvertebrate communities. Div. Water Quality Plan. & Assess., Ecol. Assess. Sect., Columbus, Ohio.

Rankin, E.T. 1989. The qualitative habitat evaluation index (QHEI): rationale, methods, and application.

Div. Water Qual. Plan. & Assess., Ecol. Assess. Sect., Columbus, Ohio.

Since the publication of the preceding guidance documents new publications by Ohio EPA have become available. The following publications should also be consulted as they represent the latest information and analyses used by Ohio EPA to implement the biological criteria.

DeShon, J.D. 1995. Development and application of the invertebrate community index (ICI), pp. 217-243. in W.S. Davis and T. Simon (eds.). *Biological Assessment and Criteria: Tools for Risk-based Planning and Decision Making.* Lewis Publishers, Boca Raton, FL.

Rankin, E. T. 1995. The use of habitat assessments in water resource management programs, pp. 181-208. in W. Davis and T. Simon (eds.). *Biological Assessment and Criteria: Tools for Water Resource Planning and Decision Making.* Lewis Publishers, Boca Raton, FL.

Yoder, C.O. and E.T. Rankin. 1995. Biological criteria program development and implementation in Ohio, pp. 109-144. in W. Davis and T. Simon (eds.). *Biological Assessment and Criteria: Tools for Water Resource Planning and Decision Making.* Lewis Publishers, Boca Raton, FL.

Yoder, C.O. and E.T. Rankin. 1995. Biological response signatures and the area of degradation value: new tools for interpreting multimetric data, pp. 263-286. in W. Davis and T. Simon (eds.). *Biological Assessment and Criteria: Tools for Water Resource Planning and Decision Making.* Lewis Publishers, Boca Raton, FL.

2.2 Collect and compile and QA/QC readily available external information

Purpose: To use data collected by groups external to Ohio EPA to supplement and strengthen (e.g., geographically) assessments or to focus more intensive monitoring efforts.

Description: This activity will vary greatly with the source of the information and documentation (e.g., purpose, QA/QC) available for each data source. Other data has been integrated into various reports (TSDs) and the 305(b) process in the past. Some can be straightforward to use. For example we used USGS and other Agency pH data to identify mine affected streams in southeast Ohio. For other datasets that are less well documented the use of the information can be difficult. Part of the plan to improve the usefulness of such data will be to create a clear process for accepting and using data (Ohio EPA 1999b). Certain types of data, for example, may be useful in identifying area for intensive monitoring or aid in associating cause and sources back to impairment. Data that is too difficult to use (e.g., poor documentation) or not rigorous enough may be excluded.

Inputs: Electronic data with well documented QA/QC (sufficient "metadata")

Output: Data that can meet various needs for the TMDL process depending on QA/QA and documentation (e.g., cause/source determination) in electronic form.

Time (Effort): 1-10 days

Time (Span): 1 month (April-May)

Dependencies:

Project: Cooperation of stakeholders, data “owners”.

Other: Establishment of a process for involving the public and stakeholders including meetings, training, technical assistance. One possibility is a body similar to the Maryland Water Monitoring Council (see 1.2). Establishment of processes and procedures for capturing data (e.g., Internet).

Recommendations: Consider these source of data and information when improving the Division's monitoring data and information systems (i.e., SWIMS II/Jr).

Information Sources:

Ohio EPA. 1999b, Draft. Guide to the uses of ambient monitoring data for surface waters in the TMDL process. Ohio EPA Fact Sheet MAS/1999-?????. Ohio EPA, Division of Surface Water, Front Street, Columbus, Ohio.

3 Assess Waterbodies

3.1 Determine impairments by designated use

<i>Purpose:</i>	To determine attainment of water quality goals (standards) for Ohio waters.
<i>Description:</i>	This activity is one of comparing results of ambient monitoring of streams, rivers, ponds, lakes, reservoirs, Lake Erie, and wetlands to the appropriate criteria listed in the Ohio WQS for these waters (it is the basis of listing/de-listing decisions). Those waters that have measures that exceed (e.g., typically stressors such as chemicals, bacteria levels) or deviate (e.g., response variables such as biocriteria) from the criteria are considered "impaired." Waters without such "exceedances" or deviations from criteria may be considered unimpaired or attaining the appropriate designated uses if data is deemed sufficient (e.g., biocriteria) to make such a call. Attaining waters may be classified as threatened if there is evidence that the use may not meet criteria in the future because of trends in or near these waters. In a few situations where some indicators conflict in their assessments of attainment a "weight of evidence" approach is used. The previous activity included the collection and much of the "grunt" work to QA/QC the data (includes proofing, voucher identification, database entry, etc.); this activity assumes the information is available in final form.
<i>Inputs:</i>	Electronic databases (proofed, QA/QC'd) of ambient assessment data (biological, chemical), other supporting data for weight of evidence analysis.
<i>Output:</i>	Multiple outputs will be produced with varying level of detail supporting these analyses. The most complex treatment will be reported in Technical Support Documents (TSDs). For TMDL watersheds, a summary of the attainment status will be produced for the TMDL report. For waters with biological criteria (aquatic life uses) attainment tables summarize the attainment status for each site and tables of chemical data summarize impairment of chemical water quality criteria. Some very simple assessments have an attainment table and are reported though the 305(b) report. Sizes of all Waterbodies impaired (i.e., miles for streams/rivers, acres for lakes) are reported in summary form in the 305(b) report and electronically in the Waterbody System (WBS)
<i>Time (Effort):</i>	2-5 days per watershed (simple to complex).
<i>Time (Span):</i>	5 months (Feb - June)
<i>Dependencies:</i>	
<i>Project:</i>	2.1, 2.2.
<i>Other:</i>	This process is dependent on the availability of data in electronic form. It is also dependent on the completion of a "Use Attainability Analysis" where appropriate. For example, Ohio EPA has a tiered system of aquatic life uses and recent survey results are use to confirm that the current use is appropriate or to recommend a use change. The criteria used to determine the attainment status vary with use, therefore determining the correct attainment status is dependent on the correct use designation. Some waters and waterbody types have use designation under development (e.g., wetlands, Lake Erie near shore area and estuaries)

(Lacustraries), and headwater streams.

Recent proposed guidelines indicate that any water quality decline in a tier 3 water (i.e., ONRW, Ohio currently has none) will be considered impaired for 303(d) purposes. Similarly any stream whose existing use, as of 1975 has been affected is also considered impaired if no use attainability has been performed. Because Ohio regularly designates or redesignates streams that we monitor that have no or have inappropriate designated uses, this problem should be minimal in Ohio.

Out of Cycle Assessments: It is not clear whether the proposed TMDL regulations will limit listing and de-listing between the 2, 4, or 5 year cycles being proposed. Ohio EPA assesses designated use attainment each year based on data collected during a previous summer period. We will likely need to consider how we handle data submitted to us off cycle intended for either a de-listing decision or a change in cause/source identification. All such data will need to meet QA/QC specifications and will be processed through the 305(b) process at a minimum.

Recommendations: For some designated uses, the current criteria or assessment methods likely need to be examined more closely (e.g., recreation, public water supply), thus determining the appropriate attainment status of these uses will be dependent on an in-depth assessment of the indicators used for these designated uses (e.g., U.S. EPA 1999).

Information Needs:

Ohio Environmental Protection Agency. 1987b. Biological criteria for the protection of aquatic life: Volume II. Users manual for biological field assessment of Ohio surface waters. Div. Water Qual. Monit. & Assess., Surface Water Section, Columbus, Ohio.

Ohio Environmental Protection Agency. 1989b. Addendum to Biological criteria for the protection of aquatic life: Volume II. Users manual for biological field

U.S. EPA. 1999. Action plan for beaches and recreational waters. Office of Research and Development/Office of Water, U.S. EPA-EPA/600/R-98/079

3.2 Determine causes/sources of impairments or threats

Purpose: For impaired or threatened waters determine reasons for impairment and sources of the stressor that is causing or may cause impairment

Description: "Multiple lines of evidence" are used to associate stressors present in the environment (e.g., elevated water chemistry values, sedimentation, habitat disturbance, nutrient enrichment and low dissolved oxygen, toxicity) with the observed impairment. The approach is analogous to a medical diagnosis on a patient (waterbody) by a doctor (biologist or scientist). The multiple lines of evidence may include whole effluent toxicity, ambient exceedances of water quality parameters, histories of spills or other episodic "events," biological response signatures in the aquatic community, elevated concentrations of nutrients compared to reference levels, etc. Long-term databases integrating biological, chemical, and habitat data have allowed us to describe predictive responses of some components of aquatic life to a gradient of environmental conditions. For example, a decrease in the substrate score of the QHEI is associated with lower IBI scores, number of

sensitive species, etc. This data, in essence, lets us diagnose many causes of impairment with a high degree of confidence. A similar process will be done for each use (e.g., recreation).

Inputs: Electronic databases of ambient assessment data (biological, chemical), other supporting data for weight of evidence analysis (permit violations, spills, effluent toxicity, land use changes, etc.).

Output: Assessments of causes and sources of impairment will generally be integrated with the assessment of the attainment status. Multiple outputs will be produced with varying level of detail supporting these analyses. The most complex treatment will be reported in Technical Support Documents (TSDs). For TMDL watersheds, a concise assessment of the associated causes and sources will be part of the TMDL report. Causes and source will also be reported in summary form in the 305(b) report, electronically in the Waterbody System (WBS), and as part of the 303(d) list.

Time (Effort): 2-4 weeks

Time (Span): January to June

Dependencies:

Project: 2.1; 2.2; 3.1.

