

## 9.0 Stream, Wetland, and Riparian Buffer Restoration

The purpose of this section is to provide guidance on how to prepare an engineering report/environmental information document (ER/EID) for a project that restores streams, wetlands, and/or riparian buffers. Some examples of stream, wetland, or riparian buffer restoration include:

- Restoring a stream that has been degraded by stormwater runoff as well as riparian buffers surrounding it.
- Restoring a wetland degraded by nearby development.

This section only applies to projects similar to the above-listed examples. Note that some projects may consist of a combination of stream restoration and the installation of stormwater best management practices (BMPs) to manage stormwater runoff. *If this is the case, then guidance from this section as well as Section 8.0 must be followed.*

Some projects may qualify for Minor ERs/EIDs. (See Section 1.4.1 for the details of when these are allowed.) For Minor ERs/EIDs, complete the tables provided in Appendix M for the requirements in each section.

For Major ERs/EIDs, the guidance may allow alternative data, methodologies, and the way material is presented; *however, the format must always be followed.* Each subsection will advise if these are allowable.

- Alternative data sets other than those specified in this section may be proposed in certain subsections. *In all cases, alternative data sets must be identified, discussed, justified and compared with the corresponding data set specified in the guidance. An acceptable rationale for the preferred alternative data set to the one specified in the guidance must be provided* if it is to be approved.
- Alternative methodologies must be specified and discussed, and the findings compared with the findings based on the corresponding methodologies in the guidance. All alternative methodologies must include supporting data, calculations, assumptions and documentation so that results can be replicated.
- If material is presented in an alternative manner, the required discussion must be in the body of the ER/EID. Supporting information (e.g., maps, calculations, supporting data, etc.) may be included in an appendix rather than the body of the ER/EID. A tabular display of the data is encouraged where practicable.

As stated in Section 2, the report must follow the prescribed format in the guidance. ERs/EIDs for projects under this section must follow the format below:

- Upfront Information
- 1.0. Executive Summary
- 2.0. Current Situation
  - 2.1. Project Location
  - 2.2. Land Use
  - 2.3. Stream Characteristics (if applicable)

- 2.4 Wetland Characteristics (if applicable)
- 2.5 Riparian Buffer Characteristics
- 3.0. Future Situation
  - 3.1. Land Use Changes of Project Area
  - 3.2. Floodplain Changes
- 4.0. Purpose and Need
- 5.0. Alternatives Analysis
  - 5.1. Alternatives Description
  - 5.2. Present Worth Analysis
  - 5.3. Alternatives Analysis Summary
  - 5.4. Proposed Project Description
- 6.0. Environmental Information Document
- 7.0. Financial Analysis
- 8.0. Public Participation

## **9.1 Upfront Information**

Prepare the upfront information (e.g., Table of Contents, Appendices) in accordance with Section 2.2.1.

## **9.2 Executive Summary**

Prepare the Executive Summary in accordance with Section 2.2.2.

## **9.3 Current Situation**

The current situation must contain information regarding both the historical and existing land usage of the project area. Some of the topics below may or may not be applicable. Address topics that are applicable. If topics are not applicable, state as such and provide the reason it is not applicable.

### ***9.3.1 Project Location***

#### **Requirements**

Clearly identify the location of the project by describing the county and/or city where the project is located, intersections with other waterbodies, road crossings, and other landmarks that will enable the reader to identify the project area. Include a figure or reference a figure that is in another section of the ER/EID. Indicate the items discussed above as well as the starting and ending point of the stream or riparian buffer section to be restored or the boundaries of the wetlands to be restored.

#### **Minor ERs/EIDs**

- Complete Table 2.1.1 in Appendix M and place in the body of the ER/EID.
- Include the figure as described above in either the body of the ER/EID or an appendix. List the appropriate appendix reference in the table.

### **9.3.2 Land Use**

Land use, past, current, and future, have an impact on the watershed encompassing a stream and therefore can impact the quality of a stream. Follow the requirements below to characterize the land use for stream/wetland/buffer restoration projects.

