

8.0 Stormwater Best Management Practices

The purpose of this section is to provide guidance on how to prepare an engineering report/environmental information document (ER/EID) for a project utilizing stormwater best management practices (BMPs) to control stormwater runoff. Some examples of stormwater BMPs may be:

- A bioretention cell used to capture and treat stormwater runoff from a parking lot in a local park.
- A level spreader and vegetated filter strip installed to protect riparian buffers from stormwater runoff.

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 BMPs to manage stormwater runoff. *If this is the case, then guidance from this section as well as Section 9.0 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 L 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.

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. Existing Land Use
 - 2.2. Existing Watershed Condition
 - 2.3. Existing Watershed Characterization
- 3.0. Future Situation
 - 3.1. Land Use and Zoning Changes
 - 3.2. Future Impervious Surface Area 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

8.1 Upfront Information

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

8.2 Executive Summary

Prepare the Executive Summary in accordance with Section 2.2.2.

8.3 Current Situation

The current situation should contain information regarding the existing land usage of the project area. Such information will enable the reviewer to gain a better understanding of the project area. It will also help to establish the need for the project. Complete the following sections according to the requirements below.

8.3.1 Project Area Definition

Requirements

Discuss in detail existing land use, watershed impairment, and drainage characteristics. Information about the current population for the project area should also be included.

Provide a project area map. Show the location of the project and clearly identify the project boundaries. The map must include roadways, drainage features (streams, wetlands, buffers, etc), existing stormwater control measures, existing impervious area, and any other relevant data. The map should be scaled and provide a North Arrow. Provide a table that includes relevant data, specifically, total project area, total existing impervious area, total drainage area, etc. Use surveying, aerial photography, and/or geographic information systems (GIS) to determine the existing impervious area.

Minor ERs/EIDs

- Complete Table 2.1.1 of Appendix L and place it in the body of the ER/EID.
- Complete the project area figure and place it either in the body of the ER/EID or in an appendix to the ER/EID. List the reference for the project area map in the table.

8.3.2 Existing Land Use

Part of determining the current situation is characterizing the existing land use patterns that are in the project area and all areas adjacent to the property area. Characterize the existing land use as discussed below.

1. Determine zoning and current land use.

Requirements

Provide a brief discussion of the zoning and land use that encompasses the project area and is adjacent to it. Provide a description of what each type of zoning means. Also include the different types of land use, both in the project area and drainage area. For example, a zoning classification of R-2 might mean residential usage at two dwelling units per acre, or the area may be considered low-density with adjacent land uses of commercial.

Minor ERs/EIDs

- Complete Tables 2.2.1 in Appendix L, which summarize the land use and zoning description.
- Complete Tables 2.2.2 and 2.2.3 in Appendix L, which specifically break out and define land use and zoning categories.
- Provide land use and zoning figures in the body of the ER/EID or an appendix to the ER/EID. List the appropriate figure references in the tables.
- All supporting information must be included in an appendix of the ER/EID. List the appropriate appendix references in the tables.

Tables E.10.1 and E.10.2 in Appendix E show how these tables would be completed.

2. Determine soils and topographic information.

Requirements

Discuss the soils that are found within the project area and the areas surrounding the project as well as the topography of the project area and areas surrounding the project. Provide a soils map and USGS topographic map as discussed below.

- **USGS topographic map.** Utilize a USGS topographic map to show the project location and how it relates to the surrounding area.
- **USGS soils map.** Show the location of the project and the associated soils. The figure must include a differentiation of the different soils in the project area, the project location, roadways, and waterbodies. It must be on a scale that allows for easy discernment of the different soil types.

Minor ERs/EIDs

- Complete Table 2.2.4 and include in the body of the ER/EID.
- Provide a soils map and USGS topographic map in the body of the ER/EID or in an appendix of the ER/EID. List the figure references in the table.
- Include any additional information in an appendix of the ER/EID.

Table E.10.3 in Appendix E shows how the table would be completed.

8.3.3 Existing Watershed Condition

Requirements

Another part of characterizing the watershed is to gain an understanding about the streams and other waterbodies within the watershed. Utilize information from the Division of Water Quality (DWQ) to determine the classification of any stream(s) within the watershed. Discuss the classification(s). Additionally, consult the most recent [Integrated Report](#) to determine if any of the waterbodies within the subwatershed are impaired. If they are, state as such and describe the type of impairment. Include information about both the classifications and impairments in the appendices of the ER/EID. For unnamed tributaries to streams, utilize the classification and use support status of the closest named stream downstream of the unnamed tributary.