Other: This process is dependent on the availability of sound data (response, stressor, and exposure indicators) in electronic form. For more detailed and robust assessment of watershed level effects, better land use and GIS information will be needed. Clearly some of these assessment are more straightforward than others and a more robust predictive capability of some of these associations is dependent on a functional "Quality Improvement Process" that will reexamine the relationships (models) between response variables (aquatic life, bacteria) and environmental stressors and exposure indicators as we gather new (e.g., pebble counts, improved bacteria indicators) and more spatially and technically sound information.

Recommendations: Although we have been recognized for having a broad and rigorous monitoring program, we need to develop more indicators that will improve our accuracy and precision in identifying NPS causes/sources. These include various substrate measures (e.g., pebble counts), measures of streambank stability (Pfankuch 199?), geomorphological measures (Rosgen 1995) as well as more accessible GIS coverages (e.g., land use, glacial features, soils, etc.).

Information needs:

Previous reports (TSDs, etc.)

Ohio EPA. 1999c, Draft. The process for assessing the causes and sources of impairment of aquatic life in Ohio streams and rivers. Ohio EPA Fact Sheet MAS/1999-?????. Ohio EPA, Division of Surface Water, Front Street, Columbus, Ohio

DeShon, J.D. 1995. Development and application of the invertebrate community index (ICI), pp. 217-243. in W.S. Davis and T. Simon (eds.). Biological Assessment and Criteria: Tools for Risk-based Planning and Decision Making. Lewis Publishers, Boca Raton, FL.

Rankin, E. T. 1995. The use of habitat assessments in water resource management programs, pp. 181-208. in W. Davis and T. Simon (eds.). *Biological Assessment and Criteria: Tools for Water Resource Planning and Decision Making.* Lewis Publishers, Boca Raton, FL.

Yoder, C.O. and E.T. Rankin. 1995. Biological criteria program development and implementation in Ohio, pp. 109-144. in W. Davis and T. Simon (eds.). *Biological Assessment and Criteria: Tools for Water Resource Planning and Decision Making.* Lewis Publishers, Boca Raton, FL.

Yoder, C.O. and E.T. Rankin. 1995. Biological response signatures and the area of degradation value: new tools for interpreting multimetric data, pp. 263-286. in W. Davis and T. Simon (eds.). *Biological Assessment and Criteria: Tools for Water Resource Planning and Decision Making.* Lewis Publishers, Boca Raton, FL.

3.3 Complete TMDL support documents

3.3.1 Watershed TMDL support documents

Purpose: To provide a detailed and sound basis for calculating a TMDL

Description: These reports will be developed to provide an environmental characterization that will for the basis for completing a TMDL. This analysis will define the impaired water or waters (e.g., subwatershed), the associated stressor(s) thought to be limiting to the attainment of water quality standards, and the source or sources of these stressors. For aquatic life, any ecological impediment or constraints will be identified. Where multiple stressors are present, those most limiting to the designated use will be identified. Where appropriate, the most ecologically desirable alternatives for restoration may be initially identified.

Inputs: The same data and analytical capabilities need to complete a TSD: electronic data in raw and summarized form and GIS and statistical data and analyses.

Output: Concise and timely reports (perhaps delivered in database or some other electronic form) identifying limitations to designated uses and an assessment of causes and sources of impairment. These assessment may be grouped regionally (e.g., watersheds) and/or by categories of stressor (e.g., toxic vs. NPS/habitat)

Time (Effort): Unknown because this would be a new product; effort somewhere between a PSD and a TSD and dependent on form (electronic vs document). Likely 20-160 hours.

Time (Span): February to September (9 months)

Dependencies:

Project: 3.1; 3.2.

Other: This process is dependent on the availability of sound data (response, stressor, and exposure indicators) in electronic form (i.e., need to assess use attainment and cause/sources of impairment) and many of the same resources needed to complete a TSD but in a shorter or different (e.g., electronic) form.

For more detailed and robust assessment of watershed level effects, better land use

and GIS information will be needed. The TSD process needs to be examined to determine the most efficient effort and format for delivering this information while maintaining the integrity of the assessment process

3.3 Complete TMDL support documents

3.3.2 305(b) Report

Purpose: To provide a summary report with site specific and larger scale summaries of water resource quality status and trends

Description: The 305(b) report (Ohio Water Resource Inventory) is a biennial report required by section 305(b) of the Clean Water Act and is intended to be the main vehicle by which states report to Congress on the status and trends in their water resource quality. For Ohio it is a summary of the data collected to support various Agency assessment functions. We do not monitor “because of 305(b)” as some states do, rather it is a tool for providing feedback on the success of our water quality management strategies and forms a basis for our strategic plan. The report contains both waterbody-specific summaries of status and causes and sources of threats or impairments and larger scale summaries of status and trends (from watershed scale to statewide scale). Because it is designed as a summary process, the 305(b) data is typically not detailed enough to form the basis of a TMDL. More detailed TMDL support documents will provide this function (see 3.3a).

Currently a biennial effort for National reporting, we should change the waterbody assessment component to an annual effort. All data used for listing waters on the TMDL list will be funneled through the 305(b) process. The proposed TMDL regulations call for a closer link between the 305(b) report and the TMDL list which we already have in Ohio.

Inputs: These summaries are completed during the final process of putting together a TSD or some similar level of assessment (where a TSD is not completed). Therefore the inputs are the various data types (indicators) needed for the TSD process. The more complex the environmental setting the greater the need for a broad array of indicators. The data needs will vary by designated use (e.g., aquatic life vs recreation).

Output: Waterbody assessments of attainment/non attainment of designated uses and causes and sources of threats and impairments in electronic form (WBS) and in paper reports (Ohio Water Resource Inventory).

Time (Effort): Approximately 5% of a EAU biologist's time is spent summarizing the data for the WBS (100 hours for all waters sampled by that biologist) and 50-75% of a FTE (1500 hours) is spent creating and editing the biennial reports and fact sheets, entering and proofing data, etc. The 100 hour estimate is roughly 1-2 hours per waterbody where a TSD or other analysis has been completed (e.g., PSD), more otherwise. Both of these estimates would increase with the need to distribute this information (which is the basis for 303(d)) more broadly and more efficiently outside of the Agency through “infographics” and the web. Better ways of communicate 303(d) information to the public and stakeholders are encouraged in the new TMDL

regulations.

Time (Span): 1 - 9 months; January to August

Dependencies:

Project: 3.2, 3.3a,

Other: This process is dependent on the availability of sound data (response, stressor, and exposure indicators) in electronic form and many of the same resources needed to complete a TSD.

If more outside data were to be used and funneled directly through the 305(b) process, significant staff time would be needed to compile, research (i.e., determine purpose, QA/QC limitations, etc.), and analyze this information.

Information Needs:

U.S. EPA. 1997 Draft, Guidelines for preparation of the 5-year state water quality assessments (305(b) reports) and annual electronic updates. Office of Water, U.S. EPA DRAFT EPA-841-B-002.

4 Identify Target Conditions

4.1 Examine readily available data

Purpose: Begin to create a picture of the watershed by examining readily available information.

Description: Locating, searching and retrieving database information, documents and files located in the Agency including the information gathered in the listing process. Compiling this information into a useable format and checking for QA/QC as needed for documents located in-house but compiled by external entities such as consultants, the regulated community and environmental groups and that were not included in the listing process.

Inputs: Electronic or hard-copy databases, files, reports, maps and documents. Verbal descriptions from staff familiar with the watershed also included. (e.g., waterbody sheets, TSDs, PSDs, existing Agency files (permits, modeling), consultant reports, CSO studies, etc.)

Outputs: Collection and organization of information.

Time (Effort): 40 to 80 hours depending on availability and format (hard copy) of data

Time (Span): 2 to 4 weeks depending on staff availability and time to retrieve electronic data

Dependencies

Project: This process is dependent on the 303(d) list and TMDL schedule being finalized.

Other: The watershed has been approved for TMDL development and a project manager and/or team has been assigned the TMDL project. Availability of staff to supply needed information.

Recommendations: Recommendations in the data management workgroup final report would be applicable here. In addition, the formation of a 'stream team' as discussed in the TMDL charter team's final report would facilitate location of internal information.

Information Sources:

The 303(d) List; current cycle, the Water Resources Inventory/305(b) Report, and the Nonpoint Source Assessment; Ohio EPA, DSW

Technical Support Document (specific to watershed); Ohio EPA, DSW

BASINS: Target/Assess/Data Mining modules; U.S. EPA, OST

Files on entities and watersheds; Ohio EPA, DSW Files

Archived reports and data; State of Ohio Archive

River mile maps of area; Ohio EPA, DSW Library

Verbal discussions with Ohio EPA district and central office staff

Chemical data: STORET, LIMS, LEAPS, datasonde databases

4.2 Gather additional data as appropriate and available

Purpose: Continue to create a picture of the watershed by gathering available, additional data

not necessarily available during the listing process.

Description: Issue a 'call for data' public notice to generate stakeholder involvement and gain watershed data. Call likely sources of information such as local universities, industries and watershed groups. Locate, search, and retrieve database information, documents, files and other data from external sources. Compile this information into a useable format and filter information using QA/QC protocols. Data meeting sufficient QA/QC requirements can be used directly; data not meeting these requirements can be used in a qualitative sense only.

Inputs: Electronic or hard-copy databases, files, reports, maps, measurements and documents. Verbal descriptions from stakeholders familiar with the watershed can be valuable qualitatively. Can be assisted with input from a stakeholder group; see 4.8.