#### **Requirements**

Describe the historical land use of the subwatershed. Discuss any trends, especially loss of vegetative cover, that may be occurring toward either environmental degradation or environmental improvement. If historical aerial photographs are available to show how land use patterns have changed, include the photographs and be sure that the location of the proposed project and any other major landmarks such as roadways and waterbodies are clearly defined.

Discuss the current land use of the subwatershed. The discussion must be based on land use plans and zoning. Provide a land use figure and/or a zoning figure that clearly shows the project location, roadways, waterbodies, and the beginning and ending of the stream restoration project. If such mapping is not available, provide an aerial photograph with the project location, roadways, waterbodies, and the beginning and ending of the stream or buffer restoration or boundaries of the wetland project clearly marked. Provide supporting information in the appendices of the ER/EID.

Also, describe the amount of impervious area by stating the percentage of the project area that is impervious. Discuss any impacts this may have on the current condition of the stream, wetland, or riparian buffer

#### **Minor ERs/EIDs**

- Complete Table 2.2.1 in Appendix M to characterize land use. Place this table in the body of the ER/EID.
- Provide any land use mapping and/or aerial photography in the body or an appendix of the ER/EID. List the appropriate reference in the table.
- Complete Table 2.2.2a and/or Table 2.2.2b in Appendix M based on zoning and land use mapping, respectively. Place each table in the body of the ER/EID.
- Complete both tables if both types of mapping are available or one or the other if only one type of mapping is available.
- Provide aerial photography and figures either in the body of the ER/EID or in an appendix. List the reference in the table.

Tables E.11.1 and E.11.2 in Appendix E show how the land use and zoning tables would be completed.

### **9.3.3 Stream Characteristics (if applicable)**

#### **Requirements**

If the project is a stream restoration project, describe the current state of the stream which includes the following information. If photographs are helpful in describing stream characteristics, include them with references in the appropriate section of the text.

- **Type of stream.** Discuss whether the stream is ephemeral, intermittent, or perennial. If the stream type changes within the segment to be restored, clearly label the transition points on the figure. Provide information about the methodology used to make stream type determinations. If the SWITC (Surface Water Identification Training and Certification) methodology was used to make this determination, include the score sheet and photos in an appendix.
- **Stream patterns and hydrology.** Describe any evidence of altered stream patterns or hydrology. Include a discussion of the history of the stream alteration, if known. Also, discuss how the hydrology of the watershed served by the stream has changed over the past ten years. Specifically discuss if bank erosion has occurred due to changes within the watershed. If aerial photos are available, include them.
- **Excessive sedimentation.** Discuss any evidence of sedimentation. Include whether sedimentation patterns have changed in the past ten years, and identify any known contributing factors such as nearby developments or land use changes, especially whether vegetative cover has been reduced. Discuss whether the LGU is approved to oversee the Sedimentation and Erosion Control locally and, if so, include a summary of enforcement actions that have been taken. In addition, discuss whether ordinances exist to address sedimentation from previously developed areas where adequate ground cover is not suitably maintained. Include these ordinances in an appendix of the ER/EID.
- **Aquatic species/habitats and water quality monitoring.** Discuss the aquatic species present and habitat that currently exists. Include data from any chemical and biological monitoring that indicates potential impairment. If significant changes have been noted in recent years, describe the changes. The discussion of water quality monitoring should encompass the past 20 years. Detail any trends that have resulted from the monitoring, and discuss any identified factors that have contributed to any significant changes in water quality monitoring during the time period for which data are available. Provide any supporting information in an appendix of the ER/EID.
- **Presence of man-made structures.** Describe any man-made structures that have been installed in the stream such as riprap, culverts, bridges, pipes, weirs, or anything that limits stream flow, aquatic species migration, etc. Include the condition of the structures (good, fair, or poor). Good means that the structure has good integrity and has been regularly maintained. Fair means that the structure has some integrity issues and has needed maintenance beyond the typical required maintenance. Poor means that the structure is in

bad shape and has not been maintained. Discuss the need to modify these structures to maintain or improve stream quality.

- **Topography.** Discuss the topography of the project area and the natural drainage patterns. Describe how development might have shifted drainage patterns. Show the project on a topographic map with the project and associated waterbodies clearly marked.