Minor ERs/EIDs

- Complete Table 2.3.1 in Appendix L and include in the body of the ER/EID.
- Place stream classification information with the appropriate streams highlighted and relevant pages from the most recent Integrated Report in an appendix of the ER/EID. List the appendix reference in the table.
- Label all appropriate streams on a figure and key it to the table. List the figure reference in the table.

Table E.10.4 shows an example of how the table would be completed.

8.3.4 Existing Watershed Characterization

Requirements

Characterize the existing watershed conditions in the watershed where the project will be located. The following steps show how to complete this characterization. For all ERs/EIDs, provide mapping as described below. Then complete Steps 1 through 4.

1. Provide an overall drainage area map.

As most projects have a drainage area larger than the project area, show the location of the drainage areas as it relates to the project to provide an understanding of how the project relates to the surrounding area. The map must include the drainage area, the project location, roadways, and drainage features. Include this figure in the body of the ER/EID or in an appendix with appropriate references.

2. Provide the drainage area for the project.

If there are multiple locations for this project, provide the drainage area in feet squared (ft²) for each section separately. Then provide the total drainage area that will be impacted by the project. Also, include a figure in the ER/EID that is a scaled map showing the project location and the drainage area(s) that each part of the project will drain. Clearly define these totals for the

appropriate drainage area(s). For example, the project may cover three drainage areas that are 3,500 ft², 2,500 ft², and 5,500 ft². Show these on a map and provide in the ER/EID the total (11,500 ft²).

3. Provide additional off-site drainage areas.

If additional off-site drainage areas are present that may impact the project, then provide each drainage area in feet squared (ft²) separately before totaling. Include a figure in the ER/EID that is a scaled map showing how these off-site drainage areas relate to the project. Clearly specify the totals as described above.

3. Provide the total existing impervious area.

Determine the total existing impervious area in feet squared (ft²). Again, if there are multiple locations of existing impervious area, then list each separately. Include a figure in the ER/EID that is a scaled map showing how these impervious areas relate to the project. Clearly specify totals as discussed above. See the map description in Section 8.4 on page 8-2, for more information. Additionally, calculate the percent impervious area within the project area.

Minor ERs/EIDs

- Complete Table 2.4.1 in Appendix L and include it in the body of the ER/EID.
- Complete the drainage area map and key it to Table 2.4.1. Place the map in the body of the ER/EID or an appendix and list the appropriate reference in the table.
- Complete Table 2.4.2 in Appendix L and include it in the body of the ER/EID.
- Complete the off-site drainage area figure and key it to Table 2.4.2. Place the figure in the body of the ER/EID or an appendix and list the figure reference in the table.
- Complete Table 2.4.3 in Appendix L and include it in the body of the ER/EID.
- Complete the existing impervious area figure and key it to Table 2.4.3. Place the figure in the body of the ER/EID or in an appendix. List the appropriate reference in the table.

Table E.10.5 shows how 3.3.1 in Appendix M would be completed. Tables 3.3.2 and 3.3.3 in Appendix M would be completed in similar fashion.

8.4 Future Situation

After characterizing the current situation in terms of zoning, land use, drainage area, and percent impervious surface, determine the future situation. This is important because the future situation will establish the need for the project and will help ensure that the stormwater BMP is adequate for future stormwater flows.

8.4.1 Land Use and Zoning Changes

Requirements

Discuss any land use and/or zoning changes that may occur within the project area and adjacent to the project area. Provide the sources utilized in the discussion (e.g., comprehensive land use plans, zoning maps) in the appendices of the ER/EID. Additionally, provide land use and zoning change figures that spatially portray how these changes will occur. The figure must show the location of the project, the drainage area, and the future land use and/or zoning.

Minor ERs/EIDs

- Complete Table 3.1.1 in Appendix L and place it in the body of the ER/EID.
- Complete a figure that shows any future land use and/or zoning changes in the future. Include this figure in the body of the ER/EID or place it in an appendix. List the reference in the table.