Outputs: Collection and organization of information.

Time (Effort): 20 to 120 hours depending on availability and format (hard-copy) of data

Time (Span): 1 to 3 months depending on the level of the response; the response time of the public, and on the format data provided is in.

Dependencies

Project: This process is dependent on the 303(d) list and TMDL schedule being final. 4.8 would facilitate this; however, the steps are not interdependent.

Other: The watershed has been approved for TMDL development and a project manager and/or team has been assigned the TMDL project. Availability of staff to locate/request needed information. Availability of external data and willingness to give data to Ohio EPA. This is also dependent on communication with the various data "owners" to understand the procedures used to collect the provided data.

Recommendations: This step could be greatly facilitated by issuing a "call for data" by: issuing news releases; sending letters and/or placing phone calls to key stakeholders and watershed groups; including information request on the DSW web page. Potential coordination with the listing call for data but this needs to be more focused on a watershed level, not a state level. A QA/QC protocol is also needed.

Information Sources:

ODNR, USGS, U.S. EPA, NRCS, city/county water and health departments, colleges and universities; local and statewide. Do a literature search to locate studies for watershed of interest. Existing watershed groups, 208 planning agencies, regulated entities, Greenway programs; Internet keyword search.

4.3. Analyze all available data

Purpose: Create a picture and an understanding of the watershed by analyzing compiled internal and external information. This differs from the listing process in that it is a watershed-specific focus and may include additional data not included in listing. In addition, other questions other than impairment are being assessed here such as

identification of major causes of concern including public perception issues (not only aquatic life and human health indicators that are included on the 303d list), resolution of an acceptable geographic scope, exact locations of sources and where what impairments are due to what causes. The listing process is more a summary of overall watershed conditions; this step is to breakdown from the general to the specific details needed in calculating the TMDL.

Description: Synthesize and analyze collected data; look for trends and red flags in the data.

Inputs: Collected data from 4.1 and 4.2

Outputs: Summary of available data; description of findings based on data and a useable database for development purposes.

Time (Effort): 10 to 120 hours depending on availability and format of data

Time (Span): 1 to 6 weeks depending on staff availability

Dependencies

Project: This process is dependent on 4.1 and 4.2.

Other: This process is dependent on the availability of existing data and availability of tools to merge data from the various sources.

Recommendations: This step could be greatly facilitated by the recommendations highlighted in the data management workgroup final report. In general, data should be easily referenced and useable, preferably in electronic format, using similar formats and a common georeferencing system. A QA/QC program needs to be instigated and used. Guidelines for use of external data should be developed. Database and/or other software tools and training should be secured. A position dedicated to this type of data management could be useful.

Information Sources:
Not applicable.

4.4. Define goal(s)

Purpose: Define goal or goals of the TMDL project. For example, is the primary concern of a particular TMDL to address biological impairments, human health concerns, a public concern, or some other focus or combination. Selection of causes of concern to focus on will be developed in the next step.

Description: Based on collected data and preferably using a team approach involving Ohio EPA and stakeholders, identify goal or goals of the TMDL project. Management input may be needed to determine available resources and Agency position of goal setting.

Inputs: Description and analysis from 4.3 and product from 3.3a.

Outputs: Defined goal or goals for the TMDL project

Time (Effort): 5 to 20 hours depending on available information and if availability of resources is an issue

Time (Span): 1 day to 3 weeks depending on staff and management availability.

Dependencies

Project: This process is dependent on completion of 4.3 and 3.3a.

Other: This process is dependent on the availability of staff to devote time to this process, and on management input and support. External input valuable but not required if staff are knowledgeable about public perception and concerns with the watershed. The selection of goal(s) will depend on availability of resources to perform the work, the results of 4.3, and potentially, public perception of the watershed.

Recommendations: This step could be greatly facilitated by having both a 'stream team' of staff and a stakeholder group to interact with at this point in the process. The TMDL charter final report describes the makeup of a stream team and the public participation workgroup final report lists recommendations to form a stakeholder group. In addition, this step is a potential management checkpoint. The strategic plan should be coordinated with this. A priority setting procedure similar to the listing method should be developed here.

Information Sources:

Ohio EPA staff, external stakeholders, the results of 4.3 and the TSD if available.

4.5. Select causes of concern

Purpose: Select which (or all) of the causes of concern that will be focused on in the TMDL project.

Description: Using the output of 4.3 and the watershed team approach list the causes of concern. Selection of causes may need managerial input and a description of the availability of resources.

Inputs: Output of 4.3, 3.3a and watershed team participation

Outputs: Ranked list of causes of concern and a description of causes selected for TMDL development

Time (Effort): 5 to 20 hours depending on amount of data to review, how familiar staff are with the watershed, and how much discussion is generated.

Time (Span): 1 to 3 weeks depending on staff and managerial availability

Dependencies

Project: This process is dependent on completion of 4.4.

Other: Participation of a watershed team, managerial input, and an idea of availability of future resources. In addition, the results of the most current watershed assessment are necessary to the successful identification of the appropriate causes of concern.

The strategic plan could be coordinated with this. A priority setting procedure similar to the listing method should be developed here.

Information Sources:

Ohio EPA staff and management, external stakeholders, the results of 4.3 and 4.4 and the TSD if available.

4.6. Identify and locate sources of selected causes

Purpose: Identify sources of the identified causes of concern in the watershed.

Description: Using the output of 4.3 and the watershed team approach determine the sources of concern.

Inputs: Output of 4.3 and watershed team participation

Outputs: List and description of sources of concern

Time (Effort): 1 to 5 hours depending on number of sources identified

Time (Span): 1 to 2 weeks depending on staff availability

Dependencies

Project: This process is dependent on completion of 4.3 and 4.5.

Other: No other dependencies exist; however, participation of a wide knowledge base would facilitate process; see recommendations.

Recommendations: This step could be greatly facilitated by having both a 'stream team' of staff and a stakeholder group to interact with at this point in the process. The TMDL charter final report describes the makeup of a stream team and the public participation workgroup final report lists recommendations to form a stakeholder group.

Information Sources:

Ohio EPA staff, external stakeholders, the results of 4.3 and the TSD if available.

4.7. Determine geographic scope

Purpose: Define the geographic scope of the TMDL project

Description: Using the output of 4.3 - 4.6 and the watershed team approach determine the geographic boundaries. Selection of boundaries will be based on availability of resources, stakeholder input, the identified goal and selected causes to be focused on and physical or other hydrologic features of the watershed.

Inputs: Output of 4.6 and watershed team participation

Outputs: Description of the geographic scope of the TMDL project

Time (Effort): 1 to 5 hours

Time (Span): 1 to 2 weeks depending on staff and managerial availability

Dependencies

Project: This process is dependent on completion of 4.6

Other: Participation of a watershed team, managerial input, and estimate of availability of future resources.

Recommendations: Availability of resources is an important input to the decision of geographic scope. This is a management checkpoint; managerial guidance needed.

Information Sources:

Ohio EPA staff and management, external stakeholders, and the results of 4.3 through 4.6.

4.8. Identify stakeholder group

Purpose: Contact and/or form a stakeholder group interested in selected TMDL project conditions. Develop a plan or agreement for how the stakeholder group will be involved in the process. Assign roles, identify work products and a timeline. The purpose of this group is to assist in the TMDL development and can serve a wide range of roles including as a public participation 'bounce' group and as a source of watershed data.

Description: Contact existing watershed groups, the external providers of data and people or organizations likely to have an interest in the TMDL project. The public participation workgroup recommendations provide guidance for this step.

Inputs: Stakeholder interest and list of people to contact

Outputs: Engagement and/or formation of stakeholder group and a plan for how to proceed.

Time (Effort): 20 to 80 hours depending on interest and availability of people to contact as well as if a group already exists.

Time (Span): 1 to 2 months depending on responses from public.

Dependencies

Project: This process is dependent on the 303(d) list and TMDL schedule being finalized.

Other: The watershed has been approved for TMDL development and a project manager and/or team has been assigned the TMDL project. Availability of staff to supply needed time and information. Availability, interest, and commitment from stakeholders and other interested parties.

Recommendations: This step can be initiated as soon as the watershed is selected for TMDL development and staff are assigned to the project. Some knowledge of the watershed would be important to have before meeting with the public, so completion of 4.1 is recommended before a meeting with the stakeholders.

Information Sources:

Ohio EPA staff, and Internet search; see public participation workgroup final report for more details.