**Minor ERs/EIDs**

- Complete Table 2.3.1 in Appendix M and include in the body of the ER/EID.
- Provide a topographic figure either in the body of the ER/EID or in an appendix. List the figure reference in the table.
- All photographs or other supplementary information should be included in appendices of the ER/EID. List the appendices references in the table.

### 9.3.4 Stream Classification

**Requirements**

Provide information about the [stream classification](#), which is available from DWQ. If the stream is an unnamed tributary, then take the classification from the closest downstream named waterbody. Provide the listing that shows the stream's classification in the appendices of the ER/EID. Show the location of all streams within the subwatershed on a figure.

Also, discuss whether the subwatershed is impaired. Consult the most recent version of the [Integrated Report](#) for a finalized list of streams. State the cause of the impairment and provide the relevant pages showing the impairment in the appendices of the ER/EID. On the figure, show where impaired streams are located and key to a table listing the streams within the subwatershed.

**Minor ERs/EIDs**

- Complete Section 2.4.1 in Appendix M and provide in the body of the ER/EIDs.
- Include all supporting information such as stream classification with the appropriate stream(s) highlighted in an appendix of the ER/EID. List the appendix reference in the table.

Table E.11.3 in Appendix E provides an example of how the the table would be completed.

### **9.3.5 Wetland Characteristics (if applicable)**

For projects involving wetland restoration, describe the current state of the wetland including the following specific items as well as any additional information that is important to understand the conditions of the project area. These items should be discussed in the context of the state criteria. If photographs are helpful for describing wetland characteristics, include them with references to the photographs in the appropriate section(s) of the text.

- **Wetland type.** Describe the type of wetland.
- **Wetland size.** Describe the size of the wetland in acres.
- **Wetland function and importance.** Discuss the primary function of the wetland and its importance to the local ecosystem. Discuss whether the wetland has experienced any filling and/or draining related to natural or man-made causes. Note whether the function is impaired, and discuss any known stressors. Additionally, include information related to any impairments due to filling, draining, etc. Provide any supporting information in an appendix of the ER/EID.
- **Species.** Describe what vegetative and animal species are present in the wetlands. Discuss the vegetative species and density. Discuss the wildlife habitat within the wetlands and whether it will be restored and how. Specifically discuss whether threatened and endangered species exist or might exist. If so, explain how the restoration project might benefit or impact those species. Provide supporting information in an appendix to the ER/EID.
- **Soil characteristics.** Discuss the types of soils that are present within the wetlands and provide a soils map that shows the location of the restoration project and the types of soils as well as roadways and waterbodies. Describe the frequency and degree of saturation.
- **Subwatershed Impairment.** Discuss whether the subwatershed is impaired. Consult the most recent [Integrated Report](#) for a finalized list of streams. State the cause of the impairment and provide the relevant pages showing the impairment in the appendices of the ER. Show the location of any streams within the subwatershed on a figure. Highlight impaired streams and key to a table listing streams within the subwatershed.

### **Minor ERs/EIDs**

- Complete Tables 2.5.1 related to watershed characterization and place in the body of the ER/EID.
- Complete a figure showing the location(s) of streams within the subwatershed and place in the body or an appendix of the ER/EID. List the reference in the table.
- Provide any supporting information in an appendix to the ER/EID. List the appendix reference in the table.
- Complete Table 2.5.2 of Appendix M to discuss wetland characteristics and place in the body of the ER/EID.
- Place any supporting information in an appendix of the ER/EID. List the appendix reference in the table.
- Use Table 2.5.3 of Appendix M to discuss soils, and include this table in the body of the ER/EID.
- Provide all supporting information in an appendix of the ER/EID. List the appendix reference in the table.

Tables E.11.4 of Appendix E shows how this table would be completed.

### **9.3.6 Riparian Buffer Characteristics**

#### **Requirements**

For all projects, include a general discussion about the riparian buffers surrounding the stream(s) and/or wetland(s) that will be restored. Describe the current state of the buffers that includes the information below. If photographs will aid in the discussion, then include them in the appendices of the ER/EID with appropriate references made in the text of the ER/EID. Additionally, provide any other supporting information in an appendix to the ER/EID.