8.4.2 Future Development Impacts

The LGU may have approved developments that may be in or adjacent to the proposed project's drainage area. For any approved developments, describe in detail what each development will contain and when in the 20-year life of the loan it will be built. For example, the drainage area may in three years contain a development that consists of 40 single family dwellings, ten duplexes, and a small shopping center may be built in Year 5 of the project's life.

Minor ERs/EIDs

- Complete Table 3.1.2 and provide in the body of the ER/EID.
- Include a figure that shows the location of these proposed developments. Place this figure in the body of the ER/EID or in an appendix. List the appropriate reference in the table.
- Place all documentation related to these proposed developments in an appendix of the ER/EID. List the appropriate reference in the table.

Table E.10.6 in Appendix E shows how this table would be completed.

8.4.3 Future Impervious Surface Area Changes

Requirements

Due to development within the drainage area of interest, the amount of impervious area may increase. Discuss how each proposed development within the drainage area will increase impervious surface. For example, the development discussed above will increase impervious surface in the drainage area from 45 percent to 55 percent.

Calculate the 1-year, 24-hour storm characterization in terms of runoff depth in inches, intensity in inches per hour, and the pre-development peak flow in cubic feet per second. This should be done for the existing condition and the future condition if there is expected to be a substantial increase in impervious surfaces for the area.

Minor ERs/EIDs

- Complete Table 3.2.1 in Appendix L for impervious surface changes. If the impervious surface change is expected to be substantial (e.g., greater than ten percent), then complete the remainder of the table that shows current stormwater and future stormwater characteristics.
- Include this table in the body of the ER/EID.

8.5 Purpose and Need

Complete the Purpose and Need statement in accordance with Section 2.2.6.

8.6 Alternatives Analysis

8.6.1 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 alternative 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 8.6.2). For stormwater BMP projects, the following must be considered:

- No-Action Alternative
- Best Management Practices Alternatives
- Preferred Alternative

Requirements

The details of what is needed for the description of the alternatives will be discussed in Sections 8.6.1.1 through 8.6.1.3 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, 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 preliminary design information for the proposed project, including preliminary design criteria for BMPs, operation and maintenance of the BMP, materials used, 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 backup 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.

8.6.1.1 No-Action Alternative

For this alternative, discuss what would happen if the project were not built. In answering this question, describe the social, economic, and environmental impacts that would occur from not constructing the project. In the rationale, describe why this alternative was not chosen, including whether it was feasible to continue as discussed in the no-action scenario.

8.6.1.2 Best Management Practice Alternatives

Describe and provide an analysis of at least two BMPs that could be implemented in the project area. Discuss the following for each alternative:

- Feasibility
- Environmental impacts (both construction impacts) and benefits (positive impacts on both hydrology and pollutant removal).
- Cost
- Estimated completion time (including construction sequence and schedule)
- Maintenance

Describe how each alternative will alter (positively or negatively) the watershed impairment as discussed in Section 8.4.2. If the project will have no effect on this impairment, then state as such.

Include and reference any details and preliminary BMP sizing calculations in the appendices of the ER/EID. See the North Carolina [Stormwater BMP Manual](#) for additional information related to BMP sizing.

8.6.1.3 Preferred Alternative

Indicate the preferred alternative from the Alternative Analysis. Discuss the rationale for its selection over the others listed in the alternative analysis. Include and reference any additional details and BMP sizing calculations in the appendices of the ER/EID. Provide the table as shown above for the preferred alternative and indicate that this is the preferred alternative.

Include descriptions, diagrams, and preliminary design criteria. Additionally, discuss any potential open space and recreational opportunities that would be associated with the project.

8.6.2 Present Worth Analysis

Complete the present worth analysis in accordance with Section 2.2.5.

8.6.3 Alternatives Analysis Summary

Complete the alternatives analysis in accordance with Section 2.2.5.

8.6.4 Proposed Project Description

Prepare the proposed project description in accordance with Section 2.2.6. Include in the project description, a bulleted list of all project components.

8.7 Environmental Information Document

Complete the environmental information document in accordance with Section 12.

8.8 Financial Analysis

Complete the financial analysis in accordance with Section 2.2.8.

8.9 Public Participation

Complete the public participation section in accordance with Section 2.2.9.