5 Develop Restoration Targets

5.1 Decide on calculation method

- Purpose:* Select the most appropriate method to calculate the TMDL
- Description:* Evaluate the suite of calculation methods based on their applicability to the causes and sources of concern, their required inputs, their accuracy and efficiency. This could be a simple calculation that multiplies the appropriate water quality criterion with a critical flow condition to a fully calibrated and verified data-intensive model.
- Inputs:* A library of calculation methods, completed rigor evaluation (Figure B.1), and completion of 4.5 and 4.6
- Outputs:* A selected calculation approach and justification for selection
- Time (Effort):* 10 to 80 hours depending on if a successful precedent exists or not and on a library of available options
- Time (Span):* 1 week to 2 months depending on staff and management availability and pre-existing knowledge of calculation methods for the identified causes and sources of concern.
- Dependencies*
- Project:* This process is dependent on completion of 4.1 through 4.7.
- Other:* Availability of a reference library and a rigor evaluation tool (however, projects must proceed even if not available). Management guidance on resource availability.
- Recommendations:* A reference library would assist this process as would a method to determine what rigor is needed (see Figure B.1) and what resources are available for a particular TMDL project. A valuable document would be a catalogue of calculation methods, organized by impairment cause which could be referenced. This document should be continuously updated with information of what methods were successful and with other information learned from previous projects. A document such as this one would contribute to quality improvement and increase project efficiency. In addition, innovative methods to calculate TMDLs would be useful to explore. Innovative methods could include the use of surrogate measures to address a cause of concern not easily modeled, the use of models or calculation methods not previously used by Ohio EPA, or other approaches not presently identified.
- Information Sources:*
Ohio EPA staff, Internet search, reference library including U.S. EPA technical guidance and protocols and the U.S. EPA document *Compendium of Tools for Watershed Assessment and TMDL Development* (May 1997)

Figure B.1. Decision Tool for Estimating Required Rigor	
Criteria	Description
Ramifications	
Socio-economic	Does the development of a restoration target have high social and economic ramifications (positive or negative)? Ramifications consider a local economy, numbers of direct and indirect jobs, state and local tax revenue, and other factors as appropriate.
Legal	Does the development of a restoration target have high legal ramifications? For example, will omission of a restoration target will result in a legal suit against the Agency by U.S. EPA or other party?
Physical Complexity	
Homogeneity of Sources and Causes (Stressors)	Is the watershed predominantly occupied with nonpoint-source or point-source activity? If the watershed is dominated with nonpoint-source activity, can the nonpoint-source load be quantified?
Capability of Model / Approach / Method	Can the adopted model, approach, or method connect cause with restoration target?
Estimation of Sources and/or Causes (Stressors)	Are sources and/or causes of pollution known with confidence? If not, are they estimable? What is the level of uncertainty in identifying the source and/or cause?
Available Resources	
Data – Existing	Does information on sources, causes (stressors), and endpoints exist or be generated with minimal effort?
Data – Type	Does information collected directly from field sampling exist? Does indirect (indicator) information exist?
Personnel	Do sufficient personnel (person-hours) with corresponding technical expertise exist?
Monetary	Do sufficient financial resources exist to complete field monitoring, laboratory analysis, equipment and additional data purchases, etc.?
Listing/Standards	
Source/Impairment Relationship	Is impairment known to be caused by exceedence of a numeric criterion?
Water Quality Criteria/Impairment Relationship	Were numeric criteria used to list [303(d)] the waterbody segment?

5.2 Determine existing load

<i>Purpose:</i>	Quantify the existing load or other existing stressor condition(s)
<i>Description:</i>	Collection and analysis of data as necessary for the calculation approach. Input data into the calculation method under existing conditions to determine existing load.
<i>Inputs:</i>	Outcome of 5.1 and 4.3
<i>Outputs:</i>	Existing load defined
<i>Time (Effort):</i>	80 to 2000 hours depending on calculation method selected, required rigor, and availability of existing data.
<i>Time (Span):</i>	1 month to 1 year
<i>Dependencies</i>	
<i>Project:</i>	This process is dependent on completion of 5.1 or at least on an idea of the required rigor and availability of resources. Many calculation methods require similar kinds of data so data collection could start before final calculation method is selected; however, data collection should not be performed blind.
<i>Other:</i>	Availability of resources, requirements of calculation method and results of a rigor decision process to determine needed rigor. Capacity and ability of the Department of Environmental Services (DES, the Ohio EPA analytical laboratory) to analyze samples for parameter of concern.

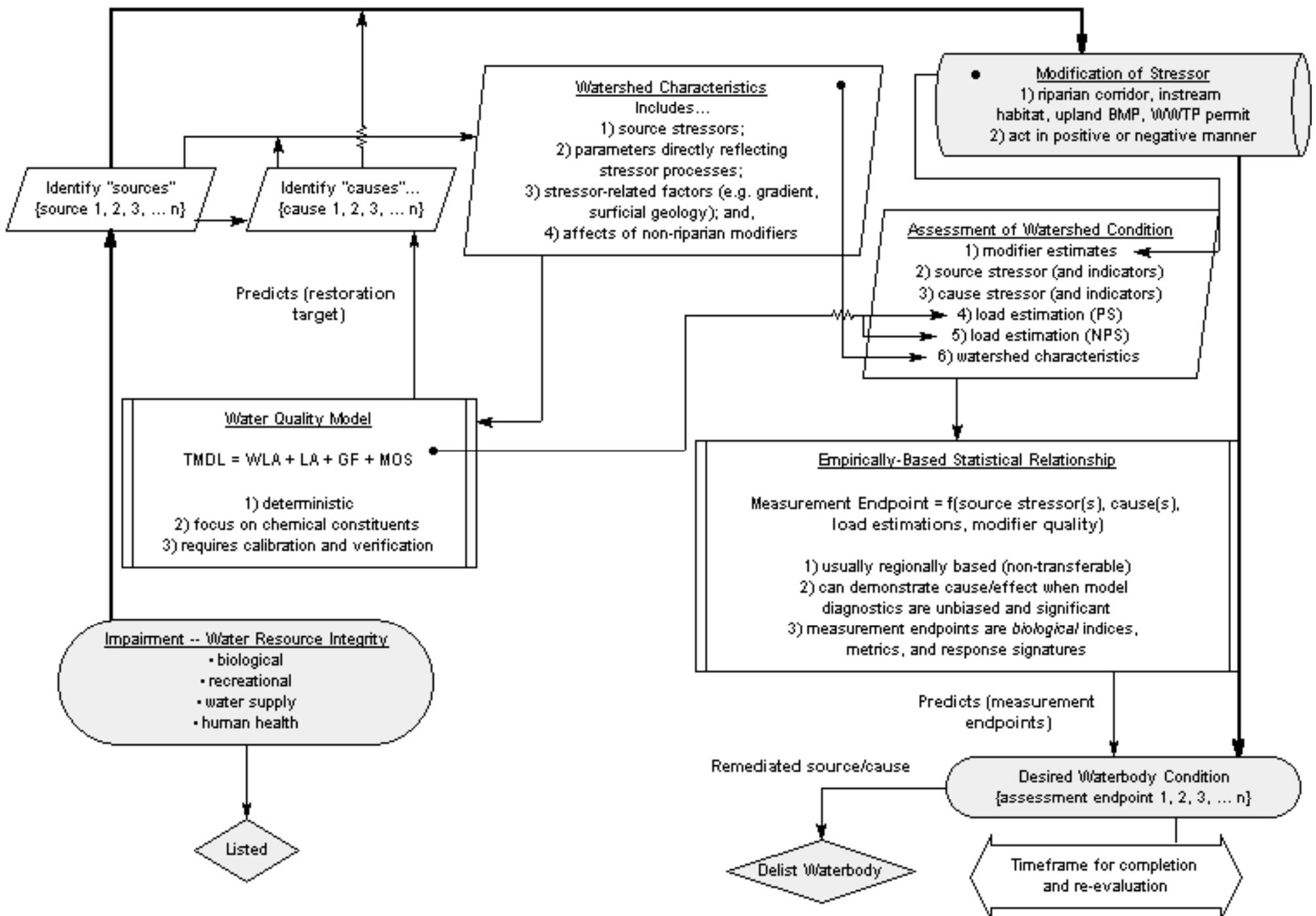
Information Sources:

Calculation method documentation, field sampling guidance and Ohio EPA staff.

5.3 Determine desired load

<i>Purpose:</i>	Quantify the desired load or other desired stressor condition(s)
<i>Description:</i>	Input data into the calculation method under desired conditions to determine desired load.
<i>Inputs:</i>	Calculation method. This could be a simple calculation that multiplies the appropriate water quality criterion with a critical flow condition to a fully calibrated and verified data-intensive model. One other method to target biological criteria yet quantify the desired stressor condition is statistical (see Figure B.2).
<i>Outputs:</i>	Desired load defined
<i>Time (Effort):</i>	1 hour to 200 hours depending on calculation method selected and required rigor.
<i>Time (Span):</i>	1 day to 6 months
<i>Dependencies</i>	

Figure B.2. Connection between Impairment and Desired State.



Project: Depending on the calculation method used and the parameters of concern, this step may only be dependent on completion through 4.7. If a more complex modeling method is used, the model would need to be set up under existing conditions (calibration and verification) before being able to predicting future conditions; therefore, it could be dependent through 5.2. In addition, a calculation of the TMDL or the assimilative capacity can be dependent on what restoration actions are selected for implementation especially if such actions impact the physical characteristics of the stream (such as dam removal) therefore, the finalization of this step could be dependent on 6.4.

Other: None.

Information Sources:

Research may be needed to quantify the flow conditions that should be used to determine the desired load.

5.4 Identify needed reduction

Purpose: Quantify the amount an existing watershed condition needs to change in order to meet the TMDL goal. For example, a needed reduction could be 50% reduction in phosphorus loading in the watershed or riparian cover needs to increase by 75 river corridor acres.

Description: Generally, this would be the difference between the existing and desired conditions. Some instances, the needed reduction would be best represented by restoration scenarios which incorporate many actions that combine to identify the needed reduction. This could be true for a stressor that is effected by many different factors, for example, dissolved oxygen which is impacted by physical stream characteristics and by nutrient and biochemical oxygen demand (BOD) loadings.

Inputs: The outcomes of 5.2 and 5.3.

Outputs: Needed reduction identified

Time (Effort): 1 hour to 120 hours depending on cause and calculation method selected

Time (Span): 1 day to 6 months

Dependencies

Project: This process is dependent on completion of 5.2 and 5.3.

Other: None.

Information Sources:

Not applicable.