- **Vegetation.** Discuss the type of vegetation in the buffer and whether the vegetation type has changed in the past 20 years. Especially note if/when any degradation has occurred, and refer to photography where applicable.
- **Soil Types.** Discuss the type of soil that is in the buffer. State whether any erosion has occurred over the past 20 years, whether channelized flow has or is occurring, and whether any bare areas exist. Refer to photography where applicable.
- **Riparian Buffer Width.** Briefly discuss the buffer width (or ranges in width) and whether it has changed over the past 20 years (e.g., grown due to regulations or shrunk due to development). Use photography to show any width trends. Discuss areas where stormwater flows are conveyed through the buffer via ditches, pipes, etc.

**Minor ERs/EIDs**

- Complete Table 2.5.4 in Appendix M and include as part of the body of the ER/EID.
- Provide any photography, supporting material or other supporting information in an appendix of the ER/EID. List this appendix reference in the table.

**9.4 Future Situation**

The future situation will also provide a need for the project. It should describe the anticipated future characteristics of the project area as a result of the project itself and of land use changes.

***9.4.1 Land Use Changes of Project Area***

**Requirements**

Discuss the future land use of the area and the trends of the land use. Base the discussion on future land use plans and/or zoning information. If such information is not available, then provide the source from which the future land use was derived. Additionally, provide a figure that shows the project location, roadways, waterbodies, and starting and ending points of the stream project or riparian buffer or boundaries of the wetland project.

Describe any proposed developments by providing (1) the name of the development, (2) a brief description of the development, (3) the size of the development in terms of acreage, and (4) when the development will be constructed during the 20-year life of the loan. Show these developments on a figure that also includes (1) the location of the project, (2) roadways, and (3) waterbodies.

**Minor ERs/EIDs**

- Complete Tables 3.1.1 in Appendix M to describe future land use. Place the table in the body of the ER/EID.
- Where possible, show the land use changes in a figure. List the figure reference in the table.
- Provide the appropriate reference documentation for future land use in an appendix to the ER/EID. List the appendix reference in the table.
- Complete Table 3.1.2 in Appendix M to discuss proposed developments. Place this table in the body of the ER/EID.
- Include a figure that shows the location of proposed developments. List the figure reference in the table.
- In an appendix of the ER/EID, provide appropriate reference documentation
- For approved developments, provide a table that contains the information as discussed above.

Table E.11.5 in Appendix E shows how the proposed development table would be completed.

**9.4.2 Floodplain Changes**

**Requirements**

Discuss any changes to the 100-year floodplain that may occur. Reference the appropriate Flood Insurance Rate Map (FIRM) panel number, and show the location of the current and future 100-year floodplain on a figure. Additionally, describe the change of impervious surface amounts that will occur due to changes in land use within the project area.

**Minor ERs/EIDs**

- Complete the appropriate cell of Table 3.2.1 of Appendix M. Place this table in the body of the ER/EID.
- Complete the floodplain figure and place it either in the body of or an appendix to the ER/EID. List the figure reference in the table.
- Include any additional supporting information in an appendix of the ER/EID. List the appendix reference in the table.

**9.5 Purpose and Need**

Complete the Purpose and Need statement in accordance with Section 2.2.3.

## 9.6 Alternatives Analysis

### 9.6.1 Alternatives Description

The first part of the alternatives analysis to be summarized in Section 2.2.5 consists of describing the alternatives considered for the project. Describing the alternatives provides the opportunity to consider the impacts and benefits related to each alternative under consideration and provides the groundwork related to the present worth analysis (see Section 2.2.4). For stream, wetland, and riparian buffer restoration projects, the following must be considered:

- No-Action Alternative
- Other Alternatives
- Preferred Alternative

#### **Requirements**

The details of what is needed for the description of the alternatives will be discussed in Sections 9.6.1.1 through 9.6.1.3 below.