5.5 Generate example restoration scenarios

Purpose: Translate desired load or required reduction into potential restoration scenarios.

Determine some restoration scenarios that would meet the goals of the TMDL and which would educate the stakeholder group on the extent and type of implementation options needed in the watershed.

Description: It is difficult to understand the extent to which restoration actions are needed unless some strategies or scenarios are presented. This step would use the calculation method or other tool to determine a few restoration scenarios able to achieve WQS if implemented. The scenarios could define the boundaries, i.e., if only nonpoint sources were reduced or if only point sources were reduced (what Ohio EPA can do with its authority). An additional strategy incorporating both voluntary and regulatory actions could also be presented. These strategies would be for educational purposes only and would serve as a starting point for the stakeholder group to use when determining an implementation plan.

Inputs: The outcomes of 5.2 and 5.3, technical knowledge of the cause of concern, effectiveness of implementation options, and a general knowledge of what may or may not be acceptable to the stakeholders.

Output: A set of potential restoration scenarios. For example, scenarios to achieve the TMDL goal through only point source reduction or only nonpoint source reductions and then some scenario incorporating both point and nonpoint source controls.

Time (Effort): 8 to 80 hours depending on cause and calculation method selected

Time (Span): 1 to 4 weeks

Dependencies

Project: This process is dependent on completion through 5.3 (not necessarily on finalization of 5.3 in the case of allocation-based approaches).

Other: This process is dependent on knowledge of effectiveness of treatment measures per cause (i.e., conservation tillage is expected to reduce 1 lb of phosphorus per acre per year) and a general feeling of what some acceptable implementation options may be. Before presenting this scenarios to a stakeholder group, the Agency position should be clear as to what it is willing to do with its authority; therefore, this is dependent on managerial input as well (Step 5.6).

Recommendations: A reference document detailing effectiveness of BMPs and other control measures.

Information Sources:

Internet search and reference library detailing effectiveness of BMPs.

5.6 Decide how Ohio EPA authority will be used to achieve needed reductions

Purpose: This is an important management and legal checkpoint at which it will be decided how Ohio EPA can use its authority to achieve the needed reductions. It will be important that stakeholders understand the ramifications of various scenarios, including this one.

Description: To make it clear to all involved how Ohio EPA will use its authority to bring the impaired water into compliance

Inputs: The outcomes of 5.2 and 5.3, technical knowledge of the cause of concern, effectiveness of implementation options.

Output: A decision on how to use Ohio EPA's authority

Time (Effort): 8 to 80 hours depending on cause and calculation method selected

Time (Span): 1 to 4 weeks

Dependencies

Project: This process is dependent on completion through 5.3 (not necessarily on finalization of 5.3 in the case of allocation-based approaches).

Recommendations: A reference document detailing effectiveness of BMPs and other control measures.

Information Sources:

Internet search and reference library detailing effectiveness of BMPs.

6 Select Restoration Scenario

6.1 Discuss scenarios with stakeholders and generation additional options

6.1.1 Review list of technically sound restoration scenarios developed as an outcome of the development process.

Purpose: Stakeholders become familiar with what types of actions and options for achieving water quality goals/restoration targets.

Description: Publicize availability of restoration scenarios. Interface with stakeholders; provide and discuss options for achieving water quality targets. Develop common understanding of water quality problems and potential solutions. Gather local information about the watershed/segment and sociopolitical issues that might affect implementation approaches. Educate stakeholders on treatment options that may exist.

Inputs: Restoration scenarios from Development Team (Step 5.5).

Outputs: Fertile ground for brainstorming or consensus. Provide background necessary to obtain local input on acceptable restoration strategies. Obtain information regarding local conditions that may enhance or hinder implementation of potential solutions to water quality problems.

Time (effort): 6-18 hours; includes preparation time and post meeting activities (1-3 meetings)

Time (span): 1-4 months (this may depend on the frequency of local watershed group meetings)

Dependencies:

Project: Completed scenarios from Step 5.5., stakeholder group (Step 4.8)

Other: Stakeholders willingness/availability to come to table.

Information Sources:

List of restoration scenarios from Step 5.5, stakeholders group from Step 4.8.

6.1.2 Expand the list of technically sound restoration scenarios to add other possible restoration scenarios developed through the public participation process.

Purpose: To ensure potential restoration scenarios are not overlooked and to provide local stakeholder input into potential restoration scenarios.

Description: Hold meetings with stakeholders and discuss/brainstorm potential alternative restoration scenarios in addition to those provided from the development process.

Inputs: Restoration scenarios from Development Team (Step 5.5). Local stakeholder feedback on additional potential restoration scenarios (if available).

Output: Additional restoration scenarios acceptable and feasible to stakeholders (if available).

Time (effort): 6-18 hours; includes preparation time and post meeting activities (1-3 meetings)

Time (span): 1-2 months

Dependencies:

Project: Completed scenarios from Development Team.(Step 5.5), stakeholder group (Step 4.8)

Other: stakeholders willingness/availability to come to table and their understanding water quality problems and solutions.

Information Sources:

local laws and regulations from stakeholders, local knowledge from stakeholder group

6.2 Develop list of criteria for evaluating list of acceptable restoration scenarios

Purpose: Develop list of criteria for evaluating list of restoration scenarios.

Description: Gathering information from various stakeholders and experts and determining the criteria to be used to evaluate the list of potential restoration scenarios. Criteria should include:

- Feasibility - The likelihood that the scenario will achieve the restoration target
- Acceptability - The likelihood that the action will take place, and
- Sustainability - The likelihood that the action(s) will stay in place.

Inputs: Stakeholders' and Ohio EPA experience regarding actions, time, legal authority, resources and programs necessary to achieve restoration scenarios, as well as identification of potential obstacles that should be considered in the evaluation process.

Outputs: List of watershed specific criteria for screening the list of potential restoration scenarios.

Time (effort): 8-40 hours

Time (span): 1 month - 3 months

Dependencies:

Project: Stakeholder group established (Step 4.8).

Other: Stakeholder involvement/participation in establishing criteria. In the absence of stakeholder interest or participation, Ohio EPA will establish the criteria.

Information Sources:

Local stakeholder groups, Ohio EPA, other state/local agencies (e.g., SWCD, LED, NRCS).

Note: Hours are expressed for a unit or group of people involved (e.g. basin team/watershed group) for Ohio EPA effort only.

6.3 Screen the list of acceptable restoration scenarios using the SELECTED criteria to identify the actions to be used to achieve the TMDL restoration target

- Purpose:* To select the most acceptable (based on the consensus derived criteria list) restoration scenario that when fully implemented will achieve the restoration target.
- Description:* The stakeholders use the criteria list from step 6.2 to rate/rank (filter) each restoration action. Upon filtering all the restoration actions, the stakeholders AND Ohio EPA will select the best combination of restoration actions or restoration scenario that will achieve the restoration target (contingent on technical validation, see Step 6.4). This selection process may need to be completed on an iterative basis as selected restoration scenarios cannot be technically verified in Step 6.4, in which case there would be repeated loops through this Step (6.3) and Step 6.4. If consensus cannot be reached on the restoration scenario, Ohio EPA will become responsible for selection and implementation of a restoration scenario.
- Input:* The criteria list from step 6.2 stakeholder input, and the combined list of restoration scenarios from Steps 5.5 and 6.1 .
- Output:* The selected restoration scenario for technical verification.
- Time(effort):* 6-40 hours, 1-3 meetings
- Time(span):* 1 week to 3 months
- Dependencies:*
- Project:* The completion of the criteria list (Step 6.2), and the combined list of restoration scenarios from Steps 5.5 and 6.1 .
 - Other:* Ability of the stakeholders to meet and come to consensus on a “best” restoration scenario.

Information Sources:
local stakeholders group, Ohio EPA, previous TMDLS, other local agencies (SWCD, LED, NRCS).

6.4 Technical Verification of Selected Restoration Scenario

- Purpose:* Verify that the restoration scenario developed through the implementation process results in attainment of water quality standards or otherwise meets the goal(s) of the TMDL project.
- Description:* This step ensures that the selected restoration scenario is technically valid and will result in the attainment of water quality standards if it is carried out as indicated. This step may be repeated in an iterative fashion if selected restoration scenarios cannot be technically verified.
- Inputs:* The selected restoration scenario from 6.3 and a calculation method from 5.2 or calibrated and verified model from 5.3.

Outputs: Verification of plan or description of where the plan fails to meet the goals of the TMDL project.

Time (Effort): 8 to 40 hours depending on calculation approach used and intensity of restoration plan

Time (Span): 1 - 4 weeks

Dependencies

Project: This process is dependent on completion through step 5.5 and on step 6.3.

Other: This process may be dependent on knowledge of effectiveness of treatment measures per cause (i.e., conservation tillage is expected to reduce 1 lb of phosphorus per acre per year).

Recommendations: A reference document detailing effectiveness of BMPs and other control measures.

Information Sources:
Internet search and reference library detailing effectiveness of BMPs.

6.5 Finalize allocations

Purpose: Finalize the allocations and the TMDL calculation if necessary based on the verified restoration plan

Description: Re-allocate the loads based on the technically verified restoration scenario and finalize the TMDL calculation if necessary. For example, the TMDL may be calculated by adding up the allocations for point sources, nonpoint sources, background conditions and including a margin of safety and a future growth factor. If allocations change then the TMDL calculated number can also change. This step is to finalize the allocations and the TMDL calculated value.

Inputs: Final restoration plan from 6.4 including a specified future growth factor.

Outputs: Final allocations and TMDL calculation.

Time (Effort): 2 to 10 hours depending on calculation approach used and intensity of restoration plan

Time (Span): 1 day - 1 week

Dependencies

Project: This process is dependent on completion through 6.4.

Other: None.

Information Sources:
Not applicable.

7 Prepare Implementation Plan

7.1 Describe actions that will be implemented

Purpose: To document the actions of the selected restoration scenario that will be implemented to achieve the TMDL restoration target.

Description: As part of an implementation plan, the stakeholders will document the actions of the selected restoration scenario that will be implemented to achieve the TMDL restoration target. The description may vary depending upon the complexity of the problem and selected actions, but at a minimum the description must include:

For point sources

- wasteload allocations for point source dischargers;
- a list of NPDES permits and the schedule for revision/issuance of these permits, if necessary, to incorporate the TMDL allocations

For nonpoint sources

- load allocation(s);
- a description of management practices or measures/control actions necessary to attain the load allocation, including:
 - ✓ who must undertake the management practices/measures or control actions. Identified parties could include either individual sources or logical groupings of sources (i.e. landowners and funding agencies), as the State determines is most appropriate to guide implementation of the particular TMDL;
 - ✓ what actions identified sources must take to meet their allocations, including an assessment of the anticipated effectiveness of the actions, how the actions would be expected to achieve the TMDL allocations, and what additional actions may be needed;
 - ✓ when those actions must be implemented, including any seasonal variations; and
 - ✓ where the actions apply (the geographic boundaries for sources and control actions/management measures).

Input: The actions of the selected restoration scenario from step 6.4, related information from step 6.1, 6.2, and the stakeholder input.

Output: Documentation of the selected actions section of the implementation plan.

Time(effort): 10-40 hours

Time(span): 3-6 months

Dependencies:

Project: The selected actions or restoration scenario (step 6.4).

Other: The ability of stakeholders to meet.

Information Sources:

7.2. Develop schedule for implementing actions

<i>Purpose:</i>	Determine how long it will take for all source control activities to be implemented.
<i>Description:</i>	This will vary greatly depending upon whether the actions are for point sources or nonpoint sources. In either case, the stakeholders implementing the actions will need to be consulted to find out realistically how long it takes to implement certain activities (e.g., farmers, industries, POTWs). Similarly, resource experts and locals familiar with social, cultural or political issues that will affect progress will be important to consult (as in 6.2). It is likely that the schedule development will be iterative as new stakeholders participate in voluntary actions and others already committed alter their plans.
<i>Inputs:</i>	Output from Step 6.4, knowledge of program implementation procedures (e.g. 319 grants, NPDES permitting procedures, EQUIP funding procedures, NRCS/SWCD program priority setting procedures).
<i>Outputs:</i>	A schedule of actions.
<i>Time (effort):</i>	8 hours - 120 hours
<i>Time (span):</i>	1 - 8 months
<i>Dependencies:</i>	
<i>Project:</i>	information from Step 6.4.
<i>Other:</i>	(1) the number of stakeholders involved; (2) stakeholder willingness to participate and cooperate; and (3) availability and receipt of financial resources.

Information Sources:
program priorities from NPDES permit program, 319 grant program, and state and federal nonpoint source management programs.

7.3 Identify legal authorities under which the implementation of selected actions will be carried out

<i>Purpose:</i>	To identify and document legal authorities under which the implementation of selected actions will be carried out.
<i>Description:</i>	The stakeholders will identify and document the legal authorities under which the selected actions will be carried out (e.g. Clean Water Act, NPDES permitting requirements, Clean Water Act sec. 401 Certification, CZARA, State forest practices acts, State water laws, State nonpoint source management programs, local laws and/or watershed management plans) and whether those actions are enforceable. The plan should also include information on how the specified authorities will be used and enforced, and by whom. For actions that will be performed on a voluntary basis, a method should be identified and documented by which parties responsible for implementation can make commitments to perform actions described in the

implementation plan (e.g. memorandums of agreement (MOA)).

Input: The output from step 7.1 and the stakeholders, knowledge of legal authorities for water quality program implementation.

Output: A documented list of enforceable or voluntary actions and corresponding legal authority.

Time(effort): 8-16 hours

Time(span): 1 week to 3 months

Dependencies:

Project: The completion of step 7.1.

Other: The ability of the stakeholders to meet.

Information Sources:

7.4. Develop list of reasonable assurances that the actions will be implemented.

Purpose: To develop and document a list of reasonable assurances that the selected actions will be implemented and result in attainment of the restoration targets identified by the TMDL.

Description: The stakeholders will develop and document a list that differentiates the enforceable and non-enforceable selected actions necessary to achieve the restoration targets identified by the TMDL. The reasonable assurance for planned point source controls (e.g. planned POTW upgrades, changes to NPDES permits) will be a schedule for implementation of planned NPDES permit actions. The minimum requirement to demonstrate that non-enforceable actions (for certain nonpoint source activities) will result in attainment of the load allocation for nonpoint sources required by the TMDL, include:

- demonstration of the availability of funds to implement the non-enforceable actions;
- description of the process for entering into any necessary agreements with/among various federal, Tribal, State, and local agencies/entities, private landowners, or others to carry out such non-enforceable actions and the probability of success in achieving such agreements.
- an assessment of the likelihood of continuation of government programs (e.g. Conservation Reserve Program) that are planned to assist in implementation; and
- an analysis of the anticipated effectiveness of the management measures (a demonstration of how, if implemented, they will actually lead to desired reductions; an evaluation of the success of existing/prior programs calling for similar controls in the watershed or a similar watershed may be used in this analysis).

Input: The description of the actions from step 7.1 and stakeholder input/consensus.

Output: The documentation of reasonable assurances that the selected actions will be implemented and result in attainment of the restoration targets identified by the TMDL.

Time(effort): 2- 20 hours

Time(span): 1 week to 6 months (to develop list of reasonable assurances, not to implement those actions).

Dependencies:

Project: The completion of step 7.1.

Other: The ability of the stakeholders to meet.

Information Sources:
Information from steps 7.1, 7.2, 7.3.

7.5 Estimate time needed to attain water quality standards

Purpose: To estimate the time required to attain applicable water quality standards and demonstrate that the standards will be met as expeditiously as practicable.

Description: The stakeholders need to estimate the time from starting implementation of selected actions until attainment of applicable water quality standards. (Assume that actions called for to implement the TMDL would begin immediately after approval of the TMDL submittal)

Input: The output from steps 7.2-4 the stakeholders, opinions from experts on anticipated biological recovery periods.

Output: A documented time estimate for attainment of applicable water quality standards.

Time(effort): 2-10 hours

Time(span): 1 week to 3 months

Dependencies:

Project: The completion of steps 7.2-4

Other: The ability of the stakeholders to meet, resources necessary to devote time to making recovery time predictions.

Information Sources:
EAU, scientific literature

7.6 Develop monitoring plan to determine the effectiveness of the implementation of selected actions

<i>Purpose:</i>	Develop monitoring plan to determine the effectiveness of the implementation of selected actions.
<i>Description:</i>	To develop a monitoring plan, consideration must be given to the lag between source control actions and in-stream effects, especially for nonpoint sources. Thus it will be important to consult with water resource specialists to determine appropriate monitoring methods based on the actions being monitored. In addition, interim or surrogate measures that document progress in water quality improvement will need to be developed and tailored to the needs and skills of the stakeholder group conducting the monitoring. Some examples include secci disk depth, stream bank rods, and pebble counts. Consideration should also be given to where the measurements of progress will be taken with respect to each source control activity and the cause of impairment to the watershed. The monitoring plan should reflect incremental source milestones and water quality targets that ultimately meet water quality goals over a time span approximating that developed in Step 7.5. The monitoring plan should also accommodate the tracking of administrative activities necessary to support activities identified in Step 7.4. (Reasonable assurances).
<i>Inputs:</i>	Selected actions and schedule of activities, information from steps 7.1, 7.2, 7.3,7.4, 7.5.
<i>Outputs:</i>	A written monitoring plan and form that can be used to document monitoring results and completion of tasks identified in the implementation plan.
<i>Time (effort):</i>	8 - 24 hours
<i>Time (span):</i>	2 to 4 months
<i>Dependencies:</i>	
<i>Project:</i>	Completion of 7.1 - identification of actions, the parties responsible for completing them, and where they will take place.
<i>Other:</i>	completion of tasks assigned in the implementation plan by both Ohio EPA and outside stakeholders, completion of assigned monitoring activities, knowledge of monitoring methods necessary to measure progress for various implementation activities.
<i>Information Sources:</i>	EAU, nonpoint source monitoring methods

7.7 Establish measurable milestones to determine if the implementation plan is being properly executed

<i>Purpose:</i>	Develop the milestones that will be measured to ensure that reasonable progress is being made towards attainment of the restoration targets.
<i>Description:</i>	The milestones that are measured should reflect the results that are expected from the monitoring plan (Step 7.6). The monitoring plan provides the data which is subsequently assessed against the milestones, which helps to determine whether or

not progress toward attainment of the restoration target is being observed.

Inputs: The monitoring plan, Step 7.6, Selected actions and the schedule of activities from Steps 7.1, 7.2, 7.3, 7.4, and 7.5.

Outputs: Measurable milestones against which to measure data provided by the monitoring plan.

Time (effort): 8-24 hours

Time (span): 2-4 months

Dependencies:

Project: Completion of Steps 7.1-6.

Other: Establishment of a tracking system for tracking progress against established milestones, identify resources to carry out this follow-up step.