#### **Minor ERs/EIDs**

- Each of the alternatives discussed in the sections below must be included by using Tables 5.1.1 through 5.1.7 in Appendix M, as needed, for each alternative.
- Each alternative description must include the following:
  - A description of each alternative as described in the sections below. Where appropriate, include figures and maps.
  - For feasible alternatives, include discussions about the methods and materials used, ongoing maintenance, monitoring activities, etc.
  - For feasible alternatives, the capital cost and present worth as derived from the present worth analysis.
  - For all alternatives, a discussion regarding why the alternative was accepted or rejected, including capital cost, present worth, and environmental impacts.
- Place the tables for each alternative in the body of the ER/EID with all supporting information in an appendix.

#### **Major ERs/EIDs**

For Major ERs/EIDs, include the information as discussed above in the requirements for Minor ERs/EIDs. However, the information may be presented in narrative form, or in some combination of narrative with tables. Supporting documentation must be included in an appendix to the ER/EID.

### 9.6.1.1 *No-Action Alternative*

The No-Action Alternative must clearly explain what will happen in and around the project area if no stream, wetland, or riparian buffer restoration activities will occur. Consider and discuss, as appropriate, the following concepts:

- Will the stream/wetland/buffer quality remain at the current state, or will further degradation of water quality and/or habitat be reasonably anticipated?
- What will the impact of no action be to aquatic species living in the stream, wetland, or waterbody surrounded by the buffer in question?

Discuss both the environmental and economic impact of taking no action.

### 9.6.1.2 *Other Alternatives*

Other alternatives must include all feasible, environmentally sound options, and there must be at least one other alternative in addition to the Preferred Alternative addressed in Section 9.6.1.3 discussed. Provide a separate discussion for each alternative that was considered. Alternatives may include different methods and techniques and/or different stream or wetland sections on which to focus efforts. Consider and discuss, as appropriate, the following topics:

- Methods and equipment that will be used for the restoration/enhancement project
- Ongoing maintenance
- Monitoring and/or other methods to evaluate progress
- Limitations on achievable goals, if any

Additionally, provide diagrams that show how these alternatives will be implemented.

Each alternative must also describe the following:

**Goals of the project.** Clearly explain the desired results of the project. Provide these results as specific goals and quantify wherever possible. Explain how quantitative goals will be measured and/or how qualitative goals will be assessed. Also, show how the goals of the project link back to the project need and purpose as discussed in Section 2.2.3.

**Future monitoring.** Describe monitoring that will be conducted to evaluate progress toward the project goals in the short- and long-term. Include a discussion of the monitoring locations, monitoring frequency, and monitoring parameters that will be measured. Explain how future monitoring will be funded. Include a full copy of the monitoring report in the appendices to the ER/EID.

**Contingency plan.** If the goals discussed in this section are not met, then explain what the contingency will be. Note whether additional funding will be needed to implement contingency plans. If the proposed project is part of a multi-phase, long-range project, explain how not meeting the goals in this phase will impact future phases. Provide the contingency plan in the appendices of the ER/EID.

### *9.6.1.3 Preferred Alternative*

For the Preferred Alternative, explain in detail how the restoration/enhancement project will be accomplished. Consider and discuss, as appropriate, the following topics:

- Rationale for choosing this particular stream segment, wetland area, or riparian buffer zone.
- Methods and equipment that will be used for the restoration/enhancement project
- How will land use within the riparian buffers and project location be controlled in the future (e.g., conservation easements)
- Vegetative species to be planted
- Ongoing maintenance
- Monitoring and/or other methods to evaluate progress
- Limitations on achievable goals, if any

The project goals, future monitoring, and contingency plan must be discussed as described above in Section 9.6.1.2.

### *9.6.2 Present Worth Analysis*

Complete the present worth analysis in accordance with Section 2.2.4.

### *9.6.3 Alternatives Analysis Summary*

Complete the alternatives analysis summary in accordance with Section 2.2.5.

### *9.6.4 Proposed Project Description*

Prepare the proposed project description in accordance with Section 2.2.6.

## **9.7 Environmental Information Document**

Prepare the environmental information document in accordance with Section 12.

## **9.8 Financial Analysis**

Complete the financial analysis in accordance with Section 2.2.8.

## **9.9 Public Participation**

Complete the public participation section in accordance with Section 2.2.9.