7.8 Develop process to re-open TMDL if necessary

Purpose: To establish the process that will determine that the implementation plan is not achieving the stated objectives, and that the TMDL must be reopened.

Description: This part of the implementation plan establishes the process by which the data from the monitoring plan in Step 7.6 and the milestones from Step 7.7. will be evaluated to determine if activities outlined in the implementation plan are being accomplished, and if those activities are accomplishing the anticipated progress towards the water quality targets. This process should provide for the evaluation of:

- whether the activities outlined in the implementation plan have been accomplished,
- whether the activities have resulted in the anticipated water quality improvements, and
- whether the water quality improvements have resulted in attainment of the water quality targets.

Inputs: Data from Step 7.6, milestones from Step 7.7, validation processes from Step 11.3

Outputs: A process by which data will be evaluated to determine the success of the implementation plan, and a stated course of action in the event that data shows that the restoration targets are not being attained.

Time (effort): 8-40 hours.

Time (span): 1-2 months

Dependencies:

Project: Output from Steps 7.6 and 7.7

Other: Experience from other TMDL validation processes.

8 Submit TMDL Report

(The placement of this step assumes that the proposal to include the implementation in the TMDL report contained in the proposed rules is adopted in the final rules.)

8.1 Prepare TMDL report

Purpose: Document the TMDL development process for the TMDL report. Currently, this is the minimum requirement for the TMDL report for approval purposes. The proposed rules would also require an implementation plan in the final submittal.

Description: This step may be either preparation of the development section of a TMDL report (proposed new rules) or may be the preparation of the TMDL report (existing rules). The minimum requirements needed in the report change depending on which set of rules is governing at the time of the TMDL project.

Inputs: Assessment of watershed, documentation of development process and description of implementation activities to date if this step is to submit TMDL report to U.S. EPA.

Outputs: The TMDL report or the development section of the TMDL report.

Time (Effort): 40 to 200 hours depending on intensity of process and needed presentation formats

Time (Span): 1 week to 3 months depending on staff availability and degree of documentation needed.

Dependencies: This process is dependent on the existence of a final, verified restoration scenario and completion of the development process.

Dependencies

Project: This process is dependent on completion through 6.4 if this step is just to address the development phase although documentation should occur throughout the development process. If this step is to produce the final report then it is also dependent on 3.3a.

Other: None.

Information Sources:

Previous approved TMDLs for format.

(Descriptions of the remaining tasks in this step will be made available later.)

9 Implement Actions Identified in Implementation Plan (Within Ohio EPA)

9.1 Provide information for WQMP revision

<i>Purpose:</i>	To ensure the TMDL is included in the applicable (preferably sub-basin) Water Quality Management Plans (WQMP).
<i>Description:</i>	Each TMDL will be included in the WQMP. Ohio EPA will need to develop a schedule for updating the WQMP to include the TMDL. It may be possible to combine several TMDLs in a WQMP revision, which may be done annually or on some other regular schedule. A public noticing process is required as part of the WQMP update process.
<i>Input:</i>	Ohio's CPP, Steps 7.1, 7.2.,and 7.4.
<i>Output:</i>	A schedule for revising the WQMP to include the TMDL.
<i>Time(effort):</i>	2-8 hours
<i>Time(span):</i>	2 weeks
<i>Dependencies:</i>	
<i>Project:</i>	Output from Steps 7.1, 7.2, 7. 4, 7. 5
<i>Other:</i>	U.S. EPA approval of TMDL.
<i>Information Sources:</i>	The Ohio CPP, public comments received during TMDL development and implementation plan development.

9.2 Incorporate the completed TMDL implementation plan into program priorities

<i>Purpose:</i>	To incorporate the completed TMDL implementation plan into DSW program priorities.
<i>Description:</i>	Identify activities and work products to be produced by Ohio EPA in order to achieve restoration targets identified in the TMDL implementation plan.
<i>Input:</i>	Final implementation plan (Output of Step 7.).
<i>Output:</i>	Lists of activities and products, including schedules for completion, from Ohio EPA required to achieve restoration targets identified in the TMDL implementation plan.
<i>Time (effort):</i>	30-50 hours
<i>Time (span):</i>	1-3 months
<i>Dependencies:</i>	Complete implementation and ability of appropriate internal people meeting.

9.3 Identify resources necessary to perform activities and develop work products

Purpose: Identify resources as a prelude to obtaining and/or allocating said resources.

Description: Determine the amount of resources that will be required to perform activities identified as being Ohio EPA'S responsibility.

Input: Output from 9.1, DSW work load model.

Output: A list of the required resources and a plan/strategy to obtain and/or allocate them.

Time (effort): 8-20 hours

Time (span): 1-3 months

Dependencies:

- Project:* Output from 9.1.
- Other:* Appropriate division people meeting and actively working on this.

Information Sources:
DSW workload model, past and future annual work plans

9.4 Identify and provide resources for oversight and tracking the implementation plan

Purpose: To insure implementation is on track.

Description: Identify and provide resources for oversight and tracking the implementation plan; the annual validation tasks.

Input: Implementation Plan, outputs 9.1 - 9.4

Output: List of resources, said list being provided, and a mechanism/process for tracking implementation plan.

Dependencies:

- Project:* Implementation Plan, outputs from 9.1 - 9.4.
- Other:* A mechanism for tracking the implementation plan being established.

9.5 Prepare/modify Annual Work Plan to reflect activities and work products to be produced.

Purpose: Incorporate TMDL implementation plan related activities into Division and unit annual work plans.

Description: Revise/prepare annual work plans (accountability agreements) to incorporate activities required by the TMDL implementation plan. This may include revision of current annual work plans as necessary, as well as population of future annual work

plans to account for commitments of the TMDL implementation plan.

Input: Output from Steps 9.1 AND 9.2, Annual Work Plans

Output: Revised work plans (if necessary), future work plans populated with commitments.

Time (span): 30-50 hours

Time (effort): 1-3 months

Dependencies:

Project: 9.2 output

Other: Appropriate division people meeting and working together to populate annual planning documents.

9.6 Perform activities and produce work products in accordance with implementation plan schedule

Purpose: To perform the activities identified in the implementation plan as being necessary to achieve the restoration targets identified in the TMDL.

Description: Accomplish the activities identified in the annual work plans in order to implement the TMDL. Examples of these activities are: issuance of point source control actions (NPDES, DFFO), preparation and execution of grant projects, negotiation and tracking of MOAs (memorandum of agreement), outreach to local government, modification of 208 Water Quality Management Plans.

Inputs: 9.1 and 6.4 outputs and 9.3 outputs.

Outputs: Activities and work products (9.2 output).

Time (effort): 120-480 hours

Time (span): 1-18 months

Dependencies:

Project: Output from Steps 9.1 - 9.3

Other: Resource availability.

9.7 Encourage the incorporation of the TMDL Implementation Plans into other Agency priorities (i.e., Unified Watershed Assessment)

Purpose: To influence grant awards, cost-share and other Agency's funding assistance programs so that higher priority is given to (1) TMDL-listed watersheds; and (2) those listed which also have completed implementation plans.

Description: This step will vary depending upon the programs which are targeted. For example, for the UWA, the effort will largely be one of coordination with NRCS, Ohio EPA's major partner in developing the UWA. For other programs which go through statewide committee reviews and selection, such as 319 and EQIP, a mechanism for ensuring that watersheds that are listed or that have completed implementation plans are weighted more favorably needs to be developed. In other instances and where appropriate, it may make sense to encourage other agencies to voluntarily weight TMDL watershed applicant more favorably, such as in awarding of NatureWorks grant. A systematic inventory and appraisal of Agency financial assistance programs would be helpful in determining where it is appropriate and possible to weight TMDL watersheds more favorably in competitive review processes.

Inputs: Inventory of possible programs and their applicant review/selection process.

Outputs: A set of recommendations for incorporating a favorably weighted value for TMDL watersheds based on their priority ranking and whether or not an implementation plan has been completed for each Agency financial assistance program that could facilitate implementation of TMDLs.

Time (effort): 8 hours - 80 hours per program

Time (span): 1 month - 1 year per program

Dependencies:

Project: TMDL list and completed implementation plans for specific watersheds.

Other: none identified

10 Implementation of TMDL (outside Ohio EPA)

10.1 Identify parties responsible for the implementation of selected action(s)

Purpose: To ensure that the external parties responsible for actions under the implementation plan are identified.

Description: To confirm parties identified in the TMDL implementation plan, and to make sure that lines of communication between DSW and the external implementing party are established.

Input: TMDL Implementation Plan, output from Step 7.1.

Output: A list of external parties responsible for implementing actions under the TMDL implementation plan, with current contacts, phone numbers, addresses, emails, etc.

Dependencies:

Project: TMDL Implementation Plan, output from Step 7.1.

Other:

10.2 Verify responsible party's willingness to voluntarily implement the selected action(s) identified in the implementation plan

Purpose: Verify responsible party's willingness to voluntarily implement the selected action(s) identified in the implementation plan.

Description: To verify the willingness of parties responsible for implementation of specific actions under the implementation plan are aware of their responsibility and intend to fulfill their agreements. This may include meetings to discuss anticipated course of action, etc.

Input: TMDL Implementation Plan, output from Step 7.1., and Step 10.1.

Output: Confirmation of plans to move forward on TMDL implementation tasks by external parties.

Dependencies:

Project: TMDL Implementation Plan, output from Step 10.1.

Other: Willingness of external parties to fulfill agreements under the TMDL implementation plan.

11 Annual Validation Activities

11.1 Verify monitoring plan

11.1.1 Check milestones and targets

11.1.2 Adjust monitoring plan (re-open TMDL)

Purpose: Assure a technically sound monitoring plan and adjust if necessary.

Description: While the monitoring plan may initially be created by those involved in writing the implementation plan, it will be important for this step to include input from others who may have expertise in monitoring and water quality evaluation. The identification of a checkpoint in the validation process should not be construed as a distant or later step to the initial development of the plan, but rather as an iterative process that not only acknowledges feasibility, acceptability but also scientific rigor at once. This step is singled out to emphasize the importance of reviewing proposed protocol for methods of measuring milestones/targets adopted in the monitoring plan to see if they are appropriate to the unique circumstances and conditions of a particular watershed and water quality conditions.

Inputs: A written monitoring plan including tables (produced in Implementation 7.6).
Descriptions/handbook of protocols for methods to measure in-stream effects (especially Tier 2).

Outputs: Stamp of approval plus comments or specific recommended changes and where to re-enter the TMDL process (7.1).

Time (effort): 5 - 20 hours

Time (span): 1 week - 3 months (Depends on whether problems are predominantly NPS or PS)

Dependencies

Project: Verification of monitoring plan needs to occur concurrently with stakeholder involvement in developing the plan (7.6).

Other: Requires bonafide monitoring measures. When these don't exist, QIP needs to develop them.

Recommendations: Research and development of surrogate measures of water quality and methods which can be used to assess them which are easily implemented. A team of staff familiar with Rosgen's stream morphology and knowledgeable of the scientific rigor of various sampling designs would be essential in developing such tools.

Information Sources:

11.2 Verification of source control actions

11.2.1 Assess implementation of source control actions.

11.2.2 Annually document source control actions using the monitoring plan reporting form.

<i>Purpose:</i>	Verification that activities have occurred and that implementation plan is proceeding as predicted. Provides opportunity to adjust implementation plan activities.
<i>Description:</i>	For point sources, verification will largely be done via inspections and verification that compliance plans are being implemented. For nonpoint sources assessment may occur at a variety of different levels. Land use controls implemented via government-funded programs such as CRP, 319, EQIP and Natureworks can be tracked by collecting data from the agencies that run the programs. These agencies usually report on an annual basis and assess implementation either through field visits or self-reporting. A second level of assessment must occur at the local level for non-government funded land use controls such as zoning and ordinances. Tracking these activities will be much more difficult and will rely upon a strong liaison between Ohio EPA and local watershed groups.
<i>Inputs:</i>	Data collected from other resource agencies and from local watershed stakeholders. Written monitoring plan (7.6)
<i>Outputs:</i>	A periodic written report using the monitoring plan format as its basis. A statewide summary of monitoring reports for all ongoing TMDLs.
<i>Time (effort):</i>	40-80 hours per watershed one or more times per year or as identified in monitoring plan. This time frame is dependent on the development of some type of data management support and infrastructure.
<i>Time (span):</i>	1 week - 1 month per TMDL assessment (Depends on whether problems are predominantly NPS or PS).
<i>Dependencies:</i>	Completion of a monitoring plan (7.6). Designated DSW staff to collect data from other agencies. Volunteers at the local level to collect and report data for non-government funded programs. If volunteers are not available at the local level, then DSW staff will need to assume these responsibilities. Thus, for this step to be successful, buy-in and support by management is critical.

11.2.3 Compare completed activities with milestones

11.2.4 Submit periodic progress reports to U.S. EPA if required for phased TMDLs or as part of reasonable assurances.

<i>Purpose:</i>	Reasonable assurances that implementation is occurring and that source control targets will be met according to schedule.
<i>Description:</i>	Evaluating the monitoring results by comparing them with the projected milestones and targets is the first step in addressing the effectiveness or appropriateness of the TMDL/implementation plan. If milestones are not being met, implementers should attempt to assess why a particular milestone has not been met and adjust future milestone to reflect a new time frame, or, they may also wish to consider re-opening the TMDL.

<i>Inputs:</i>	Data collected from other resource agencies and from local watershed stakeholders. Written monitoring plan (7.6). Electronic capture and data management and support will ensure and expedite this process.
<i>Outputs:</i>	A periodic written report using the monitoring plan format as its basis. A statewide summary of monitoring reports for all ongoing TMDLs which can be used in prioritizing various program activities e.g., 319 selection, DEFA loans, etc. This information can also be used to report back to U.S. EPA regarding phased NPS TMDLs.
<i>Time (effort):</i>	20-40 hours per watershed one or more times per year or as identified in monitoring plan.
<i>Time (span):</i>	1 week - 1 month per assessment (Depends on whether problems are predominantly NPS or PS)
<i>Dependencies:</i>	Completion of a monitoring plan (7.6) . A mechanism must be in place to verify implementation activities are occurring and being tracked (11.2).

11.3 Validation of stressors reduction

11.3.1 Assess stressors

11.3.2. Annually document stressor values using monitoring plan reporting form.

<i>Purpose:</i>	To sample and collect in-stream water quality data and document this information in the monitoring plan.
<i>Description:</i>	Assessment of stressors will vary greatly from point sources to nonpoint sources. For point sources, assessment will largely be done by the facility via self-monitoring. For nonpoint sources, however, assessment will occur at the local level whenever possible. Technically sound methods which do not require extensive training, equipment or financial resources will usually be preferred. Some of these methods exist, while others will need to be developed. At the same time, these methods must adequately assess changes in stressors and be capable of predicting water quality outcomes. Methods for tier 2 validation may need to be conducted at timed intervals that do not necessarily coincide with statewide tracking/reporting.
<i>Inputs:</i>	Written monitoring plan including tables that identify water quality targets and methods for measuring them.
<i>Outputs:</i>	A periodic written report using the monitoring plan format as its basis. A statewide summary of monitoring reports for all ongoing TMDLs.
<i>Time (effort):</i>	20-40 hours per watershed one or more times per year or as identified in monitoring plan. This will depend on whether data is received electronically and already QA/QC'd or on paper.
<i>Time (span):</i>	1 week - 1 month per assessment (Depends on whether problems are predominantly NPS or PS)

Dependencies: Development of adequate methods to assess stressors (dependent upon QIP) such as secci disc depth and pebble counts. Local stakeholders interest and willingness to conduct monitoring activities. Implementation tasks must be implemented.

11.3.3 Compare stressor values with water quality targets.

11.3.4 Evaluate the effectiveness of source control activities implemented.

11.3.5 Submit periodic progress reports to U.S. EPA if required for phased TMDLs or as part of reasonable assurances.

Purpose: To determine if water quality targets as specified in monitoring plan are appropriate
Provides reasonable assurances that restoration target will be met.

Description: This step is an exercise in comparing the data collected in step 11.3 with water quality targets established in the implementation plan (monitoring reporting form with identified milestones and targets).

Inputs: A completed, written monitoring plan including tables with established water quality targets and methods for measuring them.

Outputs: A periodic written report using the monitoring plan format as its basis.
A statewide summary of monitoring reports for all ongoing TMDLs that can be used by various DSW programs in setting priorities e.g., 319 awards, DEFA loans, field work and study plans, etc.

Time (effort): 20-40 hours per watershed one or more times per year or as identified in monitoring plan

Time (span): 1 week - 1 month per TMDL assessment (Depends on whether problems are predominantly NPS or PS and degree of local assistance.)

Dependencies: Identification and financial support for a dedicated set of staff to conduct quality improvement assessments of a single TMDL and the overall statewide TMDL process. Since the relationship between best management practices and water quality improvement is not well document and currently not well understood, it will be imperative to the success of Ohio's TMDL program that this experiential data is evaluated as it is collected. It can then be used to improve the efficiency and future outcome of TMDL development, implementation and validation efforts.

12 Have WQS Been Achieved in the Waterbody?

12.1 Documentation of attainment of water quality targets

12.1.1 Assess attainment of water quality standards

12.1.2 Document water quality findings (every 5-10 years?) Using the monitoring plan reporting form.

12.2 De-list or re-list waterbody

Purpose: Ensure that water quality targets are met (as measured by aquatic life use attainment or other indicators used in the Listing Process [e.g., chemical exceedance]) for the specific watershed so that a decision to de-list or re-enlist can be made; infer reasons for non-attainment.

Description: This step is essentially the same step in Listing where field monitoring is conducted (2.1). Conduct field monitoring for calculation of aquatic life-use attainment (i.e., determine all metrics for IBI, ICI, and MIwb) and/or other indicators. Document results using the "monitoring plan reporting form." If waterbody is in attainment, delist and document successful strategy used to restore waterbody. If not in attainment, evaluate the effectiveness of source-control activities (step 11.2) and identify reasons for non-attainment using biological response signatures (aquatic life use attainment only).

Inputs: Updated literature on biological response signatures (as output from step 12.4. on Quality Improvement Process); monitoring equipment, resources, and staff.

Outputs: Monitoring and assessment results; documentation of strategy and reasons for de-listing or re-listing.

Time (effort): For each year (season) involving determination of aquatic life use attainment, one pass will require 1-5 days (including study plan finalization and travel). Ideally, two passes per season should be conducted or a total time effort of 2-7 days for each TMDL watershed. Additional time will be required to document and evaluate data collected.

Time (span): 1-2 years for point-source dominated stressors; 5-10 years for nonpoint-source dominated stressors.

Dependencies: Indication from tier 2 validation result that water quality standards are likely to be met if sampling is conducted. Flow regime of waterbody within climatic normal; availability of staff and monitoring resources for determination of aquatic life use attainment; whether or not additional stressors are imposed on watershed and waterbody